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Uncertainty Analysis and Risk Analysis of Hydrologic Models

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1.0 Introduction

Work on this task was authorized under On-Call Contract FCD 2003C018, Assignment No. 5. The objective of this assignment was to provide assistance to the District in determining the statistical significance of the hydrologic model, specifically using the Skyline Wash hydrologic model as part of the Sun Valley Area Drainage Master Plan.

1.1 Purpose and Scope of Work

This first task of a series of proposed tasks is the start of an uncertainty analysis of water resources technical areas that will eventually encompass hydrology, hydraulics, scour analysis, and other areas as deemed necessary. This current task is to develop procedures to determine the uncertainties of hydrologic modeling inputs and their relative effects on peak discharges. As the uncertainty procedures are described, they are applied to the Skyline Wash models and designed to show the techniques and typical results.

The eventual end products will be usable by practicing water resources engineers to perform uncertainty analyses. The uncertainty analysis will be beneficial in selecting the appropriate alternatives in relation to acceptable risk. Also, it would be helpful in determining the importance (or the relative influence on the results) of model inputs, which in turn, would be helpful in deciding the level of effort that should be expended in obtaining the input variables.

The purpose of this report is to present the procedures and results in a very brief manner and will be more explanatory when converted for general use by water resources engineers.

1.2 Acknowledgments

The preparation and review of this document could not have been completed without the input and review of many key individuals. We would like to thank the following individuals at the Flood Control District of Maricopa County: Mr. Bing Zhao, Ms. Valerie Swick, Mr. Doug Williams, Ms. Julie Cox, and Ms. Mona Merkevicius.

2.0 Procedure

This section details the developed procedures for Uncertainty Analysis and their application on the Skyline Wash hydrologic model.

2.1 General Description of Procedures

Two uncertainty analysis techniques were originally considered with this project: the Monte Carlo simulation method, and the first order analysis method. Through several trials and meetings, it was decided to use the Monte Carlo simulation method throughout the project. The Monte Carlo simulation was used because the first order of analysis is an approximate method and the Monte Carlo simulation is more accurate if enough simulations are performed.

2.2 Hydrologic Parameters

The desired end product is a probability density function (PDF) and a cumulative distribution function (CDF) of the peak discharge and volume at the alluvial fan apex of Skyline Wash. The alluvial fan apex is located at concentration point HC13 in the existing hydrologic model created as part of the Sun Valley ADMP for the 100-year, 6-hour flood peak. The association statistics are the mean peak discharge, the maximum, the minimum, and the standard deviation. The basis of the density function is the probability weighing of 3 hydrologic parameters. These parameters are precipitation, initial abstraction (IA), and the Green and Ampt loss rate parameter of hydraulic conductivity at natural saturation (XKSAT). These parameters were selected because they have the most influence on runoff volume and peak rates. Routing (lag) parameters were considered but not included because of their complexity which made it difficult and cumbersome to obtain statistical information. In addition, it was decided that the other three parameters had a greater influence on peak discharges.

2.3 Description of Procedure

The following is a brief description of the procedure to determine the PDF of the 100 year peak discharge for Skyline Wash. Detailed descriptions of each step are presented later in this report.

1. Research mean and range of values for the 100-year precipitation, initial abstraction and XKSAT.
2. Determine the mean and standard deviation for the 100-year 6-hour rainfall values based on NOAA Atlas 2. Compute the log-based mean and log-based standard deviation based on the formulas given by Mays and Tung if the log-normal random variable generator requires the log-based mean and standard deviation.
3. Determine the minimum, maximum, mode and standard deviation values for initial abstraction. Since the mean value is equal to 1/3*(min+max+mode), the mode can be solved easily if the mean is known. Note: standard deviation and mean are the required values for the lognormal PDF random variable generator.
4. Determine the mean and standard deviation for the Green Ampt hydraulic conductivity or the parameters that are used to generate the Green Ampt hydraulic conductivity. (Note: An alternate method that may have been necessary would have been to compute the log-based mean and log-based standard deviation based on formulas given by Mays and Tung, but only if the log-normal random variable generator required the log-based mean and standard deviation. However, it was found that this is not necessary, that our particular program performed the log calculations.)
5. Use @Risk to randomly generate a set of 100-year precipitation values, initial abstraction values and XKSAT values. Use log-normal probability distribution for the 100-year precipitation. Use log-normal for XKSAT or the parameters that are used to compute XKSAT such as bubbling pressure, pore distribution index... Use triangular distribution for initial abstraction or the parameters that are used to generate the initial abstraction such as curve number.
6. Input randomly generated values into HEC-1 input file and run HEC-1 to get the peak flow rates and runoff volumes (Note: three random variables must be generated simultaneously; do not fix any as constants).

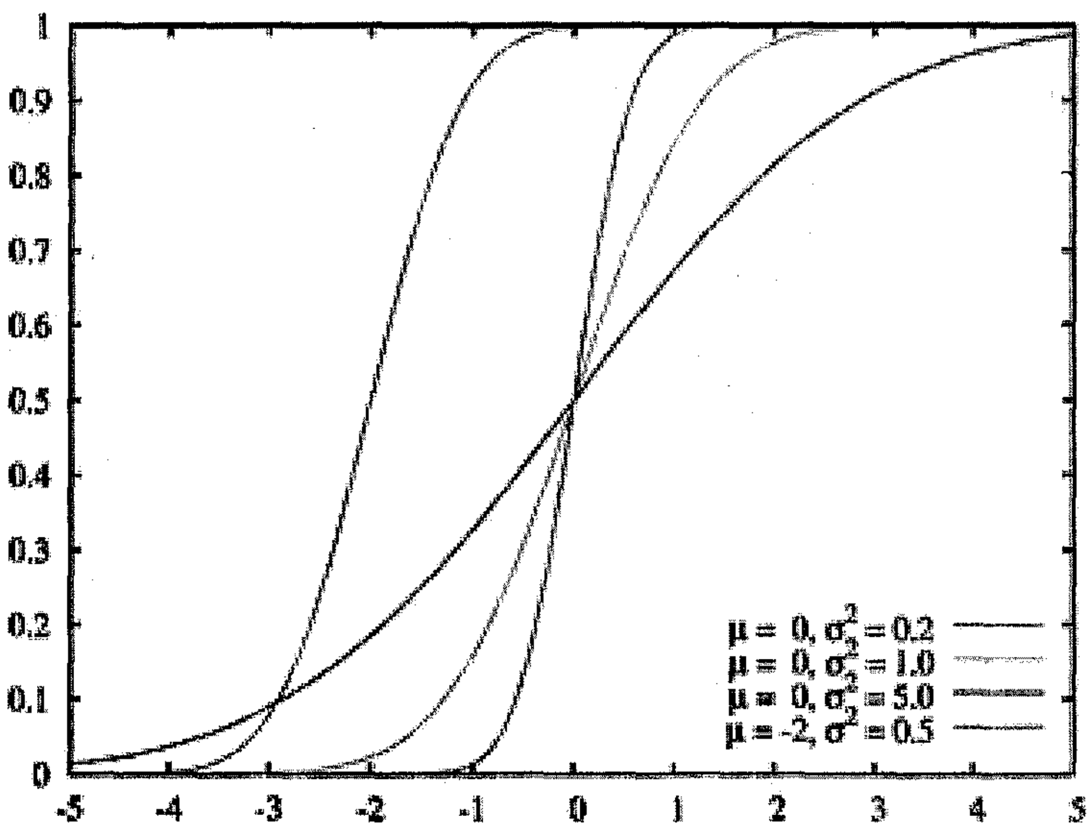
7. Repeat Step 5 and Step 6 for a large number of times, say 100, to obtain numerous peak flow rates and runoff volumes. The simulation number can be chosen such that the mean and standard deviation of peak and volume becomes convergent to a fixed value. Simulation 1 numbers for each of the three parameters were input into the first HEC-1 file, and so on, up to the chosen number of repetition. The minimum amount of repetition is 100 or more.
8. Compute the exceedance probability values for a series of peak flow rates and runoff volumes.

2.4 Descriptions of Computational Components

2.4.1 Probability Distribution Functions

To use the Monte Carlo simulation technique (described later), a probability density function had to be developed for each hydrologic variable. It has been demonstrated that nature produces variations about a mean value in a fashion that is termed normal or log-normal probability distribution (some also call it a cumulative probability curve or cumulative distribution function). This distribution looks as follows (from Wikipedia.org).

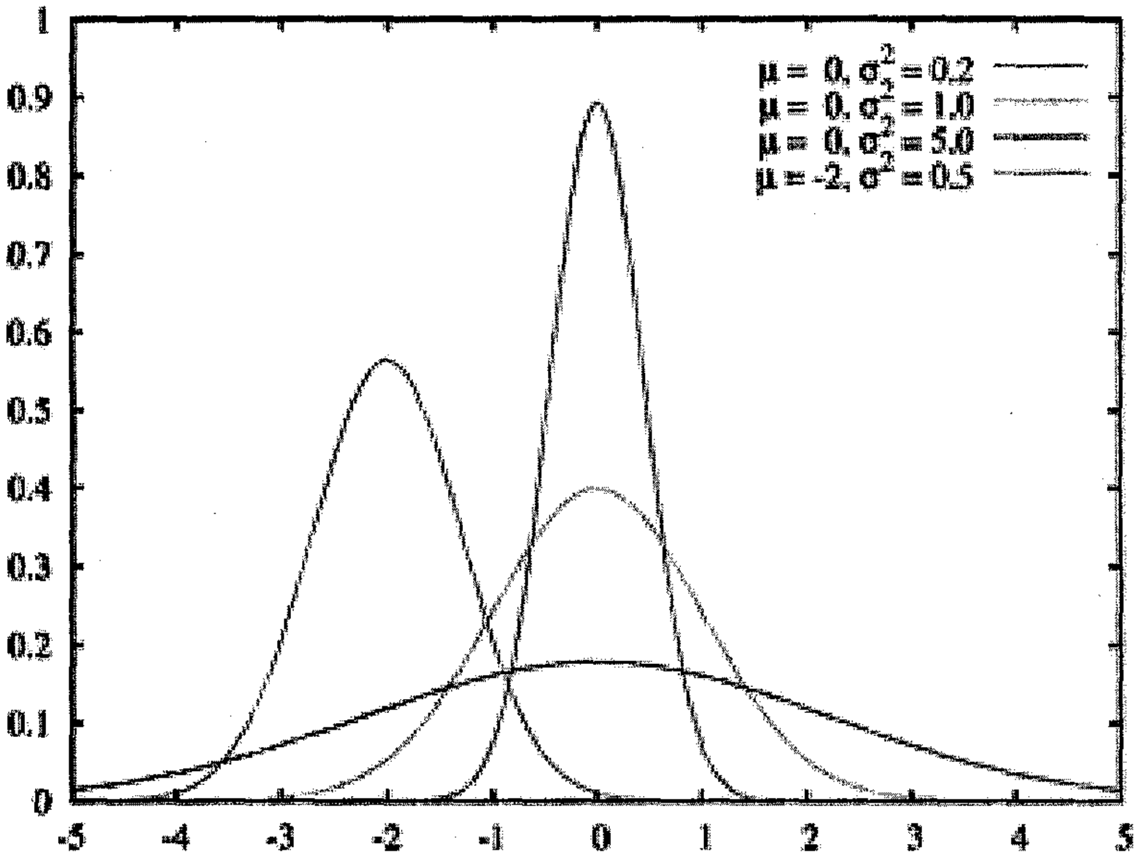
Figure 1. Example of a Cumulative Probability Curve



In this example, μ is the mean, σ is the standard deviation and σ^2 is the variance. The Y axis is the probability of occurrence in fractions and the x axis is the value of the function of interest. In this instance, μ is set to 0 and -2, but its value can be the mean value of any hydrologic parameter we select and the shape of the curve is determined by the variance.

While statisticians and mathematicians uniformly use the term "normal distribution" for this distribution, physicists sometimes call it a Gaussian distribution and, because of its curved flaring shape when converted to a probability density function (PDF), social scientists refer to it as the "bell curve. The following is an illustration of such a curve (from Wikipedia.org).

Figure 2. Example of a Probability Density Function (PDF) Curve



Note that as σ^2 (and standard deviation) increases, the base of the distribution increases, the mean stays the same, and the probability of the mean value decreases. This infers that the smaller the variance, the higher is the probability that the mean value occurs. In other words, this implies that the smaller the standard deviation, the more confident we can be in the selection of the mean as the appropriate value to use. For the uncertainty analyses, it is assumed that the selected hydrologic parameters have measurement and/or natural variations that behave in this manner. Therefore, a probability density function is determined for each major hydrologic input.

Many of the hydrologic inputs do not have statistical information such as standard deviation and true mean values. Often, these cited values, although physically based, were not actually measured but were "back computed" using models to fit observations - meaning that no statistical information could be obtained. Because of the lack of statistical information on some of the hydrologic parameters, it was decided to use a lognormal probability distribution that approximated the normal probability density function for the three hydrologic parameters. This is useful because many hydrologic parameters have means as well as lower and upper values. Such information is conducive to developing a lognormal distribution curve. The mean is then the average value of the variable and the standard deviation is the difference between the lower or upper value and the mean.

2.4.2 The Monte Carlo Technique

The Monte Carlo technique has inherently been used since humans started studying the world around them. If a phenomenon's behavior could not be explicitly determined by equations (often because it was not a perfect system), scientists would often vary input and observe the output. The inputs were generated randomly, but probability weighted, so that there would be no bias in the output. This was done many times to determine the probability of a certain outcome for a known range of input values. This process was formalized in the 1940s and termed the Monte Carlo technique because of the seemingly random but identifiable probability distributions of cards dealt in card games in Monte Carlo, which was the most prominent gambling destination of its time.

The Monte Carlo simulation (there are many types of simulations) used in this application is accomplished by repeatedly sampling values from the PDF of the hydrologic parameter to produce trial values of the parameter. These trials are then put into the HEC-1 model to produce peak discharges. The resulting PDF of the peak discharges are inherently determined by the PDF of the input parameter. When applying the Monte Carlo technique simultaneously to the 3 PDFs of the peak discharges resulting from the Monte Carlo simulations of the 3 hydrologic parameters, the 3 PDFs are all sampled to produce a series of peak discharges with associated statistical information. The Palisade's computer program @RISK was used to perform the Monte Carlo simulations; however, many other commercially available software programs are available that will perform these types simulations.

2.5 Development of HEC-1 files and Excel Spreadsheets

Monte Carlo simulations were performed on the HEC-1 input parameters using the @RISK software. The base HEC-1 model for Skyline wash was then used to create 100 new models for each of the three parameters, using the randomly generated numbers from the Monte Carlo simulations. Descriptions and detailed information on the analysis are contained in Appendix A of this report.

2.6 Hydrologic Parameters

2.6.1 Precipitation

The Skyline Wash HEC-1 input model was based on the 100-year, 6-hour storm. The Frequency Atlas of the Western United States, Volume VIII – Arizona (NOAA Atlas 2) listed the mean value for precipitation for Arizona for the 100-year, 6-hour storm as 3.50" with a standard error of 0.50". The Skyline Wash model, however, used a precipitation value of 3.40". A standard error of 0.50" and a precipitation value of 3.40" was used in this analysis to be consistent with the original Skyline model. It should be noted that NOAA Atlas 2 has been superseded as of August 2003 by NOAA Atlas 14; however, the Skyline Wash model used the NOAA Atlas 2 precipitation values. Therefore, the statistics were based on the original NOAA Atlas 2. The lognormal distribution requires a mean and a standard deviation. For this analysis it is reasonable to assume that the standard error and the standard deviation are equal, therefore, the coefficient of variation (standard deviation divided by the mean: 0.50"/3.40") is 15%. From this, 100 Monte Carlo simulations were performed using mean of 3.40" and a standard deviation of 0.50", resulting in 100 precipitation values for a 15% error. The 100 precipitation values were generated for input into the existing HEC-1 Skyline model (See Section 2.6.4).

2.6.2 Initial Abstraction, IA

To calculate the lognormal PDF for initial abstraction, the upper, lower, the "average" values and the standard deviation for initial abstraction were determined. The values given in Table 4.2, p. 4-17, in the Drainage Design Manual for Maricopa County (DDM) were used as the "average" values for each land use category. This table is included below for reference as Table 1.

Table 1. IA, RTMP, and Vegetative Cover Density for Representative Land Uses in Maricopa County

Land Use[1] Code	*Land Use Category*	Description	IA[2] Inches	RTIMP[2,3] %	Vegetation Cover[2,4] %
VLDR	Very Low Density Residential[1]	40,000 sq. feet and greater lot size	0.30	5	30
LDR	Low Density Residential[1]	12,000 – 40,000 sq. feet lot size	0.30	15	50
MDR	Medium Density Residential[1]	6,000 – 12,000 sq. feet lot size	0.25	30	50
MFR	Multiple Family Residential[1]	1,000 – 6,000 sq. feet lot size (# du/ac)	0.25	45	50
I1	Industrial 1[1]	Light and General	0.15	55	60
I2	Industrial 2[1]	General and Heavy	0.15	55	60
C1	Commercial 1[1]	Light, Neighborhood, Residential	0.10	80	75
C2	Commercial 2[1]	Central, General, Office, Intermediate	0.10	80	75
P	Pavement and Rooftops	Asphalt and Concrete, Sloped Rooftops	0.05	95	0
GR	Gravel Roadways & Shoulders	Graded and Compacted, Treated and Untreated	0.10	5	0
AG	Agricultural	Tilled Fields, Irrigated Pastures, slopes < 1%	0.50	0	85
LPC	Lawns/Parks/Cemeteries	Over 80% maintained lawn	0.20	Varies[5]	80
DL1	Desert Landscaping 1	Landscaping with impervious under treatment	0.10	95	30
DL2	Desert Landscaping 2	Landscaping without impervious under treatment	0.20	0	30
NDR	Undeveloped Desert Rangeland	Little topographic relief, slopes < 5%	0.35	Varies[5]	Varies[6]
NHS	Hillslopes, Sonoran Desert	Moderate topographic relief, slopes > 5%	0.15	Varies[5]	Varies[6]
NMT	*Mountain Terrain*	High topographic relief, slopes > 10%	0.25	Varies[5]	Varies[6]

Notes:
1. Other land use or zoning classifications, such as Planned Area Development and Schools must be evaluated on a case by case basis.
2. These values have been selected to fit many typical settings in Maricopa County; however, the engineer/hydrologist should always evaluate the specific circumstances in any particular watershed for hydrologic variations from these typical values.
3. RTIMP = Percent Effective Impervious Area, including right-of-way. Effective means that all impervious areas are assumed to be hydraulically connected. The RTIMP values may need to be adjusted based on an evaluation of hydraulic connectivity.
4. Vegetation Cover = Percent vegetation cover for pervious areas only.
5. RTIMP values must be estimated on a case by case basis.
6. Vegetation Cover values must be estimated on a case by case basis.

November 2003 (Draft)

After having researched the documents referenced in the DDM for initial abstraction, the statistical parameters behind the values listed in Table 1 were not found. Therefore, the information to obtain the upper and lower values for initial abstraction was determined from the equations and tables listed in the USDA SCS National Engineering Handbook (NEH) Section 4, Hydrology, Chapter 10, as shown below in Table 2.

Table 2. Curve Numbers (CN) and Constants for the Case $I_a = 0.2B$

1	2	3	4	5	1	2	3	4	5
CN for condition II	CN for conditions I	III	S values*	Curve* starts where P =	CN for condition II	CN for conditions I	III	S values*	Curve* starts where P =
			(inches)	(inches)				(inches)	(inches)
100	100	100	0	0	60	40	78	6.67	1.33
99	97	100	.101	.02	59	39	77	6.95	1.39
98	94	99	.204	.04	58	38	76	7.24	1.45
97	91	99	.309	.06	57	37	75	7.54	1.51
96	89	99	.417	.08	56	36	75	7.86	1.57
95	87	98	.526	.11	55	35	74	8.18	1.64
94	85	98	.638	.13	54	34	73	8.52	1.70
93	83	98	.755	.15	53	33	72	8.87	1.77
92	81	97	.870	.17	52	32	71	9.23	1.85
91	80	97	.989	.20	51	31	70	9.61	1.92
90	78	96	1.11	.22	50	31	70	10.0	2.00
89	76	96	1.24	.25	49	30	69	10.4	2.08
88	75	95	1.36	.27	48	29	68	10.8	2.16
87	73	95	1.49	.30	47	28	67	11.3	2.26
86	72	94	1.63	.33	46	27	66	11.7	2.34
85	70	94	1.76	.35	45	26	65	12.2	2.44
84	68	93	1.90	.38	44	25	64	12.7	2.54
83	67	93	2.05	.41	43	25	63	13.2	2.64
82	66	92	2.20	.44	42	24	62	13.8	2.76
81	64	92	2.34	.47	41	23	61	14.4	2.88
80	63	91	2.50	.50	40	22	60	15.0	3.00
79	62	91	2.66	.53	39	21	59	15.6	3.12
78	60	90	2.82	.56	38	21	58	16.3	3.26
77	59	89	2.99	.60	37	20	57	17.0	3.40
76	58	89	3.16	.63	36	19	56	17.8	3.56
75	57	88	3.33	.67	35	18	55	18.6	3.72
74	55	88	3.51	.70	34	18	54	19.4	3.88
73	54	87	3.70	.74	33	17	53	20.3	4.06
72	53	86	3.89	.78	32	16	52	21.2	4.24
71	52	86	4.08	.82	31	16	51	22.2	4.44
70	51	85	4.28	.86	30	15	50	23.3	4.66
69	50	84	4.49	.90					
68	48	84	4.70	.94	25	12	43	30.0	6.00
67	47	83	4.92	.98	20	9	37	40.0	8.00
66	46	82	5.15	1.03	15	6	30	56.7	11.34
65	45	82	5.38	1.08	10	4	22	90.0	18.00
64	44	81	5.62	1.12	5	2	13	190.0	38.00
63	43	80	5.87	1.17	0	0	0	infinity	infinity
62	42	79	6.13	1.23					
61	41	78	6.39	1.28					

*For CN in column 1.

If the variation in IA can be associated with uncertainty in the Antecedent Moisture Condition (AMC) of the soil, then the following procedure can be developed to explicitly determine this association. Equation 10.9 in the NEH is: IA = 0.2S where S is the potential maximum retention after runoff begins. S was calculated for each IA value listed in the DDM. The calculated S values were then associated with a curve number (CN) for AMC Condition II (average value), as shown in NEH Table 2. In Table 2, each CN listed is associated with upper and lower CN values. The S value for each land use category was then taken from the respective upper and lower CN values. The upper and lower IA values were then calculated from the upper and lower S values on the table. Thus, the upper and lower IA values, along with the standard deviation were computed for each land use category listed in Table 4.2 of the DDM.

An example is as follows. For Very Low Density Residential, the suggested IA is 0.30 from Table 1 of the DDM and is assumed to be associated with a CN of Condition II. For IA of 0.30, S is 0.30/0.2 = 1.5. From Table 2 and for S = 1.5, CN for Condition II is 87. Also from the table and for a CN of 87 for Condition II, CN is 73 and 95 for Condition I and III, respectively. For a CN of 73 and assuming now that it represents Condition II, S = 3.7 from Table 2. IA for the upper bound is 3.7/0.2 = 0.74. For CN of 95, Condition II, and Table 2 again, S = 0.526. IA for the lower bound is 0.526/0.2 = 0.1052, rounded to 0.11. The standard deviation is the square root of $((0.30^2+0.74^2+0.11^2-(0.30*0.74)-(0.30*0.11)-(0.74*0.11))/18) = 0.1328$.

The results for each land use are shown in Table 3, below.

Table 3. Basis of Triangular PDF for Initial Abstraction by Land Use

Land Use Category	Lower	IA (in)	Upper	Std Dev
Very Low Density Residential	0.11	0.30	0.74	0.1328
Low Density Residential	0.11	0.30	0.74	0.1328
Medium Density Residential	0.09	0.25	0.65	0.1170
Multiple Family Residential	0.09	0.25	0.65	0.1170
Industrial 1	0.05	0.15	0.44	0.0825
Industrial 2	0.05	0.15	0.44	0.0825
Commercial 1	0.04	0.10	0.30	0.0550
Commercial 2	0.04	0.10	0.30	0.0550
Pavement and Rooftops	0.02	0.05	0.20	0.0388
Gravel Roadways & Shoulders	0.04	0.10	0.30	0.0550
Agricultural	0.05	0.15	0.44	0.0825
Lawns/Parks/Cemeteries	0.07	0.20	0.53	0.0968
Desert Landscaping 1	0.04	0.10	0.30	0.0550
Desert Landscaping 2	0.11	0.20	0.74	0.1398
Undeveloped Desert Rangeland	0.13	0.35	0.86	0.1524
Hillslopes, Sonoran Desert	0.05	0.15	0.44	0.0825
Mountain Terrain	0.09	0.25	0.65	0.1170

The Skyline Wash HEC-1 input file listed three land-use types that were used in the 31 sub-basins: Hillslopes/Sonoran Desert, Mountain Terrain, and Rural 43. Rural 43 is not a land-use category listed in the new DDM; however, in the previous versions of DDM, Rural-43 was part of very low density residential. Therefore, it is assumed that the Rural-43 category used in the Skyline model has the same values as the very low density residential category in the new DDM.

A Monte Carlo simulation was then run using the lognormal distribution of the initial abstraction values for each of the three land-use types listed in the Skyline Wash model. 100 IA outputs were obtained for each land-use type. These IA output values were then adjusted according to the percent composites (because some land use categories were a composite of several other land uses) used in the original model. The 100 adjusted IA values were generated for input into the existing HEC-1 Skyline model (See Section 2.6.4).

2.6.3 Green and Ampt Loss Rate Parameter, XKSAT

Table 4.1 in the DDM lists values for XKSAT for eleven different soil texture classifications and is included below as Table 4 for reference:

Table 4. Green and Ampt Loss Rate Parameter Values for Bare Ground

Soil Texture Classification (1)	XKSAT Inches/hour (2)	PSIF Inches (3)	DTHETA[1] Dry (4)	DTHETA[1] Normal (5)	DTHETA[1] Saturated (6)
loamy sand & sand	1.20	2.4	0.35	0.30	0
sandy loam	0.40	4.3	0.35	0.25	0
loam	0.25	3.5	0.35	0.25	0
silty loam	0.15	6.6	0.40	0.25	0
silt	0.10	7.5	0.35	0.15	0
sandy clay loam	0.06	8.6	0.25	0.15	0
clay loam	0.04	8.2	0.25	0.15	0
silty clay loam	0.04	10.8	0.30	0.15	0
sandy clay	0.02	9.4	0.20	0.10	0
silty clay	0.02	11.5	0.20	0.10	0
clay	0.01	12.4	0.15	0.05	0

Notes:
1. Selection of DTHETA

Dry = Nonirrigated lands, such as desert and rangeland;
Normal = Irrigated lawn, turf, and permanent pasture;
Saturated = Irrigated agricultural land.

For the statistical parameters behind the XKSAT values, the DDM references a study conducted by Walter J. Rawls, *Green-Ampt Infiltration Parameters from Soils Data.* This study is attached in Appendix B. Equation 7 in that study calculates the saturated hydraulic conductivity based on three parameters: effective porosity (φ_e), bubbling pressure (ψ_b), and pore-size distribution index (λ). The equation is:

$$Ks = (((21*(\varphi_e^2/(\psi_b^2)))*((\lambda^2)/((\lambda+1)*(\lambda+2))))*3600)/2)/2.54 \qquad \text{(Equation 7)}$$

It also states that hydraulic conductivity is one-half of the saturated hydraulic conductivity. The Rawls study references a 1981 Rawls study, *Soil Water Characteristics*, which is attached as Appendix C. In Table 4 in *Soil Water*

Characteristics, the mean and standard deviation about the mean for effective porosity, bubbling pressure, and pore size distribution are listed.

The PDFs of the XKSAT parameters were developed using the lognormal distribution method. The lognormal distribution only requires the mean and standard deviation. Thus, the upper and lower values were used to develop the standard deviation. The results of the Monte Carlo simulation were used for further analysis in equation 7 to produce XKSAT values.

Table 5. Basis of Triangular PDF for Bubbling Pressure (ψb) by Soil Type

Soil Description	Mean	Lower	Upper	Std Dev
Loamy Sand	20.58	-4.04	45.20	24.620
Sandy Loam	30.20	-3.61	64.01	33.810
Loam	40.12	-20.07	100.30	60.180
Silty Loam	50.87	-7.68	109.40	58.530
Sandy Clay Loam	59.41	-4.62	123.40	63.990
Clay Loam	56.43	-11.44	124.30	67.870
Silty Clay Loam	70.33	-3.26	143.90	73.570
Sandy Clay	79.48	-20.15	179.10	99.620
Silty Clay	76.54	-6.47	159.60	83.060
Clay	85.60	-4.92	176.10	90.500

Table 6. Basis of Triangular PDF for Pore Size Distribution (λ) by Soil Type

Soil Description	Mean	Lower	Upper	Std Dev
Loamy Sand	0.553	0.234	0.872	0.319
Sandy Loam	0.378	0.140	0.616	0.238
Loam	0.252	0.086	0.418	0.166
Silty Loam	0.234	0.105	0.363	0.129
Sandy Clay Loam	0.319	0.079	0.559	0.240
Clay Loam	0.242	0.070	0.414	0.172
Silty Clay Loam	0.177	0.039	0.315	0.138
Sandy Clay	0.223	0.048	0.398	0.175
Silty Clay	0.150	0.040	0.260	0.110
Clay	0.165	0.037	0.293	0.128

Table 7. Basis of Triangular PDF for Effective Porosity (φe) by Soil Type

Soil Description	Mean	Lower	Upper	Std Dev
Loamy Sand	0.401	0.225	0.577	0.072
Sandy Loam	0.412	0.096	0.728	0.129
Loam	0.434	0.189	0.679	0.100
Silty Loam	0.486	0.261	0.711	0.092
Sandy Clay Loam	0.330	0.097	0.563	0.095
Clay Loam	0.39	0.118	0.662	0.111
Silty Clay Loam	0.432	0.224	0.640	0.085
Sandy Clay	0.321	0.042	0.600	0.114
Silty Clay	0.423	0.205	0.641	0.089
Clay	0.385	0.101	0.669	0.116

The values for XKSAT calculated from Equation 7 were for the saturated condition of XKSAT. Therefore those values were reduced by a factor of two, multiplied by 3600, and divided by 2.54 to get a resulting hydraulic conductivity in inches/hr. For each HEC-1 run, the simulated XKSAT values were adjusted according to the soil types, soil composite percentages, and vegetation factors listed in the original Skyline Model. The Monte Carlo method was run 100 different times to produce 100 different probability weighted XKSAT values for each subbasin.

2.6.4 Combined HEC-1 Runs

The 100 simulated XKSAT values for each subbasin, the precipitation values, and the adjusted IA values run were then input into the HEC-1 Skyline model. The original Skyline Wash HEC-1 model is attached in Appendix D for reference. As previously stated, the first randomly generated value for each of the three parameters was input into the first HEC-1 run, and so on, up to 100. This resulted in 100 different flow and volume values for the Skyline model and concentration point HC13, at the apex of the fan.

2.7 Results from Combining PDFs of Peak Discharges

The peak discharges and volumes resulting from the Monte Carlo simulations of variations in precipitation, initial abstraction, and the Green and Ampt XKSAT parameter were obtained from the HEC-1 output. The exceedance probability values were computed by ranking the values and computing the percentiles. The results are presented in Tables 8 and 9 for flows and volumes, respectively. Additionally, the exceedance probability function was graphed in Figures 3 and 4. Although the resulting CDF appears rough, additional simulations beyond the 100 performed in this study would provide a graphically smoother line.

Table 8. Exceedance Probability Values for Peak Flow Rates

Peak Flow Rates (cfs)	Exceedance Probability (Risk)
791	0.95
916	0.90
1720	0.80
3090	0.70
3810	0.60
3892	0.50
4308	0.40
5091	0.30
5106	0.20
5404	0.10
6195	0.05

Figure 3. CDF of Peak Discharges for Combined Variations in Precipitation, Initial Abstraction, and XKSAT

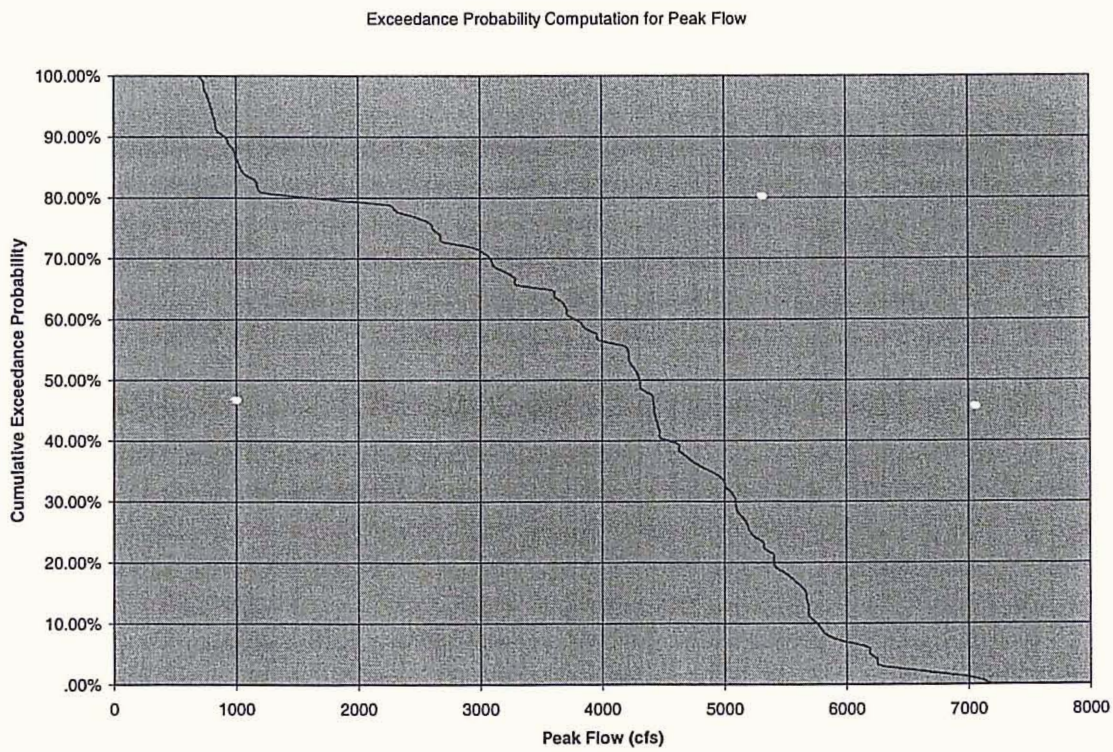
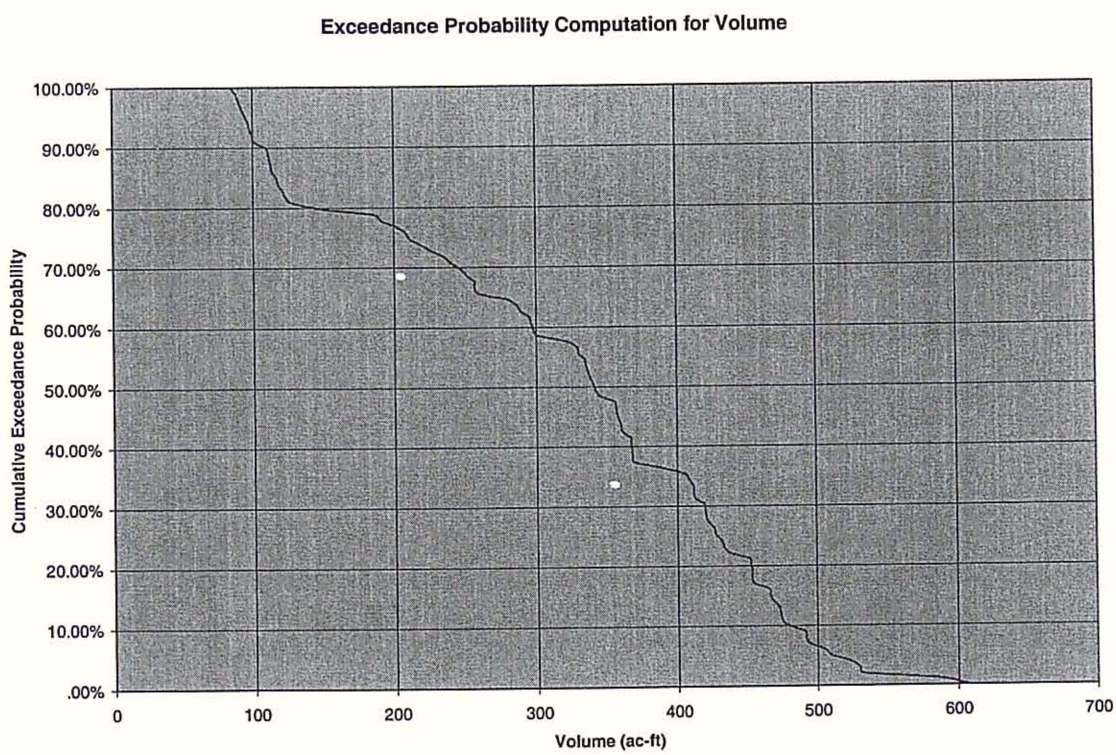


Table 9. Exceedance Probability Values for Peak Volume

Peak Volume (ac-ft)	Exceedance Probability (Risk)
95	0.95
108	0.90
147	0.80
245	0.70
297	0.60
341	0.50
368	0.40
420	0.30
453	0.20
480	0.10
512	0.05

Figure 4. CDF of Peak Volume for Combined Variations in Precipitation, Initial Abstraction, and XKSAT



3.0 Conclusions

The Uncertainty Analysis yielded a 90% confidence interval range in flows and volume at the apex of the fan on Skyline Wash based on the uncertainty statistics of three important hydrologic parameters: initial abstraction (IA), hydraulic conductivity (XKSAT), and precipitation. Exceedance probability, or risk, tables were created, which can be applied during future usages of the peak flow or volumes in hydraulic computations and design.

The procedure developed for performing the Uncertainty Analysis can be further developed into a manual for practicing engineers in the future. Additionally, this procedure can be researched for use in other water resource arenas, such as hydraulics, scour, and geomorphology.

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Appendix A - Excel Description of Spreadsheet Inputs

Excel Description of Spreadsheet Inputs

Input data

This contains all the input spreadsheets needed to create the Monte Carlo simulations for IA, XKSAT, and the precipitation input files needed to do the 100 simulations to calculate the values that were input into the HEC-1 model. There are many tabs in "Input_data" that show how the composites were created to simulate the original Skyline model.

The "precip" tab shows the lognormal distribution inputs used in the computation.

The "IA Table" tab shows a table that explains the calculations behind finding the statistical parameters behind IA (NEH 4 and CN used to determine upper and lower values and standard deviation for lognormal distribution).

The IA values for each land use type were then put into the "parameters" table to create the same composites as used in the original file.

The "parameters" tab table shows the composites used for each of the 31 subbasins. This table was created to simulate the existing Skyline model. It shows % soil types and % land use types.

The "XKSAT", "XKSAT Table", and "XKSAT Soils" tabs were created for my reference.

The "XKSAT Soils-log" tab shows the mean and the process used to calculate the standard deviation values for each soil type to be used for the lognormal distribution (parameters based on the equation and the table in Rawles research)

The "Soil Types" tab was created to simulate the actual soil type number composites used in the original model.

The "area" tab was created for my reference

The "MC Inputs" tab shows the mean and standard deviation values for each parameter and the MC lognormal distribution formula calculates a value for each one

The tabs entitled Final_IA, Final_Precip, and Final_XK show the values that were used for each of the 31 subbasins for a given Monte Carlo simulation. The spreadsheet was simulated 100 times and each one of the Final_ sheets was printed 100 times. The values for each of the 31 subbasin for each of the 100 simulations were entered into the HEC-1 model.

For precipitation: The "MC Inputs" tab created the precip lognormal distribution simulation, and the FInal_Precip shows this value (100 different simulations done). These values were entered into HEC-1.

For IA: The "MC Inputs" tab referenced the "IA" table to get the lognormal distribution needed. The "Parameters" tab then took the MC simulated value and applied the appropriate composite to each subbasin. These composite values were then shown in "Final_IA" for entry into HEC-1. This was done 100 different times.

For XKSAT: The "XKSAT Soils-log" provided the statistical parameters needed in the "MC Simulation" tab. "Soil types" then took the MC simulated values to create a composite for each soil type number. This value was then brought into "Parameters" to create the same composites of soil numbers that was used in the original model. These composite values were then shown in "Final_XKSAT" for entry into HEC-1. This was done 100 different times.

Exceedance Probability:

This spreadsheet shows the 100 different HEC-1 flows calculated for the 100 HEC-1 iterations for IA, XKSAT, and precipitation.

Exceedance Probability Computation for Peak Flow

Peak Flow (cfs)	*Rank*	*Percent*	*Exceedance Probability for Peak*
7195	1	100.00%	.00%
7036	2	98.90%	1.10%
6654	3	97.90%	2.10%
6267	4	96.90%	3.10%
6249	5	95.90%	4.10%
6191	6	94.90%	5.10%
6178	7	93.90%	6.10%
5967	8	92.90%	7.10%
5840	9	91.90%	8.10%
5794	10	90.90%	9.10%
5745	11	89.80%	10.20%
5690	12	88.80%	11.20%
5685	13	87.80%	12.20%
5684	14	86.80%	13.20%
5669	15	85.80%	14.20%
5665	16	84.80%	15.20%
5619	17	83.80%	16.20%
5562	18	82.80%	17.20%
5502	19	81.80%	18.20%
5420	20	80.80%	19.20%
5402	21	79.70%	20.30%
5400	22	78.70%	21.30%
5324	23	77.70%	22.30%
5315	24	76.70%	23.30%
5241	25	75.70%	24.30%
5200	26	74.70%	25.30%
5185	27	73.70%	26.30%
5154	28	72.70%	27.30%
5107	29	71.70%	28.30%
5094	30	70.70%	29.30%
5090	31	69.60%	30.40%
5062	32	68.60%	31.40%
5008	33	67.60%	32.40%
4995	34	66.60%	33.40%
4938	35	65.60%	34.40%
4844	36	64.60%	35.40%
4750	37	63.60%	36.40%
4690	38	62.60%	37.40%
4631	39	61.60%	38.40%
4627	40	60.60%	39.40%
4476	41	59.50%	40.50%
4474	42	58.50%	41.50%
4456	43	57.50%	42.50%
4444	44	56.50%	43.50%
4430	45	55.50%	44.50%
4429	46	54.50%	45.50%
4418	47	53.50%	46.50%
4410	48	52.50%	47.50%
4325	49	51.50%	48.50%

Exceedance Probability Computation for Peak Flow

Peak Flow (cfs)	*Rank*	*Percent*	*Exceedance Probability for Peak*
4312	50	50.50%	49.50%
4299	51	49.40%	50.60%
4273	52	48.40%	51.60%
4240	53	47.40%	52.60%
4219	54	46.40%	53.60%
4217	55	45.40%	54.60%
4188	56	44.40%	55.60%
3975	57	43.40%	56.60%
3959	58	42.40%	57.60%
3862	59	41.40%	58.60%
3822	60	40.40%	59.60%
3721	61	39.30%	60.70%
3714	62	38.30%	61.70%
3683	63	37.30%	62.70%
3616	64	36.30%	63.70%
3604	65	35.30%	64.70%
3296	66	34.30%	65.70%
3291	67	33.30%	66.70%
3217	68	32.30%	67.70%
3117	69	31.30%	68.70%
3097	70	30.30%	69.70%
3043	71	29.20%	70.80%
2944	72	28.20%	71.80%
2692	73	27.20%	72.80%
2678	74	26.20%	73.80%
2618	75	25.20%	74.80%
2597	76	24.20%	75.80%
2479	77	23.20%	76.80%
2314	78	22.20%	77.80%
2258	79	21.20%	78.80%
1730	80	20.20%	79.80%
1208	81	19.10%	80.90%
1173	82	18.10%	81.90%
1155	83	17.10%	82.90%
1069	84	16.10%	83.90%
1036	85	15.10%	84.90%
1016	86	14.10%	85.90%
990	87	13.10%	86.90%
979	88	12.10%	87.90%
937	89	11.10%	88.90%
917	90	10.10%	89.90%
843	91	9.00%	91.00%
831	92	8.00%	92.00%
821	93	7.00%	93.00%
804	94	6.00%	94.00%
791	95	5.00%	95.00%
774	96	4.00%	96.00%
757	97	3.00%	97.00%
733	98	2.00%	98.00%

Exceedance Probability Computation for Peak Flow

Peak Flow (cfs)	Rank	Percent	Exceedance Probability for Peak
730	99	1.00%	99.00%
693	100	.00%	100.00%

Exceedance Probability Computation for Runoff Volume

Runoff Volume (ac-ft)	*Rank*	*Percent*	*Exceedance Probability for Runoff Volume*
608	1	100.00%	.00%
588	2	98.90%	1.10%
532	3	97.90%	2.10%
530	4	96.90%	3.10%
523	5	95.90%	4.10%
510	6	94.90%	5.10%
505	7	93.90%	6.10%
494	8	92.90%	7.10%
492	9	91.90%	8.10%
491	10	90.90%	9.10%
478	11	89.80%	10.20%
475	12	88.80%	11.20%
474	13	87.80%	12.20%
473	14	86.80%	13.20%
469	15	85.80%	14.20%
467	16	84.80%	15.20%
466	17	83.80%	16.20%
455	18	82.80%	17.20%
454	19	80.80%	19.20%
454	19	80.80%	19.20%
453	21	79.70%	20.30%
452	22	78.70%	21.30%
437	23	77.70%	22.30%
432	24	75.70%	24.30%
432	24	75.70%	24.30%
428	26	74.70%	25.30%
427	27	73.70%	26.30%
423	28	72.70%	27.30%
421	29	71.70%	28.30%
420	30	69.60%	30.40%
420	30	69.60%	30.40%
413	32	68.60%	31.40%
412	33	66.60%	33.40%
412	33	66.60%	33.40%
406	35	64.60%	35.40%
406	35	64.60%	35.40%
390	37	63.60%	36.40%
369	38	62.60%	37.40%
368	39	61.60%	38.40%
367	40	58.50%	41.50%
367	40	58.50%	41.50%
367	40	58.50%	41.50%
361	43	57.50%	42.50%
360	44	56.50%	43.50%
357	45	54.50%	45.50%
357	45	54.50%	45.50%
356	47	52.50%	47.50%
356	47	52.50%	47.50%
345	49	51.50%	48.50%

Exceedance Probability Computation for Runoff Volume

Runoff Volume (ac-ft)	*Rank*	*Percent*	*Exceedance Probability for Runoff Volume*
342	50	50.50%	49.50%
340	51	49.40%	50.60%
338	52	48.40%	51.60%
335	53	46.40%	53.60%
335	53	46.40%	53.60%
334	55	45.40%	54.60%
330	56	44.40%	55.60%
329	57	43.40%	56.60%
321	58	42.40%	57.60%
301	59	41.40%	58.60%
298	60	40.40%	59.60%
296	61	39.30%	60.70%
295	62	38.30%	61.70%
289	63	37.30%	62.70%
286	64	36.30%	63.70%
279	65	35.30%	64.70%
259	66	34.30%	65.70%
257	67	32.30%	67.70%
257	67	32.30%	67.70%
251	69	31.30%	68.70%
247	70	30.30%	69.70%
240	71	29.20%	70.80%
235	72	28.20%	71.80%
226	73	27.20%	72.80%
219	74	26.20%	73.80%
211	75	25.20%	74.80%
208	76	24.20%	75.80%
202	77	23.20%	76.80%
191	78	22.20%	77.80%
186	79	21.20%	78.80%
149	80	20.20%	79.80%
127	81	19.10%	80.90%
123	82	18.10%	81.90%
121	83	17.10%	82.90%
118	84	16.10%	83.90%
117	85	15.10%	84.90%
114	86	14.10%	85.90%
112	87	12.10%	87.90%
112	87	12.10%	87.90%
110	89	10.10%	89.90%
110	89	10.10%	89.90%
101	91	9.00%	91.00%
100	92	8.00%	92.00%
98	93	7.00%	93.00%
97	94	6.00%	94.00%
95	95	5.00%	95.00%
93	96	4.00%	96.00%
91	97	3.00%	97.00%
88	98	1.00%	99.00%

Exceedance Probability Computation for Runoff Volume

Runoff Volume (ac-ft)	*Rank*	*Percent*	*Exceedance Probability for Runoff Volume*
88	98	1.00%	99.00%
84	100	.00%	100.00%

Appendix B – *Soil Water Characteristics*

PAPER NO. 81-2510

SOIL WATER CHARACTERISTICS

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SUMMARY: A comprehensive compilation of soil water and hydraulic properties for 1,323 soils with about 5,350 horizons from 32 states are summarized. The Brooks and Corey equation parameters, soil water retention volumes at 0.33 and 15 bar, and saturated hydraulic conductivities for the major soil texture classes, are reported. Relationships for predicting water retention volumes and saturated hydraulic conductivities based on soil properties are also presented.

