

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5

**ADJUSTMENT AND CALIBRATION OF THE SHRINK SWELL MODEL DEVELOPED TO
ESTIMATE VOLUME CHANGES DUE TO EXPANSIVE SOIL BEHAVIOR UNDER PAVEMENT
COVERED AREAS**

MAY 2023

TABLE OF CONTENTS

LIST OF FIGURES	5-2
LIST OF TABLES	5-3
5. ADJUSTMENT AND CALIBRATION OF THE SHRINK SWELL MODEL DEVELOPED TO ESTIMATE VOLUME CHANGES DUE TO EXPANSIVE SOIL BEHAVIOR UNDER PAVEMENT COVERED AREAS.....	5-4
5.1. Abstract.....	5-4
5.2. Objective	5-4
5.3. Introduction	5-4
5.4. Literature Review.....	5-5
5.4.1. <i>The Long-Term Pavement Performance (LTPP)</i>	5-5
5.4.2. <i>Seasonal Monitoring Program (SMP)</i>	5-5
5.4.3. <i>Time Domain Reflectometry (TDR)</i>	5-7
5.5. Data Collection	5-9
5.6. Analysis	5-14
5.6.1. <i>Analysis of Measured Elevation Change</i>	5-15
5.6.1.1 <i>Summary of the Available Records</i>	5-16
5.6.2. <i>Calibrating the Shrink Swell Model with the Analyzed Measured Elevation Change Data</i>	5-16
5.7. Discussion.....	5-19
5.7.1. <i>Identifying Records Measured at the Time of Possible Frost Heave Occurrence</i>	5-19
5.8. Results and Conclusions	5-26
5.9. References	5-30

LIST OF FIGURES

Figure 5.1 Elevation and Profile Data Collection Plan -AC Pavements (Rada et al., 1994)	5-6
Figure 5.2 Elevation and Profile Data Collection Plan – JCP Pavements (Rada et al., 1994).....	5-7
Figure 5.3 Elevation and Profile Data Collection Plan – JRC Pavements (Rada et al., 1994)	5-7
Figure 5.4 TDR Probe Installed in The LTPP SMP Sites (Jiang and Tayabji, 1999).....	5-8
Figure 5.5 LTPP SMP Instrumentation Layout (Jiang and Tayabji, 1999)	5-9
Figure 5.6 Percent Finer than 0.02mm Versus Average Rate of Heave (Kaplur, 1974).....	5-13
Figure 5.7 Four Climatic Zones as Identified in the LTPP (PAAC, 1995).....	5-14
Figure 5.8 Time vs. Volumetric Water Content Measured Using TDR for Probe 3 of Section MB 83-3802	5-24
Figure 5.9 Time vs. Volumetric Water Content Measured Using TDR for Probes 3 and 10 of Section MB 83-3802	5-25
Figure 5.10 Time vs. Volumetric Water Content Measured Using TDR for all Probes of Section MB 83-3802	5-26
Figure 5.11 Comparison of Predicted and Measured Elevation Changes for AC Pavements	5-29
Figure 5.12 Comparison of Predicted and Measured Elevation Changes for PCC Pavements	5-29

LIST OF TABLES

Table 5.1 LTPP Sources of the Data Collected for the Analysis	5-10
Table 5.2 Summary of the Pavement Type and Soil Properties of the Calibration SMP Sections	5-10
Table 5.3 Frost Susceptibility Classification of Soils (NCHRP 1-37A, 2004).....	5-12
Table 5.4 Portion of Measured Elevation Data Collected for AL 01-0102	5-15
Table 5.5 Summary of the Useable Data for The Analysis.....	5-18
Table 5.6 Normalizing the Predicted Elevation Values to the Measured Elevation Changes for Section AL 01-0101	5-19
Table 5.7 Layers and Thicknesses for Section MB 83-3802	5-20
Table 5.8 Measured Elevation Records Dates for Section MB 83-3802	5-20
Table 5.9 Part of Frost Penetration Records Measured in the SMP for Section MB 83-3802 (Freezing Time).....	5-22
Table 5.10 Part of Frost Penetration Records Measured in the SMP for Section MB 83-3802 (Thawing Time).....	5-23
Table 5.11 The Depth of TDR Probes from The Surface for Section MB 83-3802	5-23
Table 5.12 Sample of the GWT Measurements for Section 83-3802	5-23
Table 5.13 A Sample of Air Temperature Data Collected for Section MB 83-3802.....	5-24
Table 5.14 Measured and Predicted Values for AC Sections	5-26
Table 5.15 Measured and Predicted Values for PCC Sections	5-28

5. ADJUSTMENT AND CALIBRATION OF THE SHRINK SWELL MODEL DEVELOPED TO ESTIMATE VOLUME CHANGES DUE TO EXPANSIVE SOIL BEHAVIOR UNDER PAVEMENT COVERED AREAS

5.1. Abstract

The pavement design procedure used by AASHTO in the United States is based upon a series of mechanistic models that predict pavement damages for both asphaltic and rigid pavement systems. However, in its present form, environmentally induced damage caused by either frost heave and/or high-volume expansive soils are incorporated through an empirical Site Factor variable, developed from a regression analysis conducted on a comprehensive set of pavement performance data found in the Long-Term Pavement Performance, LTPP, database system.

The National Academies, through the US National Cooperative Highway Research Program (NCHRP) awarded a research project to Arizona State University to develop a new comprehensive set of mechanistic models to accurately predict deformation pavement profile changes and associated changes in the highway International Roughness Index (IRI), caused by environmentally induced changes in suction stresses.

This chapter focuses upon the process followed to adjust the shrink swell model to pavement covered areas. This model predicts volume changes in expansive soils caused by environmentally induced changes in suction stresses. This suction-based model was developed to estimate volume change under uncovered areas. To make the model suitable to predictions under pavement structures, the model was calibrated using pavement elevation change data at the edge of the pavement, collected in the field as part of the Seasonal Monitoring Program (SMP) from the Long-Term Pavement Performance (LTPP) program. A total of 41 calibration points were used from AC pavement sections and 17 from PCC sections. The resulting calibration equations yielded coefficient of correlations equal to 61% and 78%, for AC and PCC pavements, respectively.

The results of this calibration effort allow for the implementation of pavement distresses caused by volume change due to the presence of expansive subgrade material into the roughness models available in the AASHTOWare Pavement ME design procedure.

5.2. Objective

The objective of this study is the adjustment and calibration of the developed shrink swell model with elevation changes data under the pavement edges, where the traffic effect is believed to be relatively minimal.

5.3. Introduction

Generally, the prediction of relative movements in expansive soils can be divided into three categories: oedometer-type laboratory testing, empirical or semi-empirical methods, such as the Potential Vertical Rise (PVR), and suction methods. Studies have concluded that oedometer-type testing usually overestimates the

in-situ heave (Osman and Sharief, 1987, Dhowian et al., 1987). Empirical and semi-empirical methods are usually based on laboratory and field correlations that are valid for the samples used in the study and are less reliable for soils out of the range of calibration values. On the other hand, suction methods allow for the prediction of the heave and shrinkage of soil based on the moisture energy. In other words, movement in expansive soil is based on the change in suction stresses, which increase for decreasing the moisture content of the soil and vice versa (Lytton et al., 2005).

A newly developed mechanistic-empirical model estimates volume-change due to climatic effects on expansive soils. The objective of the model is to eventually being able to replace the empirical parameter called Site Factor (SF), currently used in the ME Pavement Design Guide to evaluate distresses in the pavement due to problematic soil conditions such as high-volume change and frost susceptible soils. Deflection data under the pavement edges, collected as part of the Long-Term Pavement Performance, LTPP, database was used in the analysis. The data was statistically analyzed and the results were divided based on the pavement type into two groups: 1) Asphalt concrete (AC) pavements, which includes new AC pavements and AC overlays of flexible pavements, and 2) Portland cement concrete (PCC) pavements, which includes a) AC overlays of rigid pavements and semi-rigid pavements, b) jointed plain concrete pavement (JPCP), and c) continuously reinforced concrete pavement (CRCP). The calibration effort was based upon the premise that the statistical variability of the predicted volume changes can be directly correlated to the current International Roughness Index (IRI) solution methodology present in the AASHTOWare PMED guide. This effort constitutes the first step of the critical calibration process.

5.4. Literature Review

5.4.1. The Long-Term Pavement Performance (LTPP)

The Long-Term Pavement Performance (LTPP) database (<https://infopave.fhwa.dot.gov/>) was used to collect the information needed for calibration. The LTPP database is the product of a large research program of data gathered from 2,000 pavement test sections over approximately a 20-year period. Data includes 1) subgrade material properties such as soil gradation from sieve analysis and hydrometer tests, Atterberg limits, water content, maximum dry density and optimum moisture content, etc., 2) climatic parameters such as annual average precipitation, temperature, freezing index, and relative humidity, 3) type of pavement, 4) pavement layers and thicknesses, 5) pavement distresses, and 6) IRI values measured overtime, among other information.

5.4.2. Seasonal Monitoring Program (SMP)

Part of the LTPP study is an endeavor known as the Seasonal Monitoring Program (SMP). The SMP primary objective is *“to provide data needed to attain a fundamental understanding of the magnitude and impact of temporal variations in pavement response and material properties due to the separate and combined effects of temperature, moisture and frost/thaw variations”* (Rada et al., 1994). In the SMP, 64 road sections, including AC and PCC pavements, distributed over the US and part of Canada had been monitored. Different instrumentation was used for different purposes: time domain reflectometry (TDR) was installed to measure moisture content of unbound and subgrade materials, electrical resistivity probes to measure frost locations, a piezometer to measure the depth to groundwater table, among others.

In addition, surface elevation and longitudinal profile were measured to obtain information related to soil volume changes due to expansivity or frost heave. The data found in United States and Canada ranged from 1993 to 2004 for both Asphalt Concrete (AC) and Portland Cement Concrete (PCC) pavements. Rod and level surveys (usually one survey in the middle of each season, especially for non-frost areas) were conducted to determine changes in pavement surface elevations for five years, on average, at five different locations for AC pavements: 1) pavement edge (PE), 2) outer-wheel path (OWP), 3) mid-lane (ML), 4) inner-wheel path (IWP), and 5) inner-lane edge (ILE), and three different locations for PCC pavements: 1) pavement edge (PE), 2) mid lane (ML), and 3) inner-lane edge (ILE), Figure 5.1, Figure 5.2, and Figure 5.3. At the pavement edge, the measurements were taken less than 6 inches from the inside edge of the painted shoulder stripe. (Rada et al., 1994).

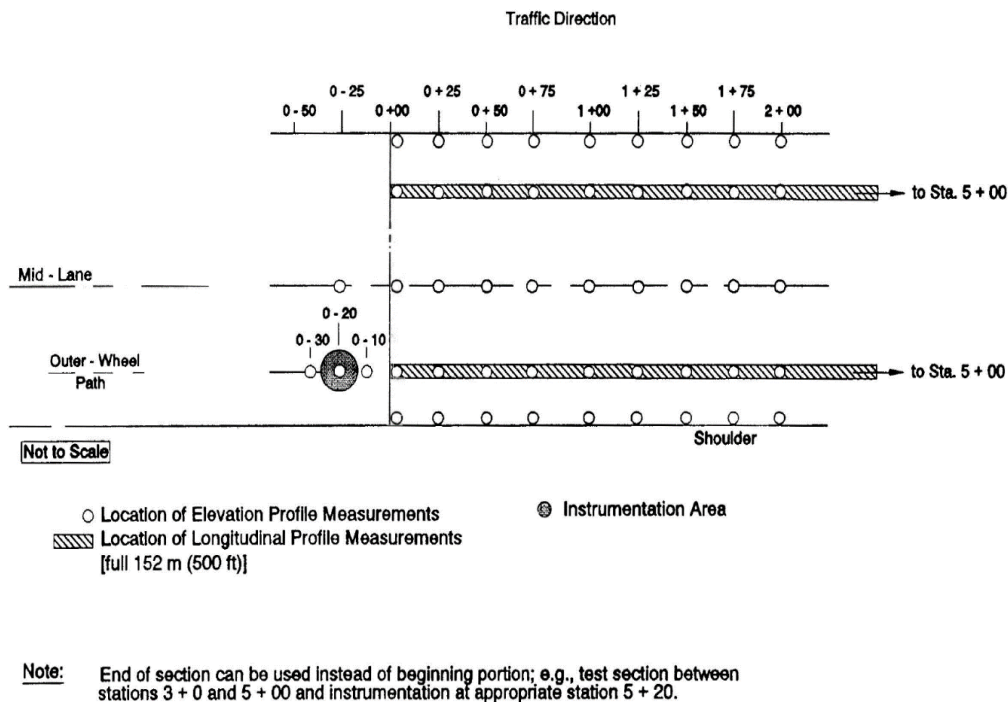


Figure 5.1 Elevation and Profile Data Collection Plan -AC Pavements (Rada et al., 1994)

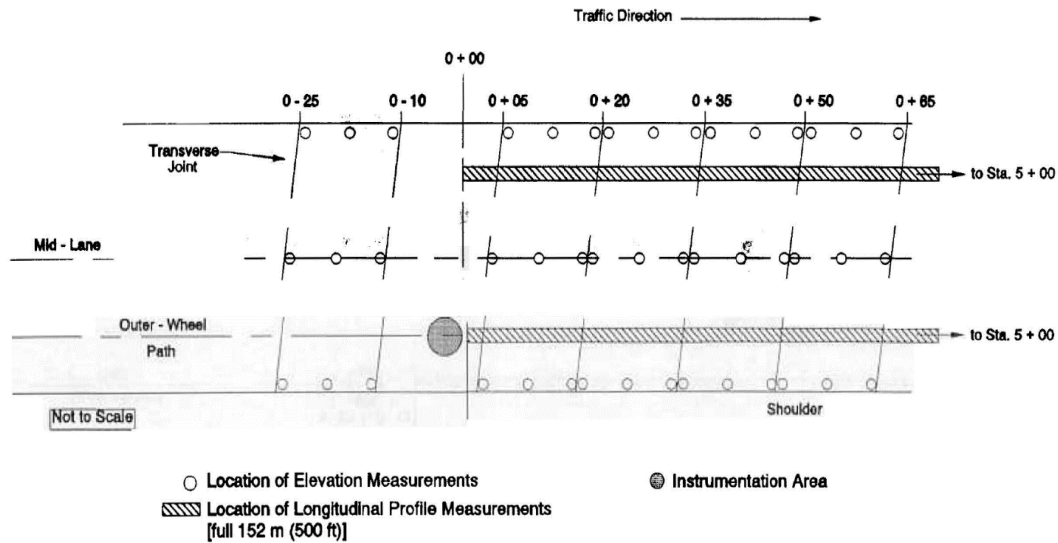


Figure 5.2 Elevation and Profile Data Collection Plan – JCP Pavements (Rada et al., 1994)

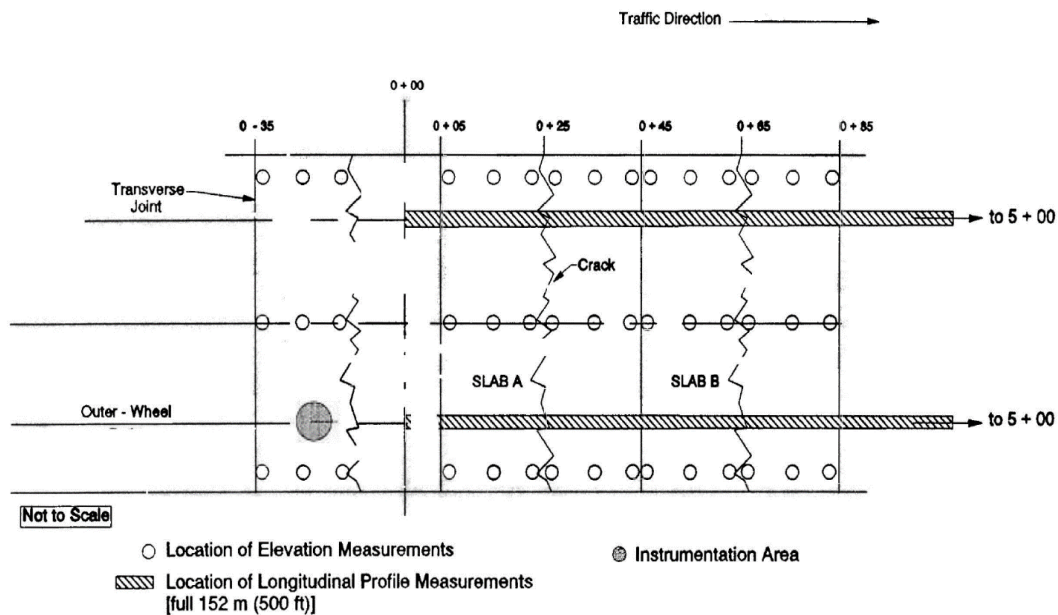


Figure 5.3 Elevation and Profile Data Collection Plan – JRC Pavements (Rada et al., 1994)

5.4.3. Time Domain Reflectometry (TDR)

The time domain reflectometry (TDR) measured the water content in unbound base and subgrade materials.

Ten probes were being used to collect the water content data with the first 8 probes spaced at 6 in, 152 mm, and the last 2 probes spaced at 1 ft, 302 mm, Figure 5.4 and Figure 5.5. The location of the first probe depends on the thickness of the top granular base or subbase layer (Jiang and Tayabji, 1999),

- Greater than 12 in (305 mm), the first TDR probe is placed 6 in (152 mm) below the bottom of the lowest stabilized layer
- Smaller or equals to 12 in (305 mm), the first TDR probe is placed at mid depth of the top granular base or subbase layer

It is important for the analysis to figure the first TDR probe number in the subgrade.