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SOIL WATER CHARACTERISTICS[1]

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ABSTRACT

Relationships of soil water tension and conductivity with soil water content are needed to quantify plant available water and to model the movement of water and solutes in and through soils. Field and laboratory measurement of these hydraulic soil properties is very difficult, laborous, and costly. To provide the best estimates possible from previous analyses, a comprehensive search of the literature and data sources for hydraulic conductivity and related soil-water data was made in 1978. From this search, data for 1,323 soils with about 5,350 horizons from 32 states were summarized. Reported here are summaries of the soil profile descriptions, soil textures, particle size distributions, organic carbon contents, bulk densities, selected chemical data, hydraulic conductivities, soil water retention data, sample location, and the specific reference or data source. The Brooks and Corey equation parameters, soil water retention volumes at 0.33 bar and 15 bar, and saturated conductivities for the major soil textures classes are reported. Relationships for predicting water retention volumes for particular tensions and saturated hydraulic conductivities based on soil properties are also presented.

INTRODUCTION

To incorporate the principles of soil water physics into hydrologic modeling (Mein and Larson, 1973), it is necessary to specify the relationships between soil tension and hydraulic conductivity as a function of soil water content. Measurement of these relationships is very costly and time consuming, making this approach difficult to use in watershed hydrology modeling. To overcome these difficulties, an extensive literature and data search for soil water retension, hydraulic conductivity, and related soils information was performed in 1978. In addition, more than 400 soil scientists were contacted, many of whom contributed unpublished data. The results of this survey are summarized in two parts: (1) the soil water retention and analysis data base and analysis and (2) the hydraulic conductivity data base and analysis.

WATER RETENTION-MATRIC POTENTIAL

The literature and data search for water retention and related soils information produced 30 sources of data each covering at least a matric suction range from 100 cm to 2,000 cm. The data sources are given in Table 1 and contain 1,323 soils with about 5,350 horizons. As shown in Figure 1, the data were from 32 states. Table 2 contains a summary of the data for each soil listed alphabetically by soil series name. Included are location (state and county), source reference number, range of moisture tension values, number of

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[1]Contribution of the USDA-ARS Hydrology Laboratory, Beltsville, Maryland, USDA-ARS, Northwest Watershed Research Center, Boise, Idaho, and USDA-ARS, Pullman, Washington.

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diversity of soils and methods used to obtain data. Even though the Gupta and Larson (1979) equations produced acceptable results there is a need for a series of prediction equations utilizing different available soils data. We developed three levels of multiple linear regression analysis relating the soil water retention at specific matric potentials to 1) percent particle size content (sand, silt, clay), organic matter content, and bulk density; 2) percent particle size content, organic matter, bulk density and 15 bar water retention; and 3) percent particle size content, organic matter, bulk density, and 1/3 and 15 bar water retention. These levels of analysis demonstrate the predictive ability achieved by adding factors which require more costly and/or time consuming laboratory procedures to the soil survey data analysis. For example, particle size distribution and organic matter data are the least expensive data to obtain while 1/3 bar water retention and bulk density data are the most expensive. The 15 bar water retention value is an intermediate cost item.

The three levels of regression equations are summarized in table 5 for the 12 matric potentials reported in the Gupta and Larson (1979) paper. The addition of the 15 bar water content to the particle size data, bulk density and organic matter content markedly increased the accuracy, especially in the range of -.33 to -10 bar water content while the addition of both the -0.33 and -15 bar water contents caused a still greater increase in the accuracy at all water contents. In general, the -0.33 bar value has greater value at the potentials less than -0.33 bar, and the -15 bar value has greater value above the -0.33 bar value.

The data used to develop the equations in table 5 included 2,541 soils horizons with a wide range of sand (mean 56%, range 0.1-99%), silt (mean 26%, range 0.1-93%), clay (mean 18%, range 0.1-94%; organic matter (mean 0.66, range 0.1 - 12.5%; bulk density (mean 1.42 gm/cm^3), range 0.1 - 2.09). These represent most agricultural soils. Soils included both expanding (montmorillonite) and nonexpanding (kolinite, illite, chlorite, and vermiculite) type clay minerals.

HYDRAULIC CONDUCTIVITY

A generalized set of unsaturated hydraulic conductivity values was defined for the USDA soil texture classes (SCS, 1975) by combining the results of numerous experiments reported in literature. Table 6 contains the principle references from which the unsaturated hydraulic conductivity data were obtained. The generalized conductivity curves were defined by first digitizing the many reference curves by enough points to adequately define them by straight line segments. Using information from the reference or standard soil survey reports, these data were classed and sorted according to the USDA soil texture classes. An average representative curve was estimated by visual analyses for each soil texture class. Some minor adjustments of the average curves were made to provide a uniform family of relationships as shown in figure 2.

The saturated hydraulic conductivities derived from figure 2 are given in table 4. Using the saturated hydraulic conductivity data set compiled by Mualem (1976) a set of mean saturated hydraulic conductivity values were

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TABLE 2. SUMMARY OF SOILS

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	MOISTURE TENSION RANGE OF TENS(CM)	LOCATION STATE	LOCATION COUNTY	KEY
1	AASTAD	X	16	7						9	102-15300	MINNESOTA	CHIPPEWA	11
2	AASTAD	X	17	6						9	102-15300	MINNESOTA	LYON	11
3	ABILENE	X	17	4				X		5	102-15300	TEXAS		30
4	ABILENE	X	17	5				X		5	102-15300	TEXAS		30
5	ACADIA	X	12	1						7	337-15300	LOUISIANA	RAPIDES	8
6	ADAMS	X	10	3						5	102-15300	MAINE	CUMBERLAND	6
7	ADAMS	X	10	4						5	102-15300	MAINE	SOMERSET	6
8	ADAMS	X	2	5						5	102-15300	MAINE	YORK	6
9	ADAMSVILLE	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	25
10	ADLER	X	15	2						6	60-15300	TENNESSEE	DYER	141
11	ALAMANCE	X	14	2						5	50-15300	NORTH CAROLINA	CHATHAM	20
12	ALAPAHA	X	2	4						5	102-15300	GEORGIA	TIFT	29
13	ALAPAHA	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
14	ALAPAHA	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
15	ALAPAHA	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
16	ALBANY	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
17	ALBANY	X	2	8	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
18	ALBANY	X	6	3	X	X	X	X	X	10	20-15300	FLORIDA	SANTA ROSA	25
19	ALBION	X	10	5				X		5	102-15300	OKLAHOMA		30
20	ALBION	X	10	5				X		5	102-15300	OKLAHOMA		30
21	ALEXIS	X	14	7				X		5	102-15300	ILLINOIS	PIATT	30
22	ALEXIS	X	14	7				X		5	102-15300	ILLINOIS	PIATT	30
23	ALEXIS	X	14	5				X		5	102-15300	ILLINOIS	PIATT	30
24	ALEXIS	X	14	5				X		5	102-15300	ILLINOIS	PIATT	30
25	ALLAGASH	X	10	7	X	X	X	X		8	60-15300	MAINE	AROOSTOOK	3
26	ALLAGASH	X	14	5	X	X	X	X		8	60-15300	MAINE	AROOSTOOK	3
27	ALLAGASH	X	10	5						5	102-15300	MAINE	PENOBSCOT	6
28	ALLAGASH	X	13	6	X	X	X	X		8	60-15300	MAINE	PISCATAQUIS	3
29	ALLAGASH	X	11	8	X	X	X	X		8	60-15300	MAINE	PISCATAQUIS	3
30	ALLAGASH	X	12	6	X	X	X	X		8	60-15300	MAINE	PISCATAQUIS	3
31	ALLAGASH	X	10	5						5	102-15300	MAINE	SOMERSET	6
32	ALLIGATOR	X	17	3						5	102-15300	MISSOURI	NEW MADRID	13
33	ALTAVISTA	X	11	2						5	50-15300	NORTH CAROLINA	ROWAN	20
34	ALTUS	X	11	5						4	337-15300	TEXAS	HALL	12
35	ALTUS	X	11	5						4	337-15300	TEXAS	HALL	12
36	AMARILLO	X	11	5						4	337-15300	TEXAS	HALL	12
37	AMARILLO	X	11	6						4	337-15300	TEXAS	HALL	12
38	ANKONA	X	2	6	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
39	ANKONA	X	2	10	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
40	[illegible]	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
41	APPLING	X	17	8						5	377-15300	GEORGIA	LINCOLN	5
42	APPLING	X	10	2						5	50-15300	NORTH CAROLINA	WAKE	20
43	APPLING	X	10	3				X		5	102-15300	VIRGINIA	BRUNSWICK	30
44	APPLING	X	10	3				X		5	102-15300	VIRGINIA	BRUNSWICK	30
45	APPLING	X	10	6				X		5	102-15300	VIRGINIA	BRUNSWICK	30
46	APPLING	X	10	6				X		5	102-15300	VIRGINIA	BRUNSWICK	30
47	APPLING	X	11	5				X		5	102-15300	VIRGINIA	HALIFAX	30
48	APPLING	X	11	5				X		5	102-15300	VIRGINIA	HALIFAX	30
49	ARIPEKA	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
50	ARREDONDO	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
51	ASHE	X	13	2						5	50-15300	NORTH CAROLINA	BUNCOMBE	20
52	ASHE	X	16	2						5	50-15300	NORTH CAROLINA	HAYWOOD	20
53	ASTATULA	X	3	4	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
54	ASTATULA	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	25
55	ASTATULA	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
56	ASTATULA	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
57	AUSTIN	X	20	5				X		5	102-15300	TEXAS		30
58	AUSTIN	X	20	4				X		5	102-15300	TEXAS		30
59	BALFOUR	X	11	2						5	50-15300	NORTH CAROLINA	BUNCOMBE	20
60	BALFOUR	X	17	2						5	50-15300	NORTH CAROLINA	HAYWOOD	20
61	BANGOR	X	14	5						5	102-15300	MAINE	PENOBSCOT	6
62	BANGOR	X	14	5						5	102-15300	MAINE	PENOBSCOT	6
63	BANGOR	X	14	7	X	X	X	X		9	60-15300	MAINE	PENOBSCOT	16
64	BANGOR	X	14	8	X	X	X	X		9	60-15300	MAINE	PISCATAQUIS	16
65	BANGOR	X	14	7	X	X	X	X		9	60-15300	MAINE	PISCATAQUIS	16
66	BANGOR	X	14	5						5	102-15300	MAINE	SOMERSET	6
67	BANGOR	X	14	7	X	X	X	X		9	60-15300	MAINE	SOMERSET	16
68	BANGOR	X	14	7	X	X	X	X		9	60-15300	MAINE	SOMERSET	16
69	BARCLAY	X	12	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
70	BARCLAY	X	12	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
71	BARNES	X	17	5						9	102-15300	MINNESOTA	CHIPPEWA	11
72	BARNES	X	17	7						9	102-15300	MINNESOTA	LYON	11
73	BARNES	X	17	6						9	102-15300	MINNESOTA	OTTER TAIL	11
74	BARTLE	X	14	5						8	337-15300	INDIANA	PERRY	18
75	BASCOM-LIKE	X	21	5				X		5	102-15300	SOUTH DAKOTA	EDDY	30
76	BASCOM-LIKE	X	21	5				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
77	BASINGER	X	3	4	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
78	BASINGER	X	3	4						10	20-15300	FLORIDA	OSCEOLA	25
79	BATH	X	14	5				X		5	102-15300	NEW YORK	TOMPKINS	30
80	BATH	X	14	5				X		5	102-15300	NEW YORK	TOMPKINS	30
81	BAXTER	X	14	4				X		5	102-15300	ARKANSAS		30
82	BAXTER	X	14	5				X		5	102-15300	ARKANSAS		30
83	BAXTER	X	14	5				X		5	102-15300	ARKANSAS		30
84	BAXTER	X	14	5				X		5	102-15300	ARKANSAS		30
85	BAXTER	X	14	3						5	102-15300	MISSOURI	GREENE	13
86	BAXTER	X	14	5						5	102-15300	MISSOURI	LAWRENCE	13
87	BAYBORO	X	14	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
88	BAYBORO	X	14	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
89	BEADLE	X	13	7						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
90	BEADLE	X	14	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
91	BEADLE	X	14	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
92	BEARDEN	X	14	6						9	102-15300	MINNESOTA	WILKIN	11
93	BEARDEN	X	18	6						4	102-15300	NORTH DAKOTA	TRAILL	1
94	BEARDEN	X	14	6						4	102-15300	NORTH DAKOTA	TRAILL	1
95	BEAUMONT	X	21	2						8	102-15300	LOUISIANA	JEFFERSON DAVIS	4
96	BEAUREGARD	X	14	2						7	337-15300	LOUISIANA	BEAUREGARD	8
97	BEAUREGARD	X	14	4						7	337-15300	LOUISIANA	BEAUREGARD	8
98	BEAUREGARD	X	14	2						7	337-15300	LOUISIANA	RAPIDES	8
99	BELTSVILLE	X	14	5				X		5	102-15300	MARYLAND	MONTGOMERY	30
100	BELTSVILLE	X	14	5				X		5	102-15300	MARYLAND	MONTGOMERY	30
101	BELTSVILLE	X	14	5				X		5	102-15300	MARYLAND	MONTGOMERY	30
102	BELTSVILLE	X	14	5				X		5	102-15300	MARYLAND	MONTGOMERY	30
103	BERKS	X	14	4	X	X		X		5	102-15300	OHIO	COSHOCTON	28
104	BERKS	X	14	4						5	102-15300	OHIO	COSHOCTON	28
105	BERKS	X	13	6				X		5	102-15300	OHIO	COSHOCTON	30
106	BERKS	X	13	6				X		5	102-15300	OHIO	COSHOCTON	30
107	BERKS 1062	X	14	3						5	102-15300	OHIO	COSHOCTON	26
108	BERKS 1063	X	13	3						5	102-15300	OHIO	COSHOCTON	26

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	MOISTURE TENSION RANGE OF TENS (CM)	LOCATION STATE	LOCATION COUNTY	REF
217	CELINA	X	14	6				X		5	102-15300	INDIANA		30
218	CHACRA	X	16	4				X		5	102-15300	NEW MEXICO		30
219	CHACRA	X	16	4				X		5	102-15300	NEW MEXICO		30
220	CHALMERS	X	18	6				X		5	102-15300	INDIANA		30
221	CHALMERS	X	18	6				X		5	102-15300	INDIANA		30
222	CHANDLER	X	13	2						5	50-15300	NORTH CAROLINA	JACKSON	20
223	CHARLESTON	X	2	6						5	102-15300	GEORGIA	BERRIEN	7
224	CHARLESTON	X	11	5	X	X	X	X		5	102-15300	GEORGIA	LIBERTY	15
225	CHARLESTON	X	3	6						5	102-15300	SOUTH CAROLINA	CHARLESTON	15
226	CHARLESTON	X	7	5	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	CHARLESTON	15
227	CHARLIEVILLE	X	21	2						8	102-15300	LOUISIANA	RICHLAND	4
228	CHARLTON	X	14	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
229	CHARLTON	X	11	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
230	CHARLTON	X	11	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
231	CHARLTON	X	11	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
232	CHARLTON	X	11	4	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
233	CHESTER	X	13	2						5	50-15300	NORTH CAROLINA	HAYWOOD	20
234	CHESTER	X	17	2						5	50-15300	NORTH CAROLINA	HAYWOOD	20
235	CHESTER	X	13	5				X		5	102-15300	VIRGINIA	FLOYD	30
236	CHESTER	X	13	6				X		5	102-15300	VIRGINIA	FLOYD	30
237	CHESTERFIELD	X	10	3						5	50-15300	NORTH CAROLINA	JOHNSTON	20
238	CHESTERFIELD	X	11	2						5	50-15300	NORTH CAROLINA	JOHNSTON	20
239	CHEWACLA	X	14	3						6	60-15300	TENNESSEE	KNOX	14
240	CHILLUM	X	13	5				X		5	102-15300	MARYLAND	MONTGOMERY	30
241	CHILLUM	X	13	4				X		5	102-15300	MARYLAND	MONTGOMERY	30
242	CHILLUM	X	14	4				X		5	102-15300	MARYLAND	MONTGOMERY	30
243	CHILLUM	X	13	4				X		5	102-15300	MARYLAND	MONTGOMERY	30
244	CHIPLEY	X	3	5				X	X	5	102-15300	GEORGIA	LIBERTY	15
245	CHIPLEY	X	3	4	X	X	X	X		5	102-15300	SOUTH CAROLINA	CLARENDON	15
246	CHIPLEY	X	3	6	X	X	X	X		5	102-15300	SOUTH CAROLINA	WILLIAMSBURG	15
247	CHIPOLA	X	6	6	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
248	CHOBEE	X	2	5	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
249	CHOBEE	X	10	6	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
250	CINCINNATI	X	14	5						7	337-15300	INDIANA	N/A	16
251	CINCINNATI	X	14	5						10	50-15300	INDIANA	OWEN	1
252	CISNE	X	14	6						6	102-15300	ILLINOIS	CUMBERLAND	1
253	CISNE	X	14	6						6	102-15300	ILLINOIS	FAYETTE	1
254	CLAIRE	X	6	5						5	50-15300	NORTH DAKOTA	MCHENRY	22
255	CLARKSBURG	X	14	5				X		5	102-15300	WEST VIRGINIA		30
256	CLARKSBURG	X	14	5				X		5	102-15300	WEST VIRGINIA		30
257	CLARKSBURG 1133	X	14	3						5	102-15300	OHIO	COSHOCTON	26
258	CLARKSBURG 1214	X	14	3						5	102-15300	OHIO	COSHOCTON	26
259	CLARKSBURG 1924	X	14	3						5	102-15300	OHIO	COSHOCTON	26
260	CLARNO	X	13	5						5	102-15300	SOUTH DAKOTA	LAKE	10
261	CLERMONT	X	14	4						10	51-15300	INDIANA	JENNINGS	1
262	CLIFTON	X	17	2						5	50-15300	NORTH CAROLINA	HAYWOOD	20
263	COBB	X	11	6						10	4-15300	OKLAHOMA	CADDO	17
264	COBB	X	11	6						10	4- 190	OKLAHOMA	CADDO	17
265	COLBERT	X	11	2						6	60-15300	TENNESSEE	BLOUNT	14
266	COLBERT	X	11	3						6	60-15300	TENNESSEE	BLOUNT	14
267	COLBERT	X	18	2						6	60-15300	TENNESSEE	KNOX	14
268	COLBERT	X	14	2						6	60-15300	TENNESSEE	MEIGS	14
269	COLBY	X	14	3				X		5	102-15300	NEBRASKA	WEBSTER	30
270	COLBY	X	14	3				X		5	102-15300	NEBRASKA	WEBSTER	30
271	COLBY	X	14	2				X		5	102-15300	NEBRASKA	WEBSTER	30
272	COLBY	X	14	2				X		5	102-15300	NEBRASKA	WEBSTER	30
273	COLLINS	X	14	3						6	60-15300	TENNESSEE	FAYETTE	141
274	COLLINS	X	14	2						6	60-15300	TENNESSEE	GIBSON	141
275	COLLINS	X	14	3						6	60-15300	TENNESSEE	MADISON	141
276	COLLINSVILLE	X	13	1				X		5	102-15300	OKLAHOMA		30
277	COLLINSVILLE	X	13	1				X		5	102-15300	OKLAHOMA		30
278	COLO	X	14	6				X		5	102-15300	IOWA		30
279	COLO	X	14	6				X		5	102-15300	IOWA		30
280	COLONA	X	7	3						7	337-15300	INDIANA	N/A	18
281	COLRAIN	X	11	4				X		5	102-15300	VERMONT	CALEDONIA	30
282	COLTON	X	6	5						5	102-15300	MAINE	PENOBSCOT	6
283	COLTON	X	10	5						5	102-15300	MAINE	WASHINGTON	6
284	COMMERCE	X	13	5						8	102-15300	LOUISIANA	MADISON	4
285	COMMERCE	X	14	2						5	102-15300	MISSOURI	NEW MADRID	13
286	CONANT	X	14	4						5	102-15300	MAINE	AROOSTOOK	6
287	CONANT	X	14	4						5	102-15300	MAINE	AROOSTOOK	6
288	CONANT	X	13	6	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
289	CONANT	X	13	5	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
290	CONANT	X	14	8	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
291	CONANT	X	14	6	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
292	CONGAREE	X	10	2						4	337-15300	TENNESSEE	COCKE	14
293	CONGAREE	X	14	3						6	60-15300	TENNESSEE	KNOX	14
294	CONGAREE	X	10	2						6	60-15300	TENNESSEE	SEVIER	14
295	CONTINENTAL	X	10	7				X		5	102-15300	ARIZONA	GRAHAM	30
296	CONTINENTAL	X	10	6				X		5	102-15300	ARIZONA	GRAHAM	30
297	CORNELIA	X	3	8	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
298	COSHOCTON	X	14	7						5	102-15300	OHIO	COSHOCTON	28
299	COSHOCTON	X	14	5	X	X		X	X	5	102-15300	OHIO	COSHOCTON	28
300	COSHOCTON	X	14	8						5	102-15300	OHIO	COSHOCTON	28
301	COSHOCTON	X	14	8						5	102-15300	OHIO	COSHOCTON	26
302	COSHOCTON 1021	X	14	3						5	102-15300	OHIO	COSHOCTON	26
303	COSHOCTON 1111	X	14	3						5	102-15300	OHIO	COSHOCTON	26
304	COSHOCTON 1112	X	14	3						5	102-15300	OHIO	COSHOCTON	26
305	COSHOCTON 1113	X	14	3						5	102-15300	OHIO	COSHOCTON	26
306	COSHOCTON 1132	X	14	3						5	102-15300	OHIO	COSHOCTON	26
307	COSHOCTON 1151	X	14	3						5	102-15300	OHIO	COSHOCTON	26
308	COSHOCTON 1152	X	14	3						5	102-15300	OHIO	COSHOCTON	26
309	COSHOCTON 1181	X	14	3						5	102-15300	OHIO	COSHOCTON	26
310	COSHOCTON 1182	X	14	3						5	102-15300	OHIO	COSHOCTON	26
311	COSHOCTON 1272	X	14	3						5	102-15300	OHIO	COSHOCTON	26
312	COSHOCTON 1273	X	14	3						5	102-15300	OHIO	COSHOCTON	26
313	COWARTS	X	6	4				X		5	102-15300	GEORGIA	TIFT	30
314	COWARTS	X	6	6				X		5	102-15300	GEORGIA	TIFT	30
315	COWARTS	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
316	COXVILLE	X	11	6						4	337-15300	GEORGIA	LIBERTY	15
317	COXVILLE	X	14	2						5	50-15300	NORTH CAROLINA	DUPLIN	20
318	COXVILLE	X	11	6	X	X	X	X		5	102-15300	SOUTH CAROLINA	SUMTER	15
319	COXVILLE	X	11	6	X	X	X	X		5	102-15300	SOUTH CAROLINA	WILLIAMSBURG	15
320	CRAVEN	X	11	2						5	50-15300	NORTH CAROLINA	DUPLIN	20
321	CROCKETT	X	17	5				X		5	102-15300	TEXAS	MCLENNAN	30
322	CROCKETT	X	17	5				X		5	102-15300	TEXAS	MCLENNAN	30
323	CROCKETT	X	11	6				X		5	102-15300	TEXAS	MCLENNAN	30
324	CROCKETT	X	11	5				X		5	102-15300	TEXAS	MCLENNAN	30

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PTS	MOISTURE TENSION RANGE OF TENS (CB)	LOCATION STATE	LOCATION COUNTY	ARE
433	EAUGALLIE	X	2	10	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
434	EDISTO	X	6	5						5	102-15300	GEORGIA	BERRIEN	7
435	EDISTO	X	7	6	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	BEAUFORT	15
436	EDISTO	X	7	5						5	102-15300	SOUTH CAROLINA	CHARLESTON	15
437	EDISTO	X	7	6	X	X	X	X		5	102-15300	SOUTH CAROLINA	CHARLESTON	15
438	EDNEYVILLE	X	11	2						5	50-15300	NORTH CAROLINA	BUNCOMBE	20
439	EDNEYVILLE	X	11	7				X		5	102-15300	VIRGINIA	FLOYD	30
440	EDNEYVILLE	X	13	4				X		5	102-15300	VIRGINIA	FLOYD	30
441	EGAN	X	18	5						5	102-15300	SOUTH DAKOTA	LAKE	10
442	EGAN	X	20	6						5	102-15300	SOUTH DAKOTA	LAKE	10
443	ELBURN	X	14	8				X		5	102-15300	ILLINOIS	PIATT	30
444	ELDORADO	X	14	4						5	102-15300	MISSOURI	LAWRENCE	13
445	ELECTRA	X	3	9	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
446	ELECTRA	X	2	5	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
447	ELECTRA	X	3	9	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
448	ELKINSVILLE	X	14	6						8	337-15300	INDIANA	PERRY	18
449	ELKTON	X	.	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
450	ELKTON	X	14	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
451	ELLIOTT	X	18	5						5	102-15300	ILLINOIS	WILL	1
452	EMBDEN	X	10	5						5	102-15300	NORTH DAKOTA	CASS	22
453	EMMET	X	10	5						5	10-15300	MICHIGAN	CHARLEVOIX	1
454	EMORY	X	14	2						6	60-15300	TENNESSEE	BLOUNT	14
455	EMORY	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
456	EMORY	X	14	4						6	60-15300	TENNESSEE	KNOX	14
457	EMRICK	X	17	10						5	102-15300	NORTH DAKOTA	N/A	22
458	ENNIS	X	14	2						6	60-15300	TENNESSEE	ROBERTSON	14
459	ENNIS	X	14	2						6	60-15300	TENNESSEE	ROBERTSON	14
460	ENON	X	6	2						5	50-15300	NORTH CAROLINA	GRANVILLE	20
461	ESTO	X	6	7	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
462	ESTO	X	10	9	X	X	X	X	X	10	20-15300	FLORIDA	SANTA ROSA	25
463	ETHAN	X	13	4						5	102-15300	SOUTH DAKOTA	LAKE	10
464	ETHAN	X	13	4						5	102-15300	SOUTH DAKOTA	LAKE	10
465	ETOWAH	X	14	4						6	60-15300	TENNESSEE	WILLIAMSON	14
466	EULONIA	X	7	5	X	X	X	X	X	5	102-15300	GEORGIA	MCINTOSH	15
467	EULONIA	X	7	6	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	BEAUFORT	15
468	EUSTIS	X	6	4						6	60-15300	TENNESSEE	CHESTER	141
469	EUSTIS	X	6	2						6	60-15300	TENNESSEE	CHESTER	141
470	EVERGLADES	X	34	3						10	20-15300	FLORIDA	OSCEOLA	25
471	FACEVILLE	X	10	7	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
472	FAIRHOPE	X	7	6	X	X	X	X	X	5	102-15300	GEORGIA	CHATHAM	15
473	FAIRHOPE	X	7	6	X	X	X	X		5	102-15300	GEORGIA	LIBERTY	15
474	FAIRHOPE	X	11	6						5	102-15300	GEORGIA	MCINTOSH	7
475	FAIRHOPE	X	11	6	X	X	X	X		5	102-15300	GEORGIA	MCINTOSH	15
476	FALAYA	X	14	5						5	102-15300	MISSOURI	STODDARD	13
477	FALAYA	X	14	3						6	60-15300	TENNESSEE	CROCKETT	141
478	FALAYA	X	14	3						6	60-15300	TENNESSEE	FAYETTE	141
479	FANNIN	X	17	8						5	50-15300	NORTH CAROLINA	HAYWOOD	20
480	FARGO	X	20	8						9	102-15300	MINNESOTA	WILKIN	11
481	FAYETTE	X	14	7						9	102-15300	MINNESOTA	WABASHA	11
482	FAYETTE	X	14	6				X		5	102-15300	WISCONSIN	LA CROSSE	30
483	FAYETTE	X	14	7				X		5	102-15300	WISCONSIN	LA CROSSE	30
484	FINCASTLE	X	14	6				X		5	102-15300	INDIANA		30
485	FINCASTLE	X	14	6				X		5	102-15300	INDIANA		30
486	FINCASTLE	X	14	6				X		5	102-15300	INDIANA		30
487	FINCASTLE	X	14	6				X		5	102-15300	INDIANA		30
488	FLANAGAN	X	14	6						6	102-15300	ILLINOIS	CHAMPAIGN	1
489	FLASHER	X	11	4				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
490	FLASHER	X	11	4				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
491	FLEMINGTON	X	7	5	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
492	FLEMINGTON	X	7	1	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
493	FLETCHER	X	14	2						5	50-15300	NORTH CAROLINA	BUNCOMBE	20
494	FLOM	X	17	5						4	102-15300	MINNESOTA	YELLOW MEDICINE	9
495	FLORIDANA	X	7	7	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
496	FLORIDANA	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	25
497	FLUVANNA	X	11	7				X		5	102-15300	VIRGINIA	LOUISA	30
498	FLUVANNA	X	11	2				X		5	102-15300	VIRGINIA	LOUISA	30
499	FLUVANNA	X	11	4				X		5	102-15300	VIRGINIA	LOUISA	30
500	FLUVANNA	X	11	4				X		5	102-15300	VIRGINIA	LOUISA	30
501	FORESTDALE	X	12	4						5	102-15300	MISSOURI	NEW MADRID	13
502	FORESTDALE	X	6	4						5	102-15300	MISSOURI	SCOTT	13
503	FREDERICK	X	14	5				X		5	102-15300	VIRGINIA	PULASKI	30
504	FREDERICK	X	14	5				X		5	102-15300	VIRGINIA	PULASKI	30
505	FENNLAND	X	1	4						5	102-15300	MISSOURI	NEW MADRID	13
506	FULLERTON	X	11	2						5	60-15300	TENNESSEE	JEFFERSON	14
507	FULLERTON	X	13	3						6	60-15300	TENNESSEE	JEFFERSON	14
508	FULLERTON	X	13	4						6	60-15300	TENNESSEE	JEFFERSON	14
509	FULLERTON	X	13	4						6	60-15300	TENNESSEE	JEFFERSON	14
510	FULLERTON	X	14	3						6	60-15300	TENNESSEE	JEFFERSON	14
511	FULLERTON	X	13	3						6	60-15300	TENNESSEE	KNOX	14
512	FULLERTON	X	14	3						6	60-15300	TENNESSEE	KNOX	14
513	FULLERTON	X	14	4						6	60-15300	TENNESSEE	KNOX	14
514	FUQUAY	X	6	8	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
515	FUQUAY	X	6	6	X	X	X	X	X	10	20-15300	FLORIDA	SANTA ROSA	25
516	FUQUAY	X	6	4						5	102-15300	GEORGIA	TIFT	29
517	FUQUAY	X	6	4						5	102-15300	GEORGIA	TIFT	29
518	FUQUAY	X	2	5						5	102-15300	GEORGIA	TIFT	29
519	FUQUAY	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
520	FUQUAY	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
521	FUQUAY	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
522	FUQUAY	X	6	5				X		5	102-15300	GEORGIA	TURNER	30
523	FUQUAY	X	6	3						5	50-15300	NORTH CAROLINA	JOHNSTON	20
524	GALLION	X	10	3						8	102-15300	LOUISIANA	CALDWELL	4
525	GARDENA	X	13	5						5	102-15300	NORTH DAKOTA	CASS	22
526	GARDENA	X	.	10						4	102-15300	NORTH DAKOTA	PIERCE	22
527	GARFIELD	X	18	4				X		5	102-15300	WASHINGTON		30
528	GARFIELD	X	18	3				X		5	102-15300	WASHINGTON		30
529	GEORGEVILLE	X	12	8						5	377-15300	GEORGIA	LINCOLN	5
530	GEORGEVILLE	X	14	2						5	50-15300	NORTH CAROLINA	CHATHAM	20
531	GERALD	X	14	4						5	102-15300	MISSOURI	LAWRENCE	13
532	GILPIN	X	14	6				X		5	102-15300	OHIO	COSHOCTON	30
533	GILPIN	X	14	5				X		5	102-15300	OHIO	COSHOCTON	30
534	GLENELG	X	13	7				X		5	102-15300	VIRGINIA	FLOYD	30
535	GLENELG	X	13	5				X		5	102-15300	VIRGINIA	FLOYD	30
536	GLENFORD 1183	X	14	3						5	102-15300	OHIO	COSHOCTON	26
537	GLENFORD 1883	X	14	3						5	102-15300	OHIO	COSHOCTON	26
538	GLYNDON	X	10	[illegible]						5	102-15300	NORTH DAKOTA	CASS	22
539	GOLDSBORO	X	2	[illegible]						5	102-15300	GEORGIA	BRYAN	7
540	GOLDSBORO	X	2	6	X	X	X	X	X	5	102-15300	GEORGIA	BRYAN	15

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	MOISTURE TENSION RANGE OF TENS (CM)	LOCATION STATE	LOCATION COUNTY	MRP
649	HUNTINGTON	X	14	3						6	60-15300	TENNESSEE	KNOX	14
650	HUNTINGTON	X	14	3						6	60-15300	TENNESSEE	KNOX	14
651	HYATTSVILLE	X	13	5				X		5	102-15300	MARYLAND	PRINCE GEORGES	30
652	HYATTSVILLE	X	13	6				X		5	102-15300	MARYLAND	PRINCE GEORGES	30
653	IDA	X	14	3						6	102-15300	IOWA	MONONA	1
654	IMMOKALEE	X	2	8	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	25
655	IMMOKALEE	X	2	6	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
656	IMPERIAL	X	20	3	X	X	X	X		6	102-15300	CALIFORNIA	IMPERIAL	27
657	INDIO	X	13	3	X	X	X	X		6	102-15300	CALIFORNIA	IMPERIAL	27
658	INDIO	X	12	4	X	X	X	X		6	102-15300	CALIFORNIA	IMPERIAL	27
659	IPAVA	X	14	7				X		5	102-15300	ILLINOIS	PIATT	30
660	IPAVA	X	14	4				X		5	102-15300	ILLINOIS	PIATT	30
661	IPAVA	X	14	4				X		5	102-15300	ILLINOIS	PIATT	30
662	IREDELL	X	11	8						5	377-15300	GEORGIA	MCDUFFIE	5
663	IREDELL	X	13	3						5	50-15300	NORTH CAROLINA	CHEROKEE	20
664	IREDELL	X	10	2						5	50-15300	NORTH CAROLINA	IREDELL	20
665	IRVINGTON	X	7	7	X	X	X	X	X	5	102-15300	GEORGIA	BRYAN	15
666	IRVINGTON	X	2	5	X	X	X	X	X	5	102-15300	GEORGIA	PIERCE	15
667	IRVINGTON	X	11	5				X		5	102-15300	GEORGIA	TIFT	30
668	IRVINGTON	X	6	6				X		5	102-15300	GEORGIA	TIFT	30
669	IRVINGTON	X	2	5						5	102-15300	GEORGIA	WAYNE	7
670	IRVINGTON	X	2	5	X	X	X	X		5	102-15300	GEORGIA	WAYNE	15
671	IVA	X	14	7				X		5	102-15300	ILLINOIS	MADISON	30
672	IVA	X	14	8				X		5	102-15300	ILLINOIS	MADISON	30
673	JUDSON	X	14	3				X		5	102-15300	WISCONSIN	GRANT	30
674	JUDSON	X	14	3				X		5	102-15300	MISSOURI		30
675	JUDSON	X	14	2				X		5	102-15300	MISSOURI		30
676	JUDSON	X	14	4				X		5	102-15300	WISCONSIN	GRANT	30
677	JUPITER	X	2	3						10	20-15300	FLORIDA	PALM BEACH	25
678	KALIGA	X	37	8						10	20-15300	FLORIDA	OSCEOLA	25
679	KALMIA	X	7	7	X	X	X	X	X	10	20-15300	FLORIDA	SANTA ROSA	25
680	KEENE	X	14	7						5	102-15300	OHIO	COSHOCTON	28
681	KEENE	X	14	7						5	102-15300	OHIO	COSHOCTON	28
682	KEENE	X	14	7				X		5	102-15300	OHIO	COSHOCTON	30
683	KEENE	X	14	7				X		5	102-15300	OHIO	COSHOCTON	30
684	KEENE	X	14	8				X		5	102-15300	OHIO	COSHOCTON	30
685	KEENE	X	14	8				X		5	102-15300	OHIO	COSHOCTON	30
686	KEENE 1033	X	14	3						5	102-15300	OHIO	COSHOCTON	26
687	KEENE 1103	X	14	3						5	102-15300	OHIO	COSHOCTON	26
688	KEENE 1131	X	14	3						5	102-15300	OHIO	COSHOCTON	26
689	KEENE 1231	X	14	3						5	102-15300	OHIO	COSHOCTON	26
690	KEENE 1232	X	14	3						5	102-15300	OHIO	COSHOCTON	26
691	KEENE 1271	X	14	3						5	102-15300	OHIO	COSHOCTON	26
692	KEENE 1351	X	14	3						5	102-15300	OHIO	COSHOCTON	26
693	KEITH	X	12	5						12	5-15300	NEBRASKA	BOX BUTTE	1
694	KENDRICK	X	7	8	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
695	KENYON	X	14	6						5	337-15300	MINNESOTA	GOODHUE	1
696	KERSHAW	X	3	3	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
697	KERSHAW	X	1	3				X		5	102-15300	GEORGIA	TIFT	30
698	KERSHAW	X	1	4				X		5	102-15300	GEORGIA	TIFT	30
699	KIAWAH	X	2	5						5	102-15300	GEORGIA	BERRIEN	7
700	KIAWAH	X	3	5	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	BEAUFORT	15
701	KIAWAH	X	3	5	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	CHARLESTON	15
702	KIAWAH	X	7	6	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	CHARLESTON	15
703	KIRKLAND	X	14	4				X		5	102-15300	OKLAHOMA		30
704	KIRKLAND	X	14	5				X		5	102-15300	OKLAHOMA		30
705	KIRVIN	X	11	6				X		5	102-15300	TEXAS		30
706	KIRVIN	X	11	5				X		5	102-15300	TEXAS		30
707	KISATCHIE	X	10	2						7	337-15300	LOUISIANA	NATCHITOCHES	4
708	KLEJ	X	2	5						5	102-15300	GEORGIA	LIBERTY	7
709	KLEJ	X	6	2						5	50-15300	NORTH CAROLINA	DUPLIN	20
710	KRANZBURG	X	14	8						9	102-15300	MINNESOTA	PIPESTONE	11
711	KRANZBURG	X	18	7						6	102-15300	SOUTH DAKOTA	CODINGTON	1
712	KRANZBURG	X	13	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
713	KRANZBURG	X	14	7						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
714	KRANZBURG	X	18	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
715	KUREB	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
716	LAKE	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
717	LAKELAND	X	2	3	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
718	LAKELAND	X	2	5						5	102-15300	GEORGIA	LIBERTY	7
719	LAKELAND	X	2	5	X	X	X	X	X	5	102-15300	GEORGIA	LIBERTY	15
720	LAKELAND	X	2	4	X	X	X	X	X	5	102-15300	GEORGIA	PIERCE	15
721	LAKELAND	X	7	4						7	337-15300	LOUISIANA	BOSSIER	4
722	LAKELAND	X	2	4						7	337-15300	LOUISIANA	NATCHITOCHES	8
723	LAKELAND	X	2	2						5	50-15300	NORTH CAROLINA	DUPLIN	20
724	LAKELAND	X	6	3	X	X	X	X	X	5	102-15300	SOUTH CAROLINA	SUMTER	15
725	LAMOURE	X	18	4						4	102-15300	MINNESOTA	LINCOLN	9
726	LAND-LIKE	X	18	7				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
727	LAND-LIKE	X	18	6				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
728	LATHAM	X	14	8				X		5	102-15300	OHIO	COSHOCTON	30
729	LATHAM	X	14	6				X		5	102-15300	OHIO	COSHOCTON	30
730	LAUDERHILL	X	36	3						10	20-15300	FLORIDA	PALM BEACH	25
731	LEEFIELD	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
732	LEEFIELD	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
733	LEON	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
734	LEON	X	2	7	X	X	X	X		5	102-15300	GEORGIA	BRANTLEY	15
735	LEON	X	3	6	X	X	X	X	X	5	102-15300	GEORGIA	BRYAN	15
736	LEON	X	3	6						5	102-15300	GEORGIA	LONG	7
737	LEON	X	3	6	X	X	X	X	X	5	102-15300	GEORGIA	LONG	15
738	LEON	X	2	4						5	50-15300	NORTH CAROLINA	JOHNSTON	20
739	LEONARDTOWN	X	14	6				X		5	102-15300	MARYLAND	MONTGOMERY	30
740	LEONARDTOWN	X	18	6				X		5	102-15300	MARYLAND	MONTGOMERY	30
741	LEXINGTON	X	14	4						7	337-15300	LOUISIANA	EAST FELICIANA	8
742	LEXINGTON	X	14	3						7	337-15300	LOUISIANA	EVANGELINE	4
743	LEXINGTON	X	14	7				X		5	102-15300	MISSISSIPPI	MARSHALL	30
744	LEXINGTON	X	14	7				X		5	102-15300	MISSISSIPPI	MARSHALL	30
745	LEXINGTON	X	14	4				X		5	102-15300	MISSISSIPPI	MARSHALL	30
746	LEXINGTON	X	14	5				X		5	102-15300	MISSISSIPPI	MARSHALL	30
747	LEXINGTON	X	14	4						6	60-15300	TENNESSEE	CHESTER	141
748	LEXINGTON	X	14	3						6	60-15300	TENNESSEE	CHESTER	141
749	LINDLEY	X	13	3						5	102-15300	MISSOURI	HARRISON	13
750	LINDSIDE	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
751	LINDSIDE	X	14	2						6	60-15300	TENNESSEE	GREENE	14
752	LINDSIDE	X	14	2						5	60-15300	TENNESSEE	KNOX	14
753	LINDSIDE	X	13	3						6	60-15300	TENNESSEE	WILLIAMSON	14
754	LINTONIA	X	14	3						6	102-15300	LOUISIANA	FRANKLIN	4
755	LISMAS	X	21	4				X		5	102-15300	SOUTH DAKOTA	BUTTE	30
756	LISMAS	X	21	5				X		5	102-15300	SOUTH DAKOTA	BUTTE	30