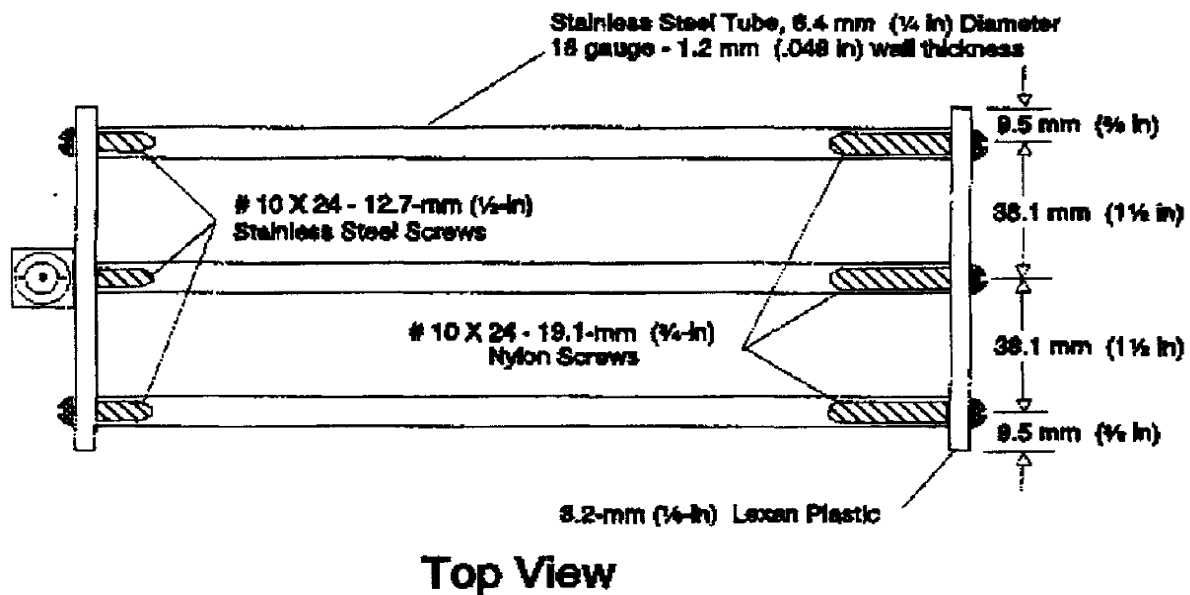


Figure 5.4 TDR Probe Installed in The LTPP SMP Sites (Jiang and Tayabji, 1999)

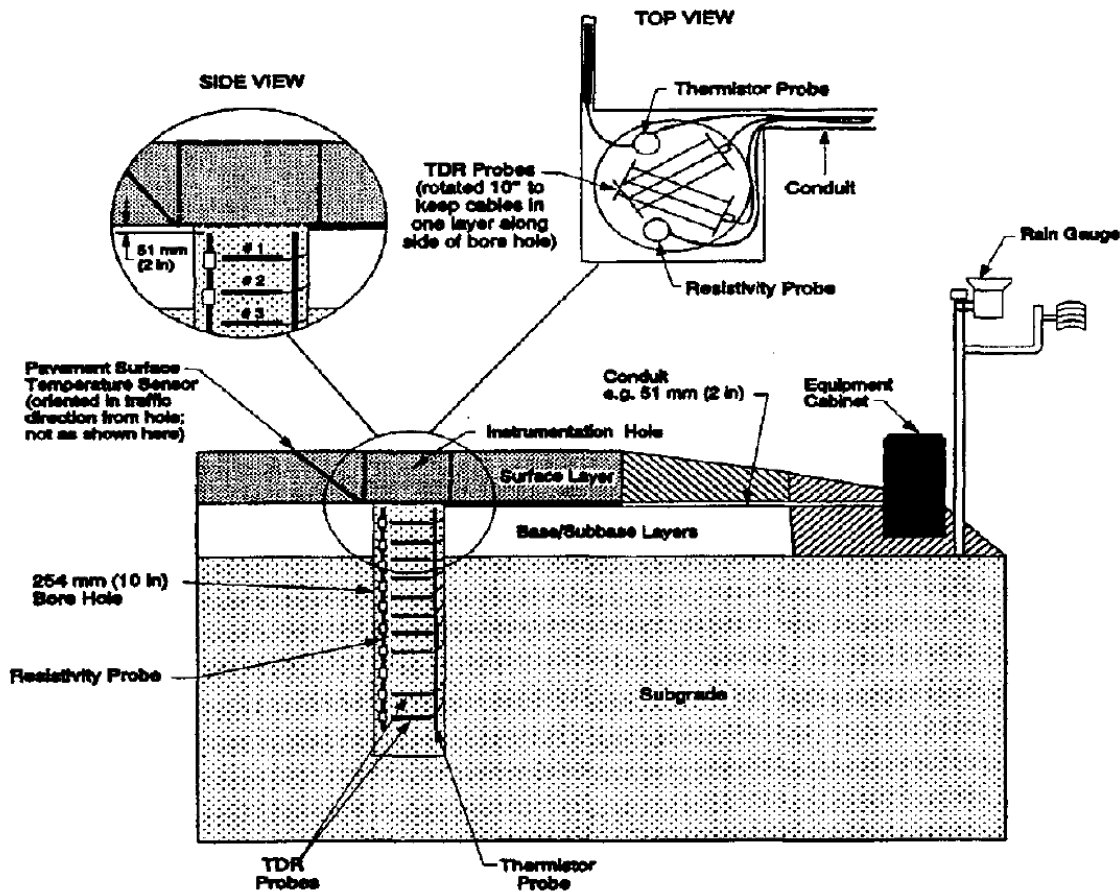


Figure 5.5 LTPP SMP Instrumentation Layout (Jiang and Tayabji, 1999)

5.5. Data Collection

A summary of the LTPP sources, spreadsheets' names, and the type of data collected can be found in Table 5.1. Weighted plasticity index, which is a product of Plasticity Index, PI, and percent passing No. 200 sieve, P_{200} , was calculated to define sections with expansive soils potential, $wPI \geq 10$, using the following formula, (Zapata et. al, 2006)

$$wPI = \frac{PI \times P_{200}\%}{100} \quad (5 - 1)$$

If more than one soil properties test was found for a section, the average value was calculated. Fifteen out of the 64 sections used in SMP were found to have subgrade material with wPI values close to or greater than 10, Table 5.2. Note that although two of the 15 sections, SD 46-0804 and IN 18-3002, do not have a wPI value that can be rounded up to 10, an exception was given because the wPI of those two sections was an average value of two tests with one had a wPI value greater than 10. Those 15 sections were primarily chosen for the calibration of the volume change due to expansive soils and will be referred herein as the "Calibration SMP Sections". Detailed soil property results for the Calibration SMP Sections can be found in Appendix 5A.

Table 5.1 LTPP Sources of the Data Collected for the Analysis

Type of Data Collected	LTPP Source (Spreadsheet Name)
Subgrade Soil Gradation	TST_SS02_UG03
Subgrade Soil Atterberg Limits	TST_UG04_SS03
Elevation Data	SPM_ELEV_AC_DATA and SMP_ELEV_PCC_DATA
Pavement Layers and Thicknesses	Individual Section Summary Reports for Each Road Section
Frost Penetration	SMP_FROST_PENETRATION
Volumetric Moisture Content Measured Using TDR	SMP_TDR_AUTO_MOISTURE_TLE
Watertable Depth	SMP_WATERTAB_DEPTH_MAN

Using the Calibration SMP Sections, changes in elevation over time along the monitored road section were computed from the elevation database. The data collected under the pavement edge was statistically analyzed, and the results were divided based on the pavement type: AC or PCC.

The analysis conducted includes the search of data that belongs to areas where frozen heave and expansive behavior may concurrently occur. When the frost heave susceptibility is moderate or severe, only the elevation change data corresponding to non-freezing months was used. The following section explains how to identify frost heave possible occurrence.

Table 5.2 Summary of the Pavement Type and Soil Properties of the Calibration SMP Sections

Section ID	Pavement Type	NO_200_PASSIN G	LIQUID_LIMI T	PLASTICITY_IND EX	w _{PI}
AL 01-0101	AC	68	49	14	10
AL 01-0102	AC	61	42	16.6	10
CO 08-1053	AC	92	40	22	20
MT 30-8129	AC	58	31	16.5	10
NE 31-0114	AC	95	48	30	28
SD 46-0804	AC	57	33.5	12.5	7
SD 46-9187	AC	64	44	24	21
TX 48-1068	AC	74	38	20	16
KS 20-4054	CRCP/JRCP	92	36	20	23
MN 27-4040	CRCP/JRCP	73	32	14	10
TX 48-4143	CRCP/JRCP	90	41	23	21
NC 37-0201	JPCP	80	57.5	27	21

OH 39-0204	JPCP	74	36	19.7	15
MB 83-3802	JPCP OL w/ AC	92	74	41.5	38
IN 18-3002	JPCP OL w/ AC	67	30.5	14	9

Frost-Susceptible Soils

The first step in the process was to identify whether the road-section-subgrade-soil is frost susceptible or not. Table 5.3 and Figure 5.6 summarizes the classification of frost-susceptible soils (Christopher et al., 2006).

Table 5.3 Frost Susceptibility Classification of Soils (NCHRP 1-37A, 2004)

Frost Group	Degree of Frost Susceptibility	Type of Soil	Percentage Finer than 0.075 mm (# 200) by wt.	Typical Soil Classification
F1	Negligible to low	Gravelly soils	3-10	GC, GP, GC-GM, GP-GM
F2	Low to medium	Gravelly soils	10-20	GM, GC-GM, GP-GM
		Sands	3-15	SW, SP, SM, SW-SM, SP-SM
F3	High	Gravelly Soils	Greater than 20	GM-GC
		Sands, except very fine silty sands	Greater than 15	SM, SC
		Clays PI>12	—	CL, CH
F4	Very high	All Silts	—	ML-MH
		Very Fine Silty Sands	Greater than 15	SM
		Clays PI<12	—	CL, CL-ML
		Varied clays and other fine grained, banded sediments	—	CL, ML, SM, CH

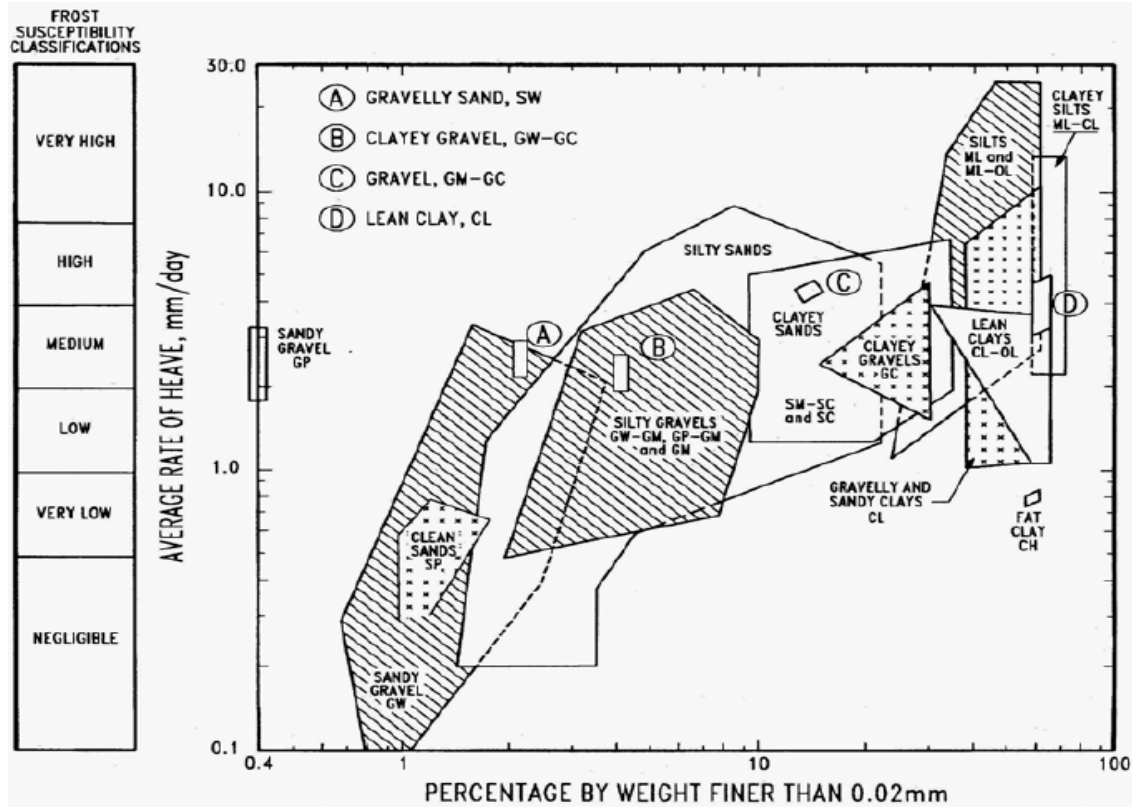


Figure 5.6 Percent Finer than 0.02mm Versus Average Rate of Heave (Kaplar, 1974)

Frost-Susceptible Conditions

Water supply is considered as the main distinctive factor to evaluate frost-susceptible conditions. Considering frost susceptible soils within the frost zone, the frost hazard potential would be rated, in general, **high** if the water table within 3 m (10 ft), and **low** if it is greater than 6 m (20 ft) below the pavement surface (Christopher et al., 2006). The other main factor is the frost penetration, or sometimes called frost depth, which is directly affected by climate change. Referring to Figure 5.7, the most frost-susceptible locations lie under the wet-freeze (WF) zone where cold weather and supply of water exist.

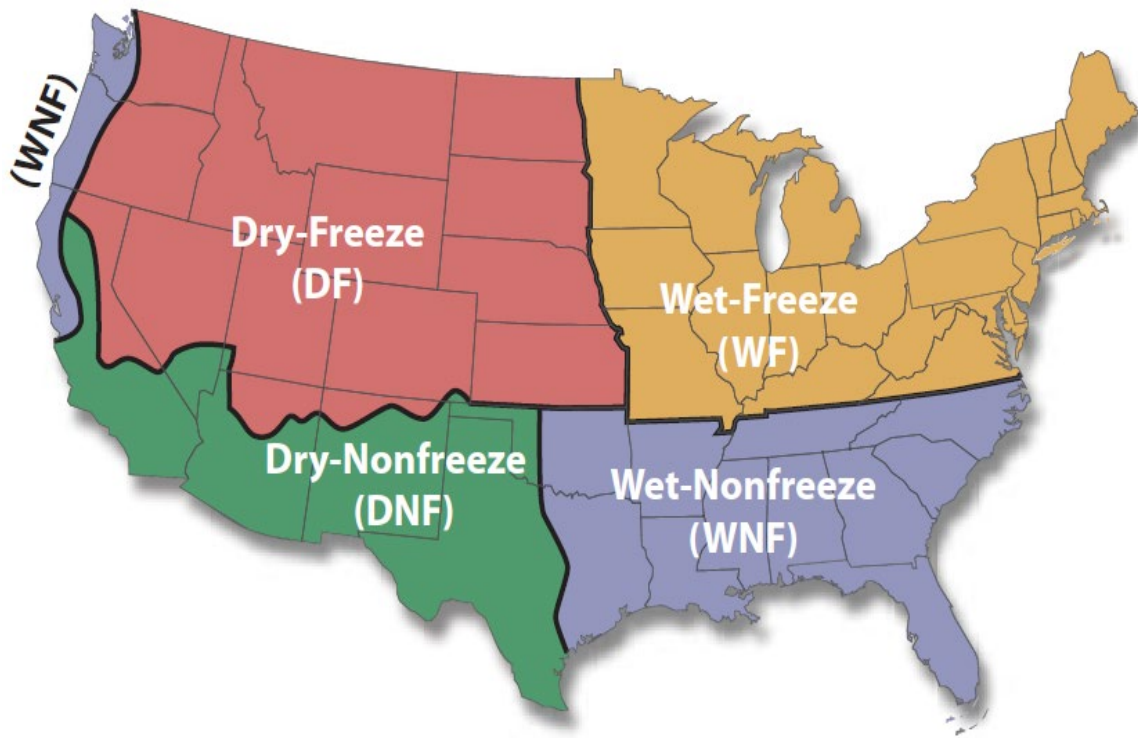


Figure 5.7 Four Climatic Zones as Identified in the LTPP (PAAC, 1995)

Identifying High Frost Hazard Potential Times (Dates) of the Calibration SMP Sections

Out of the 15 sections used in the calibration study, 11 lies under freezing regions, either wet or dry. Each of the 11 sections was examined based on soil properties, groundwater table (GWT) depth, frost penetration depth, air temperature from the closest weather station, and water content measurement from Time Domain Reflectometer (TDR). All factors, other than daily air temperature, can be found using LTPP database. However, it was found that sometimes GWT and/or depth of penetration data were not available or was partially, but not enough, available. In such cases, the TDR measurements and air temperature were used to indicate dates of frost heave possibility. An example is demonstrated later in this chapter shows detailed steps used to identify time, dates, in which records were collected with the possibility of frost heave occurrence to be eliminated from the analysis.

5.6. Analysis

Table 5.4 shows a sample of the elevation records collected from LTPP website for one of the AC sections, named AL 01-0102. As mentioned earlier, the elevations records, which were collected in meters, were measured for five transverse locations, PE, OWP, ML, IWP, ILE. Column 3, LOC_ELEV, represents the longitudinal location of the surface elevation measurement. Generally, 8 to 17 locations about 7.5 meters (25 feet) apart were found for each section, Figure 5.1. Since the purpose of this study is to adjust the shrink swell model with elevation changes data under the pavement edges due to relatively minimal traffic effect, the analysis was corresponded to the pavement edge (PE) data only.