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	RANGE OF TENS (CM)	LOCATION STATE	LOCATION COUNTY	REF
865	NORTON	X	13	6				X		5	102-15300	SOUTH DAKOTA	MEADE	30
866	MOUNTVIEW	X	14	3						6	60-15300	TENNESSEE	COFFEE	14
867	MOUNTVIEW	X	14	3						6	60-15300	TENNESSEE	GILES	141
868	MOUNTVIEW	X	14	3						6	60-15300	TENNESSEE	GILES	141
869	MOUNTVIEW	X	14	5						6	60-15300	TENNESSEE	PUTNAM	141
870	MUREN	X	18	4				X		5	102-15300	ILLINOIS	MADISON	30
871	MUREN	X	16	3				X		5	102-15300	ILLINOIS	MADISON	30
872	MUREN	X	14	5				X		5	102-15300	ILLINOIS	MADISON	30
873	MUREN	X	18	4				X		5	102-15300	ILLINOIS	MADISON	30
874	MYAKKA	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
875	MYAKKA	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
876	MYAKKA	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	25
877	MYAKKA	X	2	6	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
878	MYAKKA	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
879	NAFF	X	14	5				X		5	102-15300	WASHINGTON		30
880	NAFF	X	14	4				X		5	102-15300	WASHINGTON		30
881	NASON	X	14	4				X		5	102-15300	VIRGINIA	LOUISA	30
882	NASON	X	14	4				X		5	102-15300	VIRGINIA	LOUISA	30
883	NASON	X	14	7				X		5	102-15300	VIRGINIA	LOUISA	30
884	NASON	X	14	7				X		5	102-15300	VIRGINIA	LOUISA	30
885	NEEDMORE	X	14	4						6	60-15300	TENNESSEE	KNOX	14
886	NEWTONIA	X	14	7				X		5	102-15300	ARKANSAS		30
887	NEWTONIA	X	14	6				X		5	102-15300	ARKANSAS		30
888	NEWTONIA	X	14	4				X		5	102-15300	ARKANSAS		30
889	NEWTONIA	X	14	4				X		5	102-15300	ARKANSAS		30
890	NEWTONIA	X	14	4						5	102-15300	MISSOURI	GREENE	13
891	NEWTONIA	X	14	4						5	102-15300	MISSOURI	GREENE	13
892	NICOLLET	X	17	7						9	102-15300	MINNESOTA	SIBLEY	11
893	NICOLLET	X	17	6						9	102-15300	MINNESOTA	WATONWAN	11
894	NIXA	X	14	3						5	102-15300	MISSOURI	CHRISTIAN	13
895	NIXONTON	X	12	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
896	NIXONTON	X	14	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
897	NORFOLK	X	10	2						5	50-15300	NORTH CAROLINA	JOHNSTON	20
898	NORFOLK	X	11	2						5	50-15300	NORTH CAROLINA	JOHNSTON	20
899	NORFOLK	X	10	2						5	50-15300	NORTH CAROLINA	SCOTLAND	20
900	NORGE	X	13	5				X		5	102-15300	OKLAHOMA		30
901	NORGE	X	13	5				X		5	102-15300	OKLAHOMA		30
902	NUCKOLLS	X	14	4				X		5	102-15300	NEBRASKA	WEBSTER	30
903	NUCKOLLS	X	14	4				X		5	102-15300	NEBRASKA	WEBSTER	30
904	NUCKOLLS	X	18	4				X		5	102-15300	NEBRASKA	WEBSTER	30
905	NUCKOLLS	X	18	4				X		5	102-15300	NEBRASKA	WEBSTER	30
906	OBERLIN	X	14	4						7	337-15300	LOUISIANA	EVANGELINE	4
907	OCKLEY	X	14	5						8	337-15300	INDIANA	SHELBY	18
908	OCKLEY	X	14	3						8	337-15300	INDIANA	SHELBY	18
909	OKTIBBEHA	X	21	4	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	25
910	OLDSMAR	X	3	9	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	25
911	OLDSMAR	X	2	6	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	25
912	OLDSMAR	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
913	OLDSMAR	X	2	11	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	25
914	OLIVIER	X	14	5						8	102-15300	LOUISIANA	RICHLAND	4
915	OLIVIER	X	14	4						5	102-15300	MISSOURI	STODDARD	13
916	ONA	X	3	4	X	X	X	X		5	102-15300	GEORGIA	LONG	15
917	ONA	X	2	4	X	X	X	X		5	102-15300	GEORGIA	PIERCE	15
918	ONA	X	2	5	X	X	X	X		5	102-15300	GEORGIA	WARE	15
919	ONAWA	X	20	4						5	102-15300	MISSOURI	CARROLL	13
920	ONDAWA	X	10	4						5	102-15300	MAINE	PISCATAQUIS	6
921	ORANGEBURG	X	10	4				X		5	102-15300	GEORGIA	SCHLEY	30
922	ORANGEBURG	X	10	4				X		5	102-15300	GEORGIA	SCHLEY	30
923	ORANGEBURG	X	10	2						5	50-15300	NORTH CAROLINA	JOHNSTON	20
924	ORTEGA	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	25
925	OSIER	X	2	5				X		5	102-15300	GEORGIA	TURNER	30
926	OSWEGO	X	14	4						4	102-15300	MISSOURI	HENRY	13
927	OTHELLO	X	14	3						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
928	OTHELLO	X	14	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
929	PAISLEY	X	7	5	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
930	PALOUSE	X	14	5				X		5	102-15300	WASHINGTON		30
931	PALOUSE	X	14	5				X		5	102-15300	WASHINGTON		30
932	PAOLA	X	3	6		X	X	X	X	10	20-15300	FLORIDA	HERNANDO	25
933	PAOLA	X	2	5	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	25
934	PAOLA	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
935	PARKWOOD	X	6	7	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	25
936	PARNELL	X	18	5						4	102-15300	MINNESOTA	LINCOLN	5
937	PARNELL	X	18	5						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
938	PARR	X	14	5				X		5	102-15300	INDIANA		30
939	PARR	X	14	5				X		5	102-15300	INDIANA		30
940	PARR	X	14	4				X		5	102-15300	INDIANA		30
941	PARR	X	14	4				X		5	102-15300	INDIANA		30
942	PASQUOTANK	X	11	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
943	PASQUOTANK	X	14	2						5	50-15300	NORTH CAROLINA	PASQUOTANK	20
944	PAXTON	X	13	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
945	PAXTON	X	13	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
946	PAXTON	X	14	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
947	PAXTON	X	11	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
948	PAXTON	X	14	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
949	PEARMAN	X	14	3						5	102-15300	MISSOURI	DENT	13
950	PEMBROKE	X	14	4						6	60-15300	TENNESSEE	ROBERTSON	141
951	PENN	X	14	3				X		5	102-15300	VIRGINIA	CULPEPER	30
952	PENN	X	14	3				X		5	102-15300	VIRGINIA	LOUISA	30
953	PERHAM	X	14	4						5	102-15300	MAINE	AROOSTOOK	6
954	PERHAM	X	14	4						5	102-15300	MAINE	AROOSTOOK	6
955	PERHAM	X	13	6	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
956	PERHAM	X	13	6	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
957	PERHAM	X	14	5	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
958	PERHAM	X	14	5	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
959	PERHAM	X	14	7	X	X	X	X		9	60-15300	MAINE	AROOSTOOK	16
960	PERSAYO	X	21	3				X		5	102-15300	NEW MEXICO		30
961	PERSAYO	X	20	2				X		5	102-15300	NEW MEXICO		30
962	PHILO	X	14	4						6	60-15300	TENNESSEE	MORGAN	14
963	PIERRE	X	21	5				X		5	102-15300	SOUTH DAKOTA	MEADE	30
964	PIERRE	X	21	4				X		5	102-15300	SOUTH DAKOTA	MEADE	30
965	PIMA	X	17	6						4	50-15300	ARIZONA	PIMA	19
966	PIMA	X	17	6						4	50-15300	ARIZONA	PIMA	15
967	PINALENO	X	10	4				X		5	102-15300	ARIZONA	GRAHAM	30
968	PINEDA	X	3	8	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	250
969	PINELLAS	X	2	6	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	250
970	PLACID	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	250
971	PLAINFIELD	X	3	4						7	337-15300	INDIANA	N/A	18
972	PLAISTED	X	13	4						5	102-15300	MAINE	PENOBSCOT	6

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	MOISTURE TENSION RANGE OF TENS (CB)	LOCATION STATE	LOCATION COUNTY	REF
1081	SANIBEL	X	36	6						10	20-15300	FLORIDA	PALM BEACH	250
1082	SAPELO	X	3	9	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	250
1083	SARPY	X	11	2						5	102-15300	MISSOURI	CARROLL	13
1084	SARPY	X	7	4						5	102-15300	MISSOURI	CARROLL	13
1085	SASSAFRAS	X	10	5				X		5	102-15300	MARYLAND	PRINCE GEORGES	30
1086	SASSAFRAS	X	10	5				X		5	102-15300	MARYLAND	PRINCE GEORGES	30
1087	SATELLITE	X	2	5	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	250
1088	SATELLITE	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	250
1089	SABLE	X	14	7				X		5	102-15300	ILLINOIS	PIATT	30
1090	SCANTIC	X	14	4						5	102-15300	MAINE	SOMERSET	6
1091	SCIOTOVILLE	X	14	5						8	337-15300	INDIANA	PERRY	18
1092	SEQUOIA	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
1093	SEQUOIA	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
1094	SEQUOIA	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
1095	SEQUOIA	X	14	3						6	60-15300	TENNESSEE	KNOX	14
1096	SEQUOIA	X	14	4						6	60-15300	TENNESSEE	KNOX	14
1097	SEQUOIA	X	14	4						6	60-15300	TENNESSEE	KNOX	14
1098	SHARKEY	X	21	4						5	102-15300	MISSOURI	PEMISCOT	13
1099	SHARKEY	X	20	3						6	60-15300	TENNESSEE	DYER	141
1100	SHARON	X	14	4						5	102-15300	MISSOURI	LINCOLN	13
1101	SHARPSBURG	X	18	5						12	5-15300	NEBRASKA	LANCASTER	1
1102	SHARPSBURGH	X	14	4						5	102-15300	MISSOURI	GENTRY	13
1103	SHELBY	X	17	4				X		5	102-15300	MISSOURI		30
1104	SHELBY	X	13	5				X		5	102-15300	MISSOURI		30
1105	SHELBY	X	13	5						5	102-15300	MISSOURI	HARRISON	13
1106	SHELBY	X	13	4						5	102-15300	MISSOURI	HARRISON	13
1107	SILERTON	X	14	3						6	60-15300	TENNESSEE	CHESTER	141
1108	SIMS	X	13	4						4	10-15300	MICHIGAN	SAGINAW	1
1109	SINAI	X	18	7						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
1110	SINAI	X	20	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
1111	SINAI	X	20	6						5	102-15300	SOUTH DAKOTA	KINGSBURY	10
1112	SINAI	X	18	6						5	102-15300	SOUTH DAKOTA	LAKE	10
1113	SINAI	X	18	6						5	102-15300	SOUTH DAKOTA	LAKE	10
1114	SINAI	X	18	6						5	107-15300	SOUTH DAKOTA	LAKE	10
1115	SINAI	X	18	9						6	102-15300	WISCONSIN	GREEN LAKE	1
1116	SMYRNA	X	3	10	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	250
1117	SMYRNA	X	2	6	X	X	X			10	20-15300	FLORIDA	VOLUSIA	250
1118	SPARR	X	3	9	X	X	X	X	X	10	20-15300	FLORIDA	ALACHUA	250
1119	SPARR	X	3	11	X	X	X	X	X	10	20-15300	FLORIDA	ALACHUA	250
1120	SPARR	X	2	8						10	20-15300	FLORIDA	ALACHUA	250
1121	SPARR	X	3	7	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	250
1122	STASER	X	14	3						6	60-15300	TENNESSEE	BLOUNT	14
1123	STASER	X	14	2						5	60-15300	TENNESSEE	KNOX	14
1124	STASER	X	11	3						6	60-15300	TENNESSEE	SEVIER	14
1125	STETSON	X	10	5						5	102-15300	MAINE	AROOSTOOK	6
1126	STETSON	X	13	4						5	102-15300	MAINE	AROOSTOOK	6
1127	STICKNEY	X	14	7						5	107-15300	SOUTH DAKOTA	KINGSBURY	10
1128	STICKNEY	X	13	6						5	107-15300	SOUTH DAKOTA	KINGSBURY	10
1129	STILSON	X	6	7	X	X	X	X	X	10	20-15300	FLORIDA	JACKSON	250
1130	STILSON	X	6	6				X		5	102-15300	GEORGIA	TIFT	30
1131	STILSON	X	6	6				X		5	102-15300	GEORGIA	TIFT	30
1132	STLUCIE	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	250
1133	STLUCIE	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	ST LUCIE	250
1134	STOCKADE	X	7	5	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	250
1135	SUFFIELD	X	14	4						5	102-15300	MAINE	CUMBERLAND	6
1136	SUFFIELD	X	14	4						5	102-15300	MAINE	PENOBSCOT	6
1137	SUFFIELD	X	14	4						5	102-15300	MAINE	PENOBSCOT	6
1138	SUFFIELD	X	14	4						5	102-15300	MAINE	SOMERSET	6
1139	SUNCOOK	X	6	5						5	102-15300	MAINE	FRANKLIN	6
1140	SUNCOOK	X	6	4						5	102-15300	MAINE	FRANKLIN	4
1141	SUNSWEET	X	10	4				X		5	102-15300	GEORGIA	TIFT	30
1142	SUNSWEET	X	10	5				X		5	102-15300	GEORGIA	TIFT	30
1143	SUTTON	X	14	7	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1144	SUTTON	X	11	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1145	SUTTON	X	11	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1146	SUTTON	X	10	4	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1147	SUTTON	X	11	4	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1148	SVEA	X	13	10						4	102-15300	NORTH DAKOTA	CAVALIER	22
1149	TALBOTT	X	14	3						6	60-15300	TENNESSEE	LOUDON	14
1150	TALIHINA	X	17	3				X		5	102-15300	OKLAHOMA		30
1151	TALIHINA	X	14	2				X		5	102-15300	OKLAHOMA		30
1152	TALLADEGA	X	14	2						5	50-15300	NORTH CAROLINA	JACKSON	20
1153	TALMO	X	13	3						5	107-15300	SOUTH DAKOTA	LAKE	10
1154	TALOKA	X	14	5				X		5	102-15300	OKLAHOMA		30
1155	TALOKA	X	14	4				X		5	102-15300	OKLAHOMA		30
1156	TAMA	X	14	8				X		5	102-15300	WISCONSIN	GRANT	30
1157	TAMA	X	14	8				X		5	102-15300	WISCONSIN	GRANT	30
1158	TATE	X	14	2						5	50-15300	NORTH CAROLINA	BUNCOMBE	20
1159	TATUM	X	14	5				X		5	102-15300	VIRGINIA	LOUISA	30
1160	TATUM	X	14	6				X		5	102-15300	VIRGINIA	LOUISA	30
1161	TATUM	X	14	4				X		5	102-15300	VIRGINIA	LOUISA	30
1162	TATUM	X	14	3				X		5	102-15300	VIRGINIA	LOUISA	30
1163	TAVARES	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	HERNANDO	250
1164	TAVARES	X	3	5	X	X	X	X	X	10	20-15300	FLORIDA	VOLUSIA	250
1165	TELLER	X	13	6						9	4-15300	OKLAHOMA	PAYNE	17
1166	TELLICO	X	18	4						6	60-15300	TENNESSEE	KNOX	14
1167	THATUNA	X	14	7				X		5	102-15300	IDAHO		30
1168	THATUNA	X	14	8				X		5	102-15300	IDAHO		30
1169	THORNDIKE	X	13	3						5	102-15300	MAINE	AROOSTOOK	6
1170	THORNDIKE	X	14	4						5	102-15300	MAINE	PENOBSCOT	6
1171	THORNDIKE	X	14	3						5	102-15300	MAINE	SOMERSET	6
1172	THORP	X	14	8				X		5	102-15300	ILLINOIS	PIATT	30
1173	THORP	X	14	4				X		5	102-15300	ILLINOIS	PIATT	30
1174	THORP	X	14	5				X		5	102-15300	ILLINOIS	PIATT	30
1175	TIFTON	X	10	6	X	X	X	X	X	10	20-15300	FLORIDA	SANTA ROSA	250
1176	TIFTON	X	6	4						5	102-15300	GEORGIA	TIFT	29
1177	TIFTON	X	6	6						5	102-15300	GEORGIA	TIFT	29
1178	TIFTON	X	6	4						5	102-15300	GEORGIA	TIFT	29
1179	TIFTON	X	10	4						5	102-15300	GEORGIA	TIFT	29
1180	TIFTON	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
1181	TIFTON	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
1182	TIFTON	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
1183	TIFTON	X	6	6				X		5	102-15300	GEORGIA	TIFT	30
1184	TIFTON	X	6	4				X		5	102-15300	GEORGIA	TIFT	30
1185	TIFTON	X	6	5				X		5	102-15300	GEORGIA	TIFT	30
1186	TILLMAN	X	17	5				X		5	102-15300	TEXAS		30
1187	TILLMAN	X	17	5				X		5	102-15300	TEXAS		30
1188	TILSIT	X	14	6						8	337-15300	INDIANA	PERRY	18

TABLE 2. (CONTINUED)

NO	SOIL SERIES	PROFILE DESCR	SURFACE TEXTURE	NO HORIZ	PARTICLE SIZE BASIC	PARTICLE SIZE DETAIL	CHEM DATA	BULK DENS	SAT COND	MOISTURE TENSION NO PER HORIZ	MOISTURE TENSION RANGE OF TENS (CM)	LOCATION STATE	LOCATION COUNTY	REF
1297	WICKHAM	X	11	8						5	377-15300	GEORGIA	LINCOLN	5
1298	WICKHAM	X	13	2						5	50-15300	NORTH CAROLINA	ROWAN	20
1299	WICKHAM	X	10	2						5	50-15300	NORTH CAROLINA	ROWAN	20
1300	WILKES	X	11	2				X		5	102-15300	VIRGINIA	HALIFAX	30
1301	WILKES	X	11	3				X		5	102-15300	VIRGINIA	HALIFAX	30
1302	WILSON	X	17	6				X		5	102-15300	TEXAS	MCLENNAN	30
1303	WILSON	X	17	5				X		5	102-15300	TEXAS	MCLENNAN	30
1304	WINDER	X	3	6	X	X	X	X	X	10	20-15300	FLORIDA	OSCEOLA	250
1305	WINDER	X	2	4	X	X	X	X	X	10	20-15300	FLORIDA	PALM BEACH	250
1306	WITHEE	X	14	6						7	20-15300	WISCONSIN	WOOD	1
1307	WOLFTEVER	X	13	4						6	60-15300	TENNESSEE	KNOX	14
1308	WOODBRIDGE	X	13	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1309	WOODBRIDGE	X	13	5	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1310	WOODBRIDGE	X	13	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1311	WOODBRIDGE	X	14	6	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1312	WOODBRIDGE	X	13	4	X	X	X	X		8	60-15300	MAINE	KENNEBEC	2
1313	WOODSTOWN	X	6	2						5	50-15300	NORTH CAROLINA	COPLIN	20
1314	WORTHING	X	18	5						5	107-15300	SOUTH DAKOTA	LAKE	10
1315	WORTHING	X	18	4						5	107-15300	SOUTH DAKOTA	LAKE	10
1316	WYNDMERE	X	16	5						5	102-15300	NORTH DAKOTA	CASS	22
1317	YAHOLA	X	13	4						8	102-15300	LOUISIANA	RAPIDES	4
1318	YAHOLA	X	13	3						8	102-15300	LOUISIANA	RAPIDES	4
1319	YONGES	X	7	5	X	X	X	X	X	10	20-15300	FLORIDA	DUVAL	250
1320	ZAHL	X	16	6						4	102-15300	NORTH DAKOTA	WARD	22
1321	ZANEIS	X	13	6						9	4- 190	OKLAHOMA	PAYNE	17
1322	ZANESVILLE	X	14	6						8	337-15300	INDIANA	PERRY	18
1323	ZANESVILLE	X	14	5						8	337-15300	INDIANA	PERRY	18

BASIC PARTICLE SIZE - INCLUDES SAND, SILT AND CLAY

DETAILED PARTICLE SIZE - INCLUDES DETAILED BREAKDOWN OF SAND AND SILT

REF - REFERENCES CITED IN TABLE 1.

SURFACE TEXTURE CODES

2 - Sand
3 - Fine sand
5 - Loamy coarse sand
6 - Loamy sand
7 - Loamy fine sand
10 - Sandy loam
12 - Very fine sandy loam
13 - Loam
14 - Silt loam
16 - Sandy clay loam
17 - Clay loam
18 - Silty clay loam
20 - Silty clay
21 - Clay
34 - Humic material
36 - Supric material

TABLE 3. (CONTINUED)

STATE	COUNTY	SOIL NUMBER	SOIL SERIES	REF
GEORGIA	LINCOLN	355	DAVIDSON	5
GEORGIA	TIFT	407	DOTHAN	29
GEORGIA	TIFT	408	DOTHAN	30
GEORGIA	TIFT	409	DOTHAN	30
GEORGIA	WAYNE	419	DUNBAR	7
GEORGIA	WAYNE	420	DUNBAR	15
GEORGIA	BERRIEN	434	EDISTO	7
GEORGIA	MCINTOSH	466	EULONIA	15
GEORGIA	CHATHAM	472	FAIRHOPE	15
GEORGIA	LIBERTY	473	FAIRHOPE	15
GEORGIA	MCINTOSH	474	FAIRHOPE	7
GEORGIA	MCINTOSH	475	FAIRHOPE	15
GEORGIA	TIFT	516	FUQUAY	29
GEORGIA	TIFT	517	FUQUAY	29
GEORGIA	TIFT	518	FUQUAY	29
GEORGIA	TIFT	519	FUQUAY	30
GEORGIA	TIFT	520	FUQUAY	30
GEORGIA	TIFT	521	FUQUAY	30
GEORGIA	TURNER	522	FUQUAY	30
GEORGIA	LINCOLN	529	GEORGEVILLE	5
GEORGIA	BRYAN	539	GOLDSBORO	7
GEORGIA	BRYAN	540	GOLDSBORO	15
GEORGIA	TIFT	546	GRADY	30
GEORGIA	SCHLEY	555	GREENVILLE	30
GEORGIA	SCHLEY	556	GREENVILLE	30
GEORGIA	SCHLEY	557	GREENVILLE	30
GEORGIA	SCHLEY	558	GREENVILLE	30
GEORGIA	WARREN	605	HELENA	5
GEORGIA	MCDUFFIE	662	IREDELL	5
GEORGIA	BRYAN	665	IRVINGTON	15
GEORGIA	PIERCE	666	IRVINGTON	15
GEORGIA	TIFT	667	IRVINGTON	30
GEORGIA	TIFT	668	IRVINGTON	30
GEORGIA	WAYNE	669	IRVINGTON	7
GEORGIA	WAYNE	670	IRVINGTON	15
GEORGIA	TIFT	697	KERSHAW	30
GEORGIA	TIFT	698	KERSHAW	30
GEORGIA	BERRIEN	699	KIAWAH	7
GEORGIA	LIBERTY	700	KLEJ	7
GEORGIA	LIBERTY	718	LAKELAND	7
GEORGIA	LIBERTY	719	LAKELAND	15
GEORGIA	PIERCE	720	LAKELAND	15
GEORGIA	TIFT	731	LEEFIELD	30
GEORGIA	TIFT	732	LEEFIELD	30
GEORGIA	BRANTLEY	734	LEON	15
GEORGIA	BRYAN	735	LEON	15
GEORGIA	LONG	736	LEON	7
GEORGIA	LONG	737	LEON	15
GEORGIA	CLARKE	764	LLOYD	5
GEORGIA	COLUMBIA	765	LLOYD	5
GEORGIA	LINCOLN	766	LLOYD	5
GEORGIA	SUMTER	772	LOCAL ALLUVIAL	30
GEORGIA	SUMTER	773	LOCAL ALLUVIAL	30
GEORGIA	TIFT	774	LOCAL ALLUVIUM	30
GEORGIA	TIFT	775	LOCAL ALLUVIUM	30
GEORGIA	CLARKE	794	MADISON	30
GEORGIA	CLARKE	795	MADISON	30
GEORGIA	CLARKE	796	MADISON	30
GEORGIA	CLARKE	797	MADISON	30
GEORGIA	SUMTER	808	MARLBORO	30
GEORGIA	SUMTER	809	MARLBORO	30
GEORGIA	GLYNN	830	MEGGETT	15
GEORGIA	LIBERTY	831	MEGGETT	15
GEORGIA	MCINTOSH	832	MEGGETT	15
GEORGIA	LONG	916	ONA	15
GEORGIA	PIERCE	917	ONA	15
GEORGIA	WARE	918	ONA	15
GEORGIA	SCHLEY	921	ORANGEBURG	30
GEORGIA	SCHLEY	922	ORANGEBURG	30
GEORGIA	TURNER	925	OSIER	30
GEORGIA	TIFT	976	PLUMMER	30
GEORGIA	MCINTOSH	1012	RAINS	15
GEORGIA	TIFT	1013	RAINS	30
GEORGIA	SCHLEY	1042	RED BAY	30
GEORGIA	SCHLEY	1043	RED BAY	30
GEORGIA	TIFT	1058	ROBERTSDALE	30
GEORGIA	TIFT	1059	ROBERTSDALE	30
GEORGIA	SCHLEY	1070	RUSTON	30
GEORGIA	SCHLEY	1071	RUSTON	30
GEORGIA	TIFT	1130	STILSON	30
GEORGIA	TIFT	1131	STILSON	30
GEORGIA	TIFT	1141	SUNSWEET	30
GEORGIA	TIFT	1142	SUNSWEET	30
GEORGIA	TIFT	1176	TIFTON	29
GEORGIA	TIFT	1177	TIFTON	29
GEORGIA	TIFT	1178	TIFTON	29
GEORGIA	TIFT	1179	TIFTON	29
GEORGIA	TIFT	1180	TIFTON	30
GEORGIA	TIFT	1181	TIFTON	30
GEORGIA	TIFT	1182	TIFTON	30
GEORGIA	TIFT	1183	TIFTON	30
GEORGIA	TIFT	1184	TIFTON	30
GEORGIA	TIFT	1185	TIFTON	30
GEORGIA	TIFT	1196	TROUP	30
GEORGIA	TIFT	1197	TROUP	30
GEORGIA	TIFT	1198	TROUP	30
GEORGIA	TIFT	1199	TROUP	30
GEORGIA	SUMTER	1245	VAUCLUSE	30
GEORGIA	SUMTER	1246	VAUCLUSE	30
GEORGIA	BERRIEN	1290	WESTON	7
GEORGIA	CLARKE	1295	WICKHAM	5
GEORGIA	ELBERT	1296	WICKHAM	5
GEORGIA	LINCOLN	1297	WICKHAM	5
IDAHO		1167	THATUNA	30
IDAHO		1168	THATUNA	30
IDAHO		1219	UNNAMED FSL	30
IDAHO		1220	UNNAMED GRL	30
IDAHO		1221	UNNAMED GRL	30
IDAHO		1222	UNNAMED VGRL	30
ILLINOIS	PIATT	21	ALEXIS	30
ILLINOIS	PIATT	22	ALEXIS	30
ILLINOIS	PIATT	23	ALEXIS	30
ILLINOIS	PIATT	24	ALEXIS	30
ILLINOIS	CUMBERLAND	252	CISNE	1
ILLINOIS	FAYETTE	253	CISNE	1
ILLINOIS	PIATT	411	DRUMMER	30
ILLINOIS	PIATT	412	DRUMMER	30
ILLINOIS	PIATT	443	ELBURN	30
ILLINOIS	WILL	451	ELLIOTT	1
ILLINOIS	CHAMPAIGN	488	FLANAGAN	1
ILLINOIS	PIATT	659	IPAVA	30
ILLINOIS	PIATT	660	IPAVA	30
ILLINOIS	PIATT	661	IPAVA	30
ILLINOIS	MADISON	671	IVA	30
ILLINOIS	MADISON	672	IVA	30
ILLINOIS	MADISON	870	MUREN	30
ILLINOIS	MADISON	871	MUREN	30
ILLINOIS	MADISON	872	MUREN	30
ILLINOIS	MADISON	873	MUREN	30
ILLINOIS	PIATT	1077	SABLE	30
ILLINOIS	PIATT	1089	SAVLE	30
ILLINOIS	PIATT	1172	THORP	30
ILLINOIS	PIATT	1173	THORP	30
ILLINOIS	PIATT	1174	THORP	30
ILLINOIS	PIATT	1256	VIRGIL	30
ILLINOIS	PIATT	1257	VIRGIL	30
INDIANA	PERRY	74	BARTLE	18
INDIANA	N/A	153	BROOKSTON	18
INDIANA	SHELBY	154	BROOKSTON	18
INDIANA		216	CELINA	30
INDIANA		217	CELINA	30
INDIANA		220	CHALMERS	30
INDIANA		221	CHALMERS	30
INDIANA	N/A	250	CINCINNATI	18
INDIANA	OWEN	251	CINCINNATI	1
INDIANA	JENNINGS	261	CLERMONT	1
INDIANA	N/A	280	COLOMA	18
INDIANA	SHELBY	325	CROSBY	18
INDIANA		351	DANA	30
INDIANA		352	DANA	30
INDIANA	PERRY	448	ELKINSVILLE	18
INDIANA		484	FINCASTLE	30
INDIANA		485	FINCASTLE	30
INDIANA		486	FINCASTLE	30
INDIANA		487	FINCASTLE	30
INDIANA	N/A	847	MIAMI	18
INDIANA	SHELBY	848	MIAMI	18
INDIANA	N/A	861	MORLEY	18
INDIANA	SHELBY	907	OCKLEY	18
INDIANA	SHELBY	908	OCKLEY	18
INDIANA		938	PARR	30
INDIANA		939	PARR	30
INDIANA		940	PARR	30
INDIANA		941	PARR	30
INDIANA	N/A	971	PLAINFIELD	18
INDIANA	PERRY	995	PRINCETON	18
INDIANA		1018	RAUB	30
INDIANA		1019	RAUB	30
INDIANA	WARREN	1069	RUSSELL	1
INDIANA	PERRY	1091	SCIOTOVILLE	18
INDIANA	PERRY	1168	TILSIT	18
INDIANA	PERRY	1285	WELLSTON	18
INDIANA	SHELBY	1289	WESTLAND	18
INDIANA	PERRY	1291	WHEELING	18
INDIANA	PERRY	1292	WHEELING	18
INDIANA	PERRY	1322	ZANESVILLE	18
INDIANA	PERRY	1323	ZANESVILLE	18
IOWA		278	COLO	30
IOWA		279	COLO	30
IOWA	RINGGOLD	572	GRUNDY	1
IOWA	MONONA	653	IDA	1
IOWA		816	MARSHALL	30
IOWA		817	MARSHALL	30
IOWA	LYON	858	MOODY	1
LOUISIANA	RAPIDES	5	ACADIA	8
LOUISIANA	JEFFERSON DAVIS	95	BEAUMONT	4
LOUISIANA	BEAUREGARD	96	BEAUREGARD	8
LOUISIANA	BEAUREGARD	97	BEAUREGARD	8
LOUISIANA	RAPIDES	98	BEAUREGARD	8
LOUISIANA	BOSSIER	144	BOSWELL	4
LOUISIANA	BEAUREGARD	147	BOWIE	8
LOUISIANA	RAPIDES	148	BOWIE	8
LOUISIANA	ALLEN	171	CADDO	8
LOUISIANA	ALLEN	172	CADDO	8
LOUISIANA	BEAUREGARD	173	CADDO	8
LOUISIANA	RICHLAND	178	CALHOUN	4
LOUISIANA	RICHLAND	227	CHARLIEVILLE	4
LOUISIANA	MADISON	284	COMMERCE	4
LOUISIANA	JEFFERSON DAVIS	332	CROWLEY	4
LOUISIANA	JEFFERSON DAVIS	333	CROWLEY	4
LOUISIANA	RAPIDES	334	CROWLEY	8
LOUISIANA	CALDWELL	524	GALLION	4
LOUISIANA	WEST FELICIANA	560	GRENADA	8
LOUISIANA	MADISON	585	HARKEY	4
LOUISIANA	ST MARTIN	586	HARRIS	4
LOUISIANA	RICHLAND	599	HEBERT	4
LOUISIANA	NATCHITOCHES	707	KISATCHIE	4
LOUISIANA	BOSSIER	721	LAKELAND	4
LOUISIANA	NATCHITOCHES	722	LAKELAND	8
LOUISIANA	EAST FELICIANA	741	LEXINGTON	8
LOUISIANA	EVANGELINE	742	LEXINGTON	4
LOUISIANA	FRANKLIN	754	LINTONIA	4
LOUISIANA	RICHLAND	844	MER ROUGE	4
LOUISIANA	MADISON	846	MHOON	4
LOUISIANA	RAPIDES	852	MILLER	4
LOUISIANA	RAPIDES	853	MILLER	4

TABLE 3. (CONTINUED)

STATE	COUNTY	SOIL NUMBER	SOIL SERIES	REF
MISSOURI	GREENE	575	GUTHRIE	13
MISSOURI	LAWRENCE	576	GUTHRIE	13
MISSOURI	ST FRANCOIS	581	HAGERSTOWN	13
MISSOURI	HARRISON	587	HARRISON	13
MISSOURI	GREENE	645	HUNTINGTON	13
MISSOURI		674	JUDSON	30
MISSOURI		675	JUDSON	30
MISSOURI	HARRISON	749	LINDLEY	13
MISSOURI	LAFAYETTE	818	MARSHALL	13
MISSOURI	MCDANAY	819	MARSHALL	13
MISSOURI	ST CHARLES	843	MENFRO	13
MISSOURI	CALLAWAY	845	MEXICO	13
MISSOURI	GREENE	890	NEWTONIA	13
MISSOURI	GREENE	891	NEWTONIA	13
MISSOURI	CHRISTIAN	894	NIXA	13
MISSOURI	STODDARD	915	OLIVIER	13
MISSOURI	CARROLL	919	OHANA	13
MISSOURI	ABBEY	926	OSWEGO	13
MISSOURI	DENT	949	PEARSAN	13
MISSOURI	CALLAWAY	1010	PUTNAM	13
MISSOURI	STODDARD	1054	RICHLAND	13
MISSOURI	CARROLL	1083	SARPY	13
MISSOURI	CARROLL	1084	SARPY	13
MISSOURI	PEMISCOT	1098	SHARKEY	13
MISSOURI	LINCOLN	1100	SHARON	13
MISSOURI	GENTRY	1102	SHARPSBURGH	13
MISSOURI		1103	SHELBY	30
MISSOURI		1104	SHELBY	30
MISSOURI	HARRISON	1105	SHELBY	13
MISSOURI	HARRISON	1106	SHELBY	13
MISSOURI	CARROLL	1214	UNNAMED	13
MISSOURI	CARROLL	1260	WABASH	13
MISSOURI	HARRISON	1261	WABASH	13
MISSOURI	SCOTLAND	1274	WAVERLY	13
MISSOURI	BOONE	1284	WELDON	13
NEBRASKA	WEBSTER	269	COLBY	30
NEBRASKA	WEBSTER	270	COLBY	30
NEBRASKA	WEBSTER	271	COLBY	30
NEBRASKA	WEBSTER	272	COLBY	30
NEBRASKA	WEBSTER	594	HASTINGS	30
NEBRASKA	WEBSTER	595	HASTINGS	30
NEBRASKA	WEBSTER	596	HASTINGS	30
NEBRASKA	WEBSTER	597	HASTINGS	30
NEBRASKA	WEBSTER	619	HOBBS	30
NEBRASKA	WEBSTER	620	HOBBS	30
NEBRASKA	WEBSTER	621	HOBBS	30
NEBRASKA	WEBSTER	622	HOBBS	30
NEBRASKA	LINCOLN	623	HOLDREGE	1
NEBRASKA	WEBSTER	624	HOLDREGE	30
NEBRASKA	WEBSTER	625	HOLDREGE	30
NEBRASKA	WEBSTER	626	HOLDREGE	30
NEBRASKA	WEBSTER	627	HOLDREGE	30
NEBRASKA	BOX BUTTE	693	KEITH	1
NEBRASKA	WEBSTER	902	NUCKOLLS	30
NEBRASKA	WEBSTER	903	NUCKOLLS	30
NEBRASKA	WEBSTER	904	NUCKOLLS	30
NEBRASKA	WEBSTER	905	NUCKOLLS	30
NEBRASKA	LANCASTER	1101	SHARPSBURG	1
NEW MEXICO		129	BILLINGS	30
NEW MEXICO		130	BILLINGS	30
NEW MEXICO		131	BILLINGS	30
NEW MEXICO		132	BILLINGS	30
NEW MEXICO		184	CANONCITO	30
NEW MEXICO		185	CANONCITO	30
NEW MEXICO		218	CHACRA	30
NEW MEXICO		219	CHACRA	30
NEW MEXICO		960	PERSAYO	30
NEW MEXICO		961	PERSAYO	30
NEW MEXICO		996	PROGRESSO	30
NEW MEXICO		997	PROGRESSO	30
NEW MEXICO		1065	ROUGH	30
NEW MEXICO		1066	ROUGH LAND	30
NEW MEXICO		1067	ROUGH LAND	30
NEW MEXICO		1068	ROUGH LAND	30
NEW MEXICO		1191	TRAVESSILLA-LIKE	30
NEW MEXICO		1192	TRAVESSILLA-LIKE	30
NEW YORK	TOMPKINS	79	BATH	30
NEW YORK	TOMPKINS	80	BATH	30
NEW YORK	TOMPKINS	406	HANDIN	30
NEW YORK	TOMPKINS	407	HANDIN	30
NEW YORK	TOMPKINS	1258	VOLUSIA	30
NEW YORK	TOMPKINS	1259	VOLUSIA	30
NORTH CAROLINA	CHATHAM	11	ALAMANCE	20
NORTH CAROLINA	ROWAN	33	ALTAVISTA	20
NORTH CAROLINA	WAKE	42	APPLING	20
NORTH CAROLINA	BUNCOMBE	51	ASHE	20
NORTH CAROLINA	HAYWOOD	52	ASHE	20
NORTH CAROLINA	BUNCOMBE	59	BALFOUR	20
NORTH CAROLINA	HAYWOOD	60	BALFOUR	20
NORTH CAROLINA	PASQUOTANK	69	BARCLAY	20
NORTH CAROLINA	PASQUOTANK	70	BARCLAY	20
NORTH CAROLINA	PASQUOTANK	87	BAYBORO	20
NORTH CAROLINA	PASQUOTANK	88	BAYBORO	20
NORTH CAROLINA	PASQUOTANK	122	BERTIE	20
NORTH CAROLINA	PASQUOTANK	123	BERTIE	20
NORTH CAROLINA	PASQUOTANK	134	BLADEN	20
NORTH CAROLINA	HAYWOOD	160	BUNCOMBE	20
NORTH CAROLINA	BUNCOMBE	163	BURTON	20
NORTH CAROLINA	JOHNSTON	196	CAROLINE	20
NORTH CAROLINA	DAVIE	206	CECIL	20
NORTH CAROLINA	WAKE	207	CECIL	20
NORTH CAROLINA	JACKSON	222	CHANDLER	20
NORTH CAROLINA	HAYWOOD	233	CHESTER	20
NORTH CAROLINA	HAYWOOD	234	CHESTER	20
NORTH CAROLINA	JOHNSTON	237	CHESTERFIELD	20
NORTH CAROLINA	JOHNSTON	238	CHESTERFIELD	20
NORTH CAROLINA	HAYWOOD	262	CLIFTON	20
NORTH CAROLINA	DUPLIN	317	COXVILLE	20
NORTH CAROLINA	DUPLIN	320	CRAVEN	20
NORTH CAROLINA	DAVIE	356	DAVIDSON	20
NORTH CAROLINA	IREDELL	357	DAVIDSON	20
NORTH CAROLINA	ROWAN	358	DAVIDSON	20
NORTH CAROLINA	ROWAN	359	DAVIDSON	20
NORTH CAROLINA	DUPLIN	421	DUNBAR	20
NORTH CAROLINA	DUPLIN	428	DUPLIN	20
NORTH CAROLINA	WAKE	429	DURHAM	20
NORTH CAROLINA	BUNCOMBE	438	EDNEYVILLE	20
NORTH CAROLINA	PASQUOTANK	449	ELKTON	20
NORTH CAROLINA	PASQUOTANK	450	ELKTON	20
NORTH CAROLINA	GRANVILLE	460	ENON	20
NORTH CAROLINA	HAYWOOD	479	FANNIN	20
NORTH CAROLINA	BUNCOMBE	493	FLETCHER	20
NORTH CAROLINA	JOHNSTON	523	FUQUAY	20
NORTH CAROLINA	CHATHAM	530	GEORGEVILLE	20
NORTH CAROLINA	WAKE	552	GRANVILLE	20
NORTH CAROLINA	HAYWOOD	598	HAYESVILLE	20
NORTH CAROLINA	ALAMANCE	606	HELENA	20
NORTH CAROLINA	CHATHAM	616	HERNDON	20
NORTH CAROLINA	HAYWOOD	618	HIWASSEE	20
NORTH CAROLINA	CHEROKEE	663	IREDELL	20
NORTH CAROLINA	IREDELL	664	IREDELL	20
NORTH CAROLINA	DUPLIN	709	KLEJ	20
NORTH CAROLINA	DUPLIN	723	LAKELAND	20
NORTH CAROLINA	JOHNSTON	738	LEON	20
NORTH CAROLINA	ROWAN	767	LLOYD	20
NORTH CAROLINA	JOHNSTON	790	LYNCHBURG	20
NORTH CAROLINA	DUPLIN	810	MARLBORO	20
NORTH CAROLINA	IREDELL	829	MECKLENBURG	20
NORTH CAROLINA	PASQUOTANK	895	NIXONTON	20
NORTH CAROLINA	PASQUOTANK	896	NIXONTON	20
NORTH CAROLINA	JOHNSTON	897	NORFOLK	20
NORTH CAROLINA	JOHNSTON	898	NORFOLK	20
NORTH CAROLINA	SCOTLAND	899	NORFOLK	20
NORTH CAROLINA	JOHNSTON	923	ORANGEBURG	20
NORTH CAROLINA	PASQUOTANK	927	OTHELLA	20
NORTH CAROLINA	PASQUOTANK	928	OTHELLA	20
NORTH CAROLINA	PASQUOTANK	942	PASQUOTANK	20
NORTH CAROLINA	PASQUOTANK	943	PASQUOTANK	20
NORTH CAROLINA	DUPLIN	977	PLUMMER	20
NORTH CAROLINA	HAYWOOD	987	PORTERS	20
NORTH CAROLINA	HAYWOOD	988	PORTERS	20
NORTH CAROLINA	DUPLIN	989	PORTSMOUTH	20
NORTH CAROLINA	BUNCOMBE	1011	RABUN	20
NORTH CAROLINA	DUPLIN	1014	RAINS	20
NORTH CAROLINA	HAYWOOD	1037	RAMSEY	20
NORTH CAROLINA	DUPLIN	1074	RUSTON	20
NORTH CAROLINA	DUPLIN	1075	RUTLEDGE	20
NORTH CAROLINA	JACKSON	1152	TALLADEGA	20
NORTH CAROLINA	BUNCOMBE	1158	TATE	20
NORTH CAROLINA	HAYWOOD	1201	TUSQUITEE	20
NORTH CAROLINA	JOHNSTON	1244	VARINA	20
NORTH CAROLINA	HAYWOOD	1264	WATAUGA	20
NORTH CAROLINA	PASQUOTANK	1281	WEEKSVILLE	20
NORTH CAROLINA	PASQUOTANK	1282	WEEKSVILLE	20
NORTH CAROLINA	CHATHAM	1293	WHITE STORE	20
NORTH CAROLINA	ROWAN	1298	WICKHAM	20
NORTH CAROLINA	ROWAN	1299	WICKHAM	20
NORTH CAROLINA	DUPLIN	1313	WOODSTOWN	20
NORTH DAKOTA	TRAILL	93	BEARDEN	1
NORTH DAKOTA	TRAILL	94	BEARDEN	1
NORTH DAKOTA	MCHENRY	254	CLAIRE	22
NORTH DAKOTA	CASS	452	EMBDEN	22
NORTH DAKOTA	N/A	457	EMRICK	22
NORTH DAKOTA	CASS	525	GARDENA	22
NORTH DAKOTA	PIERCE	526	GARDENA	22
NORTH DAKOTA	CASS	538	GLYNDON	22
NORTH DAKOTA	CASS	584	HAMAR	22
NORTH DAKOTA	BOTTINEAU	600	HECLA	22
NORTH DAKOTA	CASS	601	HECLA	22
NORTH DAKOTA	RICHLAND	602	HECLA	22
NORTH DAKOTA	N/A	603	BRINDAL	22
NORTH DAKOTA	N/A	604	BRINDAL	22
NORTH DAKOTA	MCHENRY	779	LOHNES	22
NORTH DAKOTA	STARK	862	MORTON	1
NORTH DAKOTA	STARK	863	MORTON	1
NORTH DAKOTA	CAVALIER	1148	SVEA	22
NORTH DAKOTA	DICKEY	1215	UNNAMED	22
NORTH DAKOTA	DICKEY	1216	UNNAMED	22
NORTH DAKOTA	DICKEY	1217	UNNAMED	22
NORTH DAKOTA	CASS	1316	WYNDMERE	22
NORTH DAKOTA	WARD	1320	ZAHL	22
OHIO	COSHOCTON	103	BERKS	28
OHIO	COSHOCTON	104	BERKS	28
OHIO	COSHOCTON	105	BERKS	30
OHIO	COSHOCTON	106	BERKS	30
OHIO	COSHOCTON	107	BERKS 1062	26
OHIO	COSHOCTON	108	BERKS 1063	26
OHIO	COSHOCTON	109	BERKS 1064	26
OHIO	COSHOCTON	110	BERKS 1091	26
OHIO	COSHOCTON	111	BERKS 1211	26
OHIO	COSHOCTON	112	BERKS 1212	26
OHIO	COSHOCTON	113	BERKS 1213	26
OHIO	COSHOCTON	114	BERKS 1281	26
OHIO	COSHOCTON	115	BERKS 1282	26
OHIO	COSHOCTON	116	BERKS 1283	26
OHIO	COSHOCTON	117	BERKS 1291	26
OHIO	COSHOCTON	118	BERKS 1292	26
OHIO	COSHOCTON	119	BERKS 1301	26
OHIO	COSHOCTON	120	BERKS 1921	26
OHIO	COSHOCTON	121	BERKS 1922	26
OHIO	ALLEN	140	BLOUNT	1
OHIO	WAYNE	183	CANFIELD	1
OHIO	COSHOCTON	257	CLARKSBURG 1133	26
OHIO	COSHOCTON	258	CLARKSBURG 1214	26
OHIO	COSHOCTON	259	CLARKSBURG 1924	26
OHIO	COSHOCTON	298	COSHOCTON	28

TABLE 3. (CONTINUED)