5.6.1. Analysis of Measured Elevation Change

The measured elevation data for all 15 sections of the Calibration SMP Sections, used for the high-volume change study portion, were initially collected, and synthesized as follows:

Table 5.4 Portion of Measured Elevation Data Collected for AL 01-0102

SHRP ID	SMP_DATE	STATE_CODE EXP	LOC_ ELEV	ELEV_ PE	ELEV_ OWP	ELEV_ ML	ELEV_ IWP	ELEV_ ILE
0102	07/27/1995	Alabama	91.4	0.77	0.78	0.80	0.82	0.84
0102	11/21/1995	Alabama	91.4	0.77	0.78	0.80	0.82	0.84
0102	01/30/1996	Alabama	91.4	0.76	0.77	0.80	0.81	0.84
0102	04/17/1996	Alabama	91.4	0.76	0.77	0.80	0.82	0.84
0102	08/23/1996	Alabama	91.4	0.77	0.78	0.80	0.82	0.84
0102	10/11/1996	Alabama	91.4	0.77	0.78	0.80	0.82	0.84
0102	10/28/1997	Alabama	91.4	0.77	0.77	0.80	0.82	0.84
0102	01/12/1998	Alabama	91.4	0.77	0.77	0.80	0.81	0.84
0102	04/30/1998	Alabama	91.4	0.76	0.77	0.80	0.81	0.84
0102	11/21/1998	Alabama	91.4	0.76	0.77	0.80	0.81	0.84
0102	07/27/1995	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	11/21/1995	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	01/30/1996	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	04/17/1996	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	08/23/1996	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	10/11/1996	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	10/28/1997	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	01/12/1998	Alabama	99.1	0.91	0.92	0.94	0.96	0.98
0102	04/30/1998	Alabama	99.1	0.91	0.91	0.94	0.96	0.98
0102	11/21/1998	Alabama	99.1	0.91	0.92	0.94	0.96	0.98

- 1- The sections were divided into two groups, AC and PCC. *Sections with PCC overlays with AC are considered PCC since the physical behavior of the PCC, the rigidity, is believed to govern the reaction due to volume change.*
- 2- Elevation records were converted from SI units, meters, to English Units, inches.
- 3- For every station location, the initial, oldest, measure was taken as a reference point, and therefore, it was subtracted from all subsequent elevation readings to compute the incremental elevation change since the initial date. This approach provided a quantitative estimate of the change in elevation, that would be then compared to climatic change conditions at the same time. Note that the records on the first date were used as a reference and, therefore, they were ***not*** included in step 4. Tables in Appendix 5B show the results for AC and PCC sections. The following are some notes that highlight and explain the unusual values found in those tables:

- a. Column “Station (ft)” represents the longitudinal location. Sometimes, values appear as a new Station with missing dates. At the same time, a close Station includes the rest of the dates. It has been concluded that the Station value was incorrect and need to be changed so the dates add up. An example can be found in section, Kansas, KS 20-4054, Station 469.5 on 08/05/1996. The original Station value for this date is 468.8 and appears as a new Station with one record only. So, it was updated to 469.5 since this is the only date missing for the 469.5 group. Note that, although a closer Station, 469.2, was found, to which it would be more logical for this value to belong, it had no missing records. This method was applied to every highlighted cell in the “Station (ft)” column.
 - b. The highlighted cells in the “Δ ELEV_PE (in)” represent outliers.
- 4- For each elevation measuring date, there were 9 to 17 elevation change values based on the number of the longitudinal stations reported for each road section. The average elevation change, and the standard deviation were calculated to represent heave properties of the entire section, at a particular date. Appendix 5C show the results for AC and PCC sections. Note that,
- a. missing values are presented with “***”.
 - b. dates with frost heave possibility are highlighted.
 - c. in Section MB 83-3802, on 04/22/1998, the results were off for all longitudinal stations although it is believed, based on the analysis that is explained later to define whether the soil was frozen or not, that the soil was not frozen on this date. It was assumed that the reason might be just a reading error, such as using a different datum.
 - d. in Section IN 18-3002, the readings in station 512.1 were eliminated since it is believed that a reading error may have occurred.

5.6.1.1 Summary of the Available Records

As a summary, some records were eliminated due to one, or more, of the following reasons,

- 1- Missing values.
- 2- The record was an outlier when compared to the others.
 - a. Usually, the outlier is one record at a specific date within one station.
- 3- Evidence was found that part of the subgrade, which had been defined as susceptible to frost heave, was frozen at the date of the records.
 - a. The records for all stations collected on that date were eliminated. The frozen dates and their records were highlighted, and the data can be found in Appendix 5C.

For TX 48-4143, the elevation changes on 11/19/1996 and after are very different from the data collected before that time. Since no construction records were found around this time, or even after, it was assumed that the datum to which the elevation was related had been changed. Thus, the records on 11/19/1996 were used as new reference values. Table 5.5 summarizes the number of records eliminated from each Calibration SMP Section and the total number of usable records for the analysis.

5.6.2. Calibrating the Shrink Swell Model with the Analyzed Measured Elevation Change Data

A shrink swell model that considers the effect of the soil properties, environmental factors, and overburden pressure was developed to predict elevation change due to the presence of expansive soils in the subgrade

layers. This model predicts a monthly elevation value starting from the construction date of the pavement. Note, for this model to work, the depth to stable suction should be above the ground water table, GWT. The following is the summary of the analysis applied to calibrate the analyzed measured elevation change data with the predicted elevation change using the shrink swell model.

- 1- For each of the Calibration SMP Sections, the elevation change was predicted monthly from the construction date.
- 2- The predicted elevation values, which have the same month/year of the measured elevation records, were collected.
- 3- The predicted values were then normalized to the first value of the measured elevation change, so it would start at the same elevation value. This was done by using the first measured elevation change value as a reference point and subtracting it from the first predicted value, to calculate the “Normalizing Value”. Then, the Normalizing Value was used by subtracting it from all subsequent elevation prediction, Table 5.6. Note that the first predicted value, which had been used to calculate the Normalizing Value, was not included in the developed statistical correlation between the measured and normalized predicted results. Also, it was important to make sure that the reference points were not value collected when the ground was partially frozen. Appendix 5D shows the results for all sections used in the analysis. In Appendix 5D,
 - a. frozen dates are **highlighted** to be eliminated from further steps of the analysis.
 - b. the value used as the “reference point” was lightly highlighted.
- 4- A statistical correlation was developed for the measured and normalized predicted values for AC and PCC separately. A summary of the results can be found in the Results and Conclusion section.

Table 5.5 Summary of the Useable Data for The Analysis

Section ID	No. of Available Dates	No. of Stations	Total No. of Available Records	Missing Values	Outliers	Eliminated Dates due to Frost Potential	No. of Usable Records	No. of Averaged Values can be Used in the Analysis
AL 01-0101	11	8	88	0	0	0	88	10
AI 01-0102	10	9	90	0	0	0	90	9
CO 08-1053	15	9	135	0	7	0	128	14
MT 30-8129	13	9	117	1	2	5	69	7
NE 31-0114	5	12	60	0	0	1	48	3
SD 46-0804	11	12	132	1	1	3	94	7
SD 46-9187	13	11	143	0	0	4	99	8
TX 48-1068	12	9	108	0	0	0	108	11
KS 20-4054	6	15	90	0	2	0	88	5
MN 27-4040	22	15	330	0	0	11	165	10
TX 48-4143	12	15	180	0	9	0	156	10
NC 37-0201	17	17	289	36	5	2	214	14
OH 39-0204	5	15	75	0	11	0	64	4
MB 83-3802	24	15	360	0	15	13	150	9
IN 18-3002	4	15	60	1	3	0	56	3
						Total No. of Usable Average Values		124

**Table 5.6 Normalizing the Predicted Elevation Values to the Measured Elevation Changes for
Section AL 01-0101**

	Measured	Predicted	Predicted Normalized
Date	PE M	PE 1	PE 1 Norm.
11/20/1995	-0.0044	0.0131	-0.0044
01/29/1996	0.0787	0.0081	-0.0094
04/17/1996	0.0612	0.0014	-0.0161
08/22/1996	-0.0175	0.0033	-0.0142
10/10/1996	0.0000	0.0015	-0.0161
10/30/1997	0.0569	0.0005	-0.0170
01/09/1998	0.0306	0.0017	-0.0158
04/25/1998	0.1137	-0.0078	-0.0253
07/20/1998	0.0744	-0.0090	-0.0265
11/11/1998	0.1006	-0.0061	-0.0236
	Normalizing Value	0.0175	

5.7. Discussion

The shrink swell model, which predicts elevation changes for expansive soil profiles has a critical limitation: the depth to stable suction, called equilibrium suction, is assumed to be above the groundwater table, GWT. For this reason, five road sections were eliminated: CO 08-1053 and MT 30-8129 for AC pavements, and MN 27-4040, TX 48-4143, and NC 37-0201 for PCC pavements. As a result, ten out of the 15 Calibration SMP Sections had stable suction depth lower than GWT depth, 6 AC and 4 PCC pavement sections. The analysis was then conducted for AC and PCC, separately.

5.7.1. Identifying Records Measured at the Time of Possible Frost Heave Occurrence

With the available data, identifying whether the subgrade was frozen at a specific time, date, can be considered a challenge. Section MB 83-3802 in Manitoba is used as an example that reflects the process required to approach such goal. This process was used as a general guideline to identify those records measured at the time of possible frost heave occurrence to be eliminated from the expansivity analysis.

MB 83-3802 road section probably lies within the coldest region when compared with the other Calibration SMP Sections. It has a fat clay subgrade, which is considered highly susceptible to frost heave, Table 5.2. It contains almost all required data for the identification purpose. This section has a pavement type of a JPCP overlays with AC. Table 5.7 shows the layers and their thicknesses.

Table 5.8 shows a fraction of the dates for which measured elevation records are available.

Table 5.7 Layers and Thicknesses for Section MB 83-3802

Pavement Layers	Type	JPCP covered with AC
	Surface (AC) (in)	6
	JPCP (in)	9.8
	Base (in)	4.9
	Subbase (in)	5.9
	Total	26.6

Table 5.8 Measured Elevation Records Dates for Section MB 83-3802

Date
10/15/1993
11/15/1993
12/14/1993
02/15/1994
03/15/1994
03/29/1994
04/12/1994
05/02/1994
06/20/1994
08/22/1994
09/20/1994
10/18/1994
02/14/1995

In the analysis, measured elevation record found in the first date was taken as an initial reference point, as mentioned in section 5.6.1. For frost heave effect not to be directly implemented in all records, it is essential that there is no possibility of frost heave existence at the time of the initial reference point measurement.

The first step to check frost heave possibility was referring to the SMP frost penetration data measured using electrical resistivity. Table 5.9 shows an example of the frost penetration data collected during the freezing months for this road section. It should be noted that the electrical resistivity measured frost penetration from the depth of the subgrade, or very close to it. For example, the total thickness of the pavement in this section is 26.6 inches and the frost penetration measurements started at 25.2 inches below the surface, which is almost the depth to the subgrade. In other words, it can be assumed that everything above 25.2 inches was also frozen. However, vice versa situation was assumed during the thawing months since thawing, as freezing, takes place from top to bottom. In Table 5.10, for example, freeze started from 35.4 inches, which means from the depth of 25.2 inches to 35.4 inches was assumed not to be frozen and so was the depth from surface to 25.2 inches.

The reference point for this section was measured on 10/15/1993. In Manitoba, October may be a freezing month since the temperature often drops below 0 °C. The frost penetration data for this road section started on 11/09/1993, so it did not include the reference date. The reason may be because no frost occurred before 11/09/1993 on that year, or it can also be because no measurement had been taken before this date.

“Since the dielectric constant for ice is significantly different than that for water, the water contents measured by the TDR probes during the frozen periods may reflect the presence of ice” (Christopher et al., 2006). As a result, the TDR records were collected for the analysis.

Table 5.11 shows the depth of each TDR probe from the surface, and the first probe that penetrated the subgrade, probe 3, was highlighted. Figure 5.9 shows the change in water content with time for probe 3 based on TDR measurements. It can be said that when the water was frozen, the TDR reading from probe 3 would reflect a water content of about 38%, which was about 10% less than the liquid phase on the Spring/Summer months, about 48%. Also, it seems the water did not freeze in probe 3 before November in any of the available years. Thus, **it can confidently be said that the subgrade had not experienced frost heave on 10/15/1993.**

By looking at Figure 5.8, the results on 11/15/1993 may be questionable. One may argue that it is suspicious to assume that the water content on 11/12/1993 is frozen but not that on 11/15/1993, especially when the frost penetration depth was greater on the 15th than the 12th, as it appears in Table 5.9. It might be considered as a reading error. However, it might also be inaccurate TDR measurement. To further investigate, Figure 5.9 was developed to compare water content change with time for probes 3 and 10 to see whether the change in water content logically reflected the environmental conditions, which included frost penetration and groundwater table, GWT.

For that, a time was chosen when the frost penetration depth was somewhere in the middle of probes 3 and 10, 12/14/1993. Referring to Table 5.9, the frost penetration depth on 12/14/1993 was 51.2 inches from the surface, which was between probe 6 and 7, Table 5.11.

Additionally, GWT measurements collected using piezometer can be found in Table 5.12. Comparing the depth of the GWT from Table 5.12 with depths of probes from

Table 5.11 on 12/14/1993, it is obvious that probe 10 is fully submerged and the water content should be at maximum. In addition, frozen water should not occur at this probe at this time as explained in the previous paragraph. Also, Figure 5.9 shows that the water content for probe 10 can reach 52%. However, the water content of prob 10 is about 44% on 12/14/1993 when it is supposed to be around 50-52%, which means that the TDR results can be questionable.

To sum up with the TDR data, the overall change from non-freezing to freezing months can be considered **acceptable** for this section. In fact, Figure 5.10, which includes the results of all TDR probes, shows relatively similar changes, seasonally, in all the probes. However, using the exact water content value found by the TDR can be **questionable**. Note that this does not interfere with the elimination of records on 11/15/1993 due to the frost existence.

**Table 5.9 Part of Frost Penetration Records Measured in the SMP for Section MB 83-3802
(Freezing Time)**

SMP_FROST_PENETRATION						
STATE_CO DE	STATE_CODE_ EXP	SHRP_I D	SMP_DATE	FROZEN_LA YER_NO	FREEZE_F ROM (in)	FREEZE_ TO (in)
83	Manitoba	3802	11/9/1993	1	25.2	27.2
83	Manitoba	3802	11/10/1993	1	25.2	29.5
83	Manitoba	3802	11/11/1993	1	25.2	29.5
83	Manitoba	3802	11/12/1993	1	25.2	27.2
83	Manitoba	3802	11/13/1993	1	25.2	27.2
83	Manitoba	3802	11/14/1993	1	25.2	29.5
83	Manitoba	3802	11/15/1993	1	25.2	29.5
83	Manitoba	3802	12/14/1993	1	25.2	51.2
83	Manitoba	3802	1/18/1994	1	25.2	73.2
83	Manitoba	3802	1/19/1994	1	25.2	73.2
83	Manitoba	3802	1/20/1994	1	25.2	75.2
83	Manitoba	3802	1/21/1994	1	25.2	75.2
83	Manitoba	3802	1/22/1994	1	25.2	77.2
83	Manitoba	3802	1/23/1994	1	25.2	77.2
83	Manitoba	3802	1/24/1994	1	25.2	77.2
83	Manitoba	3802	1/25/1994	1	25.2	79.1
83	Manitoba	3802	1/26/1994	1	25.2	79.1
83	Manitoba	3802	1/27/1994	1	25.2	81.5
83	Manitoba	3802	1/28/1994	1	25.2	81.5
83	Manitoba	3802	1/29/1994	1	25.2	81.5
83	Manitoba	3802	1/30/1994	1	25.2	83.5
83	Manitoba	3802	1/31/1994	1	25.2	83.5

**Table 5.10 Part of Frost Penetration Records Measured in the SMP for Section MB 83-3802
(Thawing Time)**

SMP_FROST_PENETRATION						
STATE_CO DE	STATE_CODE_ EXP	SHRP_I D	SMP_DATE	FROZEN_L AYER_NO	FREEZE_FR OM (in)	FREEZE_ TO (in)
83	Manitoba	3802	4/10/1994	1	35.4	95.3
83	Manitoba	3802	4/11/1994	1	37.4	95.3
83	Manitoba	3802	4/12/1994	1	39.4	95.3
83	Manitoba	3802	4/13/1994	1	41.3	95.3
83	Manitoba	3802	4/14/1994	1	41.3	95.3
83	Manitoba	3802	4/15/1994	1	41.3	95.3
83	Manitoba	3802	4/16/1994	1	41.3	95.3
83	Manitoba	3802	4/17/1994	1	41.3	95.3
83	Manitoba	3802	4/18/1994	1	43.3	95.3
83	Manitoba	3802	4/19/1994	1	45.3	95.3
83	Manitoba	3802	4/20/1994	1	45.3	95.3

Table 5.11 The Depth of TDR Probes from The Surface for Section MB 83-3802

Probe	Depth from the surface (in)	Depth from the surface (ft)
1	18.25	1.52
2	24.25	2.02
3	30.25	2.52
4	36.25	3.02
5	42.25	3.52
6	48.25	4.02
7	54.25	4.52
8	60.25	5.02
9	72.25	6.02
10	84.25	7.02

5-24

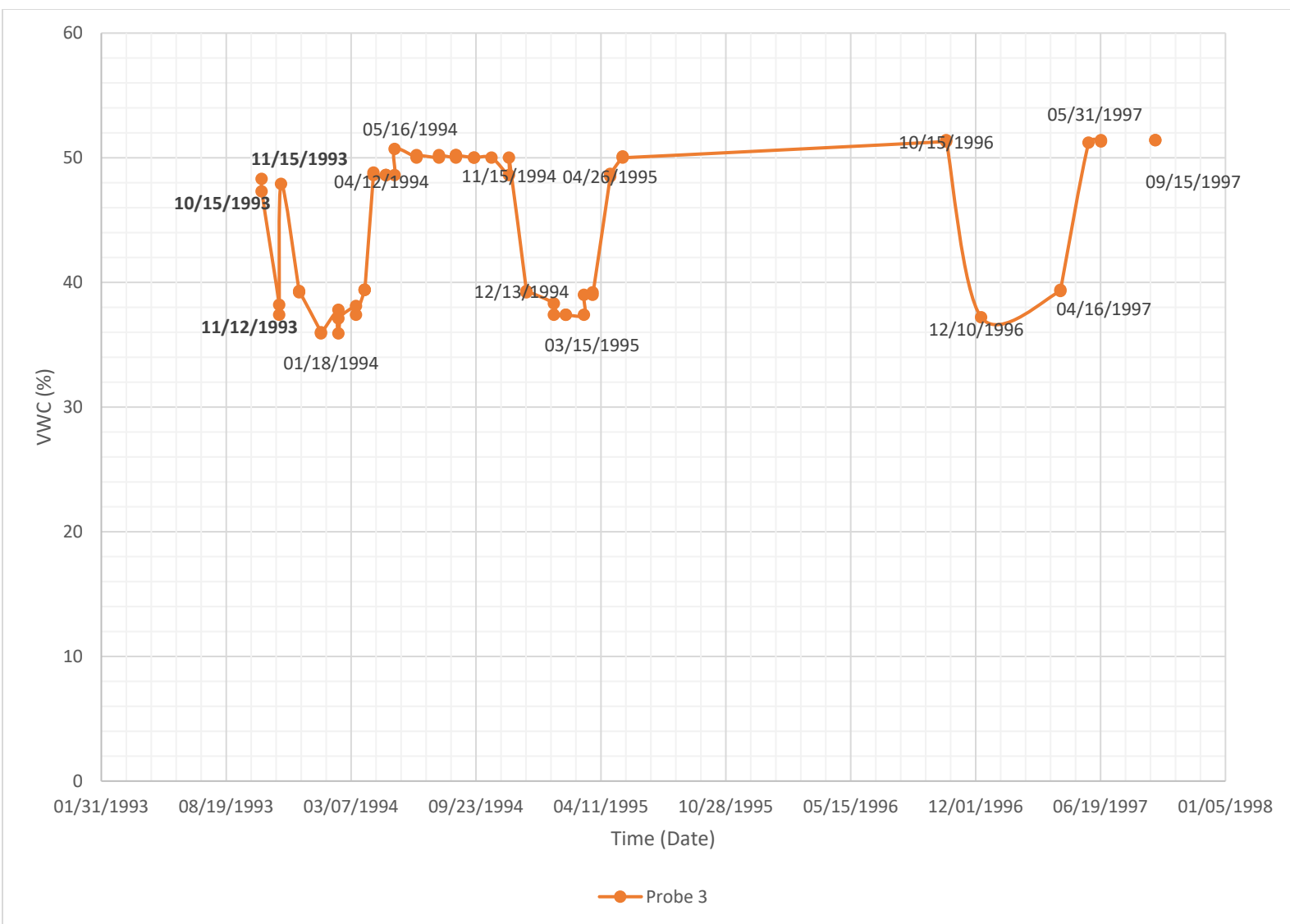


Figure 5.8 Time vs. Volumetric Water Content Measured Using TDR for Probe 3 of Section MB 83-3802