STATE	COUNTY	SOIL NUMBER	SOIL SERIES	REF
TENNESSEE	BLOUNT	338	CUMBERLAND	14
TENNESSEE	BLOUNT	339	CUMBERLAND	14
TENNESSEE	BLOUNT	340	CUMBERLAND	14
TENNESSEE	SEVIER	341	CUMBERLAND	14
TENNESSEE	BLOUNT	361	DECATUR	14
TENNESSEE	BLOUNT	362	DECATUR	14
TENNESSEE	JEFFERSON	363	DECATUR	14
TENNESSEE	KNOX	364	DECATUR	14
TENNESSEE	BLOUNT	381	DEWEY	14
TENNESSEE	BLOUNT	382	DEWEY	14
TENNESSEE	BLOUNT	383	DEWEY	14
TENNESSEE	COFFEE	392	DICKSON	14
TENNESSEE	COFFEE	393	DICKSON	14
TENNESSEE	GILES	394	DICKSON	14
TENNESSEE	PUTNAM	395	DICKSON	14
TENNESSEE	PUTNAM	396	DICKSON	14
TENNESSEE	BLOUNT	424	DUNMORE	14
TENNESSEE	BLOUNT	425	DUNMORE	14
TENNESSEE	GREENE	426	DUNMORE	14
TENNESSEE	SEVIER	427	DUNMORE	14
TENNESSEE	BLOUNT	454	EMORY	14
TENNESSEE	BLOUNT	455	EMORY	14
TENNESSEE	KNOX	456	EMORY	14
TENNESSEE	ROBERTSON	458	ENNIS	14
TENNESSEE	ROBERTSON	459	ENNIS	14
TENNESSEE	WILLIAMSON	465	ETOWAH	14
TENNESSEE	CHESTER	468	EUSTIS	141
TENNESSEE	CHESTER	469	EUSTIS	141
TENNESSEE	CROCKETT	477	FALAYA	141
TENNESSEE	FAYETTE	478	FALAYA	141
TENNESSEE	JEFFERSON	506	FULLERTON	14
TENNESSEE	JEFFERSON	507	FULLERTON	14
TENNESSEE	JEFFERSON	508	FULLERTON	14
TENNESSEE	JEFFERSON	509	FULLERTON	14
TENNESSEE	JEFFERSON	510	FULLERTON	14
TENNESSEE	KNOX	511	FULLERTON	14
TENNESSEE	KNOX	512	FULLERTON	14
TENNESSEE	KNOX	513	FULLERTON	14
TENNESSEE	KNOX	553	GREENDALE	14
TENNESSEE	FAYETTE	565	GRENADA	141
TENNESSEE	FAYETTE	566	GRENADA	141
TENNESSEE	GREENE	567	GROSECLOSE	14
TENNESSEE	COFFEE	577	GUTHRIE	14
TENNESSEE	PUTNAM	578	GUTHRIE	14
TENNESSEE	CUMBERLAND	592	HARTSELLS	14
TENNESSEE	MORGAN	593	HARTSELLS	14
TENNESSEE	FAYETTE	607	HENRY	141
TENNESSEE	MADISON	608	HENRY	141
TENNESSEE	BLOUNT	609	HERMITAGE	14
TENNESSEE	BLOUNT	610	HERMITAGE	14
TENNESSEE	JEFFERSON	629	HOLSTON	14
TENNESSEE	BLOUNT	646	HUNTINGTON	14
TENNESSEE	BLOUNT	647	HUNTINGTON	14
TENNESSEE	JEFFERSON	648	HUNTINGTON	14
TENNESSEE	KNOX	649	HUNTINGTON	14
TENNESSEE	KNOX	650	HUNTINGTON	14
TENNESSEE	CHESTER	747	LEXINGTON	141
TENNESSEE	CHESTER	748	LEXINGTON	141
TENNESSEE	BLOUNT	750	LINDSIDE	14
TENNESSEE	GREENE	751	LINDSIDE	14
TENNESSEE	KNOX	752	LINDSIDE	14
TENNESSEE	WILLIAMSON	753	LINDSIDE	14
TENNESSEE	HAWKINS	757	LITZ	14
TENNESSEE	HAWKINS	758	LITZ	14
TENNESSEE	HAWKINS	759	LITZ	14
TENNESSEE	MADISON	798	MADISON	141
TENNESSEE	GILES	822	MAURY	14
TENNESSEE	MAURY	823	MAURY	14
TENNESSEE	MAURY	824	MAURY	14
TENNESSEE	WILLIAMSON	825	MAURY	14
TENNESSEE	WILLIAMSON	826	MAURY	14
TENNESSEE	BLOUNT	834	MELVIN	14
TENNESSEE	WILLIAMSON	835	MELVIN	14
TENNESSEE	FAYETTE	840	MEMPHIS	141
TENNESSEE	FAYETTE	841	MEMPHIS	141
TENNESSEE	MADISON	842	MEMPHIS	141
TENNESSEE	WILLIAMSON	854	MIMOSA	14
TENNESSEE	WILLIAMSON	855	MIMOSA	14
TENNESSEE	COFFEE	866	MOUNTVIEW	14
TENNESSEE	GILES	867	MOUNTVIEW	141
TENNESSEE	GILES	868	MOUNTVIEW	141
TENNESSEE	PUTNAM	869	MOUNTVIEW	141
TENNESSEE	KNOX	885	NEEDMORE	14
TENNESSEE	ROBERTSON	950	PEMBROKE	141
TENNESSEE	MORGAN	962	PHILO	14
TENNESSEE	BLEDSOE	1060	ROBERTSVILLE	14
TENNESSEE	DYER	1061	ROBERTSVILLE	141
TENNESSEE	OBION	1062	ROLLIN	141
TENNESSEE	BLOUNT	1092	SEQUOIA	14
TENNESSEE	BLOUNT	1093	SEQUOIA	14
TENNESSEE	BLOUNT	1094	SEQUOIA	14
TENNESSEE	KNOX	1095	SEQUOIA	14
TENNESSEE	KNOX	1096	SEQUOIA	14
TENNESSEE	KNOX	1097	SEQUOIA	14
TENNESSEE	DYER	1099	SHARKEY	141
TENNESSEE	CHESTER	1107	SILERTON	141
TENNESSEE	BLOUNT	1122	STASER	14
TENNESSEE	KNOX	1123	STASER	14
TENNESSEE	SEVIER	1124	STASER	14
TENNESSEE	LOUDON	1149	TALBOTT	14
TENNESSEE	KNOX	1166	TELLICO	14
TENNESSEE	MORGAN	1189	TILSIT	14
TENNESSEE	FAYETTE	1275	WAVERLY	141
TENNESSEE	BLOUNT	1276	WAYNESBORO	14
TENNESSEE	COFFEE	1277	WAYNESBORO	141
TENNESSEE	COFFEE	1278	WAYNESBORO	141
TENNESSEE	KNOX	1279	WAYNESBORO	14
TENNESSEE	KNOX	1307	WOLFTEVER	14
TEXAS		3	ABILENE	30
TEXAS		4	ABILENE	30
TEXAS	HALL	34	ALTUS	12
TEXAS	HALL	35	ALTUS	12
TEXAS	HALL	36	AMARILLO	12
TEXAS	HALL	37	AMARILLO	12
TEXAS		57	AUSTIN	30
TEXAS		58	AUSTIN	30
TEXAS		145	BOSWELL	30
TEXAS		146	BOSWELL	30
TEXAS		149	BOWIE	30
TEXAS		150	BOWIE	30
TEXAS		155	BUB	30
TEXAS		156	BUB	30
TEXAS	MCLENNAN	161	BURLESON	30
TEXAS	MCLENNAN	162	BURLESON	30
TEXAS	MCLENNAN	321	CROCKETT	30
TEXAS	MCLENNAN	322	CROCKETT	30
TEXAS	MCLENNAN	323	CROCKETT	30
TEXAS	MCLENNAN	324	CROCKETT	30
TEXAS	MARTIN	543	GOMEZ	12
TEXAS	MARTIN	544	GOMEZ	12
TEXAS		635	HOUSTON	30
TEXAS		636	HOUSTON	30
TEXAS		637	HOUSTON	30
TEXAS		638	HOUSTON	30
TEXAS		705	KIRVIN	30
TEXAS		706	KIRVIN	30
TEXAS		803	MANSKER	30
TEXAS		804	MANSKER	30
TEXAS	HALL	850	MILES	12
TEXAS	HALL	851	MILES	12
TEXAS		990	POTTER	30
TEXAS		991	POTTER	30
TEXAS		1004	PULLMAN	30
TEXAS		1005	PULLMAN	30
TEXAS		1006	PULLMAN	30
TEXAS		1007	PULLMAN	30
TEXAS	RANDALL	1008	PULLMAN	12
TEXAS	RANDALL	1009	PULLMAN	12
TEXAS		1186	TILLMAN	30
TEXAS		1187	TILLMAN	30
TEXAS		1193	TRINITY	30
TEXAS		1194	TRINITY	30
TEXAS	MCLENNAN	1302	WILSON	30
TEXAS	MCLENNAN	1303	WILSON	30
VERMONT	CALEDONIA	157	BUCKLAND	30
VERMONT	CALEDONIA	158	BUCKLAND	30
VERMONT	CALEDONIA	159	BUCKLAND	30
VERMONT	CALEDONIA	168	CABOT	30
VERMONT	CALEDONIA	169	CABOT	30
VERMONT	CALEDONIA	170	CABOT	30
VERMONT	CALEDONIA	176	CALAIS	30
VERMONT	CALEDONIA	177	CALAIS	30
VERMONT	CALEDONIA	281	COLRAIN	30
VIRGINIA	BRUNSWICK	43	APPLING	30
VIRGINIA	BRUNSWICK	44	APPLING	30
VIRGINIA	BRUNSWICK	45	APPLING	30
VIRGINIA	BRUNSWICK	46	APPLING	30
VIRGINIA	HALIFAX	47	APPLING	30
VIRGINIA	HALIFAX	48	APPLING	30
VIRGINIA	FLOYD	151	BRANDYWINE	30
VIRGINIA	FLOYD	152	BRANDYWINE	30
VIRGINIA	CULPEPER	198	CATLETT	30
VIRGINIA	CULPEPER	199	CATLETT	30
VIRGINIA	BEDFORD	208	CECIL	30
VIRGINIA	BEDFORD	209	CECIL	30
VIRGINIA	BRUNSWICK	210	CECIL	30
VIRGINIA	BRUNSWICK	211	CECIL	30
VIRGINIA	BRUNSWICK	212	CECIL	30
VIRGINIA	BRUNSWICK	213	CECIL	30
VIRGINIA	HALIFAX	214	CECIL	30
VIRGINIA	HALIFAX	215	CECIL	30
VIRGINIA	FLOYD	235	CHESTER	30
VIRGINIA	FLOYD	236	CHESTER	30
VIRGINIA	CULPEPER	330	CROTON	30
VIRGINIA	CULPEPER	331	CROTON	30
VIRGINIA	FLOYD	439	EDNEYVILLE	30
VIRGINIA	FLOYD	440	EDNEYVILLE	30
VIRGINIA	LOUISA	497	FLUVANNA	30
VIRGINIA	LOUISA	498	FLUVANNA	30
VIRGINIA	LOUISA	499	FLUVANNA	30
VIRGINIA	LOUISA	500	FLUVANNA	30
VIRGINIA	PULASKI	503	FREDERICK	30
VIRGINIA	PULASKI	504	FREDERICK	30
VIRGINIA	FLOYD	534	GLENELG	30
VIRGINIA	FLOYD	535	GLENELG	30
VIRGINIA	MONTGOMERY	554	GREENDALE	30
VIRGINIA	MONTGOMERY	559	GREENVILLE	30
VIRGINIA	PULASKI	568	GROSECLOSE	30
VIRGINIA	PULASKI	569	GROSECLOSE	30
VIRGINIA	PULASKI	570	GROSECLOSE	30
VIRGINIA	PULASKI	571	GROSECLOSE	30
VIRGINIA	PULASKI	760	LITZ	30
VIRGINIA	PULASKI	761	LITZ	30
VIRGINIA	BEDFORD	768	LLOYD	30
VIRGINIA	BEDFORD	769	LLOYD	30
VIRGINIA	BEDFORD	770	LLYOD	30
VIRGINIA	BEDFORD	771	LLYOD	30
VIRGINIA	MONTGOMERY	777	LODI	30
VIRGINIA	MONTGOMERY	778	LODI	30
VIRGINIA	LOUISA	881	MASON	30
VIRGINIA	LOUISA	882	MASON	30
VIRGINIA	LOUISA	883	MASON	30
VIRGINIA	LOUISA	884	MASON	30
VIRGINIA	CULPEPER	951	PENN	30
VIRGINIA	LOUISA	952	PENN	30
VIRGINIA	LOUISA	1159	TATUM	30

Table 4. Hydrologic soil properties classified by soil texture

Texture class	Sample size	Total porosity (ϕ) cm3/cm3	Residual saturation (θ_r) cm3/cm3	Effective porosity (ϕ_e) cm3/cm3	Bubbling pressure (ψ_b) Arithmetic cm	Bubbling pressure (ψ_b) Geometric[2/] cm	Pore size distribution (λ) Arithmetic	Pore size distribution (λ) Geometric[2/]	Water retained at -0.33 bar tension cm3/cm3	Water retained at -15 bar tension cm3/cm3	Saturated Hydraulic Conductivity[3/] (K_s) cm/hr	
Sand	762	0.437[1/] (.374-.500)	0.020 (.001-.039)	0.417 (.354-.480)	15.98 (.24-31.72)	7.26 (1.36-38.74)	0.694 (.298-1.090)	0.592 (.334-1.051)	0.091 (.018-.164)	0.033 (.007-.059)	21.00	1.2 in/h
Loamy sand	338	.437 (.368-.506)	.035 (.003-.067)	.401 (.329-.473)	20.58 (-4.04-45.20)	8.69 (1.80-41.85)	.553 (.234-.872)	.474 (.271-.827)	.125 (.060-.190)	.055 (.019-.091)	6.11	
Sandy loam	666	.453 (.351-.555)	.041 (-.024-.106)	.412 (.283-.541)	30.20 (-3.61-64.01)	14.66 (3.45-62.24)	.378 (.140-.616)	.322 (.186-.558)	.207 (.126-.288)	.095 (.031-.159)	2.59	0.4
Loam	383	.463 (.375-.551)	.027 (-.020-.074)	.434 (.334-.534)	40.12 (-20.07-100.3)	11.15 (1.63-76.40)	.252 (.086-.418)	.220 (.137-.355)	.270 (.195-.345)	.117 (.069-.165)	.68	.25
Silt loam	1206	.501 (.420-.582)	.015 (-.028-.058)	.486 (.394-.578)	50.87 (-7.68-109.4)	20.76 (3.58-120.4)	.234 (.105-.363)	.211 (.136-.326)	.330 (.258-.402)	.133 (.078-.188)	1.32	.5
Sandy clay loam	498	.398 (.332-.464)	.068 (-.001-.137)	.330 (.235-.425)	59.41 (-4.62-123.4)	28.08 (5.57-141.5)	.319 (.079-.559)	.250 (.125-.502)	.255 (.186-.324)	.148 (.085-.211)	.43	.06
Clay loam	366	.464 (.409-.519)	.075 (-.024-.174)	.390 (.279-.501)	56.43 (-11.44-124.3)	25.89 (5.80-115.7)	.242 (.070-.414)	.194 (.100-.377)	.318 (.250-.386)	.197 (.115-.279)	.23	.04
Silty clay loam	689	.471 (.418-.524)	.040 (-.038-.118)	.432 (.347-.517)	70.33 (-3.26-143.9)	32.56 (6.68-158.7)	.177 (.039-.315)	.151 (.090-.253)	.366 (.304-.428)	.208 (.138-.278)	.15	.04
Sandy clay	45	.430 (.370-.490)	.109 (.013-.205)	.321 (.207-.435)	79.48 (-20.15-179.1)	29.17 (4.96-171.6)	.223 (.048-.398)	.168 (.078-.364)	.339 (.245-.433)	.239 (.162-.316)	.12	.02
Silty clay	127	.479 (.425-.533)	.056 (-.024-.136)	.423 (.334-.512)	76.54 (-6.47-159.6)	34.19 (7.04-166.2)	.150 (.040-.260)	.127 (.074-.219)	.387 (.332-.442)	.250 (.193-.307)	.09	.02
Clay	291	.475 (.427-.523)	.090 (-.015-.195)	.385 (.269-.501)	85.60 (-4.92-176.1)	37.30 (7.43-187.2)	.165 (.037-.293)	.131 (.068-.253)	.396 (.326-.466)	.272 (.208-.336)	.06	.01

1/ First line is the mean value
Second line is + one standard deviation about the mean

2/ Antilog of the log mean

3/ Obtained from figure 2

Table 6. Hydraulic Conductivity Data Sources

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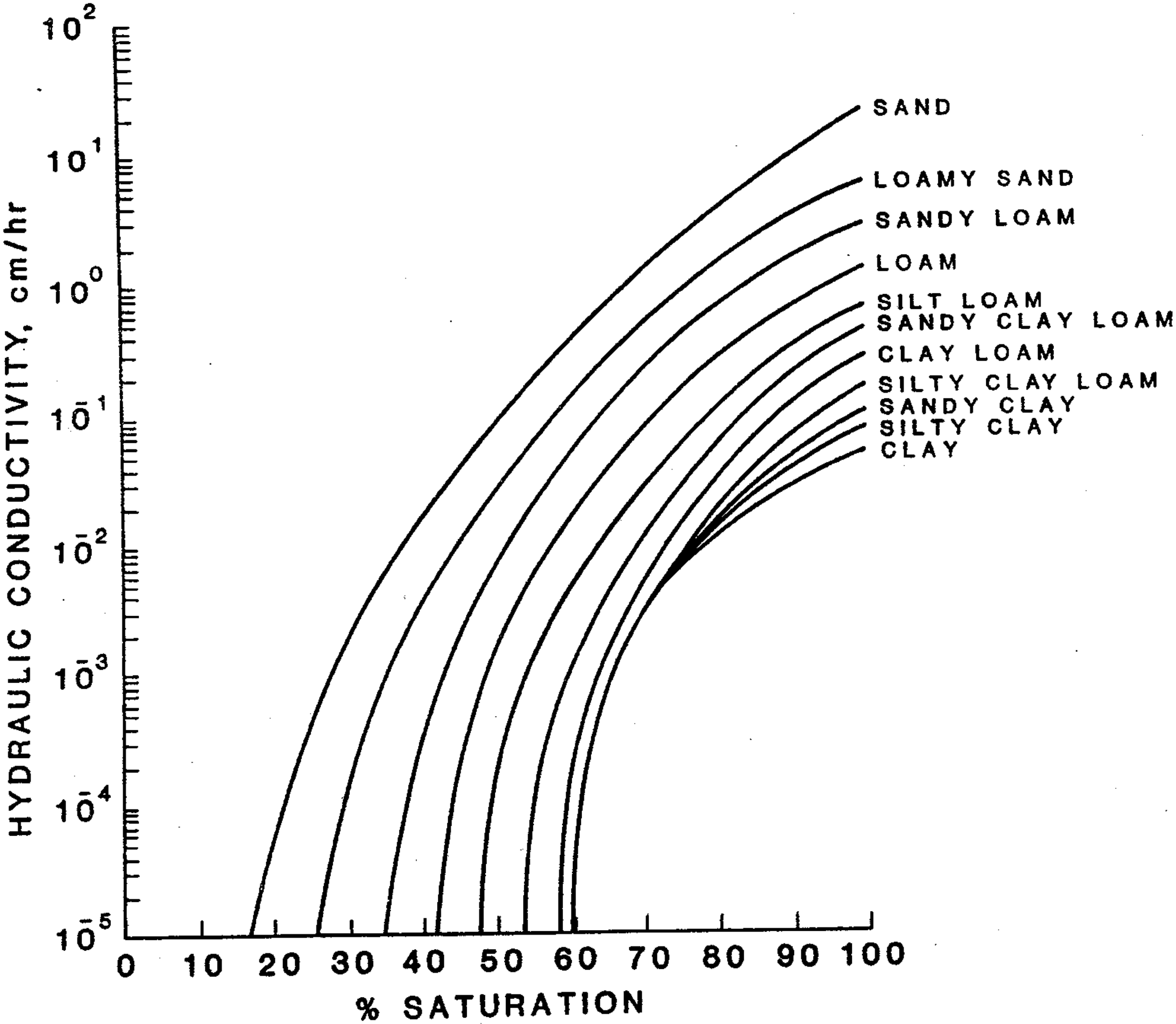

FIGURE 2. Hydraulic Conductivity Sorted by Soil Texture

Appendix C – *Green-Ampt Infiltration Parameters from Soils Data*

Green-Ampt Infiltration Parameters from Soils Data

By Walter J. Rawls,[1] M. ASCE, Donald L. Brakensiek,[2] and Norman Miller[3]

Abstract: The analysis of approx 5,000 soil horizons indicated that Green and Ampt parameters (effective porosity, wetting front capillary pressure, and hydraulic conductivity) could not be developed based on phases of soil order or suborder. However, sets of average parameters are developed based on soil horizon or soil texture class, or both. A procedure for determining the Green and Ampt parameters based on soil properties utilizing the full spectrum of soil survey information is outlined.

Introduction

If physically based infiltration models are to be used in operational hydrology, procedures for estimating infiltration model parameters based on soil properties must be developed. Not only are improved procedures needed for estimating point soil parameters, but also methods are needed for quantifying the areal and temporal variation of the soil parameters (14).

The Green and Ampt infiltration model has been found to have wide applicability for modeling the infiltration process (10,15). The Green and Ampt rate equation is written as

$$f = K\left(1 + \frac{n\,\psi_f}{F}\right) \qquad (1)$$

and its integrated form is

$$F - n\,\psi_f \ln\left(1 + \frac{F}{n\,\psi_f}\right) = Kt \qquad (2)$$

in which K = hydraulic conductivity, in centimeters per hour; ψ_f = wetting front capillary pressure head, in centimeters; and n = available porosity which is calculated as the effective porosity, θ_e (total porosity, ϕ, minus residual saturation, θ_r), minus initial soil water content. Equation variables are f = infiltration rate, in centimeters per hour; F = infiltration amount, in centimeters; and t = time, in hours.

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Application of the Green and Ampt infiltration model requires estimates of the hydraulic conductivity, K; effective porosity, θ_e; and wetting front capillary pressure head, ψ_f. Pioneering work on evaluating the Green and Ampt parameters was first reported by Bouwer (1). Additional work, relating the parameters to soil texture, has been reported by Clapp and Hornberger (7), Brakensiek, et al. (3), and McCuen, et al. (9). Since past work has used only a small portion of the available soil survey information, specifically soil texture, it is the purpose of this study to report on predicting the Green and Ampt parameters (K, θ_e, ψ_f) from soil properties utilizing the full spectrum of soil survey information.

The National Cooperative Soil Survey (a joint effort by cooperating Federal agencies, land grant universities, and other state and local agencies), uses a national system of soil classification (11,16). This system is based primarily on soil properties that can be observed in the field (e.g., texture) or inferred from other properties observable in the field (e.g., clay mineralogy). The differentiating soil properties are those that mainly affect plant growth and engineering use of the soil, such as particle size distribution, clay mineralogy, organic matter, soil temperature regime, soil moisture regime, carbonate content, and salt content.

Soil taxonomy is a hierarchy of six categories and each category includes a set of classes that are defined at about the same level. The most general definitions, with the fewest differentiating properties, are in the highest category, which consists of 10 orders. The most specific definitions, with the most differentiating properties, are in the lowest category, which is the soil series. There are more than 12,000 series. Soil series are the classes most commonly used to define and name map units in soil surveys, but classes in other categories are also used. The system is designed to facilitate both the interpretation of the soil data for practical application, and because it is national—the transfer of soil information from one location to another. A soil survey for an individual area is designed to meet certain objectives and satisfy the needs identified by local users and cooperating agencies. The distinguishing characteristics of soil surveys are summarized in Table 1.

A map unit delineated on a soil map is a unique soil area recognized in a particular soil survey area. Map units are named for the dominant soil or soils in the unit. The named soil can be at any of the categoric levels in the soil classification system. The more general the soil resource information needed, the higher the category used for the reference name.

Map unit delineations contain inclusions not identified in the map unit name. These units are named and identified by the taxonomic class they represent. Soils are natural bodies, and their properties have a characteristic natural scatter or variability. Because of this variability, certain properties may fall outside the precise limits defined for the named taxonomic class. Also, the map scale may be too small for precise mapping of a small area of these included soils. Map units are designed so that no more than about 15% of the unit consists of inclusions dissimilar enough that their use and management differ, and these inclusions are described in map unit descriptions. Generally, map units of soil surveys made in the U.' e named for soil series. These units [redacted] pr[redacted]the [redacted] most precise soil-hydrologic data.

For order 5 soil surveys, the most distinguishable soil property is the taxonomic unit, specifically the soil order or suborder. For orders 2–4 soil surveys, the soil textures at various levels of detail are the most distinguishable soil properties. Also, for orders 2–4, information on horizon identification and depth and on mineralogy might be available. In addition to the information available for the higher order soil surveys, orders 1–2 soil surveys might have more specific information, such as

TABLE 1.—Criteria for Identifying Kinds of Soil Surveys*

Kinds of soil survey (1)	Kinds of map units (2)	Kinds of components (3)	Field procedures (4)	Appropriate scales for field mapping and published maps (5)	Minimum size delineation (6)
First order	mainly consociations and some complexes	phases of soil series	the soils in each delineation are identified by transection and traversing. Soil boundaries are observed throughout their length; air photo used to aid boundary delineation	1:12,000	1.5 acres
Second order	consociations, associations, and complexes	phases of soil series	the soils in each delineation are identified by transection and traversing; soil boundaries are plotted by observation and interpretation of remotely sensed data; boundaries are verified at closely spaced intervals	1:12,000–1:31,680	1.5 acres–10 acres
Third order	associations and some consociations and complexes	phases of soil series and soil families	the soils in each delineation are identified by transecting, traversing, and some observation and interpretation by remotely sensed data and verified with some observations	1:24,000–1:250,000	6 acres–640 acres
Fourth order	associations with some consociations	phases of soil families and subgroups	the soils of delineation representative of each map unit are identified and their patterns and composition determined by transecting; subsequent delineations are mapped by some traversing, by some observation, and by interpretation of remotely sensed data verified by occasional observations; boundaries are plotted by air photo interpretations	1:100,000–1:300,000	100 acres–1,000 acres
Fifth order	associations	phases of subgroups, great groups, suborders, and orders	the soils, their patterns, and their compositions for each map unit are identified through mapping selected areas (15 sq mile–25 sq mile) with first or second order surveys, or alternatively, by transection; subsequently, mapping is by widely spaced observations, or by interpretation of remotely sensed data with occasional verification by observation or traversing	1:250,000–1:1,000,000	640 acres–10,000 acres

*Soil surveys of all orders require maintenance of a soil handbook (legend, mapping unit descriptions, taxonomic unit descriptions, field notes, and interpretations) and review by correlation procedures of the National Cooperative Soil Survey. Work plans for many survey areas list more than 1 order; the part to which each is applicable is delineated on a small scale map of the survey area.

Note: Undifferentiated groups may be used in any order with possible exception of first order. This is about the minimum size delineation for readable soil maps (i.e., 1/4 × 1/4 area)—see Table 2. In practice, the minimum size delineations are generally larger than the minimum shown. First order soil surveys are made for purposes that require appraisal of the soil resources of areas as small as experimental plots and building sites. Mapping scale could conceivably be as large as 1:1.

measured particle size information, measured soil water retention values, organic matter percentage, bulk density, and saturated hydraulic conductivity. Such detailed information might be available for higher order soil surveys; however, because of the large map scale, their usefulness might be extremely limited.

Sources of detailed soils information are the SCS Technical Service Center, the SCS National Soil Survey Laboratory, the state SCS offices, state universities (usually the soil science or agricultural engineering departments), and publications, such as Ref. 13.

Data Base

The data used in this study were from a comprehensive compilation of published soil water characteristic data, as of 1978, for approx 1,200 soils (5,000 horizons) covering 34 states (13). The distribution of the soils is shown in Fig. 1. Each soil set included at most: (1) Detailed profile descriptions; (2) particle size distribution; (3) bulk density; (4) total porosity; (5) clay mineralogy; (6) chemical data; and (7) five to 10 water retention valves covering a range of matric potentials from 160–15,300 cm.

The basic data covered most agricultural soils with the physical properties including a wide range of sand content (mean 56%, range 0.1%–99%), silt content (mean 26%, range 0.1%–93%), clay content (mean 18%, range 0.1%–94%), organic matter content (mean 0.66, range 0.1%–12.5%), and bulk density (mean 1.42 gm/cm^3, range 0.6–2.09). The soils included also both expanding (montmorillonite) and nonexpanding (kaolinite, illite, chlorite, and vermiculite) type clay minerals.

Analysis

It has been shown that the Green and Ampt parameters can be estimated from soil water data using the Brooks-Corey equation (Ref. 3). The Brooks and Corey equation (Ref. 4) is written as

$$S_e = \left(\frac{\psi_b}{\psi}\right)^{\lambda} \quad \text{in which} \quad S_e\,(\text{effective saturation}) = \frac{\theta - \theta_r}{\phi - \theta_r} \quad \ldots\ldots\ldots\ldots (3)$$

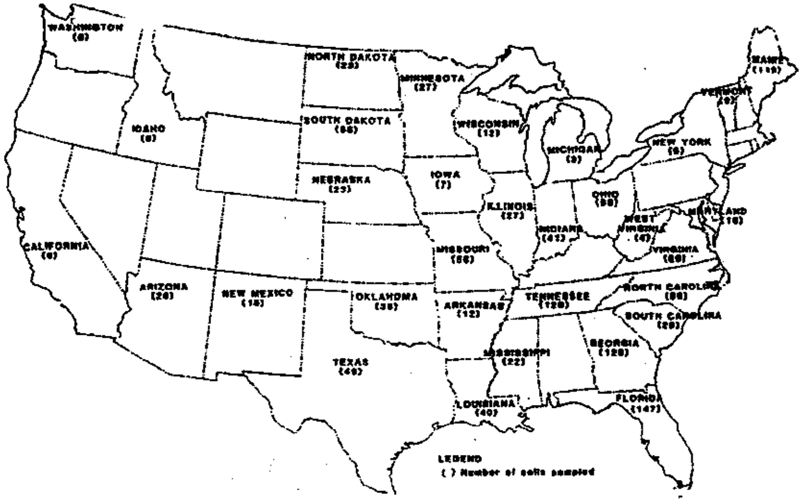

FIG. 1.—Distribution of Soils

in which θ = soil water content, in cubic centimeters per cubic centimeter; θ_r = residual saturation, in cubic centimeters per cubic centimeter; ϕ = total porosity, in cubic centimeters per cubic centimeter; ψ_b = bubbling pressure, in centimeters; ψ = capillary pressure, in centimeters; and λ = the pore-size distribution index.

The Green and Ampt parameters can be calculated from the estimated Brooks and Corey constants as follows: The wetting front capillary pressure term, ψ_f, is calculated by (2)

$$\psi_f = \frac{2\lambda + 3}{2\lambda + 2}\left(\frac{\psi_b}{2}\right) \quad (4)$$

The effective porosity, θ_e, is calculated as

$$\theta_e = \phi - \theta_r \quad (5)$$

in which ϕ = the total porosity, in cubic centimeters per cubic centimeter, and is calculated from bulk density and particle density; and θ_r = the residual soil-water content, in cubic centimeters per cubic centimeter. The Green and Ampt hydraulic conductivity, K, based on Bouwer's (4) findings that it is one-half the saturated hydraulic conductivity, is calculated as

$$K = \frac{K_s}{2} \quad (6)$$

in which the saturated conductivity, K_s, is calculated by an equation (Ref. 5) derived by substituting the Brooks and Corey equation into the Childs, Collis-George permeability integral (6) given by

$$K_s = a\frac{\phi_e^2}{\psi_b^2}\left[\frac{\lambda^2}{(\lambda + 1)(\lambda + 2)}\right] \quad (7)$$

in which a = a constant representing the effects of various fluid con-

TABLE 2.—Green and Ampt Parameters According to Soil Texture Classes and Horizons

Soil texture class (1)	Horizon (2)	Sample size (3)	Total porosity, ϕ, in cubic centimeters per cubic centimeters (4)	Effective porosity, θ_e, in cubic centimeters per cubic centimeters (5)	Wetted front capillary pressure, ψ_f,[a] in centimeters (6)	Hydraulic conductivity, K,[b] in centimeters per hour (7)
Sand[c]		762	0.437 0.374–0.500[d]	0.417 (0.354–0.480)	4.95 (0.97–25.36)	11.78
	A	370	0.452 (0.396–0.508)	0.431 (0.375–0.487)	5.34 (1.24–23.06)	
	B	185	0.440 (0.385–0.495)	0.421 (0.365–0.477)	6.38 (1.31–31.06)	
	C	127	0.424 (0.385–0.463)	0.408 (0.365–0.451)	2.07 (0.32–13.26)	
Loamy sand		338	0.437 (0.363–0.506)	0.401 (0.329–0.473)	6.13 (1.35–27.94)	2.99
	A	110	0.457 (0.385–0.529)	0.424 (0.347–0.501)	6.01 (1.58–22.87)	
	B	49	0.447 (0.379–0.515)	0.412 (0.334–0.490)	4.21 (1.03–17.24)	
	C	36	0.424 (0.372–0.476)	0.385 (0.323–0.447)	5.16 (0.76–34.85)	
Sandy loam		666	0.453 (0.351–0.555)	0.412 (0.283–0.541)	11.01 (2.67–45.47)	1.09
	A	119	0.505 (0.399–0.611)	0.469 (0.330–0.608)	15.24 (5.56–41.76)	
	B	219	0.466 (0.352–0.580)	0.428 (0.271–0.585)	8.89 (2.02–39.06)	
	C	66	0.418 (0.352–0.484)	0.389 (0.310–0.468)	6.79 (1.16–39.65)	
Loam		383	0.463 (0.375–0.551)	0.434 (0.334–0.534)	8.89 (1.33–59.38)	0.34
	A	76	0.512 (0.427–0.597)	0.476 (0.376–0.576)	10.01 (2.14–46.81)	
	B	67	0.512 (0.408–0.616)	0.498 (0.382–0.614)	6.40 (1.01–40.49)	
	C	47	0.412 (0.350–0.474)	0.382 (0.305–0.459)	9.27 (0.87–99.29)	
Silt loam		1,206	0.501 (0.420–0.582)	0.486 (0.394–0.578)	16.68 (2.92–95.39)	0.65
	A	361	0.527 (0.444–0.610)	0.514 (0.425–0.603)	10.91 (1.89–63.05)	
	B	267	0.533 (0.430–0.636)	0.515 (0.387–0.643)	7.21 (0.86–60.82)	
	C	73	0.470 (0.409–0.531)	0.460 (0.396–0.524)	12.62 (3.94–40.45)	
Sandy clay loam		498	0.398 (0.332–0.464)	0.330 (0.235–0.425)	21.85 (4.42–108.0)	0.15
	A	—[e]	— —	— —	— —	
	B	198	0.393 (0.310–0.476)	0.330 (0.223–0.437)	26.10 (4.79–142.30)	
	C	32	0.407 (0.359–0.455)	0.332 (0.251–0.413)	23.90 (5.51–103.75)	
Clay loam		366	0.464 (0.409–0.519)	0.309 (0.279–0.501)	20.88 (4.79–91.10)	0.10
	A	28	0.497 (0.434–0.560)	0.430 (0.328–0.532)	27.00 (6.13–118.9)	
	B	99	0.451 (0.401–0.501)	0.397 (0.228–0.530)	18.52 (4.36–78.73)	
	C	55	0.452 (0.412–0.492)	0.400 (0.320–0.480)	15.21 (3.79–61.01)	
Silty clay loam		689	0.471 (0.418–0.524)	0.432 (0.347–0.517)	27.30 (5.67–131.50)	0.10
	A	65	0.509 (0.449–0.569)	0.477 (0.410–0.544)	13.97 (4.20–46.53)	
	B	191	0.469 (0.423–0.515)	0.441 (0.374–0.508)	18.56 (4.08–84.44)	
	C	39	0.475 (0.436–0.514)	0.451 (0.386–0.516)	21.54 (4.56–101.7)	
Sandy clay		45	0.430 (0.370–0.490)	0.321 (0.207–0.435)	23.90 (4.08–140.2)	0.06
	A	—	— —	— —	— —	
	B	23	0.435 (0.371–0.499)	0.335 (0.220–0.450)	36.74 (8.33–162.1)	
	C	—	— —	— —	— —	
Silty clay		127	0.479 (0.425–0.533)	0.423 (0.334–0.512)	29.22 (6.13–139.4)	0.05
	A	—	— —	— —	— —	
	B	38	0.476 (0.445–0.507)	0.424 (0.345–0.503)	30.66 (7.15–131.5)	
	C	21	0.464 (0.430–0.498)	0.416 (0.346–0.486)	45.65 (18.27–114.1)	
Clay		291	0.475 (0.427–0.523)	0.385 (0.269–0.501)	31.63 (6.39–156.5)	0.03
	A	—	— —	— —	— —	
	B	70	0.470 (0.426–0.514)	0.412 (0.309–0.515)	27.72 (6.21–123.7)	
	C	23	0.483 (0.441–0.525)	0.419 (0.294–0.544)	54.65 (10.59–282.0)	

[a]Antilog of the log mean and standard deviation.
[b]Values for Rawls, et al. (13).
[c]Values for the texture class.
[d]Numbers in ( ) ± one standard deviation.
[e]Insufficient sample to determine parameters.

stants and gravity. The constant a equals 270 cm^3/sec according to Brutsaert (5).

The Brooks and Corey equation was fitted to the water retention data using pattern search optimization. Only the optimizations which produced a correlation coefficient significant at the 95% level were used. The Green and Ampt parameters were calculated from the Brooks and Corey parameters using Eqs. 4–7. Checking the saturated hydraulic conductivities derived from Eq. 7 with those reported in Rawls, et al. (13), we find that Eq. 7 produced saturated hydraulic conductivities that were approximately one order of magnitude too high; therefore, we calibrated the constant in Eq. 7 to the Rawls, et al. (13) 11 soil textures. This fitting produced a value of the a constant equal to 21.0 cm^3/sec.

The data included six of the 10 soil orders and 17 of the 49 soil suborders. Analysis of the data indicated that mean Green and Ampt parameter values were not significantly different for soil orders and suborders, thus we concluded that use of the Green and Ampt infiltration model is inappropriate for the Order 5 soil surveys.

Analysis of the data according to soil texture classes, horizon, and clay mineralogy indicated that soil texture classes were the most significant discriminators of the Green and Ampt parameters. Also, a further division according to major horizons (A, B, C) yielded further classification accuracy. Clay mineralogy was not found to be significant. The mean parameter values and standard deviations are summarized in Table 2 for the 11 USDA soil texture classifications and major horizons. The values given in Table 2 can be used when applying the Green and Ampt infiltration model using orders 2–4 soil surveys.

We considered using more detailed soil information, such as particle size distribution, organic matter, bulk density, and 1/3 and 15 bar moisture retention values, to make better estimates of the Green and Ampt parameters (ψ_f, θ_e, K) than just average values according to soil texture class and horizon. First, we attempted to relate the Green and Ampt parameters to the particle size distribution, organic matter, and bulk density using regression analysis; however, these relationships yielded correlation coefficients of approx 0.6–0.75, which we felt were not adequate for predictive purposes. Therefore, we used the approach presented by Gupta and Larson (8), and Rawls, et al. (12,13) in which the soil water retention values for −0.1, −0.2, −0.33, −0.60, −1.0, −2.0, −4.0, −10.0, and −15.0 bar matric potentials were related to the particle size, percentages, organic matter, bulk density, and measured soil water content at specific matric potentials. Depending upon which parameters were included in the relationship, this approach predicted soil water retention at specific matric potential with a correlation coefficient ranging between 0.80 and 0.98. A sensitivity test on clay, sandy loam, and silt loam textures was performed utilizing various combinations of the 10 water retention matric potential values. We concluded that for the purpose of determining the Green and Ampt parameters, only six points on the water retention matric potential curve are needed. The best combination of points is the 0.1, 0.33, 1, 4, 10, and 15 bar water retentions.

Conclusion

Appropriate procedures for determining Green and Ampt infiltration parameters (effective porosity, wetting front capillary pressure, and hydraulic conductivity) could not be developed for order 5 soil surveys. However, for orders 1–4 soil surveys, the methods for determining the Green and Ampt parameters, ranked according to accuracy, are:

1. Fit the Brooks and Corey equation to measured water retention matric potential data and determine the Green and Ampt parameters from the Brooks and Corey parameters. This probably is the most expensive and time-consuming approach.
2. Fit the Brooks and Corey equation to published water retention matric potential data obtained form literature sources, such as Rawls, et al. (13), and determine the Green and Ampt parameters from the Brooks and Corey parameters.
3. Predict the moisture tension curve based on particle size distribution, organic matter, bulk density, and either 1/3 or 15 bar water content, or both, using appropriate set of equations given in Rawls, et al. (13), or Gupta and Larson (8) for the 0.1, 0.33, 1, 4, 10, and 15 bar moisture values. Fit the Brooks and Corey equation to the water retention matric potential curve and then predict the Green and Ampt parameters from the Brooks and Corey parameters.
4. Estimate the parameters based on profile horizon and soil texture classes (Table 2).
5. Estimate the parameters based on soil texture classes (Table 2).

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Appendix D – Original Skyline Wash HEC-1 Model

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*****************************************                    *****************************************
*                                       *                    *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *   U.S. ARMY CORPS OF ENGINEERS        *
*              MAY   1991               *                    *   HYDROLOGIC ENGINEERING CENTER       *
*          VERSION 4.0.1E               *                    *         609 SECOND STREET             *
*                                       *                    *     DAVIS, CALIFORNIA 95616           *
* RUN DATE  08/19/98  TIME  15:18:15    *                    *         (916) 551-1748                *
*                                       *                    *                                       *
*****************************************                    *****************************************


                    X     X  XXXXXXX   XXXXX           X
                    X     X  X        X     X         XX
                    X     X  X        X                X
                    XXXXXXX  XXXX     X         XXXXX  X
                    X     X  X        X                X
                    X     X  X        X     X          X
                    X     X  XXXXXXX   XXXXX          XXX


THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1                                   HEC-1 INPUT                                          PAGE  1

 LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1           ID        SKYLINE WASH AND TRIBUTARIES
   2           ID        FLOODPLAIN DELINEATION STUDY
   3           ID        FCD 96-08
   4           ID
   5           ID        HEC-1
   6           ID
   7           ID        DATE:   8-19-98
   8           ID        STORM:  100-YR 6-HOUR STORM
   9           ID        FILE NAME:  SKYLINE6.DAT
  10           ID
  11           ID
  12           ID   DDM MCUHP2 SKYLINE WASH-BUCKEYE, ARIZONA
               *DIAGRAM
  13           IT       3                       300
  14           IN      15
  15           IO       5
  16           JD    3.40    0.01
  17           PC    .000    .008    .016    .025    .033    .041    .050    .058    .066    .074
  18           PC    .087    .099    .118    .138    .216    .377    .834    .911    .931    .950
  19           PC    .962    .972    .983    .991   1.000
  20           JD    3.38    0.50
  21           JD    3.33    2.80
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22        PC   .000   .009   .016   .025   .034   .042   .051   .059   .067   .076
23        PC   .087   .100   .120   .163   .252   .451   .694   .837   .900   .938
24        PC   .950   .963   .975   .988  1.000
25        JD   3.13   16.0
26        PC   .000   .015   .020   .030   .048   .063   .076   .090   .105   .119
27        PC   .135   .152   .175   .222   .304   .472   .670   .796   .868   .912
28        PC   .946   .960   .973   .987  1.000
29        JD   2.75   90.0
30        PC   .000   .021   .035   .051   .071   .087   .105   .125   .143   .160
31        PC   .179   .201   .232   .281   .364   .500   .658   .773   .841   .888
32        PC   .927   .945   .964   .982  1.000
33        JD   1.94  500.0
34        PC   .000   .024   .043   .059   .078   .098   .119   .141   .162   .186
35        PC   .212   .239   .271   .321   .408   .515   .627   .735   .814   .864
36        PC   .907   .930   .954   .977  1.000
          *  BASIN S1 - BEGINNING OF SKYLINE WASH
          * DDM   ***** Updated *****

37        KK      S1
38        KM   BASIN S1
39        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
40        KM    L=      1.2  Lca=       .6   S= 1102.5  Kn= .050  LAG=  16.6
41        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
42        BA    .51
43        LG    .25    .25   3.95    .53  18.00
44        UI   103.   273.   577.   783.  1122.   746.   585.   489.   400.   306.
45        UI   248.   206.   151.   123.   102.    79.    60.    51.    48.    20.
46        UI    20.    20.    20.    20.    20.     0.     0.     0.     0.     0.
47        UI     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
          *  BASIN S2 - UPSTREAM SUBBASIN TRIBUTARY TO SKYLINE WASH
          * DDM   ***** Updated *****
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

48        KK      S2
49        KM   BASIN S2
50        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
51        KM    L=       .9  Lca=       .6   S=  916.1  Kn= .050  LAG=  16.0
52        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
53        BA    .22
54        LG    .25    .25   3.95    .53  18.00
55        UI    46.   130.   269.   364.   496.   310.   251.   207.   166.   124.
56        UI   105.    82.    60.    51.    38.    32.    23.    23.    12.     9.
57        UI     9.     9.     9.     9.     0.     0.     0.     0.     0.     0.
58        UI     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
          * DDM   ***** Preserved *****

59        KK     HC2
60        KM        COMBINE HYDROGRAPHS FROM S1 AND S2 - UPSTREAM PORTION OF SKYLINE WASH
61        HC      2  0.7296
          * DDM   ***** Preserved *****

62        KK    R2-3
63        KM        ROUTE HYDROGRAPH HC2 THROUGH S3 - SKYLINE WASH
64        RS      2   FLOW      -1
65        RC    .07   .036    .07   2930   .029
66        RX   1000   1030   1100   1120   1130   1190   1220   1250
67        RY   1626   1624   1594   1594   1596   1624   1626   1625
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         *  BASIN S3 - MAIN SUBBASIN FOR GRANITE FALLS WASH
         * DDM    ***** Updated *****

  68     KK      S3
  69     KM   BASIN S3
  70     KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  71     KM    L=       1.5  Lca=       1.0   S=  481.0  Kn= .040  LAG=  21.0
  72     KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
  73     BA     .65
  74     LG     .20      .25    4.00     .52   13.00
  75     UI    104.     180.    422.    652.    797.   1088.    945.    652.    567.    492.
  76     UI    420.     348.    274.    245.    212.    164.    133.    115.     99.     80.
  77     UI     70.      51.     51.     49.     20.     20.     20.     20.     20.     20.
  78     UI     20.      20.      0.      0.      0.      0.      0.      0.      0.      0.
  79     UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
         * DDM    ***** Preserved *****

  80     KK      HC3
  81     KM         COMBINE HYDROGRAPH R2-3 WITH HYDROGRAPH FROM S3 - CONFLUENCE OF SKYLINE
  82     KM         WASH AND GRANITE FALLS WASH
  83     HC       2  1.3787
         * DDM    ***** Preserved *****

  84     KK    R3-4
  85     KM         ROUTE COMBINED HYDROGRAPHS HC3 THROUGH S4 - SKYLINE WASH
  86     RS       2     FLOW      -1
  87     RC     .07     .036     .07    2927    .032
  88     RX    1000     1030    1085    1160    1200    1240    1250    1275
  89     RY    1520     1518    1496    1496    1498    1516    1518    1520
         *  BASIN S4 - UPSTREAM SUBBASIN TRIBUTARY TO SKYLINE WASH
         * DDM    ***** Updated *****
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  90     KK      S4
  91     KM   BASIN S4
  92     KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  93     KM    L=       1.3  Lca=        .6   S=  503.9  Kn= .040  LAG=  16.2
  94     KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
  95     BA     .41
  96     LG     .20      .25    4.00     .52   13.00
  97     UI     85.     231.    486.    656.    913.    579.    465.    386.    312.    234.
  98     UI    196.     156.    114.     95.     73.     63.     41.     41.     28.     16.
  99     UI     16.      16.     16.     16.      0.      0.      0.      0.      0.      0.
 100     UI      0.       0.      0.      0.      0.      0.      0.      0.      0.      0.
         * DDM    ***** Preserved *****

 101     KK      HC4
 102     KM         COMBINE HYDROGRAPH R3-4 WITH HYDROGRAPH FROM S4 - CONCENTRATION POINT
 103     KM         ON SKYLINE WASH.
 104     HC       2  1.7864
         * DDM    ***** Preserved *****

 105     KK    R4-7
 106     KM         ROUTE COMBINED HYDROGRAPHS HC4 THROUGH S7 - SKYLINE WASH
 107     RS       1     FLOW      -1
 108     RC     .07     .036     .07    2211    .022
 109     RX    1000     1025    1055    1120    1145    1180    1240    1370
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110          RY    1462    1460    1462    1462    1432    1432    1456    1462
             *  BASIN S7 - TRIBUTARY BASIN TO MOUNTAIN WASH NEAR AT CONFLUENCE WITH SKYLINE
             *   WASH
             * DDM   ***** Updated *****

111          KK      S7
112          KM   BASIN S7
113          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
114          KM    L=       .9  Lca=       .6   S=  955.3  Kn= .040  LAG=  12.7
115          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
116          BA     .13
117          LG     .20     .25    4.00     .52   12.00
118          UI     37.    147.    254.    365.    229.    178.    137.     97.     78.     53.
119          UI     41.     30.     22.     17.     12.      7.      7.      7.      7.      0.
120          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
121          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

122          KK    IHC7
123          KM        COMBINE HYDROGRAPHS R4-7 AND S7 - UPSTREAM OF CONFLUENCE WITH MOUNTAIN
124          KM         WASH
125          HC       2  1.9208
             *  BASIN S5 - BEGINNING OF MOUNTAIN WASH
             * DDM   ***** Updated *****
                                             HEC-1 INPUT                                          PAGE  4

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


126          KK      S5
127          KM   BASIN S5
128          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
129          KM    L=      1.4  Lca=       .7   S=  654.8  Kn= .050  LAG=  20.2
130          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
131          BA     .53
132          LG     .25     .25    3.95     .53   20.00
133          UI     89.    164.    385.    573.    705.    988.    689.    532.    459.    396.
134          UI    334.    265.    219.    195.    157.    120.    104.     93.     68.     65.
135          UI     43.     43.     43.     18.     17.     17.     17.     17.     17.     17.
136          UI     17.      0.      0.      0.      0.      0.      0.      0.      0.      0.
137          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

138          KK    R5-6
139          KM        ROUTE HYDROGRAPH S5 THROUGH S6 - MOUNTAIN WASH
140          RS       1    FLOW      -1
141          RC     .07    .036     .07    2494    .030
142          RX    1000    1025    1075    1105    1150    1170    1220    1240
143          RY    1480    1476    1476    1460    1454    1454    1478    1480
             *  BASIN S6 - SUBBASIN TRIBUTARY TO MOUNTAIN WASH
             * DDM   ***** Updated *****

144          KK      S6
145          KM   BASIN S6
146          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
147          KM    L=       .8  Lca=       .4   S=  491.4  Kn= .042  LAG=  12.3
148          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
149          BA     .25
150          LG     .21     .25    4.00     .52   15.00
151          UI     75.    289.    495.    680.    415.    323.    244.    172.    135.     93.
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152          UI     71.     52.     35.     33.     13.     13.     13.     13.      0.      0.
153          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