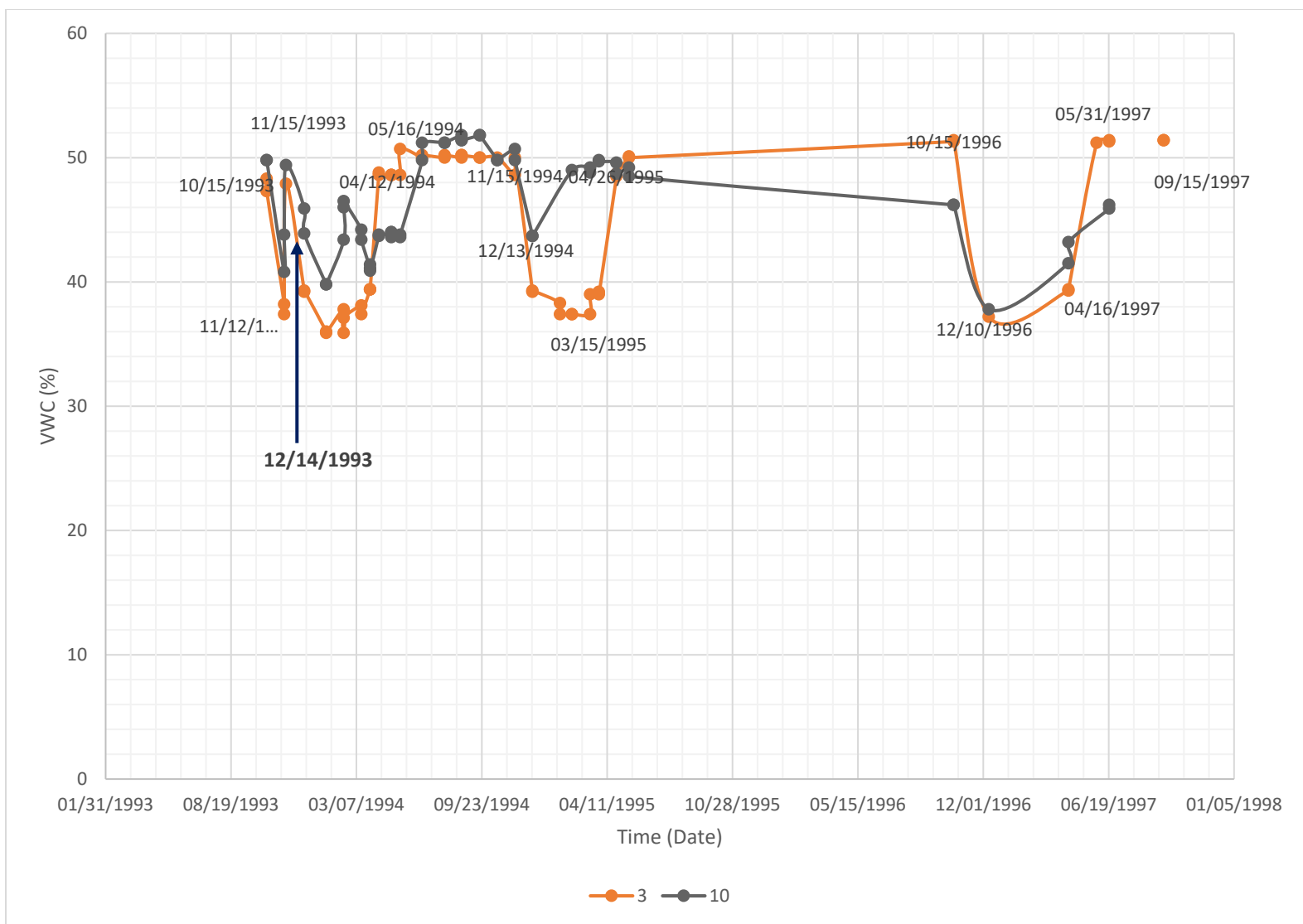


Figure 5.9 Time vs. Volumetric Water Content Measured Using TDR for Probes 3 and 10 of Section MB 83-3802

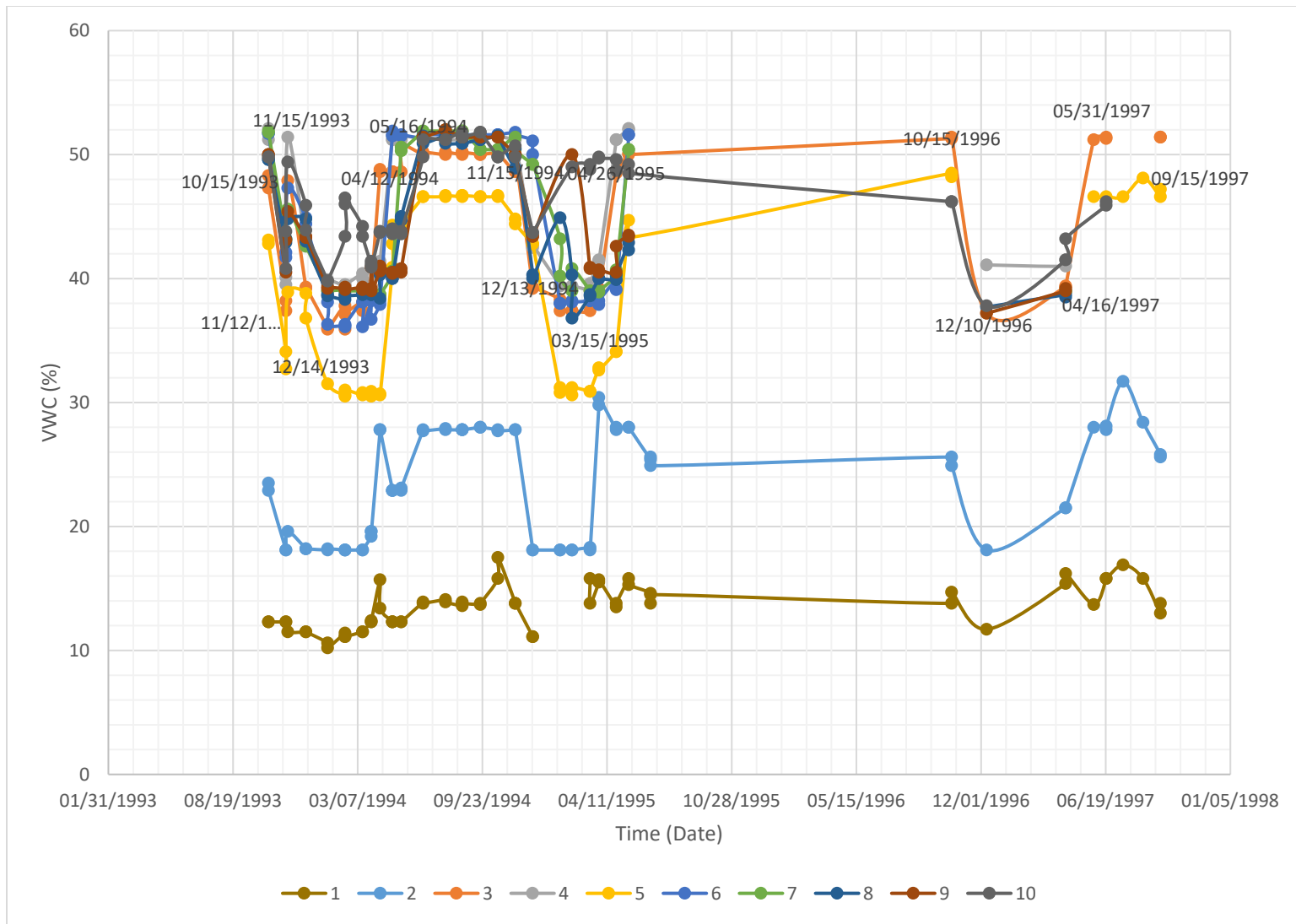


Figure 5.10 Time vs. Volumetric Water Content Measured Using TDR for all Probes of Section MB 83-3802

Table 5.12 Sample of the GWT Measurements for Section 83-3802

SMP_WATERTAB_DEPTH_MAN						
SHRP_ID	STATE_CODE	STATE_CODE_EXP	SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (in)	WATERTAB_DEPTH (ft)
3802	83	Manitoba	11/15/1993	0920	131.10	10.93
3802	83	Manitoba	11/15/1993	1305	131.10	10.93
3802	83	Manitoba	12/14/1993	0800	83.86	6.99
3802	83	Manitoba	12/14/1993	1300	83.86	6.99
3802	83	Manitoba	02/15/1994	0920	105.12	8.76
3802	83	Manitoba	02/15/1994	1345	105.12	8.76
3802	83	Manitoba	03/15/1994	0800	123.23	10.27
3802	83	Manitoba	03/15/1994	1350	123.23	10.27
3802	83	Manitoba	03/29/1994	0830	116.54	9.71
3802	83	Manitoba	03/29/1994	1447	116.93	9.74
3802	83	Manitoba	04/12/1994	0730	111.42	9.28
3802	83	Manitoba	04/12/1994	1330	111.42	9.28
3802	83	Manitoba	06/20/1994	1010	86.61	7.22
3802	83	Manitoba	06/20/1994	1330	84.25	7.02
3802	83	Manitoba	07/26/1994	0730	54.33	4.53
3802	83	Manitoba	07/26/1994	1030	54.33	4.53
3802	83	Manitoba	08/22/1994	0800	42.13	3.51
3802	83	Manitoba	08/22/1994	1500	41.73	3.48
3802	83	Manitoba	09/20/1994	0800	45.67	3.81
3802	83	Manitoba	09/20/1994	1420	45.67	3.81
3802	83	Manitoba	10/18/1994	0820	47.24	3.94
3802	83	Manitoba	10/18/1994	1430	46.46	3.87
3802	83	Manitoba	11/15/1994	1005	59.84	4.99
3802	83	Manitoba	11/15/1994	1300	59.45	4.95
3802	83	Manitoba	12/13/1994	0840	70.87	5.91
3802	83	Manitoba	12/13/1994	1530	70.87	5.91
3802	83	Manitoba	01/26/1995	1000	83.46	6.96
3802	83	Manitoba	02/14/1995	0930	115.35	9.61
3802	83	Manitoba	02/14/1995	1245	115.35	9.61

Another factor that was used in the analysis is the air temperature. For the same example discussed earlier, the air temperature had been collected using the following website, <https://winnipeg.weatherstats.ca>. Table 5.13 shows the air temperature data collected a week before the targeted date to give a better indication of the weather. For the date 10/15/1993, the low temperature did drop below freezing point, 32 °F. However, would that be enough to freeze the ground all the way to the subgrade? Comparing the temperature results with the date of the first frost penetration record available, 11/09/1993, the temperature for a full week did not reach above 32 °F but on 11/03/1993 when the maximum reached 34 °F. Keep in mind that with all this cold air temperature, frost penetrated about only 2 inches into the subgrade. Thus, again, ***it can confidently***

be said that the subgrade had not experienced frost heave on 10/15/1993. Such analysis has been applied to every date in which frost heave may have occurred for this section, and for other Calibration SMP Sections located inside freezing zones.

Table 5.13 A Sample of Air Temperature Data Collected for Section MB 83-3802

MB 83-3802		
DATE	T _{MAX}	T _{MIN}
10/9/1993	52	20
10/10/1993	60	29
10/11/1993	44	22
10/12/1993	39	22
10/13/1993	51	29
10/14/1993	45	22
10/15/1993	51	32
11/3/1993	34	28
11/4/1993	29	21
11/5/1993	24	15
11/6/1993	29	7
11/7/1993	25	16
11/8/1993	26	10
11/9/1993	25	6

Another relatively unusual record that it is worth a brief discussion is found in section MN 27-4040. Referring to Appendices 5F and 5G would help better understand this discussion. The analysis on 11/16/1993 is relatively tricky since no frost penetration depth was recorded. However, a close look at TDR probe 3 on that day can show a frost possibility. The water content for probe 3 fluctuates between about 26, in absolute freezing months, and 36 in absolute nonfreezing months. Two water content records were found for this date in the early morning and early afternoon, 27.1 and 29.1 respectively. Additionally, the water content was about 33% a month earlier. However, the water content in probes 2, which lies inside the base layer that is supposed to have high drainage, and 4 were almost constant in both 10/1993 and 11/1993. Thus, records on 11/16/1993 were eliminated due to the possibility of frost heave occurrence at the very top of the subgrade layer.

One more suspicious record was found in road Section NE 31-0114 on 02/18/1998. No frost penetration record was found at this date, Appendix 5F. However, frost penetration data stopped on 01/25/1998 and resumed on 03/09/1998 without clear indication that thawing might have occurred. So, it is believed that records between those two dates were somehow lost. By checking the TDR data, specifically probes 6 and 7, it can be said that there is a high possibility that frost did occur on 02/18/1998, Appendix 5H, so the records were eliminated.

Appendices 5E through 5L contain all tables and figures used to identify records measured at the time of possible frost heave occurrence. The following are some important notes for some of the Appendices,

- In Appendix 5F,
 - no frost penetration records available for road section NC 37-0201 although it lies within a freezing climate.
 - freezing depths were measured from the ground surface.
 - layer number 1, found in column 4 “FROZEN_LAYER_NO” means the subgrade, and 2 is above the subgrade, subbase or base, etc.
- In Appendix 5G,
 - the first probe into the subgrade for each Calibration SMP Section was highlighted.
- In Appendix 5H,
 - black cells represent missing records.
- In Appendix 5I,
 - only 3 or 4 probes were used in the figures starting with the first probe number into the subgrade followed by deeper 2 or 3 probes with as completed data as possible. It is possible to add all probes to a figure, but it will be difficult to read.
 - road Section TX 48-1068 has a very limited data. Only two probes, 1 and 2, have some continuous data. The rest has only 3 or less reading in 6 years.
- In Appendix 5J,
 - GWT was measured from the ground surface.
 - For the following sections, no GWT records were found in LTPP, AL 01-0101, SD 46-0804, NC 37-0201
 - in road Section TX 48-1068, two readings on 04/21/1997 are believed to be off, so they were highlighted and eliminated from its figure in Appendix 5K.
 - in road Section MB 83-3802, four readings on 05/31/1997, 07/17/1997, 06/11/1998, and 06/29/1998 are believed to be off, so they were highlighted and eliminated from its figure in Appendix 5K.
- In Appendix 5L,
 - for road Section MB 83-3802, air temperature data was collected from Weather Dashboard for Winnipeg website and converted from °C to °F. For all other sections, air temperatures were collected from National Centers for Environmental Information (NCEI) website.
 - in the analysis, air temperature data for a week prior to the date at which the record was available was collected and analyzed.
 - for each section, the targeted dates were highlighted.

5.8. Results and Conclusions

This study led to the development of a calibrated mechanistic model that predicts swelling for soils with free access to moisture due to seasonal fluctuations of climate under pavement covered structures. Elevation changes data measured, as part of the LTPP-SMP study, under the pavement edges, was used in the analysis. Initially, 124 data points were collected from 15 road sections, AC and PCC. However, due to the limitation of the shrink swell model, which predicts elevation changes for expansive soil profiles only if the depth to equilibrium suction is below the GWT, five road sections and their records were eliminated from the study. In addition, records with frost heave frost heave potential were eliminated as well.

A total of 58 calibration points were used, 41 from AC pavement sections and 17 from PCC sections, as shown in Table 5.14 and Table 5.15. A predicted vs measured elevation change was created, as shown in Figure 5.11 and Figure 5.12, The resulted equations for AC and PCC are respectively shown as follows:

$$Y = 0.4409 x - 0.0598 \quad (5 - 2)$$

$$Y = 1.3968 x - 0.052 \quad (5 - 3)$$

Where,

Y is the measured elevation change and x is the predicted elevation change

The agreement results are considered fair, with 61% coefficient of correlation, and good, with 78%, for AC and PCC, respectively. Those equations were used to adjust and calibrate the shrink swell model to estimate volume changes due to expansive soil behavior under pavement covered areas. The results of this chapter constitute a significant portion of the overall project goal as it compares the elevation change results from the two major project efforts that have been accomplished: (a) development of the theoretical model predicted heave and (b) assessment of the actual heave (elevation changes) from the selected LTPP SMP sections used in the calibration process.

Table 5.14 Measured and Predicted Values for AC Sections

Section	Date	AC Pavements	
		PE Measured	PE Predicted
AL 01-0101	01/29/1996	0.0787	-0.0094
	04/17/1996	0.0612	-0.0161
	08/22/1996	-0.0175	-0.0142
	10/10/1996	0.0000	-0.0161
	10/30/1997	0.0569	-0.0170
	01/09/1998	0.0306	-0.0158
	04/25/1998	0.1137	-0.0253
	07/20/1998	0.0744	-0.0265
	11/11/1998	0.1006	-0.0236

AL 01-0102	01/30/1996	-0.0700	0.0774
	04/17/1996	-0.0700	0.0427
	08/23/1996	-0.0175	0.0378
	10/11/1996	-0.0131	0.0652
	10/28/1997	0.0437	0.0377
	01/12/1998	-0.0481	0.1176
	04/30/1998	-0.1225	0.0375
	11/21/1998	-0.1312	0.0366
NE 31-0114	11/05/1997	-0.2408	0.1133
	09/23/1998	-0.4334	-0.1210
SD 46-0804	06/27/1995	-0.5052	-0.7451
	10/24/1996	-0.3419	-0.7695
	04/29/1997	-0.4823	-0.7620
	05/15/1997	-0.4629	-0.7809
	07/22/1997	-0.3989	-0.7976
	09/22/1997	-0.3250	-0.8088
SD 46-9187	10/24/1994	0.0873	0.0554
	04/07/1995	-0.0458	0.1996
	05/22/1995	-0.0372	0.2141
	06/26/1995	-0.0351	0.2198
	10/25/1996	-0.0576	0.1066
	09/23/1997	-0.1292	0.0737
TX 48-1068	04/13/1994	-0.0612	0.0074
	07/14/1994	-0.0350	0.0212
	01/27/1995	-0.0481	0.0198
	04/13/1995	-0.1137	0.0094
	06/08/1995	-0.0919	-0.0050
	11/13/1996	0.0306	0.0542
	01/23/1997	0.0306	0.0652
	04/21/1997	-0.1837	0.0480
	07/03/1997	-0.0744	-0.0005
	09/17/1997	-0.0306	-0.0263

Table 5.15 Measured and Predicted Values for PCC Sections

Section	Date	PCC Pavements	
		PE Measured	PE Predicted
KS 20-4054	11/06/1997	0.0181	0.0527
	02/17/1998	0.0265	0.0470
	08/25/1998	0.0139	0.0683
	11/19/1998	0.0218	0.0608
OH 39-0204	09/29/1998	-0.2433	-0.1294
	02/16/1999	0.1039	-0.0475
	03/23/1999	-0.5378	-0.0675
MB 83-3802	08/22/1994	0.4493	0.4513
	09/20/1994	0.4378	0.4476
	10/18/1994	0.4394	0.4469
	06/20/1995	0.2562	0.4754
	10/15/1996	0.8018	0.4865
	05/31/1997	0.7612	0.4518
	06/20/1997	0.8029	0.4497
	09/15/1997	0.7630	0.4668
IN 18-3002	07/29/1998	-0.0228	-0.0610
	09/28/1998	-0.0270	-0.0560

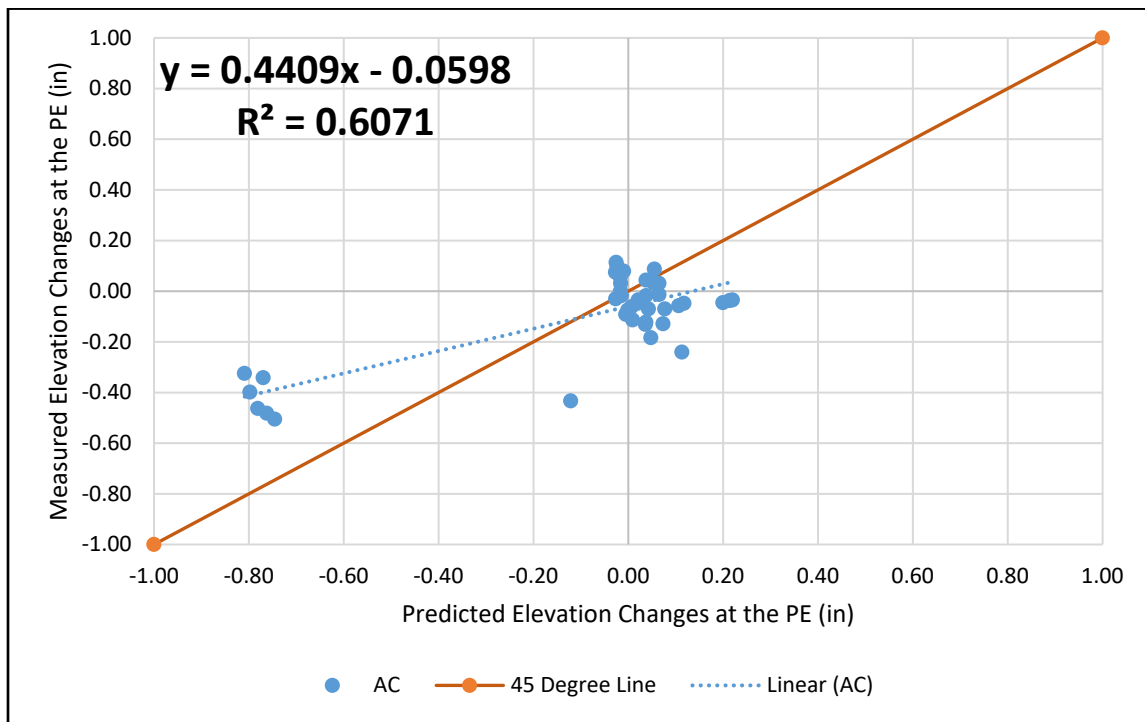


Figure 5.11 Comparison of Predicted and Measured Elevation Changes for AC Pavements

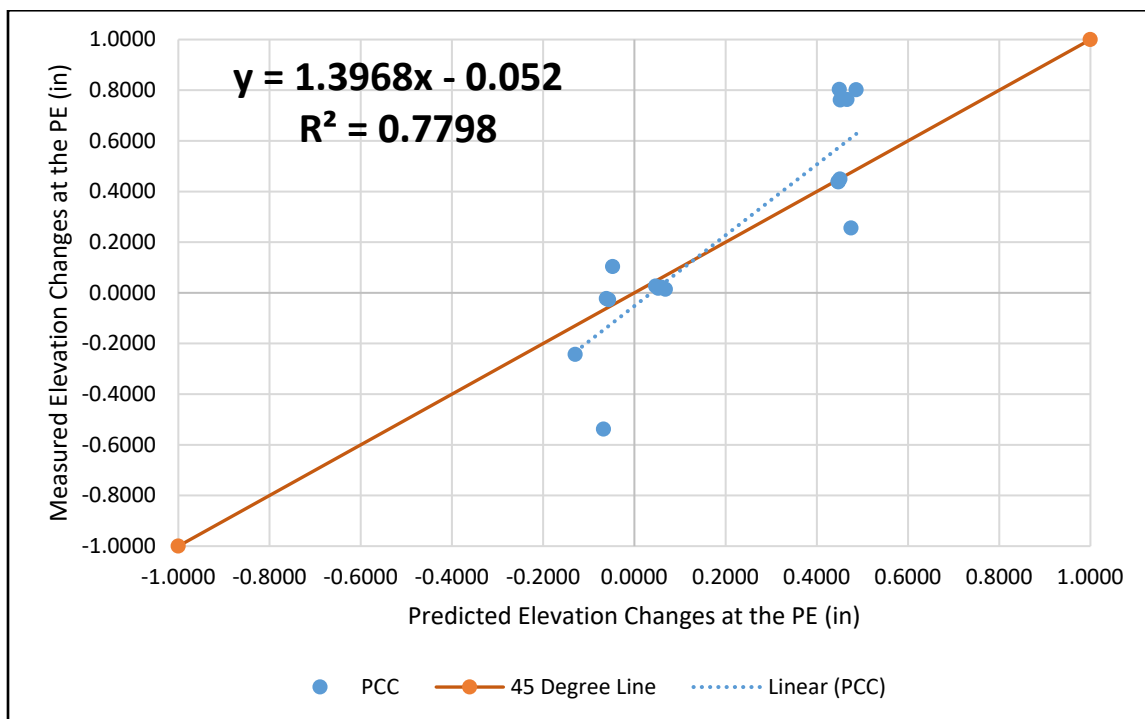


Figure 5.12 Comparison of Predicted and Measured Elevation Changes for PCC Pavements

5.9. References

- Benjamin, J. R., & Cornell, C. A. (2014). *Probability, Statistics, and Decision for Civil Engineers*. Mineola, NY, USA: Dover Publications, Inc.
- Fenton, G. A., & Griffiths, D. V. (2008). *Risk Assessment in Geotechnical Engineering*. Hoboken, NJ, USA: John Wiley & Sons, Inc.
- FHWA. (2010). *Long-Term Pavement Performance Information Management System User Guide*. Federal Highway Administration (FHWA). Washington, DC: U.S. Department of Transportation .
- Montgomery, D. C., Runger, G. C., & Hubele, N. F. (2011). *Engineering Statistics* (5th ed.). Hoboken, NJ, USA: John Wiley & Sons, Inc.
- U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). (2020). Web Soil Survey. (Version 3.4.0). Lincoln, Nebraska, USA. Retrieved 2020, from <http://websoilsurvey.nrcs.usda.gov>

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5A

SOIL PROPERTIES OF THE CALIBRATION SMP SECTIONS

MAY 2023

LIST OF TABLES

Table 5A.1 Soil Gradation Results of the Calibration SMP	1
Table 5A.2 Soil Atterberg Tests Results of the Calibration SMP.....	2

Table 5A.1 Soil Gradation Results of the Calibration SMP

Pavement Type	SHRP ID	STATE CODE	STATE_CODE_EXP	LAYER_NO	LOC_NO	CONSTRUCTION_NO	SAMPLE_NO	TST_SS02_UG03 TEST DATE	NO_4_PASSING	NO_40_PASSING	NO_200_PASSING	HYDR O 02	HYDRO 002	SILT	CLAY
AC	0101	1	Alabama	1	B6	1	BS06	04/08/1997	99.10	89.60	68.00	46.10	23.00	43.80	23.00
AC	0102	1	Alabama	1	B7	1	BS07	04/08/1997	98.90	93.00	75.80	60.70	36.50	39.80	36.50
				1	BA508	2	BS311	02/27/2006	93.00	84.00	65.60	48.40	28.60	37.00	28.60
				1	BA509	2	BS312	02/20/2006	96.00	77.00	40.00	27.10	15.60	24.40	15.60
				1	BA510	2	BS313	02/16/2006	95.00	84.00	62.80	46.00	23.30	39.50	23.20
				1	BA511	2	BS314	02/16/2006	91.00	82.00	60.60	50.00	30.70	29.90	30.70
AC	1053	8	Colorado	1	TP1	1	BS93	4/9/1991	97.00	96.00	91.80	91.40	34.20	57.60	34.20
AC	8129	30	Montana	1	TP1	1	BS92	08/23/1990	84.00	76.00	60.30	39.40	21.10	39.20	21.10
				1	BA*	1	BS**	08/23/1990	85.00	72.00	55.20	37.60	22.70	32.50	22.70
AC	0114	31	Nebraska	1	B2	1	BS02	06/19/1996	100.00	97.00	94.50	66.60	37.20	62.20	37.20
AC	0804	46	South Dakota	1	TP4	1	BS04	01/22/1993	98.00	94.00	49.00	35.00	20.50	28.70	4.00
				1	TP4	1	BS04	01/09/1996	98.00	92.00	44.00	33.10	18.60	22.40	18.60
				1	TP3	1	BS03	01/22/1993	97.00	91.00	64.00	39.20	21.90	41.60	4.90
				1	TP3	1	BS03	01/09/1996	97.00	90.00	59.70	38.80	22.10	39.10	22.10
AC	9187	46	South Dakota	1	TP1	1	BS55	07/12/1990	93.00	77.00	64.00	39.40	23.40	40.40	23.40
				1	BA1	1	BS01	07/12/1990	100.00	98.00	85.70	54.90	35.40	51.50	35.40
AC	1068	48	Texas	1	TP1	1	BS55	8/23/1991	100.00	71.00	54.00	45.00	25.90	28.10	25.90
				1	BA*	1	BS**	8/23/1991	100.00	97.00	94.00	66.00	38.90	55.10	38.90
PCC (CRCP)	4054	20	Kansas	1	BA4	1	BS04	04/19/1990	99.00	98.00	95.90	64.10	37.60	57.80	37.60
				1	BA1	1	BS01	04/19/1990	97.00	94.00	87.20	58.10	33.40	51.10	33.40
PCC (CRCP)	4040	27	Minnesota	1	TP1	1	BS55	02/12/1990	98.00	88.00	72.70	58.30	23.80	48.50	23.80
				1	BA1	1	BS01	02/12/1990	96.00	89.00	79.40	69.20	33.20	46.50	33.20
PCC (CRCP)	4143	48	Texas	1	BA*	1	BS**	4/15/1991	100.00	98.00	91.20	62.00	37.00	54.20	37.00
				1	BA*	1	BS**	4/15/1991	100.00	96.00	89.10	57.00	34.00	55.10	34.00
PCC (JPCP)	0201	37	North Carolina	1	B1	1	BS01	11/29/1993	100.00	86.00	70.30	59.70	35.30	33.70	35.30
				1	BAX11	1	BSX11	02/21/2007	99.00	95.00	89.90	60.90	26.50	63.40	26.50
PCC (JPCP)	0204	39	Ohio	1	BAX04	1	BSX04	1/26/2007	98.00	89.00	76.60	64.80	35.00	41.60	35.00
PCC (JPCP Covered with AC)	3002	18	Indiana	1	TP1	1	BS55	12/19/1990	98.00	93.00	72.80	61.60	33.60	39.10	33.60
				1	BX02	1	BSX02	1/2/1991	94.00	86.00	62.00	51.30	27.40	39.60	27.40
PCC (JPCP Covered with AC)	3802	83	Manitoba	1	TP1	1	BS55	11/25/1991	98.00	95.00	90.60	79.60	57.60	29.70	57.60
				1	TP2	1	BS56	11/25/1991	100.00	99.00	92.50	89.10	68.80	24.70	68.60

Table 5A.2 Soil Atterberg Tests Results of the Calibration SMP

Pavement Type	SHRP ID	STATE_CODE	STATE_CODE_EXP	TST_UG04_SS03 TEST DATE	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY_INDEX	wPI
AC	0101	1	Alabama	10/17/1996	49	35	14	9.5
AC	0102	1	Alabama	10/30/1996	48	33	15	11.4
				02/27/2006	41	25	16	10.5
				02/27/2006	41	24	17	6.8
				03/17/2006	39	24	15	9.4
				03/17/2006	41	21	20	12.1
AC	1053	8	Colorado	10/28/1991	40	18	22	20.2
AC	8129	30	Montana	07/18/1990	31	15	16	9.6
				07/18/1990	31	14	17	9.4
AC	0114	31	Nebraska	06/20/1996	48	18	30	28.4
AC	0804	46	South Dakota					
				01/18/1996	30	24	6	2.6
AC	9187	46	South Dakota	01/10/1996	37	18	19	11.3
				07/13/1990	44	20	24	15.4
				07/13/1990	51	19	32	27.4
AC	1068	48	Texas	10/29/1990	33	18	15	8.1
				10/29/1990	43	18	25	23.5
PCC (CRCP)	4054	20	Kansas	04/18/1990	46	20	26	24.9
				04/18/1990	39	20	19	16.6
PCC (CRCP)	4040	27	Minnesota	02/08/1990	39	19	20	14.5
				02/08/1990	32	18	14	11.1
PCC (CRCP)	4143	48	Texas	4/15/1991	43	19	24	21.9
				4/15/1991	39	17	22	19.6
PCC (JPCP)	0201	37	North Carolina	02/14/2007	54	31	23	16.2
				11/29/1993	61	30	31	27.9
PCC (JPCP)	0204	39	Ohio	2/5/2007	40	18	22	16.9
PCC (JPCP Covered with AC)	3002	18	Indiana	12/26/1990	31	17	14	10.2
				12/26/1990	30	16	14	8.7
PCC (JPCP Covered with AC)	3802	83	Manitoba	12/3/1991	69	33	36	32.6
				12/3/1991	79	32	47	43.5

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5B

ELEVATION CHANGES

MAY 2023

LIST OF TABLES

Table 5B.1 Results for Elevation Changes for <i>AC</i> Sections	1
Table 5B.2 Results for Elevation Changes for <i>PCC</i> Sections.....	25

Table 5B.1 Results for Elevation Changes for AC Sections

SHRP_ID	STATE_CO DE_EXP	SMP_DATE	Station (ft)	ELEV_PE (m)	ELEV_PE (in)	Δ ELEV_PE (in)
0101	Alabama	07/26/1995	299.9	1.7190	67.68	0.000
		11/20/1995	299.9	1.7190	67.68	0.000
		01/29/1996	299.9	1.7220	67.80	0.118
		04/17/1996	299.9	1.7220	67.80	0.118
		08/22/1996	299.9	1.7190	67.68	0.000
		10/10/1996	299.9	1.7210	67.76	0.079
		10/30/1997	299.9	1.7230	67.83	0.157
		01/09/1998	299.9	1.7220	67.80	0.118
		04/25/1998	299.9	1.7220	67.80	0.118
		07/20/1998	299.9	1.7220	67.80	0.118
		11/11/1998	299.9	1.7230	67.83	0.157
0101	Alabama	07/26/1995	325.1	1.7010	66.97	0.000
		11/20/1995	325.1	1.7010	66.97	0.000
		01/29/1996	325.1	1.7030	67.05	0.079
		04/17/1996	325.1	1.7030	67.05	0.079
		08/22/1996	325.1	1.7010	66.97	0.000
		10/10/1996	325.1	1.7030	67.05	0.079
		10/30/1997	325.1	1.7030	67.05	0.079
		01/09/1998	325.1	1.7030	67.05	0.079
		04/25/1998	325.1	1.7030	67.05	0.079
		07/20/1998	325.1	1.7030	67.05	0.079
		11/11/1998	325.1	1.7030	67.05	0.079
0101	Alabama	07/26/1995	349.7	1.6650	65.55	0.000
		11/20/1995	349.7	1.6650	65.55	0.000
		01/29/1996	349.7	1.6680	65.67	0.118
		04/17/1996	349.7	1.6670	65.63	0.079
		08/22/1996	349.7	1.6650	65.55	0.000
		10/10/1996	349.7	1.6670	65.63	0.079
		10/30/1997	349.7	1.6680	65.67	0.118
		01/09/1998	349.7	1.6680	65.67	0.118
		04/25/1998	349.7	1.6690	65.71	0.157
		07/20/1998	349.7	1.6680	65.67	0.118
		11/11/1998	349.7	1.6680	65.67	0.118
0101	Alabama	07/26/1995	375.0	1.6180	63.70	0.000
		11/20/1995	375.0	1.6180	63.70	0.000
		01/29/1996	375.0	1.6220	63.86	0.157
		04/17/1996	375.0	1.6220	63.86	0.157
		08/22/1996	375.0	1.6190	63.74	0.039