154          KK     HC6
155          KM        COMBINE HYDROGRAPHS R5-6 WITH SUBBASIN S6 - UPSTREAM OF CONFLUENCE WITH
156          KM        SKYLINE WASH
157          HC      2  0.7787
             * DDM   ***** Preserved *****

158          KK     HC7
159          KM        COMBINE HYDROGRAPHS IHC7 WITH HC6 - CONFLUENCE OF MOUNTAIN WASH WITH
160          KM        SKYLINE WASH
161          HC      2  2.6995
             * DDM   ***** Preserved *****

162          KK  R7-12E
163          KM        ROUTE COMBINED HYDROGRAPHS AT HC7 THROUGH S12E - SKYLINE WASH
164          RS       1    FLOW      -1
165          RC     .07    .036     .07    1930   .0166
166          RX    1000    1085    1170    1240    1255    1265    1310    1350
167          RY    1430    1424    1422    1420    1422    1424    1428    1430
             *
             *  BASIN S12E - SUBBASIN TRIBUTARY TO PYRITE WASH AND SKYLINE WASH CONFLUENCE
             * DDM   ***** Updated *****
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

168          KK    S12E
169          KM   BASIN S12E
170          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
171          KM    L=       .6  Lca=       .2   S=  142.9  Kn= .030  LAG=    7.8
172          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
173          BA     .05
174          LG     .15     .25    3.91     .55   18.00
175          UI     47.    167.    200.    114.     70.     44.     27.     16.     11.      5.
176          UI      5.      5.      0.      0.      0.      0.      0.      0.      0.      0.
177          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

178          KK   HC12E
179          KM        COMBINE HYDROGRAPHS S12E WITH R7-12E - CONFLUENCE OF PYRITE WASH WITH
180          KM        SKYLINE WASH
181          HC      2  2.7544
             *  BASIN S8 - BEGINNING OF PYRITE WASH
             * DDM   ***** Updated *****

182          KK      S8
183          KM   BASIN S8
184          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
185          KM    L=       .8  Lca=       .4   S=  692.1  Kn= .050  LAG=  13.0
186          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
187          BA     .34
188          LG     .25     .25    3.95     .53   20.00
189          UI     88.    352.    614.    906.    585.    452.    354.    254.    200.    145.
190          UI    105.     81.     62.     43.     38.     17.     17.     17.     17.     17.
191          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
192          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
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                 * DDM    ***** Preserved *****

 193             KK    R8-9
 194             KM          ROUTE HYDROGRAPH S8 THROUGH S9 - PYRITE WASH
 195             RS       1    FLOW      -1
 196             RC     .07    .036     .07     911    .013
 197             RX    1000    1020    1050    1065    1080    1125    1185    1190
 198             RY    1518    1518    1494    1492    1494    1494    1520    1524
                 *  BASIN S9 - SUBBASIN TRIBUTARY TO PYRITE WASH
                 * DDM    ***** Updated *****

 199             KK      S9
 200             KM   BASIN S9
 201             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 202             KM    L=       1.0  Lca=        .7   S=  415.7  Kn= .040  LAG=  15.9
 203             KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 204             BA     .21
 205             LG     .20     .25    3.95     .53   17.00
 206             UI     44.    126.    259.    351.    471.    293.    238.    196.    157.    117.
 207             UI     99.     77.     56.     48.     35.     29.     22.     22.     10.      8.
 208             UI      8.      8.      8.      8.      0.      0.      0.      0.      0.      0.
 209             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 * DDM    ***** Preserved *****
1                                           HEC-1 INPUT                                          PAGE  6

LINE             ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 210             KK     HC9
 211             KM          COMBINE ROUTED HYDROGRAPH R8-9 WITH HYDROGRAPH S9 - CONCENTRATION POINT
 212             KM          ON PYRITE WASH
 213             HC       2  0.5472
                 * DDM    ***** Preserved *****

 214             KK    R9-11
 215             KM          ROUTE COMBINED HYDROGRAPHS HC9 THROUGH S11 - PYRITE WASH
 216             RS       3    FLOW      -1
 217             RC     .07    .036     .07    3462    .023
 218             RX    1000    1080    1090    1120    1140    1290    1340    1375
 219             RY    1496    1494    1492    1472    1471    1472    1490    1494
                 *  BASIN S11 -PYRITE WASH UPSTREAM OF CONFLUENCE WITH WAGON WASH
                 * DDM    ***** Updated *****

 220             KK     S11
 221             KM   BASIN S11
 222             KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 223             KM    L=        .7  Lca=        .3   S=  797.1  Kn= .040  LAG=   9.3
 224             KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 225             BA     .17
 226             LG     .20     .25    4.00     .52   11.00
 227             UI     96.    360.    590.    366.    262.    169.    119.     73.     51.     32.
 228             UI     23.     12.     12.     12.      0.      0.      0.      0.      0.      0.
 229             UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 * DDM    ***** Preserved *****

 230             KK   IHC11
 231             KM          COMBINE ROUTED HYDROGRAPH R9-11 WITH HYDROGRAPHS S11 - UPSTREAM OF
 232             KM          CONFLUENCE WITH WAGON WASH
 233             HC       2  0.7154
                 *  BASIN S10 - BEGINNING OF WAGON WASH
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          * DDM   ***** Updated *****

 234      KK    S10
 235      KM   BASIN S10
 236      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 237      KM    L=      1.0  Lca=       .5   S=  896.9  Kn= .048  LAG=  14.2
 238      KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 239      BA     .19
 240      LG     .24     .25    3.95     .53    18.00
 241      UI     46.    157.    302.    430.    397.    263.    213.    167.    122.    101.
 242      UI     71.     55.     43.     35.     23.     23.     11.      9.      9.      9.
 243      UI      9.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 244      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
          * DDM   ***** Preserved *****

 245      KK    HC11
 246      KM         COMBINE HYDROGRAPH IHC11 WITH HYDROGRAPH S10 - CONFLUENCE OF WAGON WASH
 247      KM         WITH PYRITE WASH
 248      HC       2  0.9089
          * DDM   ***** Preserved *****
                                     HEC-1 INPUT                                              PAGE  7

LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 249      KK  R1112W
 250      KM         ROUTE COMBINED HYDROGRAPHS HC11 THROUGH S12W - CONTINUATION OF PYRITE
 251      KM         WASH DOWNSTREAM OF CONFLUENCE WITH WAGON WASH
 252      RS       1    FLOW     -1
 253      RC     .07    .036     .07    1501    .019
 254      RX    1000    1030    1065    1150    1240    1330    1375    1410
 255      RY    1422    1420    1410    1410    1410    1412    1414    1428
          *  BASIN S12W - SUBBASIN TRIBUTARY FOR PYRITE WASH AND SKYLINE WASH
          * DDM   ***** Updated *****

 256      KK    S12W
 257      KM   BASIN S12W
 258      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 259      KM    L=       .7  Lca=       .2   S=  153.6  Kn= .030  LAG=   8.2
 260      KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 261      BA     .09
 262      LG     .15     .25    3.91     .55    18.00
 263      UI     68.    246.    330.    189.    123.     79.     47.     31.     19.     11.
 264      UI      7.      7.      0.      0.      0.      0.      0.      0.      0.      0.
 265      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
          * DDM   ***** Preserved *****

 266      KK   HC12W
 267      KM         COMBINE HYDROGRAPH R1112W WITH HYDROGRAPH S12W - CONFLUENCE OF SKYLINE
 268      KM         WASH WITH PYRITE WASH
 269      HC       2  0.9994
          * DDM   ***** Preserved *****

 270      KK   HC12
 271      KM         COMBINE ROUTED HYDROGRAPH HC12W AND HC12E
 272      KM         CONFLUENCE OF SKYLINE WASH AND PYRITE WASH
 273      HC       2  3.7538
          * DDM   ***** Preserved *****

 274      KK  R12-13
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275        KM        ROUTE COMBINED HYDROGRAPHS HC12 THROUGH S13 - SKYLINE WASH
276        RS       1    FLOW      -1
277        RC     .07    .036     .07    1854    .017
278        RX    1000    1080    1110    1320    1370    1420    1500    1550
279        RY    1400    1392    1384    1382    1382    1380    1380    1400
           *  BASIN S13 - SKYLINE WASH DOWNSTREAM OF CONFLUENCE OF PYRITE WASH
           * DDM   ***** Updated *****

280        KK     S13
281        KM   BASIN S13
282        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
283        KM    L=       .9  Lca=       .3   S=  174.2  Kn= .030  LAG=  10.1
284        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
285        BA     .17
286        LG     .15     .25    3.88     .56    4.00
287        UI     82.    312.    550.    397.    278.    195.    135.     90.     64.     43.
288        UI     28.     20.     11.     11.     11.      0.      0.      0.      0.      0.
289        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           * DDM   ***** Preserved *****
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LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

290        KK    HC13
291        KM        COMBINE ROUTED HYDROGRAPH R12-13 WITH HYDROGRAPH S13 - SKYLINE WASH
292        HC       2  3.9274
           * DDM   ***** Preserved *****

293        KK    DI13
294        KM        SPLIT FLOW AT CP13; MAIN FLOW TO S24 AND MINOR FLOW TO S14
295        DT    DI24
296        DI       0     201     556    1353    2595    4157
297        DQ       0     201     461     879    1427  2078.5
           * DDM   ***** Preserved *****

298        KK   RDI13
299        KM        ROUTE HYDROGRAPH DI13 THROUGH S14 -SKYLINE WASH DOWNSTREAM OF SPLIT
300        RS       3    FLOW      -1
301        RC     .07    .036     .07    4353    .021
302        RX    1000    1025    1270    1280    1320    1330    1370    1385
303        RY    1360    1354    1354    1356    1356    1358    1358    1360
           *  BASIN S14 - BEGINNING OF COYOTE WASH
           * DDM   ***** Updated *****

304        KK     S14
305        KM   BASIN S14
306        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
307        KM    L=      1.2  Lca=       .6   S=  340.7  Kn= .030  LAG=  12.4
308        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
309        BA     .49
310        LG     .15     .25    3.91     .55   11.00
311        UI    144.    562.    962.   1341.    822.    640.    487.    343.    270.    185.
312        UI    145.    101.     72.     65.     31.     25.     25.     25.     25.      0.
313        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
314        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
           * DDM   ***** Preserved *****

315        KK    HC14
316        KM        COMBINE ROUTED HYDROGRAPH R13-14 WITH HYDROGRAPH S14 - SPLIT FLOW FROM
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317         KM        SKYLINE WASH AND COYOTE WASH SUBBASIN
318         HC        2  4.4139
            * DDM   ***** Preserved *****

319         KK  R1416S
320         KM          ROUTE COMBINED HYDROGRAPHS HC14 THROUGH S16S - SKYLINE WASH DOWNSTREAM
321         KM          OF CONFLUENCE WITH COYOTE WASH
322         RS       2     FLOW      -1
323         RC     .07     .036     .07     3140     .017
324         RX    1000     1035    1150     1180     1320     1360     1480     1481
325         RY    1236     1234    1234     1232     1232     1234     1236     1236
            *  BASIN S15 - SUBBASIN IN AREA OF EXISTING A.D.O.T. BORROW PITS
            * DDM   ***** Updated *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

326         KK     S15
327         KM   BASIN S15
328         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
329         KM    L=        .8  Lca=        .3   S=  105.0  Kn= .030  LAG=   9.8
330         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
331         BA     .11
332         LG     .15      .27     3.40      .77      .00
333         UI     56.     213.     370.     246.     176.     120.      84.      54.      37.      25.
334         UI     19.       9.       7.       7.       7.       0.       0.       0.       0.       0.
335         UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
            * DDM   ***** Preserved *****

336         KK  R1516S
337         KM          ROUTE HYDROGRAPH HC15 THROUGH S16S - SKYLINE WASH DOWNSTREAM OF
338         KM          CONFLUENCE WITH COYOTE WASH
339         RS       2     FLOW      -1
340         RC     .07     .036     .07     2218     .018
341         RX    1000     1035    1150     1180     1320     1360     1480     1481
342         RY    1236     1234    1234     1232     1232     1234     1236     1236
            *  BASIN S16S - SUBBASIN AT SKYLINE WASH DOWNSTREAM OF CONFLUENCE WITH COYOTE W.
            * DDM   ***** Updated *****

343         KK     S16S
344         KM   BASIN S16S
345         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
346         KM    L=        .6  Lca=        .3   S=  116.4  Kn= .030  LAG=   9.3
347         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
348         BA     .17
349         LG     .15      .25     3.95      .53     6.00
350         UI    100.     373.     611.     379.     271.     175.     123.      76.      53.      34.
351         UI     23.      12.      12.      12.       0.       0.       0.       0.       0.       0.
352         UI      0.       0.       0.       0.       0.       0.       0.       0.       0.       0.
            * DDM   ***** Preserved *****

353         KK  IHC16S
354         KM          COMBINE ROUTED HYDROGRAPH R14-16S AND R15-16S WITH HYDROGRAPH S16S
355         KM          DOWNSTREAM OF CONFLUENCE OF SKYLINE WASH WITH COYOTE WASH
356         HC        3  4.6952
            *  BASIN S16N - SUBBASIN TRIBUTARY TO SKYLINE WASH
            * DDM   ***** Updated *****

357         KK     S16N
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 358            KM   BASIN S16N
 359            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 360            KM    L=        .9  Lca=       .6   S=  653.2  Kn= .050  LAG=  16.5
 361            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 362            BA     .17
 363            LG     .25     .25    3.95     .53   18.00
 364            UI     34.     90.    189.    256.    366.    238.    189.    158.    129.     98.
 365            UI     80.     66.     48.     39.     32.     26.     19.     16.     15.      6.
 366            UI      6.      6.      6.      6.      6.      0.      0.      0.      0.      0.
 367            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                * DDM    ***** Preserved *****
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LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 368            KK  R16N-S
 369            KM        ROUTE HYDROGRAPH S16N THROUGH S16S
 370            RS       2    FLOW      -1
 371            RC     .07    .036     .07    3230    .022
 372            RX    1000    1035    1150    1180    1320    1360    1480    1481
 373            RY    1236    1234    1234    1232    1232    1234    1236    1236
                * DDM    ***** Preserved *****

 374            KK   HC16S
 375            KM        COMBINE ROUTED HYDROGRAPH R16N-S AND IHC16S
 376            KM        SKYLINE WASH DOWNSTREAM OF COYOTE WASH
 377            HC       2  4.8652
                * DDM    ***** Preserved *****

 378            KK   DI16S
 379            KM        SPLIT FLOW AT CP16S; MAIN FLOW TO S17 AND MINOR FLOW TO S22
 380            DT    DI22
 381            DI       0      46     144     344   708.5    1223
 382            DQ       0       0       8      52     153     329
                * DDM    ***** Preserved *****

 383            KK  RDI16S
 384            KM        ROUTE HYDROGRAPH DI16S THROUGH S17
 385            RS       3    FLOW      -1
 386            RC     .07    .036     .07    4341    .015
 387            RX    1000    1060    1090    1120    1145    1180    1200    1320
 388            RY    1202    1200  1199.5    1200    1199    1199    1200    1202
                *  BASIN S17 - SUBBASIN OF SKYLINE WASH SOUTH OF MCDOWELL ROAD ON EAST SIDE
                *  OF WATERSHED
                * DDM    ***** Updated *****

 389            KK     S17
 390            KM   BASIN S17
 391            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 392            KM    L=        .9  Lca=       .5   S=  117.9  Kn= .030  LAG=  12.8
 393            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 394            BA     .29
 395            LG     .15     .26    3.60     .67     .00
 396            UI     79.    311.    540.    784.    495.    385.    298.    212.    170.    117.
 397            UI     89.     66.     50.     37.     28.     15.     15.     15.     15.      0.
 398            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 399            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                * DDM    ***** Preserved *****
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400           KK    HC17
401           KM         COMBINE ROUTED HYDROGRAPH R16-17 WITH HYDROGRAPH S17 AT EAST SIDE OF
402           KM         BUCKEYE F.R.S. NO. 3
403           HC      2  5.1537
              *  BASIN S18 - BEGINNING OF RATTLER WASH
              * DDM   ***** Updated *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

404           KK      S18
405           KM   BASIN S18
406           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
407           KM    L=        .8  Lca=        .4   S=  292.7  Kn= .040  LAG=  12.9
408           KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
409           BA     .36
410           LG     .20     .25    3.95     .53   17.00
411           UI     96.    380.    662.    968.    618.    479.    373.    267.    211.    149.
412           UI    111.     84.     64.     46.     38.     18.     18.     18.     18.      0.
413           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
414           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Preserved *****

415           KK  R18-19
416           KM         ROUTE HYDROGRAPH HC18 THROUGH S19
417           RS       3    FLOW      -1
418           RC     .07    .036     .07    4253     .02
419           RX    1000    1050    1100    1125    1140    1180    1240    1241
420           RY    1266    1264    1242    1240    1242    1264    1266    1266
              *  BASIN S19 - SUBBASIN OF RATTLER WASH
              * DDM   ***** Updated *****

421           KK      S19
422           KM   BASIN S19
423           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
424           KM    L=       1.2  Lca=        .8   S=  824.8  Kn= .030  LAG=  11.6
425           KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
426           BA     .29
427           LG     .15     .25    4.00     .52   12.00
428           UI    102.    389.    662.    802.    483.    372.    266.    195.    138.     99.
429           UI     72.     51.     41.     22.     16.     16.     16.      0.      0.      0.
430           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Preserved *****

431           KK    HC19
432           KM         COMBINE ROUTED HYDROGRAPH R18-19 WITH HYDROGRAPH S19 - RATTLER WASH
433           HC       2  0.6498
              * DDM   ***** Preserved *****

434           KK  R19-20
435           KM         ROUTE COMBINED HYDROGRAPHS HC19 THROUGH S20 - RATTLER WASH
436           RS       3    FLOW      -1
437           RC     .07    .036     .07    3740    .022
438           RX     999    1000    1030    1095    1130    1150    1220    1221
439           RY    1208    1208    1206    1204    1204    1206    1208    1208
              *  BASIN S20 - SUBBASIN OF RATTLER WASH
              * DDM   ***** Updated *****

440           KK      S20
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441          KM   BASIN S20
442          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
443          KM    L=       .9  Lca=       .4   S=   84.1  Kn= .030  LAG=  13.0
444          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
445          BA     .09
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

446          LG     .15     .26    3.60     .67    4.00
447          UI     22.     88.    155.    228.    147.    114.     89.     64.     50.     36.
448          UI     26.     20.     16.     11.     10.      4.      4.      4.      4.      4.
449          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
450          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

451          KK    HC20
452          KM         COMBINE ROUTED HYDROGRAPH R19-20 WITH HYDROGRAPH S20 AT FAR EAST SIDE
453          KM         OF STUDY AREA NORTH OF BUCKEYE F.R.S. NO. 3
454          HC       2  0.7344
             *  BASIN S21 - SUBBASIN NORTH OF BUCKEYE F.R.S. NO 3 SPILLWAY
             * DDM   ***** Updated *****

455          KK     S21
456          KM   BASIN S21
457          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
458          KM    L=      1.2  Lca=       .6   S=  780.6  Kn= .030  LAG=  11.0
459          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
460          BA     .62
461          LG     .15     .25    4.10     .51   10.00
462          UI    245.    927.   1593.   1636.   1019.    766.    522.    392.    260.    190.
463          UI    136.     93.     67.     36.     36.     36.      0.      0.      0.      0.
464          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *  BASIN S22 - SUBBASIN IN MIDDLE LOWER PART OF WATERSHED
             * DDM   ***** Updated *****

465          KK     S22
466          KM   BASIN S22
467          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
468          KM    L=      1.3  Lca=       .4   S=  110.1  Kn= .029  LAG=  13.7
469          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
470          BA     .55
471          LG     .16     .25    3.91     .53    1.00
472          UI    135.    496.    909.   1351.   1029.    742.    594.    451.    332.    268.
473          UI    188.    151.    108.     84.     66.     51.     26.     26.     26.     26.
474          UI     26.      0.      0.      0.      0.      0.      0.      0.      0.      0.
475          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

476          KK    DI22
477          KM         RETURN DIVERTED HYDROGRAPH TO ROUTE AND COMBINE WITH S24
478          DR    DI22
             * DDM   ***** Preserved *****

479          KK   RDI22
480          KM         ROUTE HYDROGRAPH DI22 THROUGH S22 - PORTION OF DIVERT OF SKYLINE WASH
481          RS       4    FLOW      -1
482          RC     .07    .036     .07    4253    .015
483          RX     997     998     999    1000    1060    1210    1300    1300
484          RY    1217    1216    1216    1215    1215    1216    1216    1217
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          * DDM    ***** Preserved *****
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 485      KK    CP22
 486      KM        COMBINE HYDROGRAPHS AT CP22
 487      HC     2  5.4141
          *  BASIN S23 - SUBBASIN IN MIDDLE LOWER PART OF WATERSHED
          * DDM    ***** Updated *****

 488      KK     S23
 489      KM   BASIN S23
 490      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 491      KM    L=       1.6  Lca=       .5   S=  112.1  Kn= .028  LAG=  15.2
 492      KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 493      BA     .49
 494      LG     .17     .26    3.50     .70    2.00
 495      UI    108.    331.    660.    901.   1086.    670.    547.    446.    338.    263.
 496      UI    217.    155.    125.     98.     81.     53.     53.     31.     21.     21.
 497      UI     21.     21.     21.      0.      0.      0.      0.      0.      0.      0.
 498      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
          *  BASIN S24 - SUBBASIN DOWNSTREAM OF SKYLINE WASH SPLIT FLOW
          * DDM    ***** Updated *****

 499      KK     S24
 500      KM   BASIN S24
 501      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 502      KM    L=       2.4  Lca=      1.2   S=  113.8  Kn= .037  LAG=  32.2
 503      KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 504      BA     .32
 505      LG     .20     .25    4.00     .51    1.00
 506      UI     33.     33.     66.    117.    171.    211.    242.    273.    350.    361.
 507      UI    241.    206.    189.    172.    157.    142.    129.    111.     96.     84.
 508      UI     78.     73.     65.     54.     45.     42.     37.     36.     30.     25.
 509      UI     25.     22.     16.     16.     16.     16.     13.      6.      6.      6.
 510      UI      6.      6.      6.      6.      6.      6.      6.      6.      6.      0.
 511      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 512      UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
          * DDM    ***** Preserved *****

 513      KK    DI24
 514      KM         RETURN DIVERTED HYDROGRAPH TO ROUTE AND COMBINE WITH S24
 515      DR    DI24
          * DDM    ***** Preserved *****

 516      KK   RDI24
 517      KM         ROUTE HYDROGRAPH DI24 THROUGH S24
 518      RS       7    FLOW      -1
 519      RC     .07    .036     .07    9929     .02
 520      RX    1000    1045    1060    1080    1100    1120    1155    1220
 521      RY    1222    1220    1218    1218    1216    1216    1220    1220
          * DDM    ***** Preserved *****
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LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 522      KK    CP24
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523            KM        COMBINE HYDROGRAPHS AT CP24
524            HC      2  4.2443
               *  BASIN S25 - UPSTREAM END OF SMALL WATERSHED EAST OF PROSPECT WASH
               * DDM   ***** Updated *****

525            KK     S25
526            KM   BASIN S25
527            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
528            KM    L=        .7  Lca=       .3   S=  103.0  Kn= .030  LAG=  10.0
529            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
530            BA     .03
531            LG     .15      .25    4.15     .49      .00
532            UI     13.      50.     87.     61.      43.      30.      21.      14.      10.       7.
533            UI      4.       3.      2.      2.       2.       0.       0.       0.       0.       0.
534            UI      0.       0.      0.      0.       0.       0.       0.       0.       0.       0.
               * DDM   ***** Preserved *****

535            KK  R25-26
536            KM        ROUTE HYDROGRAPH S25 THROUGH S26 CROSSING NEAR THE INTERSECTION OF
537            KM        WATSON ROAD AND MCDOWELL ROAD
538            RS       5    FLOW      -1
539            RC     .07     .036     .07    6571      .02
540            RX    1000     1045    1060    1080     1100     1120     1155     1220
541            RY    1222     1220    1218    1218     1216     1216     1220     1220
               *  BASIN S26 - SUBBASIN ON THE LOWER WEST SIDE OF STUDY AREA
               * DDM   ***** Updated *****

542            KK     S26
543            KM   BASIN S26
544            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
545            KM    L=       1.2  Lca=       .5   S=  119.7  Kn= .029  LAG=  13.8
546            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
547            BA     .21
548            LG     .16      .25    4.20     .47     1.00
549            UI     52.     187.    347.    513.     403.     286.     230.     177.     129.     105.
550            UI     74.      59.     43.     33.      25.      21.      10.      10.      10.      10.
551            UI     10.       0.      0.      0.       0.       0.       0.       0.       0.       0.
552            UI      0.       0.      0.      0.       0.       0.       0.       0.       0.       0.
               * DDM   ***** Preserved *****

553            KK    HC26
554            KM        COMBINE ROUTED HYDROGRAPH R25-26 WITH HYDROGRAPH S26
555            KM        AT WEST SIDE OF WATERSHED NORTH OF BUCKEYE F.R.S. NO. 3
556            HC      2  0.2377
               *  BASIN S27 - BEGINNING OF PROSPECT WASH
               * DDM   ***** Updated *****

557            KK     S27
558            KM   BASIN S27
559            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
560            KM    L=       1.4  Lca=       .5   S=  345.2  Kn= .030  LAG=  12.6
561            KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
562            BA     .51
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563            LG     .15      .25    4.00     .52    16.00
564            UI    146.     575.    989.   1411.     878.     682.     524.     370.     295.     201.
565            UI    157.     111.     82.     67.      41.      26.      26.      26.      26.       0.
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566          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
567          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

568          KK  R27-28
569          KM          ROUTE HYDROGRAPH S27 THROUGH S28
570          RS       2    FLOW      -1
571          RC     .07    .036     .07    2482    .022
572          RX    1000    1060    1090    1100    1120    1130    1160    1230
573          RY    1250    1248    1240    1238    1238    1240    1242    1250
             *  BASIN S28 - SUBBASIN OF PROSPECT WASH
             * DDM   ***** Updated *****

574          KK     S28
575          KM   BASIN S28
576          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
577          KM    L=        .4  Lca=        .2   S=  120.0  Kn= .028  LAG=   6.2
578          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
579          BA     .04
580          LG     .17     .25    4.15     .48    2.00
581          UI     55.    180.    114.     65.     36.     19.     11.      4.      4.      0.
582          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
583          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

584          KK    HC28
585          KM          COMBINE ROUTED HYDROGRAPH R27-28 WITH HYDROGRAPH S28 - PROSPECT WASH
586          KM          AT WATSON ROAD CROSSING
587          HC       2  0.5526
             * DDM   ***** Preserved *****

588          KK  R28-29
589          KM          ROUTE COMBINED HYDROGRAPHS HC28 THROUGH S29
590          RS       3    FLOW      -1
591          RC     .07    .036     .07    3804   .0184
592          RX    1000    1000    1110    1125    1165    1170    1250    1251
593          RY    1192    1192    1190    1188    1188    1190    1192    1192
             *  BASIN S29 - SUBBASIN OF PROSPECT WASH
             * DDM   ***** Updated *****

594          KK     S29
595          KM   BASIN S29
596          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
597          KM    L=        .7  Lca=        .3   S=  102.9  Kn= .030  LAG=   9.4
598          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
599          BA     .10
600          LG     .15     .25    4.15     .49     .00
601          UI     55.    207.    343.    215.    154.    101.     71.     44.     31.     20.
602          UI     14.     7.      7.      7.      0.      0.      0.      0.      0.      0.
603          UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****
1                                  HEC-1 INPUT                                          PAGE 16

LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


604          KK    HC29
605          KM          COMBINE ROUTED HYDROGRAPH R28-29 WITH HYDROGRAPH S29 - PROSPECT WASH
606          KM          AT BUCKEYE F.R.S. NO 3
607          HC       2  0.6515
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                 *
                 * DDM   ***** Preserved *****

        608      KK  HCBES3
        609      KM       COMBINE ALL HYDROGRAPHS AT BUCKEYE FRS-3
        610      HC      8  8.7485
        611      ZZ

           SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

   37          S1
               .
               .
   48          .          S2
               .          .
               .          .
   59         HC2..........
               V
               V
   62        R2-3
               .
               .
   68          .          S3
               .          .
               .          .
   80         HC3..........
               V
               V
   84        R3-4
               .
               .
   90          .          S4
               .          .
               .          .
  101         HC4..........
               V
               V
  105        R4-7
               .
               .
  111          .          S7
               .          .
               .          .
  122        IHC7..........
               .
               .
  126          .          S5
               .          V
               .          V
  138          .        R5-6
               .          .
               .          .
  144          .          .          S6
               .          .          .
               .          .          .
  154          .         HC6..........
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              .             .
158        HC7...............
              V
              V
162       R7-12E
              .
              .
168           .           S12E
              .             .
              .             .
178       HC12E..............
              .
              .
182           .             S8
              .             V
              .             V
193           .           R8-9
              .             .
              .             .
199           .             .             S9
              .             .              .
              .             .              .
210           .            HC9...............
              .             V
              .             V
214           .          R9-11
              .             .
              .             .
220           .             .            S11
              .             .              .
              .             .              .
230           .         IHC11................
              .             .
              .             .
234           .             .            S10
              .             .              .
              .             .              .
245           .           HC11...............
              .             V
              .             V
249           .         R1112W
              .             .
              .             .
256           .             .           S12W
              .             .              .
              .             .              .
266           .         HC12W................
              .             .
              .             .
270         HC12.............
              V
              V
274       R12-13
              .
              .
280           .            S13
              .             .
              .             .
290         HC13.............
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                    .
                    .
295                 .-------->   DI24
293              DI13
                    V
                    V
298             RDI13
                    .
                    .
304                 .           S14
                    .             .
                    .             .
315              HC14.............
                    V
                    V
319            R1416S
                    .
                    .
326                 .           S15
                    .             V
                    .             V
336                 .        R1516S
                    .             .
                    .             .
343                 .             .          S16S
                    .             .             .
                    .             .             .
353            IHC16S..........................
                    .
                    .
  7                 .          S16N
                    .             V
                    .             V
368                 .        R16N-S
                    .             .
                    .             .
374             HC16S.............
                    .
                    .
380                 .-------->   DI22
378             DI16S
                    V
                    V
383            RDI16S
                    .
                    .
389                 .           S17
                    .             .
                    .             .
400              HC17.............
                    .
                    .
404                 .           S18
                    .             V
                    .             V
 15                 .        R18-19
                    .             .
                    .             .
421                 .             .           S19
                    .             .             .
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          .         .         .
431       .      HC19..........
          .         V
          .         V
434       .   R19-20
          .         .
          .         .
440       .         .       S20
          .         .         .
          .         .         .
451       .      HC20..........
          .         .
          .         .
455       .         .       S21
          .         .         .
          .         .         .
465       .         .         .       S22
          .         .         .         .
          .         .         .         .
478       .         .         .         .         .<-------   DI22
476       .         .         .         .      DI22
          .         .         .         .         V
          .         .         .         .         V
479       .         .         .         .     RDI22
          .         .         .         .         .
          .         .         .         .         .
485       .         .         .      CP22..........
          .         .         .         .
          .         .         .         .
488       .         .         .         .       S23
          .         .         .         .         .
          .         .         .         .         .
499       .         .         .         .         .       S24
          .         .         .         .         .         .
          .         .         .         .         .         .
515       .         .         .         .         .         .         .<-------   DI24
513       .         .         .         .         .         .      DI24
          .         .         .         .         .         .         V
          .         .         .         .         .         .         V
516       .         .         .         .         .         .     RDI24
          .         .         .         .         .         .         .
          .         .         .         .         .         .         .
522       .         .         .         .         .      CP24..........
          .         .         .         .         .         .
          .         .         .         .         .         .
525       .         .         .         .         .         .       S25
          .         .         .         .         .         .         V
          .         .         .         .         .         .         V
535       .         .         .         .         .         .    R25-26
          .         .         .         .         .         .         .
          .         .         .         .         .         .         .
542       .         .         .         .         .         .         .       S26
          .         .         .         .         .         .         .         .
          .         .         .         .         .         .         .         .
553       .         .         .         .         .         .      HC26..........
          .         .         .         .         .         .         .
          .         .         .         .         .         .         .
557       .         .         .         .         .         .         .       S27
          .         .         .         .         .         .         .         V
          .         .         .         .         .         .         .         V
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568       .      .      .      .      .      .      .   R27-28
          .      .      .      .      .      .      .      .
          .      .      .      .      .      .      .      .
574       .      .      .      .      .      .      .      .        S28
          .      .      .      .      .      .      .      .         .
          .      .      .      .      .      .      .      .         .
584       .      .      .      .      .      .      .    HC28...........
          .      .      .      .      .      .      .      V
          .      .      .      .      .      .      .      V
588       .      .      .      .      .      .      .   R28-29
          .      .      .      .      .      .      .      .
          .      .      .      .      .      .      .      .
594       .      .      .      .      .      .      .      .        S29
          .      .      .      .      .      .      .      .         .
          .      .      .      .      .      .      .      .         .
604       .      .      .      .      .      .      .    HC29...........
          .      .      .      .      .      .      .      .
          .      .      .      .      .      .      .      .
608    HCBES3...........................................................

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
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*****************************************               *****************************************
*                                       *               *                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *               *   U.S. ARMY CORPS OF ENGINEERS        *
*             MAY   1991                *               *   HYDROLOGIC ENGINEERING CENTER       *
*           VERSION 4.0.1E              *               *         609 SECOND STREET             *
*                                       *               *      DAVIS, CALIFORNIA 95616          *
*  RUN DATE  08/19/98  TIME  15:18:15   *               *          (916) 551-1748               *
*                                       *               *                                       *
*****************************************               *****************************************
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                        SKYLINE WASH AND TRIBUTARIES
                        FLOODPLAIN DELINEATION STUDY
                        FCD 96-08