		10/10/1996	375.0	1.6190	63.74	0.039
		10/30/1997	375.0	1.6200	63.78	0.079
		01/09/1998	375.0	1.6200	63.78	0.079
		04/25/1998	375.0	1.6240	63.94	0.236
		07/20/1998	375.0	1.6220	63.86	0.157
		11/11/1998	375.0	1.6210	63.82	0.118
0101	Alabama	07/26/1995	399.9	1.5770	62.09	0.000
		11/20/1995	399.9	1.5780	62.13	0.039
		01/29/1996	399.9	1.5800	62.20	0.118
		04/17/1996	399.9	1.5790	62.17	0.079
		08/22/1996	399.9	1.5780	62.13	0.039
		10/10/1996	399.9	1.5780	62.13	0.039
		10/30/1997	399.9	1.5800	62.20	0.118
		01/09/1998	399.9	1.5790	62.17	0.079
		04/25/1998	399.9	1.5790	62.17	0.079
		07/20/1998	399.9	1.5790	62.17	0.079
		11/11/1998	399.9	1.5790	62.17	0.079
0101	Alabama	07/26/1995	424.9	1.5240	60.00	0.000
		11/20/1995	424.9	1.5240	60.00	0.000
		01/29/1996	424.9	1.5260	60.08	0.079
		04/17/1996	424.9	1.5260	60.08	0.079
		08/22/1996	424.9	1.5230	59.96	-0.039
		10/10/1996	424.9	1.5230	59.96	-0.039
		10/30/1997	424.9	1.5260	60.08	0.079
		01/09/1998	424.9	1.5240	60.00	0.000
		04/25/1998	424.9	1.5290	60.20	0.197
		07/20/1998	424.9	1.5270	60.12	0.118
		11/11/1998	424.9	1.5270	60.12	0.118
0101	Alabama	07/26/1995	449.8	1.4680	57.80	0.000
		11/20/1995	449.8	1.4680	57.80	0.000
		01/29/1996	449.8	1.4690	57.83	0.039
		04/17/1996	449.8	1.4690	57.83	0.039
		08/22/1996	449.8	1.4670	57.76	-0.039
		10/10/1996	449.8	1.4660	57.72	-0.079
		10/30/1997	449.8	1.4660	57.72	-0.079
		01/09/1998	449.8	1.4670	57.76	-0.039
		04/25/1998	449.8	1.4710	57.91	0.118
		07/20/1998	449.8	1.4690	57.83	0.039
		11/11/1998	449.8	1.4720	57.95	0.157
0101	Alabama	07/26/1995	474.7	1.4110	55.55	0.000
		11/20/1995	474.7	1.4090	55.47	-0.079

		01/29/1996	474.7	1.4100	55.51	-0.039
		04/17/1996	474.7	1.4090	55.47	-0.079
		08/22/1996	474.7	1.4080	55.43	-0.118
		10/10/1996	474.7	1.4080	55.43	-0.118
		10/30/1997	474.7	1.4080	55.43	-0.118
		01/09/1998	474.7	1.4080	55.43	-0.118
		04/25/1998	474.7	1.4090	55.47	-0.079
		07/20/1998	474.7	1.4090	55.47	-0.079
		11/11/1998	474.7	1.4100	55.51	-0.039
0101	Alabama	07/26/1995	500.0	1.3410	52.80	0.000
		11/20/1995	500.0	1.3410	52.80	0.000
		01/29/1996	500.0	1.3420	52.83	0.039
		04/17/1996	500.0	1.3410	52.80	0.000
		08/22/1996	500.0	1.3400	52.76	-0.039
		10/10/1996	500.0	1.3390	52.72	-0.079
		10/30/1997	500.0	1.3430	52.87	0.079
		01/09/1998	500.0	1.3400	52.76	-0.039
		04/25/1998	500.0	1.3440	52.91	0.118
		07/20/1998	500.0	1.3420	52.83	0.039
		11/11/1998	500.0	1.3440	52.91	0.118
0102	Alabama	07/27/1995	299.9	0.7670	30.20	0.000
		11/21/1995	299.9	0.7660	30.16	-0.039
		01/30/1996	299.9	0.7650	30.12	-0.079
		04/17/1996	299.9	0.7650	30.12	-0.079
		08/23/1996	299.9	0.7670	30.20	0.000
		10/11/1996	299.9	0.7680	30.24	0.039
		10/28/1997	299.9	0.7660	30.16	-0.039
		01/12/1998	299.9	0.7660	30.16	-0.039
		04/30/1998	299.9	0.7650	30.12	-0.079
		11/21/1998	299.9	0.7650	30.12	-0.079
0102	Alabama	07/27/1995	325.1	0.9120	35.91	0.000
		11/21/1995	325.1	0.9110	35.87	-0.039
		01/30/1996	325.1	0.9090	35.79	-0.118
		04/17/1996	325.1	0.9100	35.83	-0.079
		08/23/1996	325.1	0.9120	35.91	0.000
		10/11/1996	325.1	0.9130	35.94	0.039
		10/28/1997	325.1	0.9130	35.94	0.039
		01/12/1998	325.1	0.9110	35.87	-0.039
		04/30/1998	325.1	0.9100	35.83	-0.079
		11/21/1998	325.1	0.9100	35.83	-0.079
0102	Alabama	07/27/1995	349.7	1.0580	41.65	0.000

		11/21/1995	349.7	1.0580	41.65	0.000
		01/30/1996	349.7	1.0570	41.61	-0.039
		04/17/1996	349.7	1.0570	41.61	-0.039
		08/23/1996	349.7	1.0580	41.65	0.000
		10/11/1996	349.7	1.0590	41.69	0.039
		10/28/1997	349.7	1.0600	41.73	0.079
		01/12/1998	349.7	1.0580	41.65	0.000
		04/30/1998	349.7	1.0550	41.54	-0.118
		11/21/1998	349.7	1.0550	41.54	-0.118
0102	Alabama	07/27/1995	375.0	1.2070	47.52	0.000
		11/21/1995	375.0	1.2050	47.44	-0.079
		01/30/1996	375.0	1.2030	47.36	-0.157
		04/17/1996	375.0	1.2030	47.36	-0.157
		08/23/1996	375.0	1.2040	47.40	-0.118
		10/11/1996	375.0	1.2060	47.48	-0.039
		10/28/1997	375.0	1.2040	47.40	-0.118
		01/12/1998	375.0	1.2030	47.36	-0.157
		04/30/1998	375.0	1.2000	47.24	-0.276
		11/21/1998	375.0	1.2020	47.32	-0.197
0102	Alabama	07/27/1995	399.9	1.3480	53.07	0.000
		11/21/1995	399.9	1.3490	53.11	0.039
		01/30/1996	399.9	1.3460	52.99	-0.079
		04/17/1996	399.9	1.3460	52.99	-0.079
		08/23/1996	399.9	1.3470	53.03	-0.039
		10/11/1996	399.9	1.3480	53.07	0.000
		10/28/1997	399.9	1.3480	53.07	0.000
		01/12/1998	399.9	1.3470	53.03	-0.039
		04/30/1998	399.9	1.3460	52.99	-0.079
		11/21/1998	399.9	1.3440	52.91	-0.157
0102	Alabama	07/27/1995	424.9	1.5020	59.13	0.000
		11/21/1995	424.9	1.5010	59.09	-0.039
		01/30/1996	424.9	1.4980	58.98	-0.157
		04/17/1996	424.9	1.4990	59.02	-0.118
		08/23/1996	424.9	1.4990	59.02	-0.118
		10/11/1996	424.9	1.4980	58.98	-0.157
		10/28/1997	424.9	1.5010	59.09	-0.039
		01/12/1998	424.9	1.4980	58.98	-0.157
		04/30/1998	424.9	1.4960	58.90	-0.236
		11/21/1998	424.9	1.4960	58.90	-0.236
0102	Alabama	01/30/1996	450.1	1.6420	64.65	0.000
		07/27/1995	450.1	1.6450	64.76	0.118

		11/21/1995	450.1	1.6440	64.72	0.079
		04/17/1996	450.1	1.6420	64.65	0.000
		08/23/1996	450.1	1.6440	64.72	0.079
		10/11/1996	450.1	1.6420	64.65	0.000
		10/28/1997	450.1	1.6500	64.96	0.315
		01/12/1998	450.1	1.6430	64.69	0.039
		04/30/1998	450.1	1.6410	64.61	-0.039
		11/21/1998	450.1	1.6400	64.57	-0.079
0102	Alabama	07/27/1995	475.1	1.7880	70.39	0.000
		11/21/1995	475.1	1.7880	70.39	0.000
		01/30/1996	475.1	1.7870	70.35	-0.039
		04/17/1996	475.1	1.7870	70.35	-0.039
		08/23/1996	475.1	1.7880	70.39	0.000
		10/11/1996	475.1	1.7880	70.39	0.000
		10/28/1997	475.1	1.7890	70.43	0.039
		01/12/1998	475.1	1.7870	70.35	-0.039
		04/30/1998	475.1	1.7850	70.28	-0.118
		11/21/1998	475.1	1.7850	70.28	-0.118
0102	Alabama	07/27/1995	500.0	1.9270	75.87	0.000
		11/21/1995	500.0	1.9280	75.91	0.039
		01/30/1996	500.0	1.9260	75.83	-0.039
		04/17/1996	500.0	1.9260	75.83	-0.039
		08/23/1996	500.0	1.9280	75.91	0.039
		10/11/1996	500.0	1.9260	75.83	-0.039
		10/28/1997	500.0	1.9300	75.98	0.118
		01/12/1998	500.0	1.9270	75.87	0.000
		04/30/1998	500.0	1.9250	75.79	-0.079
		11/21/1998	500.0	1.9240	75.75	-0.118
1053	Colorado	07/01/1993	0.0	1.4170	55.79	0.000
		12/06/1993	0.0	1.4160	55.75	-0.039
		03/14/1994	0.0	1.4160	55.75	0.000
		05/02/1994	0.0	1.4180	55.83	0.079
		08/08/1994	0.0	1.4130	55.63	-0.197
		10/21/1994	0.0	1.4100	55.51	-0.118
		01/17/1995	0.0	1.4140	55.67	0.157
		02/13/1995	0.0	1.4160	55.75	0.079
		04/21/1995	0.0	1.4120	55.59	-0.157
		05/08/1995	0.0	1.4180	55.83	0.236
		11/14/1996	0.0	1.4090	55.47	-0.354
		03/07/1997	0.0	1.4100	55.51	0.039
		05/21/1997	0.0	1.4150	55.71	0.197

		08/05/1997	0.0	1.4160	55.75	0.039
		09/26/1997	0.0	1.4150	55.71	-0.039
1053	Colorado	07/01/1993	24.9	1.3680	53.86	0.000
		12/06/1993	24.9	1.3670	53.82	-0.039
		03/14/1994	24.9	1.3690	53.90	0.079
		05/02/1994	24.9	1.3700	53.94	0.039
		08/08/1994	24.9	1.3660	53.78	-0.157
		10/21/1994	24.9	1.3650	53.74	-0.039
		01/17/1995	24.9	1.3640	53.70	-0.039
		02/13/1995	24.9	1.3680	53.86	0.157
		04/21/1995	24.9	1.3660	53.78	-0.079
		05/08/1995	24.9	1.3680	53.86	0.079
		11/14/1996	24.9	1.3630	53.66	-0.197
		03/07/1997	24.9	1.3610	53.58	-0.079
		05/21/1997	24.9	1.3700	53.94	0.354
		08/05/1997	24.9	1.3710	53.98	0.039
		09/26/1997	24.9	1.3660	53.78	-0.197
1053	Colorado	07/01/1993	49.9	1.3120	51.65	0.000
		12/06/1993	49.9	1.3100	51.57	-0.079
		03/14/1994	49.9	1.3130	51.69	0.118
		05/02/1994	49.9	1.3110	51.61	-0.079
		08/08/1994	49.9	1.3100	51.57	-0.039
		10/21/1994	49.9	1.3070	51.46	-0.118
		01/17/1995	49.9	1.3130	51.69	0.236
		02/13/1995	49.9	1.3130	51.69	0.000
		04/21/1995	49.9	1.3090	51.54	-0.157
		05/08/1995	49.9	1.3130	51.69	0.157
		11/14/1996	49.9	1.3050	51.38	-0.315
		03/07/1997	49.9	1.3050	51.38	0.000
		05/21/1997	49.9	1.3120	51.65	0.276
		08/05/1997	49.9	1.3180	51.89	0.236
		09/26/1997	49.9	1.3120	51.65	-0.236
1053	Colorado	07/01/1993	75.1	1.2760	50.24	0.000
		12/06/1993	75.1	1.2710	50.04	-0.197
		03/14/1994	75.1	1.2720	50.08	0.039
		05/02/1994	75.1	1.2700	50.00	-0.079
		08/08/1994	75.1	1.2690	49.96	-0.039
		10/21/1994	75.1	1.2680	49.92	-0.039
		01/17/1995	75.1	1.2660	49.84	-0.079
		02/13/1995	75.1	1.2730	50.12	0.276
		04/21/1995	75.1	1.2690	49.96	-0.157

		05/08/1995	75.1	1.2690	49.96	0.000
		11/14/1996	75.1	1.2620	49.69	-0.276
		03/07/1997	75.1	1.2680	49.92	0.236
		05/21/1997	75.1	1.2710	50.04	0.118
		08/05/1997	75.1	1.2760	50.24	0.197
		09/26/1997	75.1	1.2670	49.88	-0.354
1053	Colorado	07/01/1993	100.1	1.2260	48.27	0.000
		12/06/1993	100.1	1.2230	48.15	-0.118
		03/14/1994	100.1	1.2260	48.27	0.118
		05/02/1994	100.1	1.2240	48.19	-0.079
		08/08/1994	100.1	1.2260	48.27	0.079
		10/21/1994	100.1	1.2240	48.19	-0.079
		01/17/1995	100.1	1.2240	48.19	0.000
		02/13/1995	100.1	1.2270	48.31	0.118
		04/21/1995	100.1	1.2240	48.19	-0.118
		05/08/1995	100.1	1.2270	48.31	0.118
		11/14/1996	100.1	1.2220	48.11	-0.197
		03/07/1997	100.1	1.2200	48.03	-0.079
		05/21/1997	100.1	1.2280	48.35	0.315
		08/05/1997	100.1	1.2330	48.54	0.197
		09/26/1997	100.1	1.2250	48.23	-0.315
1053	Colorado	07/01/1993	125.0	1.1920	46.93	0.000
		12/06/1993	125.0	1.1860	46.69	-0.236
		03/14/1994	125.0	1.1900	46.85	0.157
		05/02/1994	125.0	1.1860	46.69	-0.157
		08/08/1994	125.0	1.1890	46.81	0.118
		10/21/1994	125.0	1.1870	46.73	-0.079
		01/17/1995	125.0	1.1900	46.85	0.118
		02/13/1995	125.0	1.1940	47.01	0.157
		04/21/1995	125.0	1.1900	46.85	-0.157
		05/08/1995	125.0	1.1900	46.85	0.000
		11/14/1996	125.0	1.1870	46.73	-0.118
		03/07/1997	125.0	1.1810	46.50	-0.236
		05/21/1997	125.0	1.1880	46.77	0.276
		08/05/1997	125.0	1.1960	47.09	0.315
		09/26/1997	125.0	1.1930	46.97	-0.118
1053	Colorado	07/01/1993	149.9	1.1530	45.39	0.000
		12/06/1993	149.9	1.1510	45.31	-0.079
		03/14/1994	149.9	1.1530	45.39	0.079
		05/02/1994	149.9	1.1460	45.12	-0.276
		08/08/1994	149.9	1.1540	45.43	0.315

		10/21/1994	149.9	1.1530	45.39	-0.039
		01/17/1995	149.9	1.1540	45.43	0.039
		02/13/1995	149.9	1.1580	45.59	0.157
		04/21/1995	149.9	1.1530	45.39	-0.197
		05/08/1995	149.9	1.1530	45.39	0.000
		11/14/1996	149.9	1.1430	45.00	-0.394
		03/07/1997	149.9	1.1480	45.20	0.197
		05/21/1997	149.9	1.1550	45.47	0.276
		08/05/1997	149.9	1.1580	45.59	0.118
		09/26/1997	149.9	1.1520	45.35	-0.236
1053	Colorado	07/01/1993	174.9	1.1140	43.86	0.000
		12/06/1993	174.9	1.1060	43.54	-0.315
		03/14/1994	174.9	1.1140	43.86	0.315
		05/02/1994	174.9	1.1080	43.62	-0.236
		08/08/1994	174.9	1.1150	43.90	0.276
		10/21/1994	174.9	1.1140	43.86	-0.039
		01/17/1995	174.9	1.1130	43.82	-0.039
		02/13/1995	174.9	1.1180	44.02	0.197
		04/21/1995	174.9	1.1140	43.86	-0.157
		05/08/1995	174.9	1.1130	43.82	-0.039
		11/14/1996	174.9	1.1070	43.58	-0.236
		03/07/1997	174.9	1.1070	43.58	0.000
		05/21/1997	174.9	1.1110	43.74	0.157
		08/05/1997	174.9	1.1170	43.98	0.236
		09/26/1997	174.9	1.1130	43.82	-0.157
1053	Colorado	07/01/1993	200.1	1.1670	45.94	0.000
		12/06/1993	200.1	1.1600	45.67	-0.276
		03/14/1994	200.1	1.1650	45.87	0.197
		05/02/1994	200.1	1.1590	45.63	-0.236
		08/08/1994	200.1	1.1670	45.94	0.315
		10/21/1994	200.1	1.1670	45.94	0.000
		01/17/1995	200.1	1.1670	45.94	0.000
		02/13/1995	200.1	1.0730	42.24	-3.701
		04/21/1995	200.1	1.0670	42.01	-0.236
		05/08/1995	200.1	1.0600	41.73	-0.276
		11/14/1996	200.1	1.0640	41.89	0.157
		03/07/1997	200.1	1.0610	41.77	-0.118
		05/21/1997	200.1	1.0650	41.93	0.157
		08/05/1997	200.1	1.0620	41.81	-0.118
		09/26/1997	200.1	1.1630	45.79	3.976
8129	Montana	12/14/1993	299.9	1.2590	49.57	0.000