                        HEC-1

                        DATE:   8-19-98
                        STORM:  100-YR 6-HOUR STORM
                        FILE NAME:  SKYLINE6.DAT


                    DDM MCUHP2 SKYLINE WASH-BUCKEYE, ARIZONA

 15 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN          3  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1   0  ENDING DATE
                     NDTIME       1457  ENDING TIME
```

ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.05 HOURS
TOTAL TIME BASE 14.95 HOURS

ENGLISH UNITS

DRAINAGE AREA	SQUARE MILES
PRECIPITATION DEPTH	INCHES
LENGTH, ELEVATION	FEET
FLOW	CUBIC FEET PER SECOND
STORAGE VOLUME	ACRE-FEET
SURFACE AREA	ACRES
TEMPERATURE	DEGREES FAHRENHEIT

16 JD INDEX STORM NO. 1
STRM 3.40 PRECIPITATION DEPTH
TRDA 0.01 TRANSPOSITION DRAINAGE AREA

17 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02
0.03	0.03	0.03	0.03	0.03	0.09	0.09	0.09	0.09	0.09
0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

20 JD INDEX STORM NO. 2
STRM 3.38 PRECIPITATION DEPTH
TRDA 0.50 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02	0.02
0.03	0.03	0.03	0.03	0.03	0.09	0.09	0.09	0.09	0.09
0.02	0.02	0.02	0.02	0.02	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

21 JD INDEX STORM NO. 3
STRM 3.33 PRECIPITATION DEPTH
TRDA 2.80 TRANSPOSITION DRAINAGE AREA

22 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05
0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

25 JD INDEX STORM NO. 4

STRM 3.13 PRECIPITATION DEPTH

TRDA 16.00 TRANSPOSITION DRAINAGE AREA

26 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

29 JD INDEX STORM NO. 5

STRM 2.75 PRECIPITATION DEPTH

TRDA 90.00 TRANSPOSITION DRAINAGE AREA

PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

33 JD INDEX STORM NO. 6

STRM 1.94 PRECIPITATION DEPTH

TRDA 500.00 TRANSPOSITION DRAINAGE AREA

34 PI PRECIPITATION PATTERN

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	S1	1104.	4.10	100.	40.	40.	0.51		
HYDROGRAPH AT	S2	490.	4.10	43.	17.	17.	0.22		
2 COMBINED AT	HC2	1443.	4.10	139.	56.	56.	0.73		
ROUTED TO	R2-3	1425.	4.15	139.	56.	56.	0.73		
HYDROGRAPH AT	S3	1138.	4.15	120.	48.	48.	0.65		
2 COMBINED AT	HC3	2082.	4.15	240.	97.	97.	1.38		
ROUTED TO	R3-4	2046.	4.20	240.	97.	97.	1.38		
HYDROGRAPH AT	S4	892.	4.10	77.	31.	31.	0.41		
2 COMBINED AT	HC4	2410.	4.20	300.	121.	121.	1.79		
ROUTED TO	R4-7	2383.	4.20	300.	121.	121.	1.79		
HYDROGRAPH AT	S7	332.	4.05	25.	10.	10.	0.13		
2 COMBINED AT	IHC7	2478.	4.20	319.	128.	128.	1.92		
HYDROGRAPH AT	S5	1022.	4.15	107.	43.	43.	0.53		
ROUTED TO	R5-6	987.	4.20	107.	43.	43.	0.53		
HYDROGRAPH AT	S6	624.	4.05	48.	19.	19.	0.25		
2 COMBINED AT	HC6	1328.	4.15	148.	60.	60.	0.78		
2 COMBINED AT	HC7	3049.	4.20	436.	175.	175.	2.70		

ROUTED TO	R7-12E	3006.	4.25	435.	175.	175.	2.70
HYDROGRAPH AT	S12E	165.	4.00	11.	4.	4.	0.05
2 COMBINED AT	HC12E	3030.	4.25	444.	179.	179.	2.75
HYDROGRAPH AT	S8	837.	4.05	68.	27.	27.	0.34
ROUTED TO	R8-9	823.	4.10	68.	27.	27.	0.34
HYDROGRAPH AT	S9	468.	4.10	41.	17.	17.	0.21
2 COMBINED AT	HC9	1259.	4.10	108.	44.	44.	0.55
ROUTED TO	R9-11	1201.	4.15	108.	44.	44.	0.55
HYDROGRAPH AT	S11	477.	4.05	32.	13.	13.	0.17
2 COMBINED AT	IHC11	1357.	4.15	136.	55.	55.	0.72
HYDROGRAPH AT	S10	459.	4.10	38.	15.	15.	0.19
2 COMBINED AT	HC11	1610.	4.15	168.	68.	68.	0.91
ROUTED TO	R1112W	1529.	4.20	168.	68.	68.	0.91
HYDROGRAPH AT	S12W	265.	4.00	18.	7.	7.	0.09
2 COMBINED AT	HC12W	1571.	4.20	183.	74.	74.	1.00
2 COMBINED AT	HC12	3873.	4.25	584.	235.	235.	3.75
ROUTED TO	R12-13	3800.	4.30	583.	235.	235.	3.75
HYDROGRAPH AT	S13	465.	4.05	29.	12.	12.	0.17
2 COMBINED AT	HC13	3889.	4.30	601.	242.	242.	3.93
DIVERSION TO	DI24	1967.	4.30	369.	149.	149.	3.93

HYDROGRAPH AT	DI13	1922.	4.30	233.	93.	93.	3.93
ROUTED TO	RDI13	1770.	4.50	233.	93.	93.	3.93
HYDROGRAPH AT	S14	1210.	4.05	90.	36.	36.	0.49
2 COMBINED AT	HC14	1901.	4.45	294.	118.	118.	4.41
ROUTED TO	R1416S	1849.	4.55	294.	118.	118.	4.41
HYDROGRAPH AT	S15	278.	4.05	16.	6.	6.	0.11
ROUTED TO	R1516S	223.	4.15	16.	6.	6.	0.11
HYDROGRAPH AT	S16S	489.	4.05	31.	12.	12.	0.17
3 COMBINED AT	IHC16S	1888.	4.55	322.	130.	130.	4.70
HYDROGRAPH AT	S16N	361.	4.10	33.	13.	13.	0.17
ROUTED TO	R16N-S	298.	4.25	33.	13.	13.	0.17
2 COMBINED AT	HC16S	1996.	4.55	345.	139.	139.	4.87
DIVERSION TO	DI22	593.	4.55	83.	33.	33.	4.87
HYDROGRAPH AT	DI16S	1403.	4.55	261.	106.	106.	4.87
ROUTED TO	RDI16S	1315.	4.75	261.	106.	106.	4.87
HYDROGRAPH AT	S17	654.	4.05	44.	18.	18.	0.29
2 COMBINED AT	HC17	1311.	4.75	286.	116.	116.	5.15
HYDROGRAPH AT	S18	890.	4.05	71.	28.	28.	0.36
ROUTED TO	R18-19	857.	4.15	71.	28.	28.	0.36
HYDROGRAPH AT	S19	760.	4.05	55.	22.	22.	0.29

2 COMBINED AT							
	HC19	1421.	4.10	122.	49.	49.	0.65
ROUTED TO							
	R19-20	1329.	4.20	122.	49.	49.	0.65
HYDROGRAPH AT							
	S20	194.	4.05	14.	5.	5.	0.09
2 COMBINED AT							
	HC20	1394.	4.20	133.	54.	54.	0.73
HYDROGRAPH AT							
	S21	1547.	4.05	112.	45.	45.	0.62
HYDROGRAPH AT							
	S22	1229.	4.10	91.	36.	36.	0.55
HYDROGRAPH AT							
	DI22	593.	4.55	83.	33.	33.	4.87
ROUTED TO							
	RDI22	539.	4.80	83.	33.	33.	4.87
2 COMBINED AT							
	CP22	1474.	4.70	306.	123.	123.	5.41
HYDROGRAPH AT							
	S23	1003.	4.10	74.	30.	30.	0.49
HYDROGRAPH AT							
	S24	423.	4.30	53.	21.	21.	0.32
HYDROGRAPH AT							
	DI24	1967.	4.30	369.	149.	149.	3.93
ROUTED TO							
	RDI24	1899.	4.55	368.	149.	149.	3.93
2 COMBINED AT							
	CP24	2082.	4.50	403.	163.	163.	4.24
HYDROGRAPH AT							
	S25	74.	4.05	5.	2.	2.	0.03
ROUTED TO							
	R25-26	42.	4.45	5.	2.	2.	0.03
HYDROGRAPH AT							
	S26	496.	4.10	37.	15.	15.	0.21
2 COMBINED AT							
	HC26	500.	4.10	41.	17.	17.	0.24
HYDROGRAPH AT							
	S27	1292.	4.05	102.	41.	41.	0.51
ROUTED TO							
	R27-28	1255.	4.10	101.	41.	41.	0.51

HYDROGRAPH AT							
	S28	120.	4.00	7.	3.	3.	0.04
2 COMBINED AT							
	HC28	1292.	4.10	107.	43.	43.	0.55
ROUTED TO							
	R28-29	1210.	4.20	107.	43.	43.	0.55
HYDROGRAPH AT							
	S29	275.	4.05	17.	7.	7.	0.10
2 COMBINED AT							
	HC29	1267.	4.20	121.	49.	49.	0.65
8 COMBINED AT							
	HCBES3	4673.	4.35	1085.	440.	440.	8.75

*** NORMAL END OF HEC-1 ***

Appendix E – Monte Carlo Simulation Documentation

10/05

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation 1

Basin Name	IA
Basin S1	0.35
Basin S2	0.35
Basin S3	0.31
Basin S4	0.31
Basin S5	0.35
Basin S6	0.32
Basin S7	0.31
Basin S8	0.35
Basin S9	0.31
Basin S10	0.34
Basin S11	0.31
Basin S12E	0.27
Basin S12W	0.27
Basin S13	0.27
Basin S14	0.27
Basin S15	0.27
Basin S16N	0.35
Basin S16S	0.27
Basin S17	0.27
Basin S18	0.31
Basin S19	0.27
Basin S20	0.27
Basin S21	0.27
Basin S22	0.34
Basin S23	0.36
Basin S24	0.35
Basin S25	0.27
Basin S26	0.32
Basin S27	0.27
Basin S28	0.36
Basin S29	0.27

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	2

Basin Name	IA
Basin S1	0.32
Basin S2	0.32
Basin S3	0.24
Basin S4	0.24
Basin S5	0.32
Basin S6	0.25
Basin S7	0.24
Basin S8	0.32
Basin S9	0.24
Basin S10	0.30
Basin S11	0.24
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.15
Basin S16N	0.32
Basin S16S	0.15
Basin S17	0.15
Basin S18	0.24
Basin S19	0.15
Basin S20	0.15
Basin S21	0.15
Basin S22	0.20
Basin S23	0.22
Basin S24	0.25
Basin S25	0.15
Basin S26	0.19
Basin S27	0.15
Basin S28	0.22
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	3

Basin Name	IA
Basin S1	0.23
Basin S2	0.23
Basin S3	0.30
Basin S4	0.30
Basin S5	0.23
Basin S6	0.29
Basin S7	0.30
Basin S8	0.23
Basin S9	0.30
Basin S10	0.25
Basin S11	0.30
Basin S12E	0.37
Basin S12W	0.37
Basin S13	0.37
Basin S14	0.37
Basin S15	0.37
Basin S16N	0.23
Basin S16S	0.37
Basin S17	0.37
Basin S18	0.30
Basin S19	0.37
Basin S20	0.37
Basin S21	0.37
Basin S22	0.30
Basin S23	0.27
Basin S24	0.27
Basin S25	0.37
Basin S26	0.32
Basin S27	0.37
Basin S28	0.27
Basin S29	0.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	4

Basin Name	IA
Basin S1	0.38
Basin S2	0.38
Basin S3	0.27
Basin S4	0.27
Basin S5	0.38
Basin S6	0.29
Basin S7	0.27
Basin S8	0.38
Basin S9	0.27
Basin S10	0.36
Basin S11	0.27
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.38
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.27
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.30
Basin S23	0.37
Basin S24	0.34
Basin S25	0.16
Basin S26	0.27
Basin S27	0.16
Basin S28	0.36
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	5

Basin Name	IA
Basin S1	0.47 ✓
Basin S2	0.47 ✓
Basin S3	0.36 ✓
Basin S4	0.36 ✓
Basin S5	0.47 ✓
Basin S6	0.39 ✓
Basin S7	0.36 ✓
Basin S8	0.47 ✓
Basin S9	0.36 ✓
Basin S10	0.45 ✓
Basin S11	0.36 ✓
Basin S12E	0.25 ✓
Basin S12W	0.25 ✓
Basin S13	0.25 ✓
Basin S14	0.25 ✓
Basin S15	0.25 ✓
Basin S16N	0.47 ✓
Basin S16S	0.25 ✓
Basin S17	0.25 ✓
Basin S18	0.36 ✓
Basin S19	0.25 ✓
Basin S20	0.25 ✓
Basin S21	0.25 ✓
Basin S22	0.33 ✓
Basin S23	0.36 ✓
Basin S24	0.39 ✓
Basin S25	0.25 ✓
Basin S26	0.31 ✓
Basin S27	0.25 ✓
Basin S28	0.36
Basin S29	0.25

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	6

Basin Name	IA
Basin S1	0.32
Basin S2	0.32
Basin S3	0.23
Basin S4	0.23
Basin S5	0.32
Basin S6	0.25
Basin S7	0.23
Basin S8	0.32
Basin S9	0.23
Basin S10	0.30
Basin S11	0.23
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.15
Basin S16N	0.32
Basin S16S	0.15
Basin S17	0.15
Basin S18	0.23
Basin S19	0.15
Basin S20	0.15
Basin S21	0.15
Basin S22	0.24
Basin S23	0.28
Basin S24	0.28
Basin S25	0.15
Basin S26	0.22
Basin S27	0.15
Basin S28	0.28
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	7

Basin Name	IA
Basin S1	0.46
Basin S2	0.46
Basin S3	0.41
Basin S4	0.41
Basin S5	0.46
Basin S6	0.42
Basin S7	0.41
Basin S8	0.46
Basin S9	0.41
Basin S10	0.45
Basin S11	0.41
Basin S12E	0.36
Basin S12W	0.36
Basin S13	0.36
Basin S14	0.36
Basin S15	0.36
Basin S16N	0.46
Basin S16S	0.36
Basin S17	0.36
Basin S18	0.41
Basin S19	0.36
Basin S20	0.36
Basin S21	0.36
Basin S22	0.30
Basin S23	0.27
Basin S24	0.36
Basin S25	0.36
Basin S26	0.31
Basin S27	0.36
Basin S28	0.28
Basin S29	0.36

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	8

Basin Name	IA
Basin S1	0.37
Basin S2	0.37
Basin S3	0.38
Basin S4	0.38
Basin S5	0.37
Basin S6	0.38
Basin S7	0.38
Basin S8	0.37
Basin S9	0.38
Basin S10	0.37
Basin S11	0.38
Basin S12E	0.39
Basin S12W	0.39
Basin S13	0.39
Basin S14	0.39
Basin S15	0.39
Basin S16N	0.37
Basin S16S	0.39
Basin S17	0.39
Basin S18	0.38
Basin S19	0.39
Basin S20	0.39
Basin S21	0.39
Basin S22	0.37
Basin S23	0.36
Basin S24	0.37
Basin S25	0.39
Basin S26	0.38
Basin S27	0.39
Basin S28	0.36
Basin S29	0.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	9

Basin Name	IA
Basin S1	0.21
Basin S2	0.21
Basin S3	0.25
Basin S4	0.25
Basin S5	0.21
Basin S6	0.24
Basin S7	0.25
Basin S8	0.21
Basin S9	0.25
Basin S10	0.22
Basin S11	0.25
Basin S12E	0.28
Basin S12W	0.28
Basin S13	0.28
Basin S14	0.28
Basin S15	0.28
Basin S16N	0.21
Basin S16S	0.28
Basin S17	0.28
Basin S18	0.25
Basin S19	0.28
Basin S20	0.28
Basin S21	0.28
Basin S22	0.29
Basin S23	0.30
Basin S24	0.26
Basin S25	0.28
Basin S26	0.29
Basin S27	0.28
Basin S28	0.30
Basin S29	0.28

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	10

Basin Name	IA
Basin S1	0.26 ✓
Basin S2	0.26 ✓
Basin S3	0.32 ✓
Basin S4	0.32 ✓
Basin S5	0.26 ✓
Basin S6	0.31 ✓
Basin S7	0.32 ✓
Basin S8	0.26 ✓
Basin S9	0.32 ✓
Basin S10	0.27 ✓
Basin S11	0.32 ✓
Basin S12E	0.38 ✓
Basin S12W	0.38 ✓
Basin S13	0.38 ✓
Basin S14	0.38 ✓
Basin S15	0.38 ✓
Basin S16N	0.26
Basin S16S	0.38 ✓
Basin S17	0.38 ✓
Basin S18	0.32 ✓
Basin S19	0.38 ✓
Basin S20	0.38 ✓
Basin S21	0.38
Basin S22	0.40
Basin S23	0.40
Basin S24	0.34
Basin S25	0.38
Basin S26	0.39
Basin S27	0.38
Basin S28	0.40
Basin S29	0.38

FCDMC Uncertainty and Risk Analysis

Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**11**

Basin Name	**IA**
Basin S1	0.35 ✓
Basin S2	0.35 ✓
Basin S3	0.20 ✓
Basin S4	0.20 ✓
Basin S5	0.35 ✓
Basin S6	0.23 ✓
Basin S7	0.20 ✓
Basin S8	0.35 ✓
Basin S9	0.20 ✓
Basin S10	0.32 ✓
Basin S11	0.20 ✓
Basin S12E	0.05 ✓
Basin S12W	0.05 ✓
Basin S13	0.05 ✓
Basin S14	0.05 ✓
Basin S15	0.05 ✓
Basin S16N	0.35 ✓
Basin S16S	0.05 ✓
Basin S17	0.05
Basin S18	0.20
Basin S19	0.05
Basin S20	0.05
Basin S21	0.05
Basin S22	0.16
Basin S23	0.21
Basin S24	0.24
Basin S25	0.05
Basin S26	0.14
Basin S27	0.05
Basin S28	0.21
Basin S29	0.05

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	12

Basin Name	IA
Basin S1	0.41 ✓
Basin S2	0.41 ✓
Basin S3	0.31 ✓
Basin S4	0.31 ✓
Basin S5	0.41 ✓
Basin S6	0.33 ✓
Basin S7	0.31 ✓
Basin S8	0.41 ✓
Basin S9	0.31 ✓
Basin S10	0.39 ✓
Basin S11	0.31 ✓
Basin S12E	0.20 ✓
Basin S12W	0.20 ✓
Basin S13	0.20 ✓
Basin S14	0.20 ✓
Basin S15	0.20 ✓
Basin S16N	0.41 ✓
Basin S16S	0.20 ✓
Basin S17	0.20 ✓
Basin S18	0.31
Basin S19	0.20
Basin S20	0.20
Basin S21	0.20
Basin S22	0.22
Basin S23	0.22
Basin S24	0.30
Basin S25	0.20
Basin S26	0.21
Basin S27	0.20
Basin S28	0.22
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	13

Basin Name	IA
Basin S1	0.22 ✓
Basin S2	0.22 ✓
Basin S3	0.16 ✓
Basin S4	0.16 ✓
Basin S5	0.22 ✓
Basin S6	0.17 ✓
Basin S7	0.16 ✓
Basin S8	0.22 ✓
Basin S9	0.16 ✓
Basin S10	0.21 ✓
Basin S11	0.16 ✓
Basin S12E	0.10 ✓
Basin S12W	0.10 ✓
Basin S13	0.10 ✓
Basin S14	0.10 ✓
Basin S15	0.10 ✓
Basin S16N	0.22 ✓
Basin S16S	0.10 ✓
Basin S17	0.10 ✓
Basin S18	0.16 ✓
Basin S19	0.10 ✓
Basin S20	0.10 ✓
Basin S21	0.10 ✓
Basin S22	0.22 ✓
Basin S23	0.29 ✓
Basin S24	0.23
Basin S25	0.10
Basin S26	0.20
Basin S27	0.10
Basin S28	0.28
Basin S29	0.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	14

Basin Name	IA
Basin S1	0.22
Basin S2	0.22
Basin S3	0.16
Basin S4	0.16
Basin S5	0.22
Basin S6	0.17
Basin S7	0.16
Basin S8	0.22
Basin S9	0.16
Basin S10	0.20
Basin S11	0.16
Basin S12E	0.10
Basin S12W	0.10
Basin S13	0.10
Basin S14	0.10
Basin S15	0.10
Basin S16N	0.22
Basin S16S	0.10
Basin S17	0.10
Basin S18	0.16
Basin S19	0.10
Basin S20	0.10
Basin S21	0.10
Basin S22	0.11
Basin S23	0.12
Basin S24	0.15
Basin S25	0.10
Basin S26	0.11
Basin S27	0.10
Basin S28	0.12
Basin S29	0.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	15

Basin Name	IA
Basin S1	0.39 ✓
Basin S2	0.39 ✓
Basin S3	0.29 ✓
Basin S4	0.29 ✓
Basin S5	0.39 ✓
Basin S6	0.31 ✓
Basin S7	0.29 ✓
Basin S8	0.39
Basin S9	0.29
Basin S10	0.37 ✓
Basin S11	0.29 ✓
Basin S12E	0.19 ✓
Basin S12W	0.19 ✓
Basin S13	0.19 ✓
Basin S14	0.19 ✓
Basin S15	0.19 ✓
Basin S16N	0.39 ✓
Basin S16S	0.19 ✓
Basin S17	0.19
Basin S18	0.29
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.34
Basin S23	0.41
Basin S24	0.37
Basin S25	0.19
Basin S26	0.31
Basin S27	0.19
Basin S28	0.41
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	16

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.21
Basin S4	0.21
Basin S5	0.27
Basin S6	0.22
Basin S7	0.21
Basin S8	0.27
Basin S9	0.21
Basin S10	0.26
Basin S11	0.21
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.14
Basin S16N	0.27
Basin S16S	0.14
Basin S17	0.14
Basin S18	0.21
Basin S19	0.14
Basin S20	0.14
Basin S21	0.14
Basin S22	0.19
Basin S23	0.22
Basin S24	0.23
Basin S25	0.14
Basin S26	0.18
Basin S27	0.14
Basin S28	0.22
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	17

Basin Name	IA
Basin S1	0.23
Basin S2	0.23
Basin S3	0.23
Basin S4	0.23
Basin S5	0.23
Basin S6	0.23
Basin S7	0.23
Basin S8	0.23
Basin S9	0.23
Basin S10	0.23
Basin S11	0.23
Basin S12E	0.23
Basin S12W	0.23
Basin S13	0.23
Basin S14	0.23
Basin S15	0.23
Basin S16N	0.23
Basin S16S	0.23
Basin S17	0.23
Basin S18	0.23
Basin S19	0.23
Basin S20	0.23
Basin S21	0.23
Basin S22	0.30
Basin S23	0.34
Basin S24	0.28
Basin S25	0.23
Basin S26	0.29
Basin S27	0.23
Basin S28	0.33
Basin S29	0.23

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Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	18

Basin Name	IA
Basin S1	0.44
Basin S2	0.44
Basin S3	0.30
Basin S4	0.30
Basin S5	0.44
Basin S6	0.33
Basin S7	0.30
Basin S8	0.44
Basin S9	0.30
Basin S10	0.41
Basin S11	0.30
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.17
Basin S16N	0.44
Basin S16S	0.17
Basin S17	0.17
Basin S18	0.30
Basin S19	0.17
Basin S20	0.17
Basin S21	0.17
Basin S22	0.17
Basin S23	0.17
Basin S24	0.28
Basin S25	0.17
Basin S26	0.17
Basin S27	0.17
Basin S28	0.17
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	19

Basin Name	IA
Basin S1	0.13
Basin S2	0.13
Basin S3	0.17
Basin S4	0.17
Basin S5	0.13
Basin S6	0.16
Basin S7	0.17
Basin S8	0.13
Basin S9	0.17
Basin S10	0.14
Basin S11	0.17
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.20
Basin S16N	0.13
Basin S16S	0.20
Basin S17	0.20
Basin S18	0.17
Basin S19	0.20
Basin S20	0.20
Basin S21	0.20
Basin S22	0.21
Basin S23	0.22
Basin S24	0.18
Basin S25	0.20
Basin S26	0.21
Basin S27	0.20
Basin S28	0.22
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	20

Basin Name	IA
Basin S1	0.40
Basin S2	0.40
Basin S3	0.29
Basin S4	0.29
Basin S5	0.40
Basin S6	0.31
Basin S7	0.29
Basin S8	0.40
Basin S9	0.29
Basin S10	0.38
Basin S11	0.29
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.40
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.29
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.21
Basin S23	0.23
Basin S24	0.29
Basin S25	0.19
Basin S26	0.21
Basin S27	0.19
Basin S28	0.23
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	21

Basin Name	IA
Basin S1	0.28
Basin S2	0.28
Basin S3	0.22
Basin S4	0.22
Basin S5	0.28
Basin S6	0.23
Basin S7	0.22
Basin S8	0.28
Basin S9	0.22
Basin S10	0.27
Basin S11	0.22
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.28
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.22
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.26
Basin S23	0.30
Basin S24	0.27
Basin S25	0.16
Basin S26	0.23
Basin S27	0.16
Basin S28	0.30
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	22

Basin Name	IA
Basin S1	0.47
Basin S2	0.47
Basin S3	0.32
Basin S4	0.32
Basin S5	0.47
Basin S6	0.35
Basin S7	0.32
Basin S8	0.47
Basin S9	0.32
Basin S10	0.44
Basin S11	0.32
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.47
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.32
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.19
Basin S23	0.20
Basin S24	0.31
Basin S25	0.18
Basin S26	0.19
Basin S27	0.18
Basin S28	0.20
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**23**

Basin Name	IA
Basin S1	0.57
Basin S2	0.57
Basin S3	0.37
Basin S4	0.37
Basin S5	0.57
Basin S6	0.41
Basin S7	0.37
Basin S8	0.57
Basin S9	0.37
Basin S10	0.53
Basin S11	0.37
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.57
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.37
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.23
Basin S23	0.26
Basin S24	0.37
Basin S25	0.16
Basin S26	0.21
Basin S27	0.16
Basin S28	0.26
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	24

Basin Name	IA
Basin S1	0.26
Basin S2	0.26
Basin S3	0.19
Basin S4	0.19
Basin S5	0.26
Basin S6	0.20
Basin S7	0.19
Basin S8	0.26
Basin S9	0.19
Basin S10	0.24
Basin S11	0.19
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.26
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.19
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.17
Basin S23	0.19
Basin S24	0.21
Basin S25	0.12
Basin S26	0.16
Basin S27	0.12
Basin S28	0.19
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**25**

Basin Name	IA
Basin S1	0.21
Basin S2	0.21
Basin S3	0.20
Basin S4	0.20
Basin S5	0.21
Basin S6	0.20
Basin S7	0.20
Basin S8	0.21
Basin S9	0.20
Basin S10	0.21
Basin S11	0.20
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.21
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.20
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.24
Basin S23	0.26
Basin S24	0.23
Basin S25	0.19
Basin S26	0.23
Basin S27	0.19
Basin S28	0.26
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	26

Basin Name	IA
Basin S1	0.42
Basin S2	0.42
Basin S3	0.31
Basin S4	0.31
Basin S5	0.42
Basin S6	0.33
Basin S7	0.31
Basin S8	0.42
Basin S9	0.31
Basin S10	0.39
Basin S11	0.31
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.21
Basin S14	0.21
Basin S15	0.21
Basin S16N	0.42
Basin S16S	0.21
Basin S17	0.21
Basin S18	0.31
Basin S19	0.21
Basin S20	0.21
Basin S21	0.21
Basin S22	0.21
Basin S23	0.21
Basin S24	0.29
Basin S25	0.21
Basin S26	0.21
Basin S27	0.21
Basin S28	0.21
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	27

Basin Name	IA
Basin S1	0.31
Basin S2	0.31
Basin S3	0.28
Basin S4	0.28
Basin S5	0.31
Basin S6	0.29
Basin S7	0.28
Basin S8	0.31
Basin S9	0.28
Basin S10	0.31
Basin S11	0.28
Basin S12E	0.25
Basin S12W	0.25
Basin S13	0.25
Basin S14	0.25
Basin S15	0.25
Basin S16N	0.31
Basin S16S	0.25
Basin S17	0.25
Basin S18	0.28
Basin S19	0.25
Basin S20	0.25
Basin S21	0.25
Basin S22	0.30
Basin S23	0.32
Basin S24	0.31
Basin S25	0.25
Basin S26	0.29
Basin S27	0.25
Basin S28	0.32
Basin S29	0.25

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	28

Basin Name	IA
Basin S1	0.63
Basin S2	0.63
Basin S3	0.40
Basin S4	0.40
Basin S5	0.63
Basin S6	0.45
Basin S7	0.40
Basin S8	0.63
Basin S9	0.40
Basin S10	0.58
Basin S11	0.40
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.63
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.40
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.26
Basin S23	0.30
Basin S24	0.41
Basin S25	0.18
Basin S26	0.24
Basin S27	0.18
Basin S28	0.30
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	29

Basin Name	IA
Basin S1	0.16
Basin S2	0.16
Basin S3	0.23
Basin S4	0.23
Basin S5	0.16
Basin S6	0.22
Basin S7	0.23
Basin S8	0.16
Basin S9	0.23
Basin S10	0.17
Basin S11	0.23
Basin S12E	0.31
Basin S12W	0.31
Basin S13	0.31
Basin S14	0.31
Basin S15	0.31
Basin S16N	0.16
Basin S16S	0.31
Basin S17	0.31
Basin S18	0.23
Basin S19	0.31
Basin S20	0.31
Basin S21	0.31
Basin S22	0.31
Basin S23	0.31
Basin S24	0.25
Basin S25	0.31
Basin S26	0.31
Basin S27	0.31
Basin S28	0.31
Basin S29	0.31

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	30

Basin Name	IA
Basin S1	0.41
Basin S2	0.41
Basin S3	0.25
Basin S4	0.25
Basin S5	0.41
Basin S6	0.28
Basin S7	0.25
Basin S8	0.41
Basin S9	0.25
Basin S10	0.38
Basin S11	0.25
Basin S12E	0.09
Basin S12W	0.09
Basin S13	0.09
Basin S14	0.09
Basin S15	0.09
Basin S16N	0.41
Basin S16S	0.09
Basin S17	0.09
Basin S18	0.25
Basin S19	0.09
Basin S20	0.09
Basin S21	0.09
Basin S22	0.17
Basin S23	0.21
Basin S24	0.27
Basin S25	0.09
Basin S26	0.15
Basin S27	0.09
Basin S28	0.20
Basin S29	0.09

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	31

Basin Name	IA
Basin S1	0.25
Basin S2	0.25
Basin S3	0.21
Basin S4	0.21
Basin S5	0.25
Basin S6	0.22
Basin S7	0.21
Basin S8	0.25
Basin S9	0.21
Basin S10	0.24
Basin S11	0.21
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.17
Basin S16N	0.25
Basin S16S	0.17
Basin S17	0.17
Basin S18	0.21
Basin S19	0.17
Basin S20	0.17
Basin S21	0.17
Basin S22	0.20
Basin S23	0.21
Basin S24	0.22
Basin S25	0.17
Basin S26	0.19
Basin S27	0.17
Basin S28	0.21
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	32

Basin Name	IA
Basin S1	0.39
Basin S2	0.39
Basin S3	0.31
Basin S4	0.31
Basin S5	0.39
Basin S6	0.33
Basin S7	0.31
Basin S8	0.39
Basin S9	0.31
Basin S10	0.37
Basin S11	0.31
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.24
Basin S14	0.24
Basin S15	0.24
Basin S16N	0.39
Basin S16S	0.24
Basin S17	0.24
Basin S18	0.31
Basin S19	0.24
Basin S20	0.24
Basin S21	0.24
Basin S22	0.24
Basin S23	0.24
Basin S24	0.30
Basin S25	0.24
Basin S26	0.24
Basin S27	0.24
Basin S28	0.24
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis

Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	33

Basin Name	IA
Basin S1	0.52
Basin S2	0.52
Basin S3	0.38
Basin S4	0.38
Basin S5	0.52
Basin S6	0.40
Basin S7	0.38
Basin S8	0.52
Basin S9	0.38
Basin S10	0.49
Basin S11	0.38
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.24
Basin S14	0.24
Basin S15	0.24
Basin S16N	0.52
Basin S16S	0.24
Basin S17	0.24
Basin S18	0.38
Basin S19	0.24
Basin S20	0.24
Basin S21	0.24
Basin S22	0.33
Basin S23	0.38
Basin S24	0.41
Basin S25	0.24
Basin S26	0.31
Basin S27	0.24
Basin S28	0.37
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	34

Basin Name	IA
Basin S1	0.23
Basin S2	0.23
Basin S3	0.30
Basin S4	0.30
Basin S5	0.23
Basin S6	0.29
Basin S7	0.30
Basin S8	0.23
Basin S9	0.30
Basin S10	0.24
Basin S11	0.30
Basin S12E	0.37
Basin S12W	0.37
Basin S13	0.37
Basin S14	0.37
Basin S15	0.37
Basin S16N	0.23
Basin S16S	0.37
Basin S17	0.37
Basin S18	0.30
Basin S19	0.37
Basin S20	0.37
Basin S21	0.37
Basin S22	0.34
Basin S23	0.32
Basin S24	0.29
Basin S25	0.37
Basin S26	0.34
Basin S27	0.37
Basin S28	0.32
Basin S29	0.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	35

Basin Name	IA
Basin S1	0.38
Basin S2	0.38
Basin S3	0.38
Basin S4	0.38
Basin S5	0.38
Basin S6	0.38
Basin S7	0.38
Basin S8	0.38
Basin S9	0.38
Basin S10	0.38
Basin S11	0.38
Basin S12E	0.39
Basin S12W	0.39
Basin S13	0.39
Basin S14	0.39
Basin S15	0.39
Basin S16N	0.38
Basin S16S	0.39
Basin S17	0.39
Basin S18	0.38
Basin S19	0.39
Basin S20	0.39
Basin S21	0.39
Basin S22	0.34
Basin S23	0.31
Basin S24	0.35
Basin S25	0.39
Basin S26	0.35
Basin S27	0.39
Basin S28	0.31
Basin S29	0.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	36

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.27
Basin S4	0.27
Basin S5	0.27
Basin S6	0.27
Basin S7	0.27
Basin S8	0.27
Basin S9	0.27
Basin S10	0.27
Basin S11	0.27
Basin S12E	0.28
Basin S12W	0.28
Basin S13	0.28
Basin S14	0.28
Basin S15	0.28
Basin S16N	0.27
Basin S16S	0.28
Basin S17	0.28
Basin S18	0.27
Basin S19	0.28
Basin S20	0.28
Basin S21	0.28
Basin S22	0.31
Basin S23	0.33
Basin S24	0.30
Basin S25	0.28
Basin S26	0.30
Basin S27	0.28
Basin S28	0.32
Basin S29	0.28

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	37

Basin Name	IA
Basin S1	0.50
Basin S2	0.50
Basin S3	0.41
Basin S4	0.41
Basin S5	0.50
Basin S6	0.42
Basin S7	0.41
Basin S8	0.50
Basin S9	0.41
Basin S10	0.48
Basin S11	0.41
Basin S12E	0.31
Basin S12W	0.31
Basin S13	0.31
Basin S14	0.31
Basin S15	0.31
Basin S16N	0.50
Basin S16S	0.31
Basin S17	0.31
Basin S18	0.41
Basin S19	0.31
Basin S20	0.31
Basin S21	0.31
Basin S22	0.36
Basin S23	0.38
Basin S24	0.42
Basin S25	0.31
Basin S26	0.35
Basin S27	0.31
Basin S28	0.38
Basin S29	0.31

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	38

Basin Name	IA
Basin S1	0.20
Basin S2	0.20
Basin S3	0.17
Basin S4	0.17
Basin S5	0.20
Basin S6	0.17
Basin S7	0.17
Basin S8	0.20
Basin S9	0.17
Basin S10	0.19
Basin S11	0.17
Basin S12E	0.13
Basin S12W	0.13
Basin S13	0.13
Basin S14	0.13
Basin S15	0.13
Basin S16N	0.20
Basin S16S	0.13
Basin S17	0.13
Basin S18	0.17
Basin S19	0.13
Basin S20	0.13
Basin S21	0.13
Basin S22	0.18
Basin S23	0.19
Basin S24	0.19
Basin S25	0.13
Basin S26	0.17
Basin S27	0.13
Basin S28	0.19
Basin S29	0.13

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**39**

Basin Name	**IA**
Basin S1	0.46
Basin S2	0.46
Basin S3	0.30
Basin S4	0.30
Basin S5	0.46
Basin S6	0.33
Basin S7	0.30
Basin S8	0.46
Basin S9	0.30
Basin S10	0.43
Basin S11	0.30
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.14
Basin S16N	0.46
Basin S16S	0.14
Basin S17	0.14
Basin S18	0.30
Basin S19	0.14
Basin S20	0.14
Basin S21	0.14
Basin S22	0.17
Basin S23	0.19
Basin S24	0.29
Basin S25	0.14
Basin S26	0.16
Basin S27	0.14
Basin S28	0.19
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	40

Basin Name	IA
Basin S1	0.26
Basin S2	0.26
Basin S3	0.24
Basin S4	0.24
Basin S5	0.26
Basin S6	0.25
Basin S7	0.24
Basin S8	0.26
Basin S9	0.24
Basin S10	0.26
Basin S11	0.24
Basin S12E	0.23
Basin S12W	0.23
Basin S13	0.23
Basin S14	0.23
Basin S15	0.23
Basin S16N	0.26
Basin S16S	0.23
Basin S17	0.23
Basin S18	0.24
Basin S19	0.23
Basin S20	0.23
Basin S21	0.23
Basin S22	0.28
Basin S23	0.31
Basin S24	0.28
Basin S25	0.23
Basin S26	0.27
Basin S27	0.23
Basin S28	0.30
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	41

Basin Name	IA
Basin S1	0.17
Basin S2	0.17
Basin S3	0.18
Basin S4	0.18
Basin S5	0.17
Basin S6	0.17
Basin S7	0.18
Basin S8	0.17
Basin S9	0.18
Basin S10	0.17
Basin S11	0.18
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.17
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.18
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.27
Basin S23	0.30
Basin S24	0.23
Basin S25	0.18
Basin S26	0.25
Basin S27	0.18
Basin S28	0.30
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	42

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.28
Basin S4	0.28
Basin S5	0.27
Basin S6	0.28
Basin S7	0.28
Basin S8	0.27
Basin S9	0.28
Basin S10	0.27
Basin S11	0.28
Basin S12E	0.28
Basin S12W	0.28
Basin S13	0.28
Basin S14	0.28
Basin S15	0.28
Basin S16N	0.27
Basin S16S	0.28
Basin S17	0.28
Basin S18	0.28
Basin S19	0.28
Basin S20	0.28
Basin S21	0.28
Basin S22	0.26
Basin S23	0.25
Basin S24	0.26
Basin S25	0.28
Basin S26	0.26
Basin S27	0.28
Basin S28	0.25
Basin S29	0.28

FCDMC Uncertainty and Risk Analysis

Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	43

Basin Name	IA
Basin S1	0.30
Basin S2	0.30
Basin S3	0.23
Basin S4	0.23
Basin S5	0.30
Basin S6	0.24
Basin S7	0.23
Basin S8	0.30
Basin S9	0.23
Basin S10	0.29
Basin S11	0.23
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.15
Basin S16N	0.30
Basin S16S	0.15
Basin S17	0.15
Basin S18	0.23
Basin S19	0.15
Basin S20	0.15
Basin S21	0.15
Basin S22	0.18
Basin S23	0.19
Basin S24	0.23
Basin S25	0.15
Basin S26	0.17
Basin S27	0.15
Basin S28	0.19
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	44

Basin Name	IA
Basin S1	0.37
Basin S2	0.37
Basin S3	0.28
Basin S4	0.28
Basin S5	0.37
Basin S6	0.29
Basin S7	0.28
Basin S8	0.37
Basin S9	0.28
Basin S10	0.35
Basin S11	0.28
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.37
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.28
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.28
Basin S23	0.32
Basin S24	0.32
Basin S25	0.18
Basin S26	0.26
Basin S27	0.18
Basin S28	0.32
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	45

Basin Name	IA
Basin S1	0.30
Basin S2	0.30
Basin S3	0.33
Basin S4	0.33
Basin S5	0.30
Basin S6	0.32
Basin S7	0.33
Basin S8	0.30
Basin S9	0.33
Basin S10	0.31
Basin S11	0.33
Basin S12E	0.35
Basin S12W	0.35
Basin S13	0.35
Basin S14	0.35
Basin S15	0.35
Basin S16N	0.30
Basin S16S	0.35
Basin S17	0.35
Basin S18	0.33
Basin S19	0.35
Basin S20	0.35
Basin S21	0.35
Basin S22	0.30
Basin S23	0.28
Basin S24	0.30
Basin S25	0.35
Basin S26	0.31
Basin S27	0.35
Basin S28	0.29
Basin S29	0.35

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	46

Basin Name	IA
Basin S1	0.21
Basin S2	0.21
Basin S3	0.29
Basin S4	0.29
Basin S5	0.21
Basin S6	0.28
Basin S7	0.29
Basin S8	0.21
Basin S9	0.29
Basin S10	0.22
Basin S11	0.29
Basin S12E	0.38
Basin S12W	0.38
Basin S13	0.38
Basin S14	0.38
Basin S15	0.38
Basin S16N	0.21
Basin S16S	0.38
Basin S17	0.38
Basin S18	0.29
Basin S19	0.38
Basin S20	0.38
Basin S21	0.38
Basin S22	0.33
Basin S23	0.30
Basin S24	0.27
Basin S25	0.38
Basin S26	0.34
Basin S27	0.38
Basin S28	0.30
Basin S29	0.38

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**47**

Basin Name	**IA**
Basin S1	0.19
Basin S2	0.19
Basin S3	0.20
Basin S4	0.20
Basin S5	0.19
Basin S6	0.20
Basin S7	0.20
Basin S8	0.19
Basin S9	0.20
Basin S10	0.19
Basin S11	0.20
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.21
Basin S14	0.21
Basin S15	0.21
Basin S16N	0.19
Basin S16S	0.21
Basin S17	0.21
Basin S18	0.20
Basin S19	0.21
Basin S20	0.21
Basin S21	0.21
Basin S22	0.24
Basin S23	0.25
Basin S24	0.22
Basin S25	0.21
Basin S26	0.23
Basin S27	0.21
Basin S28	0.25
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	48

Basin Name	IA
Basin S1	0.31
Basin S2	0.31
Basin S3	0.26
Basin S4	0.26
Basin S5	0.31
Basin S6	0.27
Basin S7	0.26
Basin S8	0.31
Basin S9	0.26
Basin S10	0.30
Basin S11	0.26
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.21
Basin S14	0.21
Basin S15	0.21
Basin S16N	0.31
Basin S16S	0.21
Basin S17	0.21
Basin S18	0.26
Basin S19	0.21
Basin S20	0.21
Basin S21	0.21
Basin S22	0.20
Basin S23	0.20
Basin S24	0.25
Basin S25	0.21
Basin S26	0.21
Basin S27	0.21
Basin S28	0.20
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	49

Basin Name	IA
Basin S1	0.31
Basin S2	0.31
Basin S3	0.29
Basin S4	0.29
Basin S5	0.31
Basin S6	0.29
Basin S7	0.29
Basin S8	0.31
Basin S9	0.29
Basin S10	0.30
Basin S11	0.29
Basin S12E	0.28
Basin S12W	0.28
Basin S13	0.28
Basin S14	0.28
Basin S15	0.28
Basin S16N	0.31
Basin S16S	0.28
Basin S17	0.28
Basin S18	0.29
Basin S19	0.28
Basin S20	0.28
Basin S21	0.28
Basin S22	0.32
Basin S23	0.33
Basin S24	0.32
Basin S25	0.28
Basin S26	0.31
Basin S27	0.28
Basin S28	0.33
Basin S29	0.28

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	50

Basin Name	IA
Basin S1	0.39
Basin S2	0.39
Basin S3	0.26
Basin S4	0.26
Basin S5	0.39
Basin S6	0.29
Basin S7	0.26
Basin S8	0.39
Basin S9	0.26
Basin S10	0.37
Basin S11	0.26
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.14
Basin S16N	0.39
Basin S16S	0.14
Basin S17	0.14
Basin S18	0.26
Basin S19	0.14
Basin S20	0.14
Basin S21	0.14
Basin S22	0.18
Basin S23	0.21
Basin S24	0.27
Basin S25	0.14
Basin S26	0.17
Basin S27	0.14
Basin S28	0.21
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	51

Basin Name	IA
Basin S1	0.36
Basin S2	0.36
Basin S3	0.27
Basin S4	0.27
Basin S5	0.36
Basin S6	0.29
Basin S7	0.27
Basin S8	0.36
Basin S9	0.27
Basin S10	0.34
Basin S11	0.27
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.36
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.27
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.19
Basin S23	0.19
Basin S24	0.26
Basin S25	0.19
Basin S26	0.19
Basin S27	0.19
Basin S28	0.19
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	52

Basin Name	IA
Basin S1	0.12
Basin S2	0.12
Basin S3	0.12
Basin S4	0.12
Basin S5	0.12
Basin S6	0.12
Basin S7	0.12
Basin S8	0.12
Basin S9	0.12
Basin S10	0.12
Basin S11	0.12
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.12
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.12
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.17
Basin S23	0.20
Basin S24	0.15
Basin S25	0.12
Basin S26	0.16
Basin S27	0.12
Basin S28	0.19
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	53

Basin Name	IA
Basin S1	0.25
Basin S2	0.25
Basin S3	0.25
Basin S4	0.25
Basin S5	0.25
Basin S6	0.25
Basin S7	0.25
Basin S8	0.25
Basin S9	0.25
Basin S10	0.25
Basin S11	0.25
Basin S12E	0.26
Basin S12W	0.26
Basin S13	0.26
Basin S14	0.26
Basin S15	0.26
Basin S16N	0.25
Basin S16S	0.26
Basin S17	0.26
Basin S18	0.25
Basin S19	0.26
Basin S20	0.26
Basin S21	0.26
Basin S22	0.37
Basin S23	0.42
Basin S24	0.33
Basin S25	0.26
Basin S26	0.34
Basin S27	0.26
Basin S28	0.42
Basin S29	0.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	54

Basin Name	IA
Basin S1	0.32
Basin S2	0.32
Basin S3	0.22
Basin S4	0.22
Basin S5	0.32
Basin S6	0.24
Basin S7	0.22
Basin S8	0.32
Basin S9	0.22
Basin S10	0.30
Basin S11	0.22
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.32
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.22
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.15
Basin S23	0.17
Basin S24	0.22
Basin S25	0.12
Basin S26	0.14
Basin S27	0.12
Basin S28	0.16
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	55

Basin Name	IA
Basin S1	0.42
Basin S2	0.42
Basin S3	0.30
Basin S4	0.30
Basin S5	0.42
Basin S6	0.32
Basin S7	0.30
Basin S8	0.42
Basin S9	0.30
Basin S10	0.39
Basin S11	0.30
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.42
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.30
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.20
Basin S23	0.20
Basin S24	0.29
Basin S25	0.18
Basin S26	0.19
Basin S27	0.18
Basin S28	0.20
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	56

Basin Name	IA
Basin S1	0.44
Basin S2	0.44
Basin S3	0.29
Basin S4	0.29
Basin S5	0.44
Basin S6	0.32
Basin S7	0.29
Basin S8	0.44
Basin S9	0.29
Basin S10	0.41
Basin S11	0.29
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.15
Basin S16N	0.44
Basin S16S	0.15
Basin S17	0.15
Basin S18	0.29
Basin S19	0.15
Basin S20	0.15
Basin S21	0.15
Basin S22	0.20
Basin S23	0.22
Basin S24	0.30
Basin S25	0.15
Basin S26	0.19
Basin S27	0.15
Basin S28	0.22
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	57

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.21
Basin S4	0.21
Basin S5	0.27
Basin S6	0.22
Basin S7	0.21
Basin S8	0.27
Basin S9	0.21
Basin S10	0.26
Basin S11	0.21
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.15
Basin S16N	0.27
Basin S16S	0.15
Basin S17	0.15
Basin S18	0.21
Basin S19	0.15
Basin S20	0.15
Basin S21	0.15
Basin S22	0.23
Basin S23	0.27
Basin S24	0.25
Basin S25	0.15
Basin S26	0.21
Basin S27	0.15
Basin S28	0.27
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	58

Basin Name	IA
Basin S1	0.12
Basin S2	0.12
Basin S3	0.16
Basin S4	0.16
Basin S5	0.12
Basin S6	0.15
Basin S7	0.16
Basin S8	0.12
Basin S9	0.16
Basin S10	0.13
Basin S11	0.16
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.12
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.16
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.26
Basin S23	0.29
Basin S24	0.21
Basin S25	0.19
Basin S26	0.24
Basin S27	0.19
Basin S28	0.29
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	59

Basin Name	IA
Basin S1	0.55
Basin S2	0.55
Basin S3	0.40
Basin S4	0.40
Basin S5	0.55
Basin S6	0.43
Basin S7	0.40
Basin S8	0.55
Basin S9	0.40
Basin S10	0.52
Basin S11	0.40
Basin S12E	0.26
Basin S12W	0.26
Basin S13	0.26
Basin S14	0.26
Basin S15	0.26
Basin S16N	0.55
Basin S16S	0.26
Basin S17	0.26
Basin S18	0.40
Basin S19	0.26
Basin S20	0.26
Basin S21	0.26
Basin S22	0.31
Basin S23	0.34
Basin S24	0.41
Basin S25	0.26
Basin S26	0.30
Basin S27	0.26
Basin S28	0.34
Basin S29	0.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	60

Basin Name	IA
Basin S1	0.56
Basin S2	0.56
Basin S3	0.41
Basin S4	0.41
Basin S5	0.56
Basin S6	0.44
Basin S7	0.41
Basin S8	0.56
Basin S9	0.41
Basin S10	0.53
Basin S11	0.41
Basin S12E	0.26
Basin S12W	0.26
Basin S13	0.26
Basin S14	0.26
Basin S15	0.26
Basin S16N	0.56
Basin S16S	0.26
Basin S17	0.26
Basin S18	0.41
Basin S19	0.26
Basin S20	0.26
Basin S21	0.26
Basin S22	0.29
Basin S23	0.30
Basin S24	0.40
Basin S25	0.26
Basin S26	0.28
Basin S27	0.26
Basin S28	0.30
Basin S29	0.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	61

Basin Name	IA
Basin S1	0.26
Basin S2	0.26
Basin S3	0.18
Basin S4	0.18
Basin S5	0.26
Basin S6	0.19
Basin S7	0.18
Basin S8	0.26
Basin S9	0.18
Basin S10	0.24
Basin S11	0.18
Basin S12E	0.10
Basin S12W	0.10
Basin S13	0.10
Basin S14	0.10
Basin S15	0.10
Basin S16N	0.26
Basin S16S	0.10
Basin S17	0.10
Basin S18	0.18
Basin S19	0.10
Basin S20	0.10
Basin S21	0.10
Basin S22	0.11
Basin S23	0.11
Basin S24	0.17
Basin S25	0.10
Basin S26	0.11
Basin S27	0.10
Basin S28	0.11
Basin S29	0.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	62

Basin Name	IA
Basin S1	0.34
Basin S2	0.34
Basin S3	0.28
Basin S4	0.28
Basin S5	0.34
Basin S6	0.29
Basin S7	0.28
Basin S8	0.34
Basin S9	0.28
Basin S10	0.33
Basin S11	0.28
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.22
Basin S14	0.22
Basin S15	0.22
Basin S16N	0.34
Basin S16S	0.22
Basin S17	0.22
Basin S18	0.28
Basin S19	0.22
Basin S20	0.22
Basin S21	0.22
Basin S22	0.23
Basin S23	0.24
Basin S24	0.28
Basin S25	0.22
Basin S26	0.23
Basin S27	0.22
Basin S28	0.24
Basin S29	0.22

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	63

Basin Name	IA
Basin S1	0.55
Basin S2	0.55
Basin S3	0.38
Basin S4	0.38
Basin S5	0.55
Basin S6	0.41
Basin S7	0.38
Basin S8	0.55
Basin S9	0.38
Basin S10	0.52
Basin S11	0.38
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.20
Basin S16N	0.55
Basin S16S	0.20
Basin S17	0.20
Basin S18	0.38
Basin S19	0.20
Basin S20	0.20
Basin S21	0.20
Basin S22	0.25
Basin S23	0.28
Basin S24	0.38
Basin S25	0.20
Basin S26	0.24
Basin S27	0.20
Basin S28	0.28
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	64

Basin Name	IA
Basin S1	0.26
Basin S2	0.26
Basin S3	0.25
Basin S4	0.25
Basin S5	0.26
Basin S6	0.26
Basin S7	0.25
Basin S8	0.26
Basin S9	0.25
Basin S10	0.26
Basin S11	0.25
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.24
Basin S14	0.24
Basin S15	0.24
Basin S16N	0.26
Basin S16S	0.24
Basin S17	0.24
Basin S18	0.25
Basin S19	0.24
Basin S20	0.24
Basin S21	0.24
Basin S22	0.27
Basin S23	0.28
Basin S24	0.27
Basin S25	0.24
Basin S26	0.26
Basin S27	0.24
Basin S28	0.28
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	65

Basin Name	IA
Basin S1	0.14
Basin S2	0.14
Basin S3	0.16
Basin S4	0.16
Basin S5	0.14
Basin S6	0.15
Basin S7	0.16
Basin S8	0.14
Basin S9	0.16
Basin S10	0.14
Basin S11	0.16
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.14
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.16
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.23
Basin S23	0.26
Basin S24	0.20
Basin S25	0.18
Basin S26	0.22
Basin S27	0.18