		04/20/1994	299.9	1.2530	49.33	-0.236
		08/22/1994	299.9	1.2560	49.45	-0.118
		10/31/1994	299.9	1.2620	49.69	0.118
		01/23/1995	299.9	1.2660	49.84	0.276
		02/17/1995	299.9	1.2530	49.33	-0.236
		04/27/1995	299.9	1.2610	49.65	0.079
		01/23/1997	299.9	1.2690	49.96	0.394
		03/12/1997	299.9	1.3210	52.01	2.441
		05/28/1997	299.9	1.2560	49.45	-0.118
		10/01/1997	299.9	1.2560	49.45	-0.118
8129	Montana	12/14/1993	325.1	1.2440	48.98	0.000
		04/20/1994	325.1	1.2350	48.62	-0.354
		08/22/1994	325.1	1.2360	48.66	-0.315
		10/31/1994	325.1	1.2390	48.78	-0.197
		01/23/1995	325.1	1.2550	49.41	0.433
		02/17/1995	325.1	1.2460	49.06	0.079
		04/27/1995	325.1	1.2440	48.98	0.000
		01/23/1997	325.1	1.2480	49.13	0.157
		03/12/1997	325.1	1.2850	50.59	1.614
		05/28/1997	325.1	1.2390	48.78	-0.197
8129	Montana	10/01/1997	325.1	1.2380	48.74	-0.236
		12/14/1993	350.1	1.2410	48.86	0.000
		04/20/1994	350.1	1.2360	48.66	-0.197
		08/22/1994	350.1	1.2360	48.66	-0.197
		10/31/1994	350.1	1.2370	48.70	-0.157
		01/23/1995	350.1	1.2530	49.33	0.472
		02/17/1995	350.1	1.2440	48.98	0.118
		04/27/1995	350.1	1.2430	48.94	0.079
		01/23/1997	349.7	1.2470	49.09	0.236
		03/12/1997	349.7	1.2750	50.20	1.339
8129	Montana	05/28/1997	349.7	1.2360	48.66	-0.197
		10/01/1997	349.7	1.2400	48.82	-0.039
		12/14/1993	375.0	1.2400	48.82	0.000
		04/20/1994	375.0	1.2380	48.74	-0.079
		08/22/1994	375.0	1.2350	48.62	-0.197
		10/31/1994	375.0	1.2380	48.74	-0.079
		01/23/1995	375.0	1.2460	49.06	0.236
		02/17/1995	375.0	1.2480	49.13	0.315
		04/27/1995	375.0	1.2430	48.94	0.118
8129	Montana	01/23/1997	375.0	1.2540	49.37	0.551
		03/12/1997	375.0	1.2580	49.53	0.709

		05/28/1997	375.0	1.2350	48.62	-0.197
		10/01/1997	375.0	1.2420	48.90	0.079
8129	Montana	12/14/1993	399.9	1.2310	48.46	0.000
		04/20/1994	399.9	1.2350	48.62	0.157
		08/22/1994	399.9	1.2320	48.50	0.039
		10/31/1994	399.9	1.2350	48.62	0.157
		01/23/1995	399.9	1.2330	48.54	0.079
		02/17/1995	399.9	1.2450	49.02	0.551
		04/27/1995	399.9	1.2380	48.74	0.276
		01/23/1997	399.9	1.2430	48.94	0.472
		03/12/1997	399.9	1.2370	48.70	0.236
		05/28/1997	399.9	1.2350	48.62	0.157
		10/01/1997	399.9	1.2400	48.82	0.354
8129	Montana	12/14/1993	424.9	1.2190	47.99	0.000
		04/20/1994	424.9	1.2240	48.19	0.197
		08/22/1994	424.9	1.2190	47.99	0.000
		10/31/1994	424.9	1.2260	48.27	0.276
		01/23/1995	424.9	1.2220	48.11	0.118
		02/17/1995	424.9	1.2300	48.43	0.433
		04/27/1995	424.9	1.2550	49.41	1.417
		01/23/1997	424.9	1.2300	48.43	0.433
		03/12/1997	424.9	1.2110	47.68	-0.315
		05/28/1997	424.9	1.2230	48.15	0.157
		10/01/1997	424.9	1.2240	48.19	0.197
8129	Montana	12/14/1993	450.1	1.2040	47.40	0.000
		04/20/1994	450.1	1.2120	47.72	0.315
		08/22/1994	450.1	1.2050	47.44	0.039
		10/31/1994	450.1	1.2150	47.83	0.433
		01/23/1995	450.1	1.2060	47.48	0.079
		02/17/1995	450.1	1.2170	47.91	0.512
		04/27/1995	450.1	1.2110	47.68	0.276
		01/23/1997	449.8	1.2140	47.80	0.394
		03/12/1997	449.8	1.1790	46.42	-0.984
		05/28/1997	449.8	1.2060	47.48	0.079
		10/01/1997	449.8	1.2100	47.64	0.236
8129	Montana	12/14/1993	475.1	1.1900	46.85	0.000
		04/20/1994	475.1	1.1980	47.17	0.315
		08/22/1994	475.1	1.1870	46.73	-0.118
		10/31/1994	475.1	1.2000	47.24	0.394
		02/17/1995	475.1	1.2050	47.44	0.591
		04/27/1995	475.1	1.1950	47.05	0.197

		05/18/1995	475.1	1.1900	46.85	0.000
		01/23/1997	474.7	1.1990	47.20	0.354
		03/12/1997	474.7	1.1550	45.47	-1.378
		05/28/1997	474.7	1.1930	46.97	0.118
		10/01/1997	474.7	1.1940	47.01	0.157
8129	Montana	12/14/1993	500.0	1.1770	46.34	0.000
		04/20/1994	500.0	1.1870	46.73	0.394
		08/22/1994	500.0	1.1760	46.30	-0.039
		10/31/1994	500.0	1.1860	46.69	0.354
		01/23/1995	500.0	1.1940	47.01	0.669
		02/17/1995	500.0	1.1940	47.01	0.669
		04/27/1995	500.0	1.1830	46.57	0.236
		01/23/1997	500.0	1.1840	46.61	0.276
		03/12/1997	500.0	1.1300	44.49	-1.850
		05/28/1997	500.0	1.1820	46.54	0.197
		10/01/1997	500.0	1.1850	46.65	0.315
0114	Nebraska	04/24/1996	-20.0	0.7871	30.99	0.000
		08/08/1996	-20.0	0.7849	30.90	-0.087
		11/05/1997	-20.0	0.7800	30.71	-0.280
		02/18/1998	-20.0	0.7807	30.74	-0.252
		09/23/1998	-20.0	0.7738	30.46	-0.524
0114	Nebraska	04/24/1996	-9.8	0.7893	31.07	0.000
		08/08/1996	-9.8	0.7865	30.96	-0.110
		11/05/1997	-9.8	0.7844	30.88	-0.193
		02/18/1998	-9.8	0.7828	30.82	-0.256
		09/23/1998	-9.8	0.7799	30.70	-0.370
0114	Nebraska	04/24/1996	-4.9	0.7878	31.02	0.000
		08/08/1996	-4.9	0.7843	30.88	-0.138
		11/05/1997	-4.9	0.7816	30.77	-0.244
		02/18/1998	-4.9	0.7812	30.76	-0.260
		09/23/1998	-4.9	0.7767	30.58	-0.437
0114	Nebraska	04/24/1996	0.0	0.7884	31.04	0.000
		08/08/1996	0.0	0.7855	30.93	-0.114
		11/05/1997	0.0	0.7838	30.86	-0.181
		02/18/1998	0.0	0.7834	30.84	-0.197
		09/23/1998	0.0	0.7790	30.67	-0.370
0114	Nebraska	04/24/1996	24.0	0.7850	30.91	0.000
		08/08/1996	24.9	0.7887	31.05	0.146
		11/05/1997	24.9	0.7815	30.77	-0.138
		02/18/1998	24.9	0.7805	30.73	-0.177
		09/23/1998	24.9	0.7762	30.56	-0.346

0114	Nebraska	04/24/1996	49.9	0.7936	31.24	0.000
		08/08/1996	49.9	0.7895	31.08	-0.161
		11/05/1997	49.9	0.7834	30.84	-0.402
		02/18/1998	49.9	0.7830	30.83	-0.417
		09/23/1998	49.9	0.7778	30.62	-0.622
0114	Nebraska	04/24/1996	75.1	0.7978	31.41	0.000
		08/08/1996	75.1	0.7945	31.28	-0.130
		11/05/1997	75.1	0.7888	31.06	-0.354
		02/18/1998	75.1	0.7889	31.06	-0.350
		09/23/1998	75.1	0.7846	30.89	-0.520
0114	Nebraska	04/24/1996	100.1	0.8054	31.71	0.000
		08/08/1996	100.1	0.8029	31.61	-0.098
		11/05/1997	100.1	0.7986	31.44	-0.268
		02/18/1998	100.1	0.7988	31.45	-0.260
		09/23/1998	100.1	0.7950	31.30	-0.409
0114	Nebraska	04/24/1996	125.0	0.8031	31.62	0.000
		08/08/1996	125.0	0.8009	31.53	-0.087
		11/05/1997	125.0	0.7975	31.40	-0.220
		02/18/1998	125.0	0.7970	31.38	-0.240
		09/23/1998	125.0	0.7931	31.22	-0.394
0114	Nebraska	04/24/1996	149.9	0.8114	31.94	0.000
		08/08/1996	149.9	0.8098	31.88	-0.063
		11/05/1997	149.9	0.8074	31.79	-0.157
		02/18/1998	149.9	0.8067	31.76	-0.185
		09/23/1998	149.9	0.8025	31.59	-0.350
0114	Nebraska	04/24/1996	174.9	0.8112	31.94	0.000
		08/08/1996	174.9	0.8081	31.81	-0.122
		11/05/1997	174.9	0.8061	31.74	-0.201
		02/18/1998	174.9	0.8065	31.75	-0.185
		09/23/1998	174.9	0.8009	31.53	-0.406
0114	Nebraska	04/24/1996	200.1	0.8126	31.99	0.000
		08/08/1996	200.1	0.8081	31.81	-0.177
		11/05/1997	200.1	0.8062	31.74	-0.252
		02/18/1998	200.1	0.8065	31.75	-0.240
		09/23/1998	200.1	0.8011	31.54	-0.453
0804	South Dakota	10/25/1994	299.9	0.8522	33.55	0.000
		03/23/1995	299.9	0.8311	32.72	-0.831
		04/20/1995	299.9	0.8391	33.04	-0.516
		06/27/1995	299.9	0.8378	32.98	-0.567
		10/24/1996	299.9	0.8397	33.06	-0.492
		04/29/1997	299.9	0.8240	32.44	-1.110

		05/15/1997	299.9	0.8351	32.88	-0.673
		07/22/1997	299.9	0.8363	32.93	-0.626
		09/22/1997	299.9	0.8379	32.99	-0.563
		12/16/2003	299.9	0.8393	33.04	-0.508
0804	South Dakota	10/25/1994	325.1	0.8064	31.75	0.000
		12/20/1994	325.1	0.7901	31.11	-0.642
		03/23/1995	325.1	0.7871	30.99	-0.760
		04/20/1995	325.1	0.7950	31.30	-0.449
		06/27/1995	325.1	0.7936	31.24	-0.504
		10/24/1996	325.1	0.7968	31.37	-0.378
		04/29/1997	325.1	0.7954	31.31	-0.433
		05/15/1997	325.1	0.7936	31.24	-0.504
		07/22/1997	325.1	0.7954	31.31	-0.433
		09/22/1997	325.1	0.7964	31.35	-0.394
		12/16/2003	325.1	0.8008	31.53	-0.220
0804	South Dakota	10/25/1994	350.1	0.7632	30.05	0.000
		12/20/1994	350.1	0.7458	29.36	-0.685
		03/23/1995	350.1	0.7441	29.30	-0.752
		04/20/1995	350.1	0.7508	29.56	-0.488
		06/27/1995	350.1	0.7504	29.54	-0.504
		10/24/1996	350.1	0.7536	29.67	-0.378
		04/29/1997	350.1	0.7499	29.52	-0.524
		05/15/1997	350.1	0.7507	29.56	-0.492
		07/22/1997	350.1	0.7514	29.58	-0.465
		09/22/1997	350.1	0.7529	29.64	-0.406
		12/16/2003	350.1	0.7603	29.93	-0.114
0804	South Dakota	10/25/1994	375.0	0.7200	28.35	0.000
		12/20/1994	375.0	0.7028	27.67	-0.677
		03/23/1995	375.0	0.7041	27.72	-0.626
		04/20/1995	375.0	0.7085	27.89	-0.453
		06/27/1995	375.0	0.7092	27.92	-0.425
		10/24/1996	375.0	0.7113	28.00	-0.343
		04/29/1997	375.0	0.7087	27.90	-0.445
		05/15/1997	375.0	0.7095	27.93	-0.413
		07/22/1997	375.0	0.7109	27.99	-0.358
		09/22/1997	375.0	0.7113	28.00	-0.343
		12/16/2003	375.0	0.7202	28.35	0.008
0804	South Dakota	10/25/1994	399.9	0.6763	26.63	0.000
		12/20/1994	399.9	0.6564	25.84	-0.783
		03/23/1995	399.9	0.6623	26.07	-0.551
		04/20/1995	399.9	0.6642	26.15	-0.476

		06/27/1995	399.9	0.6648	26.17	-0.453
		10/24/1996	399.9	0.6666	26.24	-0.382
		04/29/1997	399.9	0.6636	26.13	-0.500
		05/15/1997	399.9	0.6637	26.13	-0.496
		07/22/1997	399.9	0.6652	26.19	-0.437
		09/22/1997	399.9	0.7199	28.34	1.717
		12/16/2003	399.9	0.6751	26.58	-0.047
0804	South Dakota	10/25/1994	424.9	0.6163	24.26	0.000
		12/20/1994	424.9	0.5955	23.44	-0.819
		03/23/1995	424.9	0.6034	23.76	-0.508
		04/20/1995	424.9	0.6046	23.80	-0.461
		06/27/1995	424.9	0.6055	23.84	-0.425
		10/24/1996	424.9	0.6072	23.91	-0.358
		04/29/1997	424.9	0.6050	23.82	-0.445
		05/15/1997	424.9	0.6051	23.82	-0.441
		07/22/1997	424.9	0.6063	23.87	-0.394
		09/22/1997	424.9	0.6078	23.93	-0.335
		12/16/2003	424.9	0.6142	24.18	-0.083
0804	South Dakota	10/25/1994	450.1	0.5552	21.86	0.000
		12/20/1994	450.1	0.5348	21.06	-0.803
		03/23/1995	450.1	0.5425	21.36	-0.500
		04/20/1995	450.1	0.5439	21.41	-0.445
		06/27/1995	450.1	0.5451	21.46	-0.398
		10/24/1996	450.1	0.5468	21.53	-0.331
		04/29/1997	450.1	0.5456	21.48	-0.378
		05/15/1997	450.1	0.5457	21.48	-0.374
		07/22/1997	450.1	0.5472	21.54	-0.315
		09/22/1997	450.1	0.5495	21.63	-0.224
		12/16/2003	450.1	0.5523	21.74	-0.114
0804	South Dakota	10/25/1994	475.1	0.4958	19.52	0.000
		12/20/1994	475.1	0.4738	18.65	-0.866
		03/23/1995	475.1	0.4828	19.01	-0.512
		04/20/1995	475.1	0.4841	19.06	-0.461
		06/27/1995	475.1	0.4844	19.07	-0.449
		10/24/1996	475.1	0.4877	19.20	-0.319
		04/29/1997	475.1	0.4864	19.15	-0.370
		05/15/1997	475.1	0.4861	19.14	-0.382
		07/22/1997	475.1	0.4880	19.21	-0.307
		09/22/1997	475.1	0.4901	19.30	-0.224
		12/16/2003	475.1	0.4920	19.37	-0.150
0804	South Dakota	10/25/1994	500.0	0.4298	16.92	0.000

		12/20/1994	500.0	0.4053	15.96	-0.965
		03/23/1995	500.0	0.4172	16.43	-0.496
		04/20/1995	500.0	0.4181	16.46	-0.461
		06/27/1995	500.0	0.4190	16.50	-0.425
		10/24/1996	500.0	0.4232	16.66	-0.260
		04/29/1997	500.0	0.4214	16.59	-0.331
		05/15/1997	500.0	0.4205	16.56	-0.366
		07/22/1997	500.0	0.4223	16.63	-0.295
		09/22/1997	500.0	0.4245	16.71	-0.209
		12/16/2003	500.0	0.4306	16.95	0.031
0804	South Dakota	10/25/1994	509.8	0.4025	15.85	0.000
		12/20/1994	509.8	0.3825	15.06	-0.787
		03/23/1995	509.8	0.3908	15.39	-0.461
		04/20/1995	509.8	0.3918	15.43	-0.421
		06/27/1995	509.8	0.3926	15.46	-0.390
		10/24/1996	509.8	0.3961	15.59	-0.252
		04/29/1997	509.8	0.3938	15.50	-0.343
		05/15/1997	509.8	0.3923	15.44	-0.402
		07/22/1997	509.8	0.3947	15.54	-0.307
		09/22/1997	509.8	0.3973	15.64	-0.205
		12/16/2003	509.8	0.3999	15.74	-0.102
0804	South Dakota	10/25/1994	520.0	0.3755	14.78	0.000
		12/20/1994	520.0	0.3567	14.04	-0.740
		03/23/1995	520.0	0.3624	14.27	-0.516
		04/20/1995	520.0	0.3638	14.32	-0.461
		06/27/1995	520.0	0.3473	13.67	-1.110
		10/24/1996	520.0	0.3675	14.47	-0.315
		04/29/1997	520.0	0.3630	14.29	-0.492
		05/15/1997	520.0	0.3619	14.25	-0.535
		07/22/1997	520.0	0.3645	14.35	-0.433
		09/22/1997	520.0	0.3667	14.44	-0.346
		12/16/2003	520.0	0.3670	14.45	-0.335
0804	South Dakota	10/25/1994	524.9	0.3639	14.33	0.000
		12/20/1994	524.9	0.3452	13.59	-0.736
		03/23/1995	524.9	0.3511	13.82	-0.504
		04/20/1995	524.9	0.3530	13.90	-0.429
		06/27/1995	524.9	0.3534	13.91	-0.413
		10/24/1996	524.9	0.3564	14.03	-0.295
		04/29/1997	524.9	0.3533	13.91	-0.417
		05/15/1997	524.9	0.3518	13.85	-0.476
		07/22/1997	524.9	0.3533	13.91	-0.417