Basin S28	0.26
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	66

Basin Name	IA
Basin S1	0.50
Basin S2	0.50
Basin S3	0.32
Basin S4	0.32
Basin S5	0.50
Basin S6	0.36
Basin S7	0.32
Basin S8	0.50
Basin S9	0.32
Basin S10	0.47
Basin S11	0.32
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.14
Basin S16N	0.50
Basin S16S	0.14
Basin S17	0.14
Basin S18	0.32
Basin S19	0.14
Basin S20	0.14
Basin S21	0.14
Basin S22	0.19
Basin S23	0.22
Basin S24	0.32
Basin S25	0.14
Basin S26	0.18
Basin S27	0.14
Basin S28	0.21
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	67

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.23
Basin S4	0.23
Basin S5	0.27
Basin S6	0.24
Basin S7	0.23
Basin S8	0.27
Basin S9	0.23
Basin S10	0.26
Basin S11	0.23
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.27
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.23
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.32
Basin S23	0.38
Basin S24	0.31
Basin S25	0.19
Basin S26	0.29
Basin S27	0.19
Basin S28	0.38
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	68

Basin Name	IA
Basin S1	0.36
Basin S2	0.36
Basin S3	0.32
Basin S4	0.32
Basin S5	0.36
Basin S6	0.32
Basin S7	0.32
Basin S8	0.36
Basin S9	0.32
Basin S10	0.35
Basin S11	0.32
Basin S12E	0.27
Basin S12W	0.27
Basin S13	0.27
Basin S14	0.27
Basin S15	0.27
Basin S16N	0.36
Basin S16S	0.27
Basin S17	0.27
Basin S18	0.32
Basin S19	0.27
Basin S20	0.27
Basin S21	0.27
Basin S22	0.27
Basin S23	0.27
Basin S24	0.31
Basin S25	0.27
Basin S26	0.27
Basin S27	0.27
Basin S28	0.27
Basin S29	0.27

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	69

Basin Name	IA
Basin S1	0.49
Basin S2	0.49
Basin S3	0.44
Basin S4	0.44
Basin S5	0.49
Basin S6	0.45
Basin S7	0.44
Basin S8	0.49
Basin S9	0.44
Basin S10	0.48
Basin S11	0.44
Basin S12E	0.39
Basin S12W	0.39
Basin S13	0.39
Basin S14	0.39
Basin S15	0.39
Basin S16N	0.49
Basin S16S	0.39
Basin S17	0.39
Basin S18	0.44
Basin S19	0.39
Basin S20	0.39
Basin S21	0.39
Basin S22	0.34
Basin S23	0.32
Basin S24	0.40
Basin S25	0.39
Basin S26	0.35
Basin S27	0.39
Basin S28	0.32
Basin S29	0.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**70**

Basin Name	IA
Basin S1	0.44
Basin S2	0.44
Basin S3	0.38
Basin S4	0.38
Basin S5	0.44
Basin S6	0.39
Basin S7	0.38
Basin S8	0.44
Basin S9	0.38
Basin S10	0.43
Basin S11	0.38
Basin S12E	0.32
Basin S12W	0.32
Basin S13	0.32
Basin S14	0.32
Basin S15	0.32
Basin S16N	0.44
Basin S16S	0.32
Basin S17	0.32
Basin S18	0.38
Basin S19	0.32
Basin S20	0.32
Basin S21	0.32
Basin S22	0.27
Basin S23	0.25
Basin S24	0.34
Basin S25	0.32
Basin S26	0.28
Basin S27	0.32
Basin S28	0.25
Basin S29	0.32

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	71

Basin Name	IA
Basin S1	0.24
Basin S2	0.24
Basin S3	0.26
Basin S4	0.26
Basin S5	0.24
Basin S6	0.26
Basin S7	0.26
Basin S8	0.24
Basin S9	0.26
Basin S10	0.24
Basin S11	0.26
Basin S12E	0.29
Basin S12W	0.29
Basin S13	0.29
Basin S14	0.29
Basin S15	0.29
Basin S16N	0.24
Basin S16S	0.29
Basin S17	0.29
Basin S18	0.26
Basin S19	0.29
Basin S20	0.29
Basin S21	0.29
Basin S22	0.28
Basin S23	0.27
Basin S24	0.26
Basin S25	0.29
Basin S26	0.28
Basin S27	0.29
Basin S28	0.27
Basin S29	0.29

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	72

Basin Name	IA
Basin S1	0.14
Basin S2	0.14
Basin S3	0.15
Basin S4	0.15
Basin S5	0.14
Basin S6	0.15
Basin S7	0.15
Basin S8	0.14
Basin S9	0.15
Basin S10	0.14
Basin S11	0.15
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.17
Basin S16N	0.14
Basin S16S	0.17
Basin S17	0.17
Basin S18	0.15
Basin S19	0.17
Basin S20	0.17
Basin S21	0.17
Basin S22	0.25
Basin S23	0.29
Basin S24	0.21
Basin S25	0.17
Basin S26	0.23
Basin S27	0.17
Basin S28	0.29
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	73

Basin Name	IA
Basin S1	0.28
Basin S2	0.28
Basin S3	0.33
Basin S4	0.33
Basin S5	0.28
Basin S6	0.32
Basin S7	0.33
Basin S8	0.28
Basin S9	0.33
Basin S10	0.29
Basin S11	0.33
Basin S12E	0.37
Basin S12W	0.37
Basin S13	0.37
Basin S14	0.37
Basin S15	0.37
Basin S16N	0.28
Basin S16S	0.37
Basin S17	0.37
Basin S18	0.33
Basin S19	0.37
Basin S20	0.37
Basin S21	0.37
Basin S22	0.36
Basin S23	0.36
Basin S24	0.33
Basin S25	0.37
Basin S26	0.36
Basin S27	0.37
Basin S28	0.36
Basin S29	0.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	74

Basin Name	IA
Basin S1	0.38
Basin S2	0.38
Basin S3	0.29
Basin S4	0.29
Basin S5	0.38
Basin S6	0.31
Basin S7	0.29
Basin S8	0.38
Basin S9	0.29
Basin S10	0.36
Basin S11	0.29
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.20
Basin S16N	0.38
Basin S16S	0.20
Basin S17	0.20
Basin S18	0.29
Basin S19	0.20
Basin S20	0.20
Basin S21	0.20
Basin S22	0.35
Basin S23	0.42
Basin S24	0.37
Basin S25	0.20
Basin S26	0.32
Basin S27	0.20
Basin S28	0.42
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	75

Basin Name	IA
Basin S1	0.29
Basin S2	0.29
Basin S3	0.23
Basin S4	0.23
Basin S5	0.29
Basin S6	0.24
Basin S7	0.23
Basin S8	0.29
Basin S9	0.23
Basin S10	0.28
Basin S11	0.23
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.29
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.23
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.19
Basin S23	0.21
Basin S24	0.23
Basin S25	0.16
Basin S26	0.19
Basin S27	0.16
Basin S28	0.21
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	76

Basin Name	IA
Basin S1	0.56
Basin S2	0.56
Basin S3	0.34
Basin S4	0.34
Basin S5	0.56
Basin S6	0.39
Basin S7	0.34
Basin S8	0.56
Basin S9	0.34
Basin S10	0.52
Basin S11	0.34
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.56
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.34
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.23
Basin S23	0.28
Basin S24	0.37
Basin S25	0.12
Basin S26	0.20
Basin S27	0.12
Basin S28	0.28
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	77

Basin Name	IA
Basin S1	0.49
Basin S2	0.49
Basin S3	0.29
Basin S4	0.29
Basin S5	0.49
Basin S6	0.33
Basin S7	0.29
Basin S8	0.49
Basin S9	0.29
Basin S10	0.45
Basin S11	0.29
Basin S12E	0.09
Basin S12W	0.09
Basin S13	0.09
Basin S14	0.09
Basin S15	0.09
Basin S16N	0.49
Basin S16S	0.09
Basin S17	0.09
Basin S18	0.29
Basin S19	0.09
Basin S20	0.09
Basin S21	0.09
Basin S22	0.19
Basin S23	0.24
Basin S24	0.32
Basin S25	0.09
Basin S26	0.17
Basin S27	0.09
Basin S28	0.24
Basin S29	0.09

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	78

Basin Name	IA
Basin S1	0.35
Basin S2	0.35
Basin S3	0.32
Basin S4	0.32
Basin S5	0.35
Basin S6	0.33
Basin S7	0.32
Basin S8	0.35
Basin S9	0.32
Basin S10	0.34
Basin S11	0.32
Basin S12E	0.30
Basin S12W	0.30
Basin S13	0.30
Basin S14	0.30
Basin S15	0.30
Basin S16N	0.35
Basin S16S	0.30
Basin S17	0.30
Basin S18	0.32
Basin S19	0.30
Basin S20	0.30
Basin S21	0.30
Basin S22	0.40
Basin S23	0.45
Basin S24	0.39
Basin S25	0.30
Basin S26	0.38
Basin S27	0.30
Basin S28	0.45
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	79

Basin Name	IA
Basin S1	0.27
Basin S2	0.27
Basin S3	0.30
Basin S4	0.30
Basin S5	0.27
Basin S6	0.29
Basin S7	0.30
Basin S8	0.27
Basin S9	0.30
Basin S10	0.27
Basin S11	0.30
Basin S12E	0.33
Basin S12W	0.33
Basin S13	0.33
Basin S14	0.33
Basin S15	0.33
Basin S16N	0.27
Basin S16S	0.33
Basin S17	0.33
Basin S18	0.30
Basin S19	0.33
Basin S20	0.33
Basin S21	0.33
Basin S22	0.30
Basin S23	0.28
Basin S24	0.28
Basin S25	0.33
Basin S26	0.30
Basin S27	0.33
Basin S28	0.28
Basin S29	0.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	80

Basin Name	IA
Basin S1	0.29
Basin S2	0.29
Basin S3	0.31
Basin S4	0.31
Basin S5	0.29
Basin S6	0.30
Basin S7	0.31
Basin S8	0.29
Basin S9	0.31
Basin S10	0.29
Basin S11	0.31
Basin S12E	0.33
Basin S12W	0.33
Basin S13	0.33
Basin S14	0.33
Basin S15	0.33
Basin S16N	0.29
Basin S16S	0.33
Basin S17	0.33
Basin S18	0.31
Basin S19	0.33
Basin S20	0.33
Basin S21	0.33
Basin S22	0.34
Basin S23	0.34
Basin S24	0.32
Basin S25	0.33
Basin S26	0.34
Basin S27	0.33
Basin S28	0.34
Basin S29	0.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	81

Basin Name	IA
Basin S1	0.58
Basin S2	0.58
Basin S3	0.41
Basin S4	0.41
Basin S5	0.58
Basin S6	0.44
Basin S7	0.41
Basin S8	0.58
Basin S9	0.41
Basin S10	0.54
Basin S11	0.41
Basin S12E	0.23
Basin S12W	0.23
Basin S13	0.23
Basin S14	0.23
Basin S15	0.23
Basin S16N	0.58
Basin S16S	0.23
Basin S17	0.23
Basin S18	0.41
Basin S19	0.23
Basin S20	0.23
Basin S21	0.23
Basin S22	0.27
Basin S23	0.29
Basin S24	0.40
Basin S25	0.23
Basin S26	0.26
Basin S27	0.23
Basin S28	0.29
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	82

Basin Name	IA
Basin S1	0.33
Basin S2	0.33
Basin S3	0.28
Basin S4	0.28
Basin S5	0.33
Basin S6	0.29
Basin S7	0.28
Basin S8	0.33
Basin S9	0.28
Basin S10	0.32
Basin S11	0.28
Basin S12E	0.23
Basin S12W	0.23
Basin S13	0.23
Basin S14	0.23
Basin S15	0.23
Basin S16N	0.33
Basin S16S	0.23
Basin S17	0.23
Basin S18	0.28
Basin S19	0.23
Basin S20	0.23
Basin S21	0.23
Basin S22	0.23
Basin S23	0.22
Basin S24	0.27
Basin S25	0.23
Basin S26	0.23
Basin S27	0.23
Basin S28	0.22
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	83

Basin Name	IA
Basin S1	0.24
Basin S2	0.24
Basin S3	0.19
Basin S4	0.19
Basin S5	0.24
Basin S6	0.20
Basin S7	0.19
Basin S8	0.24
Basin S9	0.19
Basin S10	0.23
Basin S11	0.19
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.14
Basin S16N	0.24
Basin S16S	0.14
Basin S17	0.14
Basin S18	0.19
Basin S19	0.14
Basin S20	0.14
Basin S21	0.14
Basin S22	0.25
Basin S23	0.31
Basin S24	0.26
Basin S25	0.14
Basin S26	0.23
Basin S27	0.14
Basin S28	0.31
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	84

Basin Name	IA
Basin S1	0.33
Basin S2	0.33
Basin S3	0.22
Basin S4	0.22
Basin S5	0.33
Basin S6	0.24
Basin S7	0.22
Basin S8	0.33
Basin S9	0.22
Basin S10	0.31
Basin S11	0.22
Basin S12E	0.11
Basin S12W	0.11
Basin S13	0.11
Basin S14	0.11
Basin S15	0.11
Basin S16N	0.33
Basin S16S	0.11
Basin S17	0.11
Basin S18	0.22
Basin S19	0.11
Basin S20	0.11
Basin S21	0.11
Basin S22	0.20
Basin S23	0.24
Basin S24	0.26
Basin S25	0.11
Basin S26	0.18
Basin S27	0.11
Basin S28	0.24
Basin S29	0.11

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	85

Basin Name	IA
Basin S1	0.34
Basin S2	0.34
Basin S3	0.26
Basin S4	0.26
Basin S5	0.34
Basin S6	0.28
Basin S7	0.26
Basin S8	0.34
Basin S9	0.26
Basin S10	0.33
Basin S11	0.26
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.18
Basin S14	0.18
Basin S15	0.18
Basin S16N	0.34
Basin S16S	0.18
Basin S17	0.18
Basin S18	0.26
Basin S19	0.18
Basin S20	0.18
Basin S21	0.18
Basin S22	0.24
Basin S23	0.26
Basin S24	0.28
Basin S25	0.18
Basin S26	0.23
Basin S27	0.18
Basin S28	0.26
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	86

Basin Name	IA
Basin S1	0.15
Basin S2	0.15
Basin S3	0.16
Basin S4	0.16
Basin S5	0.15
Basin S6	0.16
Basin S7	0.16
Basin S8	0.15
Basin S9	0.16
Basin S10	0.15
Basin S11	0.16
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.15
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.16
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.21
Basin S23	0.23
Basin S24	0.19
Basin S25	0.16
Basin S26	0.20
Basin S27	0.16
Basin S28	0.23
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis

Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	87

Basin Name	IA
Basin S1	0.42
Basin S2	0.42
Basin S3	0.33
Basin S4	0.33
Basin S5	0.42
Basin S6	0.35
Basin S7	0.33
Basin S8	0.42
Basin S9	0.33
Basin S10	0.40
Basin S11	0.33
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.24
Basin S14	0.24
Basin S15	0.24
Basin S16N	0.42
Basin S16S	0.24
Basin S17	0.24
Basin S18	0.33
Basin S19	0.24
Basin S20	0.24
Basin S21	0.24
Basin S22	0.23
Basin S23	0.22
Basin S24	0.30
Basin S25	0.24
Basin S26	0.23
Basin S27	0.24
Basin S28	0.22
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	88

Basin Name	IA
Basin S1	0.33
Basin S2	0.33
Basin S3	0.29
Basin S4	0.29
Basin S5	0.33
Basin S6	0.30
Basin S7	0.29
Basin S8	0.33
Basin S9	0.29
Basin S10	0.32
Basin S11	0.29
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.24
Basin S14	0.24
Basin S15	0.24
Basin S16N	0.33
Basin S16S	0.24
Basin S17	0.24
Basin S18	0.29
Basin S19	0.24
Basin S20	0.24
Basin S21	0.24
Basin S22	0.25
Basin S23	0.26
Basin S24	0.29
Basin S25	0.24
Basin S26	0.25
Basin S27	0.24
Basin S28	0.26
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	89

Basin Name	IA
Basin S1	0.16
Basin S2	0.16
Basin S3	0.14
Basin S4	0.14
Basin S5	0.16
Basin S6	0.15
Basin S7	0.14
Basin S8	0.16
Basin S9	0.14
Basin S10	0.16
Basin S11	0.14
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.16
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.14
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.12
Basin S23	0.12
Basin S24	0.14
Basin S25	0.12
Basin S26	0.12
Basin S27	0.12
Basin S28	0.12
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	90

Basin Name	IA
Basin S1	0.52
Basin S2	0.52
Basin S3	0.35
Basin S4	0.35
Basin S5	0.52
Basin S6	0.38
Basin S7	0.35
Basin S8	0.52
Basin S9	0.35
Basin S10	0.49
Basin S11	0.35
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.19
Basin S16N	0.52
Basin S16S	0.19
Basin S17	0.19
Basin S18	0.35
Basin S19	0.19
Basin S20	0.19
Basin S21	0.19
Basin S22	0.28
Basin S23	0.33
Basin S24	0.38
Basin S25	0.19
Basin S26	0.26
Basin S27	0.19
Basin S28	0.33
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**91**

Basin Name	**IA**
Basin S1	0.29
Basin S2	0.29
Basin S3	0.29
Basin S4	0.29
Basin S5	0.29
Basin S6	0.29
Basin S7	0.29
Basin S8	0.29
Basin S9	0.29
Basin S10	0.29
Basin S11	0.29
Basin S12E	0.30
Basin S12W	0.30
Basin S13	0.30
Basin S14	0.30
Basin S15	0.30
Basin S16N	0.29
Basin S16S	0.30
Basin S17	0.30
Basin S18	0.29
Basin S19	0.30
Basin S20	0.30
Basin S21	0.30
Basin S22	0.35
Basin S23	0.37
Basin S24	0.33
Basin S25	0.30
Basin S26	0.34
Basin S27	0.30
Basin S28	0.37
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	92

Basin Name	IA
Basin S1	0.35
Basin S2	0.35
Basin S3	0.28
Basin S4	0.28
Basin S5	0.35
Basin S6	0.29
Basin S7	0.28
Basin S8	0.35
Basin S9	0.28
Basin S10	0.33
Basin S11	0.28
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.20
Basin S16N	0.35
Basin S16S	0.20
Basin S17	0.20
Basin S18	0.28
Basin S19	0.20
Basin S20	0.20
Basin S21	0.20
Basin S22	0.22
Basin S23	0.23
Basin S24	0.27
Basin S25	0.20
Basin S26	0.22
Basin S27	0.20
Basin S28	0.23
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis

Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	**93**

Basin Name	IA
Basin S1	0.11
Basin S2	0.11
Basin S3	0.10
Basin S4	0.10
Basin S5	0.11
Basin S6	0.11
Basin S7	0.10
Basin S8	0.11
Basin S9	0.10
Basin S10	0.11
Basin S11	0.10
Basin S12E	0.10
Basin S12W	0.10
Basin S13	0.10
Basin S14	0.10
Basin S15	0.10
Basin S16N	0.11
Basin S16S	0.10
Basin S17	0.10
Basin S18	0.10
Basin S19	0.10
Basin S20	0.10
Basin S21	0.10
Basin S22	0.22
Basin S23	0.28
Basin S24	0.19
Basin S25	0.10
Basin S26	0.20
Basin S27	0.10
Basin S28	0.28
Basin S29	0.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	94

Basin Name	IA
Basin S1	0.40
Basin S2	0.40
Basin S3	0.30
Basin S4	0.30
Basin S5	0.40
Basin S6	0.32
Basin S7	0.30
Basin S8	0.40
Basin S9	0.30
Basin S10	0.38
Basin S11	0.30
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.21
Basin S14	0.21
Basin S15	0.21
Basin S16N	0.40
Basin S16S	0.21
Basin S17	0.21
Basin S18	0.30
Basin S19	0.21
Basin S20	0.21
Basin S21	0.21
Basin S22	0.25
Basin S23	0.27
Basin S24	0.31
Basin S25	0.21
Basin S26	0.24
Basin S27	0.21
Basin S28	0.27
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	95

Basin Name	IA
Basin S1	0.15
Basin S2	0.15
Basin S3	0.13
Basin S4	0.13
Basin S5	0.15
Basin S6	0.13
Basin S7	0.13
Basin S8	0.15
Basin S9	0.13
Basin S10	0.14
Basin S11	0.13
Basin S12E	0.11
Basin S12W	0.11
Basin S13	0.11
Basin S14	0.11
Basin S15	0.11
Basin S16N	0.15
Basin S16S	0.11
Basin S17	0.11
Basin S18	0.13
Basin S19	0.11
Basin S20	0.11
Basin S21	0.11
Basin S22	0.12
Basin S23	0.13
Basin S24	0.13
Basin S25	0.11
Basin S26	0.12
Basin S27	0.11
Basin S28	0.13
Basin S29	0.11

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	96

Basin Name	IA
Basin S1	0.18
Basin S2	0.18
Basin S3	0.17
Basin S4	0.17
Basin S5	0.18
Basin S6	0.17
Basin S7	0.17
Basin S8	0.18
Basin S9	0.17
Basin S10	0.18
Basin S11	0.17
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.16
Basin S14	0.16
Basin S15	0.16
Basin S16N	0.18
Basin S16S	0.16
Basin S17	0.16
Basin S18	0.17
Basin S19	0.16
Basin S20	0.16
Basin S21	0.16
Basin S22	0.18
Basin S23	0.19
Basin S24	0.18
Basin S25	0.16
Basin S26	0.18
Basin S27	0.16
Basin S28	0.19
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	97

Basin Name	IA
Basin S1	0.39
Basin S2	0.39
Basin S3	0.28
Basin S4	0.28
Basin S5	0.39
Basin S6	0.30
Basin S7	0.28
Basin S8	0.39
Basin S9	0.28
Basin S10	0.37
Basin S11	0.28
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.17
Basin S16N	0.39
Basin S16S	0.17
Basin S17	0.17
Basin S18	0.28
Basin S19	0.17
Basin S20	0.17
Basin S21	0.17
Basin S22	0.23
Basin S23	0.27
Basin S24	0.30
Basin S25	0.17
Basin S26	0.22
Basin S27	0.17
Basin S28	0.26
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	98

Basin Name	IA
Basin S1	0.35
Basin S2	0.35
Basin S3	0.23
Basin S4	0.23
Basin S5	0.35
Basin S6	0.26
Basin S7	0.23
Basin S8	0.35
Basin S9	0.23
Basin S10	0.33
Basin S11	0.23
Basin S12E	0.12
Basin S12W	0.12
Basin S13	0.12
Basin S14	0.12
Basin S15	0.12
Basin S16N	0.35
Basin S16S	0.12
Basin S17	0.12
Basin S18	0.23
Basin S19	0.12
Basin S20	0.12
Basin S21	0.12
Basin S22	0.17
Basin S23	0.20
Basin S24	0.25
Basin S25	0.12
Basin S26	0.16
Basin S27	0.12
Basin S28	0.19
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	99

Basin Name	IA
Basin S1	0.43
Basin S2	0.43
Basin S3	0.30
Basin S4	0.30
Basin S5	0.43
Basin S6	0.33
Basin S7	0.30
Basin S8	0.43
Basin S9	0.30
Basin S10	0.41
Basin S11	0.30
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.17
Basin S16N	0.43
Basin S16S	0.17
Basin S17	0.17
Basin S18	0.30
Basin S19	0.17
Basin S20	0.17
Basin S21	0.17
Basin S22	0.16
Basin S23	0.16
Basin S24	0.27
Basin S25	0.17
Basin S26	0.16
Basin S27	0.17
Basin S28	0.16
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Initial Abstraction

M.C. Simulation	100

Basin Name	IA
Basin S1	0.31
Basin S2	0.31
Basin S3	0.19
Basin S4	0.19
Basin S5	0.31
Basin S6	0.21
Basin S7	0.19
Basin S8	0.31
Basin S9	0.19
Basin S10	0.29
Basin S11	0.19
Basin S12E	0.07
Basin S12W	0.07
Basin S13	0.07
Basin S14	0.07
Basin S15	0.07
Basin S16N	0.31
Basin S16S	0.07
Basin S17	0.07
Basin S18	0.19
Basin S19	0.07
Basin S20	0.07
Basin S21	0.07
Basin S22	0.11
Basin S23	0.13
Basin S24	0.19
Basin S25	0.07
Basin S26	0.10
Basin S27	0.07
Basin S28	0.13
Basin S29	0.07

10/05

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	1

%	Precipitation
25%	2.98

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	2

%	Precipitation
25%	3.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	3

%	Precipitation
25%	3.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	4

%	Precipitation
25%	3.51

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	5

%	Precipitation
25%	3.61

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	6

%	Precipitation
25%	3.44

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation 7

%	Precipitation
25%	3.66

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	8

%	Precipitation
25%	3.70

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**9**

%	Precipitation
25%	3.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	10

%	Precipitation
25%	3.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	11

%	Precipitation
25%	2.56

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	12

%	Precipitation
25%	2.80

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	13

%	Precipitation
25%	3.27

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	14

%	Precipitation
25%	2.71

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	15

%	Precipitation
25%	3.46

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	16

%	Precipitation
25%	3.92

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	17

%	Precipitation
25%	4.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	18

%	Precipitation
25%	3.65

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**19**

%	**Precipitation**
25%	2.76

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	20

%	Precipitation
25%	2.93

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	21

%	Precipitation
25%	2.72

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	22

%	Precipitation
25%	3.07

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	23

%	Precipitation
25%	4.11

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	24

%	Precipitation
25%	2.92

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	25

%	Precipitation
25%	*3.19*

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	26

%	Precipitation
25%	3.03

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	27

%	Precipitation
25%	3.11

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	28

%	Precipitation
25%	3.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**29**

%	Precipitation
25%	2.45

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	30

%	Precipitation
25%	3.51

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	31

%	Precipitation
25%	4.02

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	32

%	Precipitation
25%	3.66

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	33

%	Precipitation
25%	3.60

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	34

%	Precipitation
25%	2.79

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**35**

%	Precipitation
25%	3.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	36

%	Precipitation
25%	4.41

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	37

%	Precipitation
25%	2.88

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	38

%	Precipitation
25%	3.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	39

%	Precipitation
25%	3.55

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	40

%	Precipitation
25%	3.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	41

%	Precipitation
25%	3.56

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	42

%	Precipitation
25%	3.47

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	43

%	Precipitation
25%	3.52

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	44

%	Precipitation
25%	3.70

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	45

%	Precipitation
25%	3.41

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	46

%	Precipitation
25%	2.76

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	47

%	Precipitation
25%	3.54

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	48

%	Precipitation
25%	3.44

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	49

%	Precipitation
25%	3.48

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	50

%	Precipitation
25%	3.04

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	51

%	Precipitation
25%	3.65

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	52

%	Precipitation
25%	3.58

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**53**

%	Precipitation
25%	2.60

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	54

%	Precipitation
25%	3.29

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	55

%	Precipitation
25%	2.86

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation **56**

%	Precipitation
25%	3.86

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**57**

%	**Precipitation**
25%	3.57

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	58

%	Precipitation
25%	3.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	59

%	Precipitation
25%	4.06

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	60

%	Precipitation
25%	3.05

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	61

%	Precipitation
25%	2.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	62

%	Precipitation
25%	2.97

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	63

%	Precipitation
25%	3.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**64**

%	Precipitation
25%	4.28

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**65**

%	Precipitation
25%	2.77

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	66

%	Precipitation
25%	2.62

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**67**

%	Precipitation
25%	3.02

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	68

%	Precipitation
25%	3.64

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	69

%	Precipitation
25%	3.75

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	70

%	Precipitation
25%	3.03

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	71

%	Precipitation
25%	2.89

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	72

%	Precipitation
25%	3.89

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**73**

%	Precipitation
25%	3.47

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	74

%	Precipitation
25%	3.09

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	75

%	Precipitation
25%	3.57

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	76

%	Precipitation
25%	4.64

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	77

%	Precipitation
25%	3.06

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**78**

%	Precipitation
25%	3.35

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	79

%	Precipitation
25%	4.49

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	80

%	Precipitation
25%	3.62

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	81

%	Precipitation
25%	3.38

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	82

%	Precipitation
25%	2.97

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	83

%	Precipitation
25%	3.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	84

%	Precipitation
25%	2.99

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	*85*

%	Precipitation
25%	3.09

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	86

%	Precipitation
25%	3.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	87

%	Precipitation
25%	3.78

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	88

%	Precipitation
25%	3.43

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	89

%	Precipitation
25%	2.92

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	90

%	Precipitation
25%	3.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	91

%	Precipitation
25%	4.58

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	**92**

%	Precipitation
25%	3.69

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	93

%	Precipitation
25%	3.89

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	94

%	Precipitation
25%	3.50

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	95

%	Precipitation
25%	3.44

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	96

%	Precipitation
25%	3.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	97

%	Precipitation
25%	3.82

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	98

%	Precipitation
25%	3.70

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	99

%	Precipitation
25%	3.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for Precipitation

M.C. Simulation	100

%	Precipitation
25%	3.84

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	100

Basin Name	XKSAT
Basin S1	0.28
Basin S2	0.28
Basin S3	0.28
Basin S4	0.28
Basin S5	0.28
Basin S6	0.28
Basin S7	0.28
Basin S8	0.28
Basin S9	0.28
Basin S10	0.28
Basin S11	0.28
Basin S12E	0.30
Basin S12W	0.30
Basin S13	0.32
Basin S14	0.30
Basin S15	0.49
Basin S16N	0.28
Basin S16S	0.30
Basin S17	0.41
Basin S18	0.28
Basin S19	0.28
Basin S20	0.40
Basin S21	0.28
Basin S22	0.38
Basin S23	0.42
Basin S24	0.39
Basin S25	0.28
Basin S26	0.27
Basin S27	0.31
Basin S28	0.40
Basin S29	0.39

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	99

Basin Name	XKSAT
Basin S1	0.29
Basin S2	0.29
Basin S3	0.31
Basin S4	0.30
Basin S5	0.28
Basin S6	0.30
Basin S7	0.31
Basin S8	0.28
Basin S9	0.29
Basin S10	0.29
Basin S11	0.31
Basin S12E	0.32
Basin S12W	0.32
Basin S13	0.48
Basin S14	0.36
Basin S15	1.69
Basin S16N	0.29
Basin S16S	0.39
Basin S17	1.00
Basin S18	0.29
Basin S19	0.31
Basin S20	0.87
Basin S21	0.32
Basin S22	0.75
Basin S23	1.26
Basin S24	0.62
Basin S25	0.36
Basin S26	0.36
Basin S27	0.49
Basin S28	1.61
Basin S29	1.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	98

Basin Name	XKSAT
Basin S1	0.29
Basin S2	0.29
Basin S3	0.27
Basin S4	0.28
Basin S5	0.29
Basin S6	0.28
Basin S7	0.27
Basin S8	0.29
Basin S9	0.28
Basin S10	0.29
Basin S11	0.27
Basin S12E	0.30
Basin S12W	0.30
Basin S13	0.29
Basin S14	0.29
Basin S15	0.42
Basin S16N	0.29
Basin S16S	0.27
Basin S17	0.35
Basin S18	0.28
Basin S19	0.27
Basin S20	0.36
Basin S21	0.26
Basin S22	0.19
Basin S23	0.36
Basin S24	0.16
Basin S25	0.25
Basin S26	0.21
Basin S27	0.27
Basin S28	0.33
Basin S29	0.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	97

Basin Name	XKSAT
Basin S1	0.57
Basin S2	0.57
Basin S3	0.58
Basin S4	0.58
Basin S5	0.56
Basin S6	0.57
Basin S7	0.58
Basin S8	0.56
Basin S9	0.57
Basin S10	0.57
Basin S11	0.58
Basin S12E	0.61
Basin S12W	0.61
Basin S13	0.74
Basin S14	0.64
Basin S15	1.45
Basin S16N	0.57
Basin S16S	0.65
Basin S17	1.10
Basin S18	0.57
Basin S19	0.58
Basin S20	1.05
Basin S21	0.59
Basin S22	0.96
Basin S23	1.23
Basin S24	1.02
Basin S25	0.61
Basin S26	0.60
Basin S27	0.73
Basin S28	1.36
Basin S29	1.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	96

Basin Name	XKSAT
Basin S1	0.69
Basin S2	0.69
Basin S3	0.61
Basin S4	0.62
Basin S5	0.71
Basin S6	0.64
Basin S7	0.60
Basin S8	0.71
Basin S9	0.67
Basin S10	0.69
Basin S11	0.59
Basin S12E	0.70
Basin S12W	0.70
Basin S13	0.53
Basin S14	0.61
Basin S15	0.60
Basin S16N	0.68
Basin S16S	0.54
Basin S17	0.55
Basin S18	0.67
Basin S19	0.60
Basin S20	0.60
Basin S21	0.59
Basin S22	0.46
Basin S23	0.55
Basin S24	0.61
Basin S25	0.47
Basin S26	0.41
Basin S27	0.49
Basin S28	0.51
Basin S29	0.54

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	95

Basin Name	XKSAT
Basin S1	0.36
Basin S2	0.36
Basin S3	0.34
Basin S4	0.34
Basin S5	0.37
Basin S6	0.35
Basin S7	0.33
Basin S8	0.37
Basin S9	0.36
Basin S10	0.36
Basin S11	0.33
Basin S12E	0.36
Basin S12W	0.36
Basin S13	0.31
Basin S14	0.33
Basin S15	0.33
Basin S16N	0.36
Basin S16S	0.31
Basin S17	0.31
Basin S18	0.36
Basin S19	0.33
Basin S20	0.32
Basin S21	0.32
Basin S22	0.18
Basin S23	0.30
Basin S24	0.16
Basin S25	0.29
Basin S26	0.25
Basin S27	0.29
Basin S28	0.24
Basin S29	0.27

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	94

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.15
Basin S4	0.15
Basin S5	0.15
Basin S6	0.15
Basin S7	0.15
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.15
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.17
Basin S14	0.16
Basin S15	0.26
Basin S16N	0.15
Basin S16S	0.16
Basin S17	0.22
Basin S18	0.15
Basin S19	0.15
Basin S20	0.21
Basin S21	0.15
Basin S22	0.19
Basin S23	0.22
Basin S24	0.22
Basin S25	0.15
Basin S26	0.14
Basin S27	0.16
Basin S28	0.18
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	93

Basin Name	XKSAT
Basin S1	0.24
Basin S2	0.24
Basin S3	0.24
Basin S4	0.24
Basin S5	0.24
Basin S6	0.24
Basin S7	0.24
Basin S8	0.24
Basin S9	0.24
Basin S10	0.24
Basin S11	0.24
Basin S12E	0.25
Basin S12W	0.25
Basin S13	0.26
Basin S14	0.25
Basin S15	0.34
Basin S16N	0.24
Basin S16S	0.24
Basin S17	0.30
Basin S18	0.24
Basin S19	0.24
Basin S20	0.31
Basin S21	0.24
Basin S22	0.32
Basin S23	0.30
Basin S24	0.65
Basin S25	0.23
Basin S26	0.22
Basin S27	0.25
Basin S28	0.26
Basin S29	0.27

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	92

Basin Name	XKSAT
Basin S1	0.18
Basin S2	0.18
Basin S3	0.18
Basin S4	0.18
Basin S5	0.19
Basin S6	0.18
Basin S7	0.18
Basin S8	0.19
Basin S9	0.18
Basin S10	0.19
Basin S11	0.18
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.19
Basin S14	0.19
Basin S15	0.25
Basin S16N	0.18
Basin S16S	0.18
Basin S17	0.22
Basin S18	0.18
Basin S19	0.18
Basin S20	0.22
Basin S21	0.18
Basin S22	0.16
Basin S23	0.21
Basin S24	0.15
Basin S25	0.17
Basin S26	0.15
Basin S27	0.18
Basin S28	0.17
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	91

Basin Name	XKSAT
Basin S1	1.79
Basin S2	1.79
Basin S3	1.77
Basin S4	1.77
Basin S5	1.80
Basin S6	1.77
Basin S7	1.76
Basin S8	1.80
Basin S9	1.78
Basin S10	1.79
Basin S11	1.76
Basin S12E	1.96
Basin S12W	1.94
Basin S13	2.21
Basin S14	1.98
Basin S15	4.75
Basin S16N	1.79
Basin S16S	1.93
Basin S17	3.43
Basin S18	1.78
Basin S19	1.76
Basin S20	3.37
Basin S21	1.78
Basin S22	2.93
Basin S23	3.98
Basin S24	3.84
Basin S25	1.71
Basin S26	1.67
Basin S27	2.12
Basin S28	4.67
Basin S29	4.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation **90**

Basin Name	XKSAT
Basin S1	0.26
Basin S2	0.26
Basin S3	0.25
Basin S4	0.25
Basin S5	0.26
Basin S6	0.25
Basin S7	0.25
Basin S8	0.26
Basin S9	0.26
Basin S10	0.26
Basin S11	0.25
Basin S12E	0.27
Basin S12W	0.27
Basin S13	0.28
Basin S14	0.27
Basin S15	0.44
Basin S16N	0.26
Basin S16S	0.26
Basin S17	0.36
Basin S18	0.26
Basin S19	0.25
Basin S20	0.36
Basin S21	0.25
Basin S22	0.22
Basin S23	0.38
Basin S24	0.20
Basin S25	0.23
Basin S26	0.21
Basin S27	0.26
Basin S28	0.36
Basin S29	0.35

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	89

Basin Name	XKSAT
Basin S1	1.30
Basin S2	1.30
Basin S3	1.24
Basin S4	1.25
Basin S5	1.32
Basin S6	1.26
Basin S7	1.23
Basin S8	1.32
Basin S9	1.29
Basin S10	1.31
Basin S11	1.22
Basin S12E	1.42
Basin S12W	1.40
Basin S13	1.42
Basin S14	1.36
Basin S15	2.79
Basin S16N	1.29
Basin S16S	1.28
Basin S17	2.07
Basin S18	1.29
Basin S19	1.23
Basin S20	2.09
Basin S21	1.22
Basin S22	1.47
Basin S23	2.36
Basin S24	1.55
Basin S25	1.10
Basin S26	1.00
Basin S27	1.34
Basin S28	2.70
Basin S29	2.46

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	88

Basin Name	XKSAT
Basin S1	0.37
Basin S2	0.37
Basin S3	0.36
Basin S4	0.36
Basin S5	0.37
Basin S6	0.36
Basin S7	0.36
Basin S8	0.37
Basin S9	0.36
Basin S10	0.37
Basin S11	0.36
Basin S12E	0.39
Basin S12W	0.39
Basin S13	0.42
Basin S14	0.39
Basin S15	0.75
Basin S16N	0.36
Basin S16S	0.38
Basin S17	0.58
Basin S18	0.36
Basin S19	0.36
Basin S20	0.56
Basin S21	0.34
Basin S22	0.23
Basin S23	0.63
Basin S24	0.16
Basin S25	0.34
Basin S26	0.29
Basin S27	0.40
Basin S28	0.66
Basin S29	0.62

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	87

Basin Name	XKSAT
Basin S1	3.02
Basin S2	2.99
Basin S3	2.57
Basin S4	2.60
Basin S5	3.15
Basin S6	2.73
Basin S7	2.48
Basin S8	3.17
Basin S9	2.88
Basin S10	3.02
Basin S11	2.45
Basin S12E	2.99
Basin S12W	3.02
Basin S13	1.94
Basin S14	2.43
Basin S15	1.73
Basin S16N	2.95
Basin S16S	2.05
Basin S17	1.73
Basin S18	2.91
Basin S19	2.49
Basin S20	1.99
Basin S21	2.43
Basin S22	1.95
Basin S23	1.70
Basin S24	2.73
Basin S25	1.75
Basin S26	1.57
Basin S27	1.73
Basin S28	1.64
Basin S29	1.80

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	86

Basin Name	XKSAT
Basin S1	0.22
Basin S2	0.22
Basin S3	0.22
Basin S4	0.22
Basin S5	0.22
Basin S6	0.22
Basin S7	0.22
Basin S8	0.22
Basin S9	0.22
Basin S10	0.22
Basin S11	0.22
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.24
Basin S14	0.23
Basin S15	0.31
Basin S16N	0.22
Basin S16S	0.23
Basin S17	0.28
Basin S18	0.22
Basin S19	0.22
Basin S20	0.27
Basin S21	0.22
Basin S22	0.28
Basin S23	0.27
Basin S24	0.45
Basin S25	0.22
Basin S26	0.22
Basin S27	0.23
Basin S28	0.22
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	85

Basin Name	XKSAT
Basin S1	2.24
Basin S2	2.23
Basin S3	2.02
Basin S4	2.04
Basin S5	2.31
Basin S6	2.10
Basin S7	1.97
Basin S8	2.32
Basin S9	2.18
Basin S10	2.25
Basin S11	1.96
Basin S12E	2.35
Basin S12W	2.34
Basin S13	1.92
Basin S14	2.08
Basin S15	2.67
Basin S16N	2.21
Basin S16S	1.86
Basin S17	2.26
Basin S18	2.19
Basin S19	1.98
Basin S20	2.39
Basin S21	1.88
Basin S22	0.99
Basin S23	2.42
Basin S24	0.89
Basin S25	1.57
Basin S26	1.35
Basin S27	1.76
Basin S28	2.58
Basin S29	2.56

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	84

Basin Name	XKSAT
Basin S1	1.48
Basin S2	1.47
Basin S3	1.28
Basin S4	1.29
Basin S5	1.54
Basin S6	1.35
Basin S7	1.23
Basin S8	1.55
Basin S9	1.42
Basin S10	1.48
Basin S11	1.22
Basin S12E	1.48
Basin S12W	1.49
Basin S13	1.01
Basin S14	1.22
Basin S15	0.97
Basin S16N	1.45
Basin S16S	1.05
Basin S17	0.94
Basin S18	1.43
Basin S19	1.24
Basin S20	1.04
Basin S21	1.16
Basin S22	0.50
Basin S23	0.93
Basin S24	0.42
Basin S25	0.90
Basin S26	0.75
Basin S27	0.91
Basin S28	0.88
Basin S29	0.96

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	83

Basin Name	XKSAT
Basin S1	0.19
Basin S2	0.19
Basin S3	0.19
Basin S4	0.19
Basin S5	0.19
Basin S6	0.19
Basin S7	0.19
Basin S8	0.19
Basin S9	0.19
Basin S10	0.19
Basin S11	0.19
Basin S12E	0.20
Basin S12W	0.19
Basin S13	0.20
Basin S14	0.19
Basin S15	0.23
Basin S16N	0.19
Basin S16S	0.19
Basin S17	0.22
Basin S18	0.19
Basin S19	0.19
Basin S20	0.22
Basin S21	0.19
Basin S22	0.19
Basin S23	0.20
Basin S24	0.27
Basin S25	0.19
Basin S26	0.19
Basin S27	0.19
Basin S28	0.15
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	82

Basin Name	XKSAT
Basin S1	0.75
Basin S2	0.74
Basin S3	0.72
Basin S4	0.72
Basin S5	0.75
Basin S6	0.73
Basin S7	0.71
Basin S8	0.75
Basin S9	0.74
Basin S10	0.75
Basin S11	0.71
Basin S12E	0.75
Basin S12W	0.75
Basin S13	0.69
Basin S14	0.72
Basin S15	0.74
Basin S16N	0.74
Basin S16S	0.69
Basin S17	0.71
Basin S18	0.74
Basin S19	0.71
Basin S20	0.73
Basin S21	0.71
Basin S22	0.78
Basin S23	0.70
Basin S24	1.02
Basin S25	0.65
Basin S26	0.65
Basin S27	0.67
Basin S28	0.66
Basin S29	0.68

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	81

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.14
Basin S4	0.14
Basin S5	0.14
Basin S6	0.14
Basin S7	0.14
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.14
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.16
Basin S14	0.15
Basin S15	0.29
Basin S16N	0.14
Basin S16S	0.15
Basin S17	0.22
Basin S18	0.14
Basin S19	0.14
Basin S20	0.21
Basin S21	0.14
Basin S22	0.21
Basin S23	0.23
Basin S24	0.20
Basin S25	0.14
Basin S26	0.13
Basin S27	0.16
Basin S28	0.20
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	80

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.15
Basin S4	0.15
Basin S5	0.15
Basin S6	0.15
Basin S7	0.15
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.15
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.18
Basin S14	0.16
Basin S15	0.31
Basin S16N	0.15
Basin S16S	0.17
Basin S17	0.25
Basin S18	0.15
Basin S19	0.15
Basin S20	0.24
Basin S21	0.15
Basin S22	0.25
Basin S23	0.25
Basin S24	0.25
Basin S25	0.16
Basin S26	0.16
Basin S27	0.18
Basin S28	0.22
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	79

Basin Name	XKSAT
Basin S1	0.36
Basin S2	0.36
Basin S3	0.35
Basin S4	0.35
Basin S5	0.37
Basin S6	0.35
Basin S7	0.34
Basin S8	0.37
Basin S9	0.36
Basin S10	0.36
Basin S11	0.34
Basin S12E	0.38
Basin S12W	0.38
Basin S13	0.36
Basin S14	0.36
Basin S15	0.53
Basin S16N	0.36
Basin S16S	0.35
Basin S17	0.44
Basin S18	0.36
Basin S19	0.34
Basin S20	0.45
Basin S21	0.34
Basin S22	0.39
Basin S23	0.46
Basin S24	0.38
Basin S25	0.31
Basin S26	0.28
Basin S27	0.34
Basin S28	0.44
Basin S29	0.44

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	78

Basin Name	XKSAT
Basin S1	0.17
Basin S2	0.17
Basin S3	0.18
Basin S4	0.18
Basin S5	0.17
Basin S6	0.18
Basin S7	0.18
Basin S8	0.17
Basin S9	0.17
Basin S10	0.17
Basin S11	0.18
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.22
Basin S14	0.19
Basin S15	0.41
Basin S16N	0.17
Basin S16S	0.20
Basin S17	0.32
Basin S18	0.17
Basin S19	0.18
Basin S20	0.30
Basin S21	0.18
Basin S22	0.34
Basin S23	0.34
Basin S24	0.36
Basin S25	0.19
Basin S26	0.18
Basin S27	0.22
Basin S28	0.33
Basin S29	0.29

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	77

Basin Name	XKSAT
Basin S1	0.21
Basin S2	0.21
Basin S3	0.21
Basin S4	0.21
Basin S5	0.21
Basin S6	0.21
Basin S7	0.21
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.21
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.26
Basin S14	0.23
Basin S15	0.47
Basin S16N	0.21
Basin S16S	0.23
Basin S17	0.36
Basin S18	0.21
Basin S19	0.21
Basin S20	0.35
Basin S21	0.21
Basin S22	0.29
Basin S23	0.39
Basin S24	0.27
Basin S25	0.22
Basin S26	0.20
Basin S27	0.25
Basin S28	0.38
Basin S29	0.35

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	76

Basin Name	XKSAT
Basin S1	1.07
Basin S2	1.07
Basin S3	1.02
Basin S4	1.03
Basin S5	1.09
Basin S6	1.04
Basin S7	1.01
Basin S8	1.09
Basin S9	1.06
Basin S10	1.08
Basin S11	1.01
Basin S12E	1.14
Basin S12W	1.13
Basin S13	1.11
Basin S14	1.09
Basin S15	1.81
Basin S16N	1.07
Basin S16S	1.03
Basin S17	1.45
Basin S18	1.06
Basin S19	1.01
Basin S20	1.48
Basin S21	1.00
Basin S22	1.38
Basin S23	1.59
Basin S24	1.28
Basin S25	0.91
Basin S26	0.84
Basin S27	1.05
Basin S28	1.73
Basin S29	1.63

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	75

Basin Name	XKSAT
Basin S1	0.84
Basin S2	0.85
Basin S3	0.88
Basin S4	0.87
Basin S5	0.84
Basin S6	0.86
Basin S7	0.88
Basin S8	0.83
Basin S9	0.85
Basin S10	0.84
Basin S11	0.89
Basin S12E	0.96
Basin S12W	0.94
Basin S13	1.32
Basin S14	1.04
Basin S15	4.10
Basin S16N	0.85
Basin S16S	1.08
Basin S17	2.56
Basin S18	0.85
Basin S19	0.88
Basin S20	2.34
Basin S21	0.89
Basin S22	1.39
Basin S23	3.18
Basin S24	1.23
Basin S25	0.96
Basin S26	0.92
Basin S27	1.30
Basin S28	4.02
Basin S29	3.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	74

Basin Name	XKSAT
Basin S1	2.17
Basin S2	2.15
Basin S3	1.82
Basin S4	1.85
Basin S5	2.28
Basin S6	1.95
Basin S7	1.75
Basin S8	2.29
Basin S9	2.06
Basin S10	2.18
Basin S11	1.73
Basin S12E	2.18
Basin S12W	2.19
Basin S13	1.38
Basin S14	1.74
Basin S15	1.36
Basin S16N	2.12
Basin S16S	1.45
Basin S17	1.30
Basin S18	2.09
Basin S19	1.76
Basin S20	1.48
Basin S21	1.64
Basin S22	0.71
Basin S23	1.30
Basin S24	0.61
Basin S25	1.19
Basin S26	0.98
Basin S27	1.22
Basin S28	1.27
Basin S29	1.38

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation 73

Basin Name	XKSAT
Basin S1	0.20
Basin S2	0.20
Basin S3	0.20
Basin S4	0.20
Basin S5	0.20
Basin S6	0.20
Basin S7	0.20
Basin S8	0.20
Basin S9	0.20
Basin S10	0.20
Basin S11	0.20
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.22
Basin S14	0.21
Basin S15	0.31
Basin S16N	0.20
Basin S16S	0.21
Basin S17	0.27
Basin S18	0.20
Basin S19	0.20
Basin S20	0.27
Basin S21	0.20
Basin S22	0.23
Basin S23	0.27
Basin S24	0.28
Basin S25	0.20
Basin S26	0.18
Basin S27	0.21
Basin S28	0.22
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	72

Basin Name	XKSAT
Basin S1	0.29
Basin S2	0.29
Basin S3	0.30
Basin S4	0.29
Basin S5	0.28
Basin S6	0.29
Basin S7	0.30
Basin S8	0.28
Basin S9	0.29
Basin S10	0.29
Basin S11	0.30
Basin S12E	0.30
Basin S12W	0.30
Basin S13	0.37
Basin S14	0.32
Basin S15	0.66
Basin S16N	0.29
Basin S16S	0.33
Basin S17	0.52
Basin S18	0.29
Basin S19	0.30
Basin S20	0.49
Basin S21	0.29
Basin S22	0.26
Basin S23	0.56
Basin S24	0.21
Basin S25	0.32
Basin S26	0.31
Basin S27	0.37
Basin S28	0.57
Basin S29	0.52

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	71

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.13
Basin S4	0.13
Basin S5	0.14
Basin S6	0.13
Basin S7	0.13
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.13
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.20
Basin S16N	0.14
Basin S16S	0.14
Basin S17	0.17
Basin S18	0.14
Basin S19	0.13
Basin S20	0.17
Basin S21	0.13
Basin S22	0.13
Basin S23	0.16
Basin S24	0.14
Basin S25	0.13
Basin S26	0.12
Basin S27	0.14
Basin S28	0.11
Basin S29	0.13

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	70

Basin Name	XKSAT
Basin S1	0.44
Basin S2	0.43
Basin S3	0.41
Basin S4	0.41
Basin S5	0.44
Basin S6	0.42
Basin S7	0.41
Basin S8	0.44
Basin S9	0.43
Basin S10	0.44
Basin S11	0.40
Basin S12E	0.44
Basin S12W	0.44
Basin S13	0.39
Basin S14	0.41
Basin S15	0.45
Basin S16N	0.43
Basin S16S	0.39
Basin S17	0.42
Basin S18	0.43
Basin S19	0.41
Basin S20	0.43
Basin S21	0.39
Basin S22	0.31
Basin S23	0.41
Basin S24	0.24
Basin S25	0.36
Basin S26	0.32
Basin S27	0.37
Basin S28	0.36
Basin S29	0.38

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	69

Basin Name	XKSAT
Basin S1	0.18
Basin S2	0.18
Basin S3	0.18
Basin S4	0.18
Basin S5	0.18
Basin S6	0.18
Basin S7	0.18
Basin S8	0.18
Basin S9	0.18
Basin S10	0.18
Basin S11	0.18
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.21
Basin S14	0.19
Basin S15	0.30
Basin S16N	0.18
Basin S16S	0.20
Basin S17	0.26
Basin S18	0.18
Basin S19	0.18
Basin S20	0.25
Basin S21	0.18
Basin S22	0.22
Basin S23	0.25
Basin S24	0.22
Basin S25	0.19
Basin S26	0.18
Basin S27	0.20
Basin S28	0.21
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	68

Basin Name	XKSAT
Basin S1	0.13
Basin S2	0.13
Basin S3	0.13
Basin S4	0.13
Basin S5	0.13
Basin S6	0.13
Basin S7	0.13
Basin S8	0.14
Basin S9	0.13
Basin S10	0.13
Basin S11	0.13
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.15
Basin S14	0.14
Basin S15	0.23
Basin S16N	0.13
Basin S16S	0.14
Basin S17	0.19
Basin S18	0.13
Basin S19	0.13
Basin S20	0.18
Basin S21	0.13
Basin S22	0.15
Basin S23	0.18
Basin S24	0.14
Basin S25	0.13
Basin S26	0.12
Basin S27	0.14
Basin S28	0.14
Basin S29	0.14

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	67

Basin Name	XKSAT
Basin S1	3.54
Basin S2	3.50
Basin S3	2.83
Basin S4	2.88
Basin S5	3.77
Basin S6	3.08
Basin S7	2.68
Basin S8	3.79
Basin S9	3.32
Basin S10	3.55
Basin S11	2.65
Basin S12E	3.27
Basin S12W	3.34
Basin S13	1.61
Basin S14	2.40
Basin S15	0.86
Basin S16N	3.42
Basin S16S	1.91
Basin S17	1.04
Basin S18	3.37
Basin S19	2.71
Basin S20	1.25
Basin S21	2.53
Basin S22	0.87
Basin S23	0.92
Basin S24	0.99
Basin S25	1.65
Basin S26	1.41
Basin S27	1.41
Basin S28	0.77
Basin S29	0.96

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	66

Basin Name	XKSAT
Basin S1	3.34
Basin S2	3.32
Basin S3	2.86
Basin S4	2.90
Basin S5	3.49
Basin S6	3.04
Basin S7	2.76
Basin S8	3.51
Basin S9	3.20
Basin S10	3.35
Basin S11	2.74
Basin S12E	3.40
Basin S12W	3.41
Basin S13	2.31
Basin S14	2.79
Basin S15	2.49
Basin S16N	3.27
Basin S16S	2.37
Basin S17	2.31
Basin S18	3.24
Basin S19	2.78
Basin S20	2.54
Basin S21	2.53
Basin S22	0.87
Basin S23	2.37
Basin S24	0.51
Basin S25	1.96
Basin S26	1.58
Basin S27	2.06
Basin S28	2.40
Basin S29	2.54

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	**65**

Basin Name	XKSAT
Basin S1	0.26
Basin S2	0.26
Basin S3	0.26
Basin S4	0.26
Basin S5	0.25
Basin S6	0.26
Basin S7	0.27
Basin S8	0.25
Basin S9	0.26
Basin S10	0.26
Basin S11	0.27
Basin S12E	0.28
Basin S12W	0.27
Basin S13	0.35
Basin S14	0.29
Basin S15	0.70
Basin S16N	0.26
Basin S16S	0.30
Basin S17	0.52
Basin S18	0.26
Basin S19	0.27
Basin S20	0.48
Basin S21	0.27
Basin S22	0.34
Basin S23	0.58
Basin S24	0.24
Basin S25	0.29
Basin S26	0.28
Basin S27	0.34
Basin S28	0.61
Basin S29	0.54

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	64

Basin Name	XKSAT
Basin S1	0.63
Basin S2	0.63
Basin S3	0.60
Basin S4	0.61
Basin S5	0.64
Basin S6	0.61
Basin S7	0.60
Basin S8	0.64
Basin S9	0.62
Basin S10	0.63
Basin S11	0.60
Basin S12E	0.69
Basin S12W	0.68
Basin S13	0.70
Basin S14	0.66
Basin S15	1.38
Basin S16N	0.63
Basin S16S	0.63
Basin S17	1.02
Basin S18	0.63
Basin S19	0.60
Basin S20	1.00
Basin S21	0.57
Basin S22	0.47
Basin S23	1.15
Basin S24	0.24
Basin S25	0.54
Basin S26	0.46
Basin S27	0.66
Basin S28	1.29
Basin S29	1.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	63

Basin Name	XKSAT
Basin S1	0.75
Basin S2	0.75
Basin S3	0.73
Basin S4	0.73
Basin S5	0.76
Basin S6	0.74
Basin S7	0.72
Basin S8	0.76
Basin S9	0.75
Basin S10	0.75
Basin S11	0.72
Basin S12E	0.77
Basin S12W	0.77
Basin S13	0.72
Basin S14	0.74
Basin S15	0.82
Basin S16N	0.75
Basin S16S	0.71
Basin S17	0.77
Basin S18	0.75
Basin S19	0.72
Basin S20	0.78
Basin S21	0.71
Basin S22	0.53
Basin S23	0.77
Basin S24	0.63
Basin S25	0.66
Basin S26	0.64
Basin S27	0.69
Basin S28	0.73
Basin S29	0.75

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	62

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.14
Basin S4	0.14
Basin S5	0.14
Basin S6	0.14
Basin S7	0.14
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.14
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.15
Basin S14	0.15
Basin S15	0.22
Basin S16N	0.14
Basin S16S	0.15
Basin S17	0.19
Basin S18	0.14
Basin S19	0.14
Basin S20	0.19
Basin S21	0.14
Basin S22	0.17
Basin S23	0.18
Basin S24	0.25
Basin S25	0.14
Basin S26	0.13
Basin S27	0.15
Basin S28	0.14
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	*61*

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.18
Basin S14	0.17
Basin S15	0.28
Basin S16N	0.16
Basin S16S	0.17
Basin S17	0.23
Basin S18	0.16
Basin S19	0.16
Basin S20	0.23
Basin S21	0.16
Basin S22	0.15
Basin S23	0.23
Basin S24	0.13
Basin S25	0.16
Basin S26	0.14
Basin S27	0.17
Basin S28	0.19
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	60

Basin Name	XKSAT
Basin S1	0.13
Basin S2	0.13
Basin S3	0.13
Basin S4	0.13
Basin S5	0.13
Basin S6	0.13
Basin S7	0.13
Basin S8	0.13
Basin S9	0.13
Basin S10	0.13
Basin S11	0.13
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.14
Basin S14	0.14
Basin S15	0.20
Basin S16N	0.13
Basin S16S	0.13
Basin S17	0.17
Basin S18	0.13
Basin S19	0.13
Basin S20	0.17
Basin S21	0.13
Basin S22	0.13
Basin S23	0.16
Basin S24	0.12
Basin S25	0.13
Basin S26	0.11
Basin S27	0.13
Basin S28	0.11
Basin S29	0.12

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	59

Basin Name	XKSAT
Basin S1	0.21
Basin S2	0.21
Basin S3	0.20
Basin S4	0.20
Basin S5	0.21
Basin S6	0.21
Basin S7	0.20
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.20
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.24
Basin S14	0.22
Basin S15	0.40
Basin S16N	0.21
Basin S16S	0.22
Basin S17	0.32
Basin S18	0.21
Basin S19	0.20
Basin S20	0.31
Basin S21	0.20
Basin S22	0.28
Basin S23	0.34
Basin S24	0.21
Basin S25	0.20
Basin S26	0.19
Basin S27	0.23
Basin S28	0.32
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	58

Basin Name	XKSAT
Basin S1	0.23
Basin S2	0.23
Basin S3	0.22
Basin S4	0.22
Basin S5	0.23
Basin S6	0.22
Basin S7	0.22
Basin S8	0.23
Basin S9	0.23
Basin S10	0.23
Basin S11	0.22
Basin S12E	0.23
Basin S12W	0.23
Basin S13	0.21
Basin S14	0.22
Basin S15	0.25
Basin S16N	0.23
Basin S16S	0.21
Basin S17	0.23
Basin S18	0.23
Basin S19	0.22
Basin S20	0.23
Basin S21	0.21
Basin S22	0.16
Basin S23	0.22
Basin S24	0.15
Basin S25	0.20
Basin S26	0.18
Basin S27	0.20
Basin S28	0.16
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation 57

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.17
Basin S4	0.17
Basin S5	0.16
Basin S6	0.16
Basin S7	0.17
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.17
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.22
Basin S14	0.18
Basin S15	0.65
Basin S16N	0.16
Basin S16S	0.19
Basin S17	0.41
Basin S18	0.16
Basin S19	0.17
Basin S20	0.36
Basin S21	0.17
Basin S22	0.39
Basin S23	0.48
Basin S24	0.36
Basin S25	0.18
Basin S26	0.18
Basin S27	0.23
Basin S28	0.56
Basin S29	0.43

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	56

Basin Name	XKSAT
Basin S1	19.46
Basin S2	19.20
Basin S3	14.82
Basin S4	15.15
Basin S5	21.00
Basin S6	16.42
Basin S7	13.91
Basin S8	21.17
Basin S9	18.01
Basin S10	19.56
Basin S11	13.69
Basin S12E	18.54
Basin S12W	18.90
Basin S13	8.30
Basin S14	12.86
Basin S15	5.02
Basin S16N	18.70
Basin S16S	9.68
Basin S17	5.75
Basin S18	18.35
Basin S19	14.08
Basin S20	7.15
Basin S21	12.47
Basin S22	2.71
Basin S23	5.36
Basin S24	1.72
Basin S25	7.63
Basin S26	5.92
Basin S27	6.96
Basin S28	4.94
Basin S29	5.98

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	55

Basin Name	XKSAT
Basin S1	3.20
Basin S2	3.18
Basin S3	2.95
Basin S4	2.96
Basin S5	3.27
Basin S6	3.04
Basin S7	2.89
Basin S8	3.28
Basin S9	3.12
Basin S10	3.20
Basin S11	2.88
Basin S12E	3.34
Basin S12W	3.33
Basin S13	2.89
Basin S14	3.04
Basin S15	4.02
Basin S16N	3.16
Basin S16S	2.78
Basin S17	3.42
Basin S18	3.14
Basin S19	2.90
Basin S20	3.60
Basin S21	2.83
Basin S22	3.52
Basin S23	3.67
Basin S24	2.66
Basin S25	2.41
Basin S26	2.23
Basin S27	2.69
Basin S28	3.93
Basin S29	3.85

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	**54**

Basin Name	**XKSAT**
Basin S1	0.14
Basin S2	0.13
Basin S3	0.13
Basin S4	0.13
Basin S5	0.14
Basin S6	0.13
Basin S7	0.13
Basin S8	0.14
Basin S9	0.13
Basin S10	0.14
Basin S11	0.13
Basin S12E	0.14
Basin S12W	0.14
Basin S13	0.15
Basin S14	0.14
Basin S15	*0.26*
Basin S16N	0.13
Basin S16S	0.14
Basin S17	0.20
Basin S18	0.13
Basin S19	0.13
Basin S20	0.19
Basin S21	0.13
Basin S22	0.15
Basin S23	0.20
Basin S24	0.14
Basin S25	0.13
Basin S26	0.12
Basin S27	0.14
Basin S28	0.17
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	53

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.15
Basin S4	0.15
Basin S5	0.15
Basin S6	0.15
Basin S7	0.15
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.15
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.16
Basin S14	0.15
Basin S15	0.23
Basin S16N	0.15
Basin S16S	0.15
Basin S17	0.20
Basin S18	0.15
Basin S19	0.15
Basin S20	0.20
Basin S21	0.15
Basin S22	0.20
Basin S23	0.19
Basin S24	0.24
Basin S25	0.14
Basin S26	0.14
Basin S27	0.16
Basin S28	0.14
Basin S29	0.15

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	52

Basin Name	XKSAT
Basin S1	0.28
Basin S2	0.28
Basin S3	0.28
Basin S4	0.28
Basin S5	0.28
Basin S6	0.28
Basin S7	0.28
Basin S8	0.28
Basin S9	0.28
Basin S10	0.28
Basin S11	0.28
Basin S12E	0.29
Basin S12W	0.29
Basin S13	0.33
Basin S14	0.30
Basin S15	0.53
Basin S16N	0.28
Basin S16S	0.30
Basin S17	0.43
Basin S18	0.28
Basin S19	0.28
Basin S20	0.42
Basin S21	0.28
Basin S22	0.41
Basin S23	0.45
Basin S24	0.35
Basin S25	0.28
Basin S26	0.27
Basin S27	0.32
Basin S28	0.44
Basin S29	0.42

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	51

Basin Name	XKSAT
Basin S1	0.17
Basin S2	0.17
Basin S3	0.16
Basin S4	0.16
Basin S5	0.17
Basin S6	0.17
Basin S7	0.16
Basin S8	0.17
Basin S9	0.17
Basin S10	0.17
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.19
Basin S14	0.17
Basin S15	0.28
Basin S16N	0.17
Basin S16S	0.17
Basin S17	0.24
Basin S18	0.17
Basin S19	0.16
Basin S20	0.23
Basin S21	0.16
Basin S22	0.16
Basin S23	0.23
Basin S24	0.14
Basin S25	0.16
Basin S26	0.15
Basin S27	0.18
Basin S28	0.20
Basin S29	0.20

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	50

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.19
Basin S14	0.17
Basin S15	0.35
Basin S16N	0.16
Basin S16S	0.17
Basin S17	0.27
Basin S18	0.16
Basin S19	0.16
Basin S20	0.25
Basin S21	0.16
Basin S22	0.24
Basin S23	0.28
Basin S24	0.25
Basin S25	0.16
Basin S26	0.15
Basin S27	0.18
Basin S28	0.26
Basin S29	0.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	49

Basin Name	XKSAT
Basin S1	0.58
Basin S2	0.58
Basin S3	0.55
Basin S4	0.55
Basin S5	0.59
Basin S6	0.56
Basin S7	0.54
Basin S8	0.60
Basin S9	0.58
Basin S10	0.59
Basin S11	0.54
Basin S12E	0.58
Basin S12W	0.58
Basin S13	0.49
Basin S14	0.54
Basin S15	0.48
Basin S16N	0.58
Basin S16S	0.50
Basin S17	0.47
Basin S18	0.58
Basin S19	0.54
Basin S20	0.50
Basin S21	0.54
Basin S22	0.46
Basin S23	0.45
Basin S24	0.59
Basin S25	0.48
Basin S26	0.46
Basin S27	0.47
Basin S28	0.39
Basin S29	0.42

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	48

Basin Name	XKSAT
Basin S1	2.69
Basin S2	2.68
Basin S3	2.35
Basin S4	2.37
Basin S5	2.80
Basin S6	2.47
Basin S7	2.27
Basin S8	2.81
Basin S9	2.59
Basin S10	2.70
Basin S11	2.25
Basin S12E	2.66
Basin S12W	2.69
Basin S13	1.82
Basin S14	2.22
Basin S15	1.60
Basin S16N	2.64
Basin S16S	1.92
Basin S17	1.62
Basin S18	2.62
Basin S19	2.29
Basin S20	1.79
Basin S21	2.12
Basin S22	0.74
Basin S23	1.59
Basin S24	0.59
Basin S25	1.68
Basin S26	1.44
Basin S27	1.65
Basin S28	1.51
Basin S29	1.65

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	47

Basin Name	XKSAT
Basin S1	0.38
Basin S2	0.38
Basin S3	0.38
Basin S4	0.38
Basin S5	0.38
Basin S6	0.38
Basin S7	0.38
Basin S8	0.37
Basin S9	0.38
Basin S10	0.38
Basin S11	0.38
Basin S12E	0.40
Basin S12W	0.39
Basin S13	0.45
Basin S14	0.41
Basin S15	0.70
Basin S16N	0.38
Basin S16S	0.42
Basin S17	0.58
Basin S18	0.38
Basin S19	0.38
Basin S20	0.56
Basin S21	0.39
Basin S22	0.45
Basin S23	0.61
Basin S24	0.47
Basin S25	0.40
Basin S26	0.39
Basin S27	0.45
Basin S28	0.61
Basin S29	0.58

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	46

Basin Name	XKSAT
Basin S1	1.79
Basin S2	1.78
Basin S3	1.59
Basin S4	1.61
Basin S5	1.86
Basin S6	1.66
Basin S7	1.55
Basin S8	1.86
Basin S9	1.73
Basin S10	1.80
Basin S11	1.54
Basin S12E	1.77
Basin S12W	1.78
Basin S13	1.26
Basin S14	1.51
Basin S15	1.10
Basin S16N	1.76
Basin S16S	1.33
Basin S17	1.12
Basin S18	1.75
Basin S19	1.55
Basin S20	1.22
Basin S21	1.45
Basin S22	0.48
Basin S23	1.09
Basin S24	0.44
Basin S25	1.19
Basin S26	1.04
Basin S27	1.16
Basin S28	1.01
Basin S29	1.10

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	45

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.15
Basin S4	0.15
Basin S5	0.15
Basin S6	0.15
Basin S7	0.15
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.15
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.18
Basin S14	0.16
Basin S15	0.28
Basin S16N	0.15
Basin S16S	0.17
Basin S17	0.23
Basin S18	0.15
Basin S19	0.15
Basin S20	0.23
Basin S21	0.15
Basin S22	0.20
Basin S23	0.23
Basin S24	0.25
Basin S25	0.16
Basin S26	0.15
Basin S27	0.17
Basin S28	0.20
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	44

Basin Name	XKSAT
Basin S1	9.99
Basin S2	9.92
Basin S3	8.56
Basin S4	8.67
Basin S5	10.43
Basin S6	9.07
Basin S7	8.26
Basin S8	10.48
Basin S9	9.56
Basin S10	10.02
Basin S11	8.18
Basin S12E	10.03
Basin S12W	10.09
Basin S13	6.69
Basin S14	8.22
Basin S15	6.49
Basin S16N	9.77
Basin S16S	6.98
Basin S17	6.30
Basin S18	9.67
Basin S19	8.32
Basin S20	6.99
Basin S21	7.62
Basin S22	2.47
Basin S23	6.36
Basin S24	1.62
Basin S25	5.87
Basin S26	4.98
Basin S27	5.99
Basin S28	6.41
Basin S29	6.84

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	43

Basin Name	XKSAT
Basin S1	12.19
Basin S2	12.07
Basin S3	10.01
Basin S4	10.17
Basin S5	12.88
Basin S6	10.78
Basin S7	9.56
Basin S8	12.95
Basin S9	11.52
Basin S10	12.23
Basin S11	9.45
Basin S12E	12.32
Basin S12W	12.41
Basin S13	7.43
Basin S14	9.57
Basin S15	7.50
Basin S16N	11.84
Basin S16S	7.77
Basin S17	7.07
Basin S18	11.68
Basin S19	9.64
Basin S20	7.99
Basin S21	8.48
Basin S22	1.73
Basin S23	7.24
Basin S24	0.78
Basin S25	6.19
Basin S26	4.76
Basin S27	6.45
Basin S28	7.42
Basin S29	7.99

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	42

Basin Name	XKSAT
Basin S1	0.65
Basin S2	0.65
Basin S3	0.62
Basin S4	0.62
Basin S5	0.67
Basin S6	0.63
Basin S7	0.61
Basin S8	0.67
Basin S9	0.64
Basin S10	0.65
Basin S11	0.61
Basin S12E	0.72
Basin S12W	0.71
Basin S13	0.73
Basin S14	0.69
Basin S15	1.67
Basin S16N	0.65
Basin S16S	0.64
Basin S17	1.15
Basin S18	0.65
Basin S19	0.61
Basin S20	1.13
Basin S21	0.57
Basin S22	0.33
Basin S23	1.35
Basin S24	0.20
Basin S25	0.54
Basin S26	0.43
Basin S27	0.67
Basin S28	1.58
Basin S29	1.41

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	41

Basin Name	XKSAT
Basin S1	0.87
Basin S2	0.86
Basin S3	0.80
Basin S4	0.80
Basin S5	0.89
Basin S6	0.82
Basin S7	0.78
Basin S8	0.89
Basin S9	0.85
Basin S10	0.87
Basin S11	0.78
Basin S12E	0.91
Basin S12W	0.91
Basin S13	0.80
Basin S14	0.83
Basin S15	1.17
Basin S16N	0.86
Basin S16S	0.76
Basin S17	0.97
Basin S18	0.85
Basin S19	0.79
Basin S20	0.99
Basin S21	0.73
Basin S22	0.31
Basin S23	1.04
Basin S24	0.22
Basin S25	0.65
Basin S26	0.54
Basin S27	0.74
Basin S28	1.08
Basin S29	1.06

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	40

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.19
Basin S14	0.17
Basin S15	0.31
Basin S16N	0.16
Basin S16S	0.17
Basin S17	0.25
Basin S18	0.16
Basin S19	0.16
Basin S20	0.24
Basin S21	0.16
Basin S22	0.21
Basin S23	0.25
Basin S24	0.22
Basin S25	0.16
Basin S26	0.15
Basin S27	0.18
Basin S28	0.22
Basin S29	0.21

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	39

Basin Name	XKSAT
Basin S1	0.62
Basin S2	0.62
Basin S3	0.63
Basin S4	0.63
Basin S5	0.62
Basin S6	0.62
Basin S7	0.63
Basin S8	0.62
Basin S9	0.62
Basin S10	0.62
Basin S11	0.63
Basin S12E	0.67
Basin S12W	0.66
Basin S13	0.76
Basin S14	0.68
Basin S15	1.37
Basin S16N	0.62
Basin S16S	0.69
Basin S17	1.07
Basin S18	0.62
Basin S19	0.63
Basin S20	1.03
Basin S21	0.62
Basin S22	0.59
Basin S23	1.19
Basin S24	0.45
Basin S25	0.64
Basin S26	0.60
Basin S27	0.75
Basin S28	1.29
Basin S29	1.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	38

Basin Name	XKSAT
Basin S1	0.85
Basin S2	0.85
Basin S3	0.77
Basin S4	0.77
Basin S5	0.88
Basin S6	0.80
Basin S7	0.75
Basin S8	0.88
Basin S9	0.83
Basin S10	0.86
Basin S11	0.74
Basin S12E	0.88
Basin S12W	0.88
Basin S13	0.70
Basin S14	0.77
Basin S15	0.88
Basin S16N	0.84
Basin S16S	0.69
Basin S17	0.78
Basin S18	0.84
Basin S19	0.75
Basin S20	0.82
Basin S21	0.71
Basin S22	0.33
Basin S23	0.80
Basin S24	0.27
Basin S25	0.59
Basin S26	0.49
Basin S27	0.64
Basin S28	0.79
Basin S29	0.81

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	**37**

Basin Name	**XKSAT**
Basin S1	0.52
Basin S2	0.52
Basin S3	0.50
Basin S4 –	0.50 – NO LGCARD
Basin S5	0.53
Basin S6	0.50
Basin S7	0.49
Basin S8	0.53
Basin S9	0.51
Basin S10	0.52
Basin S11	0.49
Basin S12E	0.53
Basin S12W	0.53
Basin S13	0.49
Basin S14	0.50
Basin S15	0.59
Basin S16N	0.52
Basin S16S	0.48
Basin S17	0.54
Basin S18	0.51
Basin S19	0.49
Basin S20	0.55
Basin S21	0.48
Basin S22	0.33
Basin S23	0.54
Basin S24	0.35
Basin S25	0.44
Basin S26	0.41
Basin S27	0.46
Basin S28	0.50
Basin S29	0.51

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	36

Basin Name	XKSAT
Basin S1	0.18
Basin S2	0.18
Basin S3	0.17
Basin S4	0.17
Basin S5	0.18
Basin S6	0.18
Basin S7	0.17
Basin S8	0.18
Basin S9	0.18
Basin S10	0.18
Basin S11	0.17
Basin S12E	0.18
Basin S12W	0.18
Basin S13	0.19
Basin S14	0.18
Basin S15	0.25
Basin S16N	0.18
Basin S16S	0.18
Basin S17	0.22
Basin S18	0.18
Basin S19	0.17
Basin S20	0.22
Basin S21	0.17
Basin S22	0.18
Basin S23	0.21
Basin S24	0.18
Basin S25	0.17
Basin S26	0.15
Basin S27	0.18
Basin S28	0.16
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	35

Basin Name	XKSAT
Basin S1	4.66 → L6 Missing??
Basin S2	4.63
Basin S3	4.03
Basin S4	4.08
Basin S5	4.86
Basin S6	4.26
Basin S7	3.89
Basin S8	4.88
Basin S9	4.47
Basin S10	4.68
Basin S11	3.86
Basin S12E	4.74
Basin S12W	4.76
Basin S13	3.30
Basin S14	3.94
Basin S15	3.56
Basin S16N	4.57
Basin S16S	3.37
Basin S17	3.31
Basin S18	4.52
Basin S19	3.92
Basin S20	3.63
Basin S21	3.59
Basin S22	1.11
Basin S23	3.40
Basin S24	0.80
Basin S25	2.82
Basin S26	2.34
Basin S27	2.96
Basin S28	3.47
Basin S29	3.64

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	34

Basin Name	XKSAT
Basin S1	0.17
Basin S2	0.17
Basin S3	0.17
Basin S4	0.17
Basin S5	0.16
Basin S6	0.17
Basin S7	0.17
Basin S8	0.16
Basin S9	0.17
Basin S10	0.17
Basin S11	0.17
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.20
Basin S14	0.18
Basin S15	0.33
Basin S16N	0.17
Basin S16S	0.18
Basin S17	0.26
Basin S18	0.17
Basin S19	0.17
Basin S20	0.25
Basin S21	0.17
Basin S22	0.21
Basin S23	0.27
Basin S24	0.22
Basin S25	0.17
Basin S26	0.16
Basin S27	0.19
Basin S28	0.24
Basin S29	0.23

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	33

Basin Name	XKSAT
Basin S1	0.61
Basin S2	0.60
Basin S3	0.60
Basin S4	0.60
Basin S5	0.61
Basin S6	0.60
Basin S7	0.60
Basin S8	0.61
Basin S9	0.60
Basin S10	0.61
Basin S11	0.60
Basin S12E	0.65
Basin S12W	0.64
Basin S13	0.70
Basin S14	0.65
Basin S15	1.22
Basin S16N	0.60
Basin S16S	0.64
Basin S17	0.96
Basin S18	0.60
Basin S19	0.60
Basin S20	0.93
Basin S21	0.58
Basin S22	0.51
Basin S23	1.05
Basin S24	0.36
Basin S25	0.58
Basin S26	0.53
Basin S27	0.68
Basin S28	1.13
Basin S29	1.05

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	32

Basin Name	XKSAT
Basin S1	4.29
Basin S2	4.24
Basin S3	3.42
Basin S4	3.49
Basin S5	4.57
Basin S6	3.73
Basin S7	3.25
Basin S8	4.60
Basin S9	4.02
Basin S10	4.30
Basin S11	3.21
Basin S12E	4.14
Basin S12W	4.20
Basin S13	2.16
Basin S14	3.07
Basin S15	1.53
Basin S16N	4.15
Basin S16S	2.43
Basin S17	1.66
Basin S18	4.08
Basin S19	3.28
Basin S20	1.97
Basin S21	2.96
Basin S22	0.79
Basin S23	1.57
Basin S24	0.60
Basin S25	1.99
Basin S26	1.58
Basin S27	1.87
Basin S28	1.45
Basin S29	1.69

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	**31**

Basin Name	**XKSAT**
Basin S1	0.21
Basin S2	0.21
Basin S3	0.21
Basin S4	0.21
Basin S5	0.21
Basin S6	0.21
Basin S7	0.21
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.21
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.25
Basin S14	0.22
Basin S15	0.50
Basin S16N	0.21
Basin S16S	0.22
Basin S17	0.37
Basin S18	0.21
Basin S19	0.21
Basin S20	0.36
Basin S21	0.21
Basin S22	0.30
Basin S23	0.40
Basin S24	0.31
Basin S25	0.21
Basin S26	0.19
Basin S27	0.24
Basin S28	0.41
Basin S29	0.37

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	30

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.16
Basin S4	0.16
Basin S5	0.15
Basin S6	0.16
Basin S7	0.16
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.16
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.20
Basin S14	0.17
Basin S15	0.45
Basin S16N	0.15
Basin S16S	0.18
Basin S17	0.32
Basin S18	0.15
Basin S19	0.16
Basin S20	0.28
Basin S21	0.16
Basin S22	0.24
Basin S23	0.35
Basin S24	0.22
Basin S25	0.17
Basin S26	0.16
Basin S27	0.20
Basin S28	0.36
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	29

Basin Name	XKSAT
Basin S1	0.19
Basin S2	0.19
Basin S3	0.19
Basin S4	0.19
Basin S5	0.19
Basin S6	0.19
Basin S7	0.19
Basin S8	0.19
Basin S9	0.19
Basin S10	0.19
Basin S11	0.19
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.27
Basin S14	0.22
Basin S15	0.84
Basin S16N	0.19
Basin S16S	0.22
Basin S17	0.50
Basin S18	0.19
Basin S19	0.19
Basin S20	0.45
Basin S21	0.19
Basin S22	0.30
Basin S23	0.62
Basin S24	0.23
Basin S25	0.21
Basin S26	0.19
Basin S27	0.26
Basin S28	0.75
Basin S29	0.58

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	28

Basin Name	XKSAT
Basin S1	0.20
Basin S2	0.20
Basin S3	0.19
Basin S4	0.19
Basin S5	0.20
Basin S6	0.19
Basin S7	0.19
Basin S8	0.20
Basin S9	0.19
Basin S10	0.20
Basin S11	0.19
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.26
Basin S16N	0.20
Basin S16S	0.20
Basin S17	0.23
Basin S18	0.20
Basin S19	0.19
Basin S20	0.24
Basin S21	0.19
Basin S22	0.23
Basin S23	0.23
Basin S24	0.31
Basin S25	0.19
Basin S26	0.17
Basin S27	0.19
Basin S28	0.18
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	27

Basin Name	XKSAT
Basin S1	0.77
Basin S2	0.77
Basin S3	0.74
Basin S4	0.74
Basin S5	0.78
Basin S6	0.75
Basin S7	0.73
Basin S8	0.78
Basin S9	0.76
Basin S10	0.77
Basin S11	0.73
Basin S12E	0.79
Basin S12W	0.79
Basin S13	0.74
Basin S14	0.76
Basin S15	0.91
Basin S16N	0.77
Basin S16S	0.72
Basin S17	0.83
Basin S18	0.76
Basin S19	0.73
Basin S20	0.84
Basin S21	0.72
Basin S22	0.57
Basin S23	0.84
Basin S24	0.59
Basin S25	0.67
Basin S26	0.63
Basin S27	0.71
Basin S28	0.83
Basin S29	0.83

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	26

Basin Name	XKSAT
Basin S1	0.64
Basin S2	0.64
Basin S3	0.62
Basin S4	0.62
Basin S5	0.64
Basin S6	0.63
Basin S7	0.62
Basin S8	0.64
Basin S9	0.63
Basin S10	0.64
Basin S11	0.62
Basin S12E	0.65
Basin S12W	0.65
Basin S13	0.63
Basin S14	0.63
Basin S15	0.73
Basin S16N	0.63
Basin S16S	0.61
Basin S17	0.68
Basin S18	0.63
Basin S19	0.62
Basin S20	0.69
Basin S21	0.61
Basin S22	0.48
Basin S23	0.68
Basin S24	0.60
Basin S25	0.59
Basin S26	0.57
Basin S27	0.61
Basin S28	0.64
Basin S29	0.65

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	25

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.24
Basin S16N	0.16
Basin S16S	0.17
Basin S17	0.21
Basin S18	0.16
Basin S19	0.16
Basin S20	0.21
Basin S21	0.16
Basin S22	0.16
Basin S23	0.20
Basin S24	0.18
Basin S25	0.16
Basin S26	0.15
Basin S27	0.17
Basin S28	0.15
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	24

Basin Name	XKSAT
Basin S1	25.60
Basin S2	25.31
Basin S3	20.30
Basin S4	20.68
Basin S5	27.32
Basin S6	22.15
Basin S7	19.23
Basin S8	27.50
Basin S9	23.96
Basin S10	25.71
Basin S11	18.97
Basin S12E	25.34
Basin S12W	25.64
Basin S13	13.43
Basin S14	18.71
Basin S15	11.23
Basin S16N	24.74
Basin S16S	14.64
Basin S17	11.35
Basin S18	24.36
Basin S19	19.43
Basin S20	13.51
Basin S21	17.45
Basin S22	3.58
Basin S23	11.25
Basin S24	3.12
Basin S25	11.51
Basin S26	9.16
Basin S27	11.45
Basin S28	11.15
Basin S29	12.56

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	23

Basin Name	XKSAT
Basin S1	0.23
Basin S2	0.23
Basin S3	0.24
Basin S4	0.24
Basin S5	0.23
Basin S6	0.24
Basin S7	0.24
Basin S8	0.23
Basin S9	0.23
Basin S10	0.23
Basin S11	0.24
Basin S12E	0.24
Basin S12W	0.24
Basin S13	0.29
Basin S14	0.26
Basin S15	0.43
Basin S16N	0.23
Basin S16S	0.26
Basin S17	0.36
Basin S18	0.23
Basin S19	0.24
Basin S20	0.35
Basin S21	0.24
Basin S22	0.34
Basin S23	0.37
Basin S24	0.31
Basin S25	0.26
Basin S26	0.26
Basin S27	0.28
Basin S28	0.34
Basin S29	0.33

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	22

Basin Name	XKSAT
Basin S1	0.22
Basin S2	0.22
Basin S3	0.22
Basin S4	0.22
Basin S5	0.22
Basin S6	0.22
Basin S7	0.22
Basin S8	0.22
Basin S9	0.22
Basin S10	0.22
Basin S11	0.22
Basin S12E	0.24
Basin S12W	0.23
Basin S13	0.28
Basin S14	0.24
Basin S15	0.57
Basin S16N	0.22
Basin S16S	0.25
Basin S17	0.42
Basin S18	0.22
Basin S19	0.22
Basin S20	0.39
Basin S21	0.22
Basin S22	0.25
Basin S23	0.46
Basin S24	0.20
Basin S25	0.23
Basin S26	0.21
Basin S27	0.27
Basin S28	0.48
Basin S29	0.43

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	21

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.14
Basin S4	0.14
Basin S5	0.14
Basin S6	0.14
Basin S7	0.14
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.14
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.17
Basin S14	0.15
Basin S15	0.40
Basin S16N	0.14
Basin S16S	0.15
Basin S17	0.26
Basin S18	0.14
Basin S19	0.14
Basin S20	0.24
Basin S21	0.14
Basin S22	0.22
Basin S23	0.29
Basin S24	0.17
Basin S25	0.14
Basin S26	0.13
Basin S27	0.16
Basin S28	0.31
Basin S29	0.26

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	20

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.14
Basin S4	0.14
Basin S5	0.14
Basin S6	0.14
Basin S7	0.14
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.14
Basin S12E	0.15
Basin S12W	0.15
Basin S13	0.16
Basin S14	0.15
Basin S15	0.26
Basin S16N	0.14
Basin S16S	0.15
Basin S17	0.21
Basin S18	0.14
Basin S19	0.14
Basin S20	0.21
Basin S21	0.14
Basin S22	0.21
Basin S23	0.21
Basin S24	0.23
Basin S25	0.14
Basin S26	0.13
Basin S27	0.16
Basin S28	0.18
Basin S29	0.17

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	19

Basin Name	XKSAT
Basin S1	15.95
Basin S2	15.72
Basin S3	11.86
Basin S4	12.14
Basin S5	17.34
Basin S6	13.26
Basin S7	11.06
Basin S8	17.49
Basin S9	14.66
Basin S10	16.04
Basin S11	10.87
Basin S12E	14.53
Basin S12W	14.92
Basin S13	5.67
Basin S14	9.65
Basin S15	2.40
Basin S16N	15.27
Basin S16S	7.10
Basin S17	3.16
Basin S18	14.97
Basin S19	11.21
Basin S20	4.06
Basin S21	9.89
Basin S22	1.24
Basin S23	2.74
Basin S24	1.23
Basin S25	5.75
Basin S26	4.50
Basin S27	4.73
Basin S28	2.32
Basin S29	3.02

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	18

Basin Name	XKSAT
Basin S1	0.20
Basin S2	0.20
Basin S3	0.19
Basin S4	0.19
Basin S5	0.20
Basin S6	0.19
Basin S7	0.19
Basin S8	0.20
Basin S9	0.20
Basin S10	0.20
Basin S11	0.19
Basin S12E	0.20
Basin S12W	0.20
Basin S13	0.20
Basin S14	0.20
Basin S15	0.25
Basin S16N	0.20
Basin S16S	0.19
Basin S17	0.22
Basin S18	0.20
Basin S19	0.19
Basin S20	0.23
Basin S21	0.19
Basin S22	0.15
Basin S23	0.21
Basin S24	0.14
Basin S25	0.18
Basin S26	0.16
Basin S27	0.19
Basin S28	0.16
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	**17**

Basin Name	**XKSAT**
Basin S1	0.21
Basin S2	0.21
Basin S3	0.21
Basin S4	0.21
Basin S5	0.21
Basin S6	0.21
Basin S7	0.21
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.21
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.26
Basin S14	0.23
Basin S15	0.50
Basin S16N	0.21
Basin S16S	0.24
Basin S17	0.38
Basin S18	0.21
Basin S19	0.21
Basin S20	0.36
Basin S21	0.21
Basin S22	0.32
Basin S23	0.41
Basin S24	0.30
Basin S25	0.22
Basin S26	0.21
Basin S27	0.26
Basin S28	0.42
Basin S29	0.38

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	16

Basin Name	XKSAT
Basin S1	0.17
Basin S2	0.17
Basin S3	0.16
Basin S4	0.16
Basin S5	0.17
Basin S6	0.16
Basin S7	0.16
Basin S8	0.17
Basin S9	0.17
Basin S10	0.17
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.18
Basin S14	0.17
Basin S15	0.26
Basin S16N	0.17
Basin S16S	0.17
Basin S17	0.22
Basin S18	0.17
Basin S19	0.16
Basin S20	0.22
Basin S21	0.16
Basin S22	0.15
Basin S23	0.22
Basin S24	0.13
Basin S25	0.16
Basin S26	0.14
Basin S27	0.17
Basin S28	0.17
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	15

Basin Name	XKSAT
Basin S1	1.83
Basin S2	1.82
Basin S3	1.60
Basin S4	1.62
Basin S5	1.90
Basin S6	1.69
Basin S7	1.56
Basin S8	1.91
Basin S9	1.76
Basin S10	1.83
Basin S11	1.54
Basin S12E	1.84
Basin S12W	1.85
Basin S13	1.32
Basin S14	1.56
Basin S15	1.35
Basin S16N	1.79
Basin S16S	1.36
Basin S17	1.29
Basin S18	1.78
Basin S19	1.56
Basin S20	1.39
Basin S21	1.44
Basin S22	0.56
Basin S23	1.29
Basin S24	0.35
Basin S25	1.17
Basin S26	0.97
Basin S27	1.20
Basin S28	1.26
Basin S29	1.34

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	14

Basin Name	XKSAT
Basin S1	0.79
Basin S2	0.79
Basin S3	0.74
Basin S4	0.75
Basin S5	0.81
Basin S6	0.76
Basin S7	0.73
Basin S8	0.81
Basin S9	0.78
Basin S10	0.79
Basin S11	0.73
Basin S12E	0.85
Basin S12W	0.85
Basin S13	0.82
Basin S14	0.80
Basin S15	1.49
Basin S16N	0.79
Basin S16S	0.75
Basin S17	1.13
Basin S18	0.78
Basin S19	0.73
Basin S20	1.16
Basin S21	0.72
Basin S22	0.76
Basin S23	1.27
Basin S24	0.72
Basin S25	0.64
Basin S26	0.56
Basin S27	0.76
Basin S28	1.40
Basin S29	1.31

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	13

Basin Name	XKSAT
Basin S1	0.36
Basin S2	0.36
Basin S3	0.36
Basin S4	0.36
Basin S5	0.37
Basin S6	0.36
Basin S7	0.36
Basin S8	0.37
Basin S9	0.36
Basin S10	0.36
Basin S11	0.36
Basin S12E	0.38
Basin S12W	0.37
Basin S13	0.38
Basin S14	0.37
Basin S15	0.48
Basin S16N	0.36
Basin S16S	0.37
Basin S17	0.43
Basin S18	0.36
Basin S19	0.36
Basin S20	0.43
Basin S21	0.35
Basin S22	0.26
Basin S23	0.43
Basin S24	0.29
Basin S25	0.35
Basin S26	0.33
Basin S27	0.37
Basin S28	0.40
Basin S29	0.40

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	12

Basin Name	XKSAT
Basin S1	0.21
Basin S2	0.21
Basin S3	0.21
Basin S4	0.21
Basin S5	0.21
Basin S6	0.21
Basin S7	0.20
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.20
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.21
Basin S14	0.21
Basin S15	0.26
Basin S16N	0.21
Basin S16S	0.20
Basin S17	0.24
Basin S18	0.21
Basin S19	0.20
Basin S20	0.24
Basin S21	0.20
Basin S22	0.19
Basin S23	0.23
Basin S24	0.18
Basin S25	0.19
Basin S26	0.18
Basin S27	0.20
Basin S28	0.17
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	11

Basin Name	XKSAT
Basin S1	0.89
Basin S2	0.89
Basin S3	0.86
Basin S4	0.86
Basin S5	0.90
Basin S6	0.87
Basin S7	0.85
Basin S8	0.90
Basin S9	0.88
Basin S10	0.89
Basin S11	0.85
Basin S12E	0.96
Basin S12W	0.95
Basin S13	0.98
Basin S14	0.93
Basin S15	1.79
Basin S16N	0.89
Basin S16S	0.89
Basin S17	1.38
Basin S18	0.89
Basin S19	0.86
Basin S20	1.38
Basin S21	0.84
Basin S22	0.86
Basin S23	1.54
Basin S24	0.89
Basin S25	0.79
Basin S26	0.72
Basin S27	0.93
Basin S28	1.70
Basin S29	1.57

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	10

Basin Name	XKSAT
Basin S1	0.21
Basin S2	0.21
Basin S3	0.21
Basin S4	0.21
Basin S5	0.21
Basin S6	0.21
Basin S7	0.20
Basin S8	0.21
Basin S9	0.21
Basin S10	0.21
Basin S11	0.20
Basin S12E	0.22
Basin S12W	0.22
Basin S13	0.23
Basin S14	0.22
Basin S15	0.33
Basin S16N	0.21
Basin S16S	0.21
Basin S17	0.28
Basin S18	0.21
Basin S19	0.20
Basin S20	0.28
Basin S21	0.20
Basin S22	0.22
Basin S23	0.28
Basin S24	0.24
Basin S25	0.19
Basin S26	0.18
Basin S27	0.21
Basin S28	0.25
Basin S29	0.25

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	9

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.17
Basin S14	0.17
Basin S15	0.23
Basin S16N	0.16
Basin S16S	0.16
Basin S17	0.20
Basin S18	0.16
Basin S19	0.16
Basin S20	0.20
Basin S21	0.16
Basin S22	0.15
Basin S23	0.19
Basin S24	0.14
Basin S25	0.15
Basin S26	0.14
Basin S27	0.16
Basin S28	0.14
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	8

Basin Name	XKSAT
Basin S1	0.14
Basin S2	0.14
Basin S3	0.14
Basin S4	0.14
Basin S5	0.14
Basin S6	0.14
Basin S7	0.14
Basin S8	0.14
Basin S9	0.14
Basin S10	0.14
Basin S11	0.14
Basin S12E	0.15
Basin S12W	0.14
Basin S13	0.16
Basin S14	0.15
Basin S15	0.25
Basin S16N	0.14
Basin S16S	0.14
Basin S17	0.20
Basin S18	0.14
Basin S19	0.14
Basin S20	0.20
Basin S21	0.14
Basin S22	0.17
Basin S23	0.20
Basin S24	0.17
Basin S25	0.14
Basin S26	0.12
Basin S27	0.15
Basin S28	0.16
Basin S29	0.16

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	7

Basin Name	XKSAT
Basin S1	0.15
Basin S2	0.15
Basin S3	0.15
Basin S4	0.15
Basin S5	0.15
Basin S6	0.15
Basin S7	0.15
Basin S8	0.15
Basin S9	0.15
Basin S10	0.15
Basin S11	0.15
Basin S12E	0.16
Basin S12W	0.16
Basin S13	0.18
Basin S14	0.16
Basin S15	0.28
Basin S16N	0.15
Basin S16S	0.17
Basin S17	0.24
Basin S18	0.15
Basin S19	0.15
Basin S20	0.22
Basin S21	0.15
Basin S22	0.28
Basin S23	0.24
Basin S24	0.39
Basin S25	0.16
Basin S26	0.16
Basin S27	0.18
Basin S28	0.20
Basin S29	0.19

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	6

Basin Name	XKSAT
Basin S1	0.18
Basin S2	0.18
Basin S3	0.18
Basin S4	0.18
Basin S5	0.18
Basin S6	0.18
Basin S7	0.18
Basin S8	0.18
Basin S9	0.18
Basin S10	0.18
Basin S11	0.18
Basin S12E	0.19
Basin S12W	0.19
Basin S13	0.21
Basin S14	0.19
Basin S15	0.41
Basin S16N	0.18
Basin S16S	0.19
Basin S17	0.31
Basin S18	0.18
Basin S19	0.18
Basin S20	0.29
Basin S21	0.18
Basin S22	0.23
Basin S23	0.33
Basin S24	0.18
Basin S25	0.18
Basin S26	0.16
Basin S27	0.21
Basin S28	0.32
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	5

Basin Name	XKSAT
Basin S1	1.01
Basin S2	1.01
Basin S3	0.97
Basin S4	0.97
Basin S5	1.03
Basin S6	0.98
Basin S7	0.96
Basin S8	1.03
Basin S9	1.00
Basin S10	1.01
Basin S11	0.95
Basin S12E	1.05
Basin S12W	1.05
Basin S13	0.99
Basin S14	1.00
Basin S15	1.35
Basin S16N	1.01
Basin S16S	0.95
Basin S17	1.17
Basin S18	1.00
Basin S19	0.96
Basin S20	1.19
Basin S21	0.93
Basin S22	0.78
Basin S23	1.23
Basin S24	0.66
Basin S25	0.86
Basin S26	0.80
Basin S27	0.95
Basin S28	1.27
Basin S29	1.24

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	4

Basin Name	XKSAT
Basin S1	0.16
Basin S2	0.16
Basin S3	0.16
Basin S4	0.16
Basin S5	0.16
Basin S6	0.16
Basin S7	0.16
Basin S8	0.16
Basin S9	0.16
Basin S10	0.16
Basin S11	0.16
Basin S12E	0.17
Basin S12W	0.17
Basin S13	0.18
Basin S14	0.17
Basin S15	0.26
Basin S16N	0.16
Basin S16S	0.17
Basin S17	0.22
Basin S18	0.16
Basin S19	0.16
Basin S20	0.22
Basin S21	0.16
Basin S22	0.20
Basin S23	0.22
Basin S24	0.21
Basin S25	0.16
Basin S26	0.15
Basin S27	0.17
Basin S28	0.18
Basin S29	0.18

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation 3

Basin Name	XKSAT
Basin S1	0.20
Basin S2	0.20
Basin S3	0.20
Basin S4	0.20
Basin S5	0.20
Basin S6	0.20
Basin S7	0.20
Basin S8	0.20
Basin S9	0.20
Basin S10	0.20
Basin S11	0.20
Basin S12E	0.21
Basin S12W	0.21
Basin S13	0.23
Basin S14	0.21
Basin S15	0.41
Basin S16N	0.20
Basin S16S	0.21
Basin S17	0.32
Basin S18	0.20
Basin S19	0.20
Basin S20	0.31
Basin S21	0.19
Basin S22	0.20
Basin S23	0.34
Basin S24	0.17
Basin S25	0.20
Basin S26	0.18
Basin S27	0.23
Basin S28	0.32
Basin S29	0.30

FCDMC Uncertainty and Risk Analysis
Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	2

Basin Name	XKSAT
Basin S1	0.28
Basin S2	0.28
Basin S3	0.27
Basin S4	0.27
Basin S5	0.28
Basin S6	0.28
Basin S7	0.27
Basin S8	0.28
Basin S9	0.28
Basin S10	0.28
Basin S11	0.27
Basin S12E	0.29
Basin S12W	0.29
Basin S13	0.30
Basin S14	0.29
Basin S15	0.40
Basin S16N	0.28
Basin S16S	0.28
Basin S17	0.35
Basin S18	0.28
Basin S19	0.27
Basin S20	0.35
Basin S21	0.27
Basin S22	0.30
Basin S23	0.35
Basin S24	0.28
Basin S25	0.26
Basin S26	0.25
Basin S27	0.28
Basin S28	0.32
Basin S29	0.32

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Monte Carlo Adjusted HEC-1 Inputs for XKSAT

M.C. Simulation	1

Basin Name	XKSAT
Basin S1	8.15
Basin S2	8.08
Basin S3	6.79
Basin S4	6.89
Basin S5	8.58
Basin S6	7.28
Basin S7	6.51
Basin S8	8.63
Basin S9	7.74
Basin S10	8.18
Basin S11	6.44
Basin S12E	8.69
Basin S12W	8.68
Basin S13	5.95
Basin S14	6.98
Basin S15	9.39
Basin S16N	7.94
Basin S16S	5.73
Basin S17	7.37
Basin S18	7.84
Basin S19	6.56
Basin S20	8.26
Basin S21	6.09
Basin S22	3.28
Basin S23	8.24
Basin S24	2.60
Basin S25	4.35
Basin S26	3.44
Basin S27	5.13
Basin S28	9.30
Basin S29	9.22

OUTSTANDING COMMENTS

The following comments by Bing Zhao/FCDMC were not addressed in this final report:

- References are not cited correctly
- The sentence "Simulation 1 numbers for each of the three parameters were input into the first HEC-1 file, and so on, up to the chosen number of repetition." was requested to be changed to "The simulated 100 sets of three parameters were input into HEC-1 input files to run HEC-1 100 times to obtain 100 peak flows and runoff volumes."