		09/22/1997	524.9	0.3556	14.00	-0.327
		12/16/2003	524.9	0.3562	14.02	-0.303
9187	South Dakota	07/19/1994	-24.9	0.7276	28.65	0.000
		09/26/1994	-24.9	0.7291	28.70	0.059
		10/24/1994	-24.9	0.7299	28.74	0.091
		12/19/1994	-24.9	0.7168	28.22	-0.425
		03/10/1995	-24.9	0.7180	28.27	-0.378
		04/07/1995	-24.9	0.7280	28.66	0.016
		05/22/1995	-24.9	0.7276	28.65	0.000
		06/26/1995	-24.9	0.7270	28.62	-0.024
		10/25/1996	-24.9	0.7274	28.64	-0.008
		02/19/1997	-24.9	0.7043	27.73	-0.917
		04/14/1997	-24.9	0.7199	28.34	-0.303
		05/14/1997	-24.9	0.7201	28.35	-0.295
		09/23/1997	-24.9	0.7262	28.59	-0.055
9187	South Dakota	07/19/1994	-15.1	0.7257	28.57	0.000
		09/26/1994	-15.1	0.7266	28.61	0.035
		10/24/1994	-15.1	0.7282	28.67	0.098
		12/19/1994	-15.1	0.7146	28.13	-0.437
		03/10/1995	-15.1	0.7135	28.09	-0.480
		04/07/1995	-15.1	0.7259	28.58	0.008
		05/22/1995	-15.1	0.7269	28.62	0.047
		06/26/1995	-15.1	0.7241	28.51	-0.063
		10/25/1996	-15.1	0.7261	28.59	0.016
		02/19/1997	-15.1	0.7003	27.57	-1.000
		04/14/1997	-15.1	0.7176	28.25	-0.319
		05/14/1997	-15.1	0.7186	28.29	-0.280
		09/23/1997	-15.1	0.7244	28.52	-0.051
9187	South Dakota	07/19/1994	0.0	0.7307	28.77	0.000
		09/26/1994	0.0	0.7321	28.82	0.055
		10/24/1994	0.0	0.7329	28.85	0.087
		12/19/1994	0.0	0.7188	28.30	-0.469
		03/10/1995	0.0	0.7178	28.26	-0.508
		04/07/1995	0.0	0.7316	28.80	0.035
		05/22/1995	0.0	0.7318	28.81	0.043
		06/26/1995	0.0	0.7304	28.76	-0.012
		10/25/1996	0.0	0.7299	28.74	-0.031
		02/19/1997	0.0	0.7021	27.64	-1.126
		04/14/1997	0.0	0.7203	28.36	-0.409
		05/14/1997	0.0	0.7225	28.44	-0.323
		09/23/1997	0.0	0.7277	28.65	-0.118

9187	South Dakota	07/19/1994	24.9	0.7327	28.85	0.000
		09/26/1994	24.9	0.7342	28.91	0.059
		10/24/1994	24.9	0.7433	29.26	0.417
		12/19/1994	24.9	0.7226	28.45	-0.398
		03/10/1995	24.9	0.7224	28.44	-0.406
		04/07/1995	24.9	0.7314	28.80	-0.051
		05/22/1995	24.9	0.7329	28.85	0.008
		06/26/1995	24.9	0.7325	28.84	-0.008
		10/25/1996	24.9	0.7323	28.83	-0.016
		02/19/1997	24.9	0.7055	27.78	-1.071
		04/14/1997	24.9	0.7233	28.48	-0.370
		05/14/1997	24.9	0.7241	28.51	-0.339
		09/23/1997	24.9	0.7295	28.72	-0.126
9187	South Dakota	07/19/1994	49.9	0.7409	29.17	0.000
		09/26/1994	49.9	0.7425	29.23	0.063
		10/24/1994	49.9	0.7413	29.19	0.016
		12/19/1994	49.9	0.7301	28.74	-0.425
		03/10/1995	49.9	0.7305	28.76	-0.409
		04/07/1995	49.9	0.7387	29.08	-0.087
		05/22/1995	49.9	0.7392	29.10	-0.067
		06/26/1995	49.9	0.7398	29.13	-0.043
		10/25/1996	49.9	0.7395	29.11	-0.055
		02/19/1997	49.9	0.7138	28.10	-1.067
		04/14/1997	49.9	0.7310	28.78	-0.390
		05/14/1997	49.9	0.7318	28.81	-0.358
		09/23/1997	49.9	0.7366	29.00	-0.169
9187	South Dakota	07/19/1994	75.1	0.7439	29.29	0.000
		09/26/1994	75.1	0.7447	29.32	0.031
		10/24/1994	75.1	0.7450	29.33	0.043
		12/19/1994	75.1	0.7346	28.92	-0.366
		03/10/1995	75.1	0.7351	28.94	-0.346
		04/07/1995	75.1	0.7421	29.22	-0.071
		05/22/1995	75.1	0.7430	29.25	-0.035
		06/26/1995	75.1	0.7435	29.27	-0.016
		10/25/1996	75.1	0.7421	29.22	-0.071
		02/19/1997	75.1	0.7150	28.15	-1.138
		04/14/1997	75.1	0.7341	28.90	-0.386
		05/14/1997	75.1	0.7353	28.95	-0.339
		09/23/1997	75.1	0.7398	29.13	-0.161
9187	South Dakota	07/19/1994	100.1	0.7549	29.72	0.000
		09/26/1994	100.1	0.7562	29.77	0.051

		10/24/1994	100.1	0.7559	29.76	0.039
		12/19/1994	100.1	0.7450	29.33	-0.390
		03/10/1995	100.1	0.7450	29.33	-0.390
		04/07/1995	100.1	0.7529	29.64	-0.079
		05/22/1995	100.1	0.7532	29.65	-0.067
		06/26/1995	100.1	0.7536	29.67	-0.051
		10/25/1996	100.1	0.7508	29.56	-0.161
		02/19/1997	100.1	0.7225	28.44	-1.276
		04/14/1997	100.1	0.7430	29.25	-0.469
		05/14/1997	100.1	0.7450	29.33	-0.390
		09/23/1997	100.1	0.7499	29.52	-0.197
9187	South Dakota	07/19/1994	125.0	0.7658	30.15	0.000
		09/26/1994	125.0	0.7665	30.18	0.028
		10/24/1994	125.0	0.7664	30.17	0.024
		12/19/1994	125.0	0.7564	29.78	-0.370
		03/10/1995	125.0	0.7550	29.72	-0.425
		04/07/1995	125.0	0.7637	30.07	-0.083
		05/22/1995	125.0	0.7628	30.03	-0.118
		06/26/1995	125.0	0.7640	30.08	-0.071
		10/25/1996	125.0	0.7627	30.03	-0.122
		02/19/1997	125.0	0.7349	28.93	-1.217
		04/14/1997	125.0	0.7550	29.72	-0.425
9187	South Dakota	05/14/1997	125.0	0.7567	29.79	-0.358
		09/23/1997	125.0	0.7613	29.97	-0.177
		07/19/1994	149.9	0.7733	30.44	0.000
		09/26/1994	149.9	0.7740	30.47	0.028
		10/24/1994	149.9	0.7735	30.45	0.008
		12/19/1994	149.9	0.7657	30.15	-0.299
		03/10/1995	149.9	0.7650	30.12	-0.327
		04/07/1995	149.9	0.7709	30.35	-0.094
		05/22/1995	149.9	0.7708	30.35	-0.098
		06/26/1995	149.9	0.7717	30.38	-0.063
		10/25/1996	149.9	0.7703	30.33	-0.118
		02/19/1997	149.9	0.7469	29.41	-1.039
		04/14/1997	149.9	0.7617	29.99	-0.457
		05/14/1997	149.9	0.7641	30.08	-0.362
		09/23/1997	149.9	0.7682	30.24	-0.201
9187	South Dakota	07/19/1994	174.9	0.7763	30.56	0.000
		09/26/1994	174.9	0.7778	30.62	0.059
		10/24/1994	174.9	0.7775	30.61	0.047
		12/19/1994	174.9	0.7693	30.29	-0.276

		03/10/1995	174.9	0.7670	30.20	-0.366
		04/07/1995	174.9	0.7752	30.52	-0.043
		05/22/1995	174.9	0.7742	30.48	-0.083
		06/26/1995	174.9	0.7754	30.53	-0.035
		10/25/1996	174.9	0.7752	30.52	-0.043
		02/19/1997	174.9	0.7525	29.63	-0.937
		04/14/1997	174.9	0.7654	30.13	-0.429
		05/14/1997	174.9	0.7689	30.27	-0.291
		09/23/1997	174.9	0.7734	30.45	-0.114
9187	South Dakota	07/19/1994	200.1	0.7823	30.80	0.000
		09/26/1994	200.1	0.7849	30.90	0.102
		10/24/1994	200.1	0.7846	30.89	0.091
		12/19/1994	200.1	0.7766	30.57	-0.224
		03/10/1995	200.1	0.7726	30.42	-0.382
		04/07/1995	200.1	0.7809	30.74	-0.055
		05/22/1995	200.1	0.7813	30.76	-0.039
		06/26/1995	200.1	0.7823	30.80	0.000
		10/25/1996	200.1	0.7817	30.78	-0.024
		02/19/1997	200.1	0.7585	29.86	-0.937
		04/14/1997	200.1	0.7722	30.40	-0.398
		05/14/1997	200.1	0.7760	30.55	-0.248
		09/23/1997	200.1	0.7810	30.75	-0.051
1068	Texas	12/16/1993	0.0	1.2080	47.56	0.000
		01/12/1994	0.0	1.2070	47.52	-0.039
		04/13/1994	0.0	1.2070	47.52	-0.039
		07/14/1994	0.0	1.2080	47.56	0.000
		01/27/1995	0.0	1.2080	47.56	0.000
		04/13/1995	0.0	1.2060	47.48	-0.079
		06/08/1995	0.0	1.2080	47.56	0.000
		11/13/1996	0.0	1.2090	47.60	0.039
		01/23/1997	0.0	1.2070	47.52	-0.039
		04/21/1997	0.0	1.2040	47.40	-0.157
		07/03/1997	0.0	1.2050	47.44	-0.118
		09/17/1997	0.0	1.2090	47.60	0.039
1068	Texas	12/16/1993	24.9	1.2160	47.87	0.000
		01/12/1994	24.9	1.2160	47.87	0.000
		04/13/1994	24.9	1.2140	47.80	-0.079
		07/14/1994	24.9	1.2160	47.87	0.000
		01/27/1995	24.9	1.2160	47.87	0.000
		04/13/1995	24.9	1.2140	47.80	-0.079
		06/08/1995	24.9	1.2160	47.87	0.000

		11/13/1996	24.9	1.2190	47.99	0.118
		01/23/1997	24.9	1.2170	47.91	0.039
		04/21/1997	24.9	1.2140	47.80	-0.079
		07/03/1997	24.9	1.2160	47.87	0.000
		09/17/1997	24.9	1.2180	47.95	0.079
1068	Texas	12/16/1993	49.9	1.2360	48.66	0.000
		01/12/1994	49.9	1.2350	48.62	-0.039
		04/13/1994	49.9	1.2350	48.62	-0.039
		07/14/1994	49.9	1.2350	48.62	-0.039
		01/27/1995	49.9	1.2350	48.62	-0.039
		04/13/1995	49.9	1.2340	48.58	-0.079
		06/08/1995	49.9	1.2340	48.58	-0.079
		11/13/1996	49.9	1.2370	48.70	0.039
		01/23/1997	49.9	1.2370	48.70	0.039
		04/21/1997	49.9	1.2340	48.58	-0.079
		07/03/1997	49.9	1.2360	48.66	0.000
		09/17/1997	49.9	1.2380	48.74	0.079
1068	Texas	12/16/1993	75.1	1.2410	48.86	0.000
		01/12/1994	75.1	1.2400	48.82	-0.039
		04/13/1994	75.1	1.2400	48.82	-0.039
		07/14/1994	75.1	1.2410	48.86	0.000
		01/27/1995	75.1	1.2400	48.82	-0.039
		04/13/1995	75.1	1.2390	48.78	-0.079
		06/08/1995	75.1	1.2390	48.78	-0.079
		11/13/1996	75.1	1.2400	48.82	-0.039
		01/23/1997	75.1	1.2410	48.86	0.000
		04/21/1997	75.1	1.2350	48.62	-0.236
		07/03/1997	75.1	1.2420	48.90	0.039
		09/17/1997	75.1	1.2390	48.78	-0.079
1068	Texas	12/16/1993	100.1	1.2430	48.94	0.000
		01/12/1994	100.1	1.2420	48.90	-0.039
		04/13/1994	100.1	1.2420	48.90	-0.039
		07/14/1994	100.1	1.2420	48.90	-0.039
		01/27/1995	100.1	1.2420	48.90	-0.039
		04/13/1995	100.1	1.2390	48.78	-0.157
		06/08/1995	100.1	1.2390	48.78	-0.157
		11/13/1996	100.1	1.2440	48.98	0.039
		01/23/1997	100.1	1.2390	48.78	-0.157
		04/21/1997	100.1	1.2390	48.78	-0.157
		07/03/1997	100.1	1.2390	48.78	-0.157
		09/17/1997	100.1	1.2400	48.82	-0.118

1068	Texas	12/16/1993	125.0	1.2400	48.82	0.000
		01/12/1994	125.0	1.2400	48.82	0.000
		04/13/1994	125.0	1.2400	48.82	0.000
		07/14/1994	125.0	1.2400	48.82	0.000
		01/27/1995	125.0	1.2390	48.78	-0.039
		04/13/1995	125.0	1.2370	48.70	-0.118
		06/08/1995	125.0	1.2380	48.74	-0.079
		11/13/1996	125.0	1.2430	48.94	0.118
		01/23/1997	125.0	1.2430	48.94	0.118
		04/21/1997	125.0	1.2360	48.66	-0.157
		07/03/1997	125.0	1.2390	48.78	-0.039
		09/17/1997	125.0	1.2380	48.74	-0.079
1068	Texas	12/16/1993	149.9	1.2460	49.06	0.000
		01/12/1994	149.9	1.2460	49.06	0.000
		04/13/1994	149.9	1.2460	49.06	0.000
		07/14/1994	149.9	1.2460	49.06	0.000
		01/27/1995	149.9	1.2450	49.02	-0.039
		04/13/1995	149.9	1.2430	48.94	-0.118
		06/08/1995	149.9	1.2450	49.02	-0.039
		11/13/1996	149.9	1.2470	49.09	0.039
		01/23/1997	149.9	1.2510	49.25	0.197
		04/21/1997	149.9	1.2420	48.90	-0.157
		07/03/1997	149.9	1.2450	49.02	-0.039
		09/17/1997	149.9	1.2470	49.09	0.039
1068	Texas	11/13/1996	174.9	1.2770	50.28	0.000
		01/23/1997	174.9	1.2790	50.35	0.079
		04/21/1997	174.9	1.2690	49.96	-0.315
		07/03/1997	174.9	1.2720	50.08	-0.197
		09/17/1997	174.9	1.2740	50.16	-0.118
		12/16/1993	175.2	1.2720	50.08	-0.197
		01/12/1994	175.2	1.2690	49.96	-0.315
		04/13/1994	175.2	1.2710	50.04	-0.236
		07/14/1994	175.2	1.2710	50.04	-0.236
		01/27/1995	175.2	1.2700	50.00	-0.276
		04/13/1995	175.2	1.2690	49.96	-0.315
		06/08/1995	175.2	1.2700	50.00	-0.276
1068	Texas	12/16/1993	200.1	1.2760	50.24	0.000
		01/12/1994	200.1	1.2750	50.20	-0.039
		04/13/1994	200.1	1.2760	50.24	0.000
		07/14/1994	200.1	1.2750	50.20	-0.039
		01/27/1995	200.1	1.2730	50.12	-0.118

		04/13/1995	200.1	1.2730	50.12	-0.118
		06/08/1995	200.1	1.2740	50.16	-0.079
		11/13/1996	200.1	1.2800	50.39	0.157
		01/23/1997	200.1	1.2840	50.55	0.315
		04/21/1997	200.1	1.2670	49.88	-0.354
		07/03/1997	200.1	1.2750	50.20	-0.039
		09/17/1997	200.1	1.2770	50.28	0.039

Table 5B.2 Results for Elevation Changes for PCC Sections

SHRP_ID	STATE_CODE_EXP	SMP_DATE	Station (ft)	ELEV_PE (m)	ELEV_PE (in)	Δ ELEV_PE (in)
4054	Kansas	04/25/1996	439.0	0.64	25.35	0.000
		08/05/1996	439.0	0.64	25.33	-0.020
		11/06/1997	439.0	0.65	25.40	0.047
		02/17/1998	439.0	0.65	25.44	0.083
		08/25/1998	439.0	0.64	25.37	0.020
		11/19/1998	439.0	0.65	25.41	0.051
4054	Kansas	04/25/1996	446.9	0.66	25.83	0.000
		08/05/1996	446.9	0.66	25.80	-0.031
		11/06/1997	446.9	0.66	25.85	0.020
		02/17/1998	446.9	0.66	25.87	0.035
		08/25/1998	446.9	0.66	25.81	-0.016
		11/19/1998	446.9	0.66	25.85	0.016
4054	Kansas	04/25/1996	454.1	0.67	26.51	0.000
		08/05/1996	454.1	0.67	26.52	0.008
		11/06/1997	454.1	0.67	26.52	0.008
		02/17/1998	454.1	0.67	26.54	0.028
		08/25/1998	454.1	0.67	26.53	0.024
		11/19/1998	454.1	0.67	26.52	0.016
4054	Kansas	04/25/1996	454.4	0.67	26.51	0.000
		08/05/1996	454.4	0.67	26.52	0.008
		11/06/1997	454.4	0.67	26.52	0.008
		02/17/1998	454.4	0.67	26.52	0.012
		08/25/1998	454.4	0.67	26.53	0.020
		11/19/1998	454.4	0.67	26.53	0.016
4054	Kansas	04/25/1996	461.9	0.68	26.95	0.000
		08/05/1996	461.9	0.68	26.93	-0.020
		11/06/1997	461.9	0.69	26.97	0.020
		02/17/1998	461.9	0.69	26.97	0.016
		08/25/1998	461.9	0.68	26.95	0.000
		11/19/1998	461.9	0.68	26.96	0.012
4054	Kansas	04/25/1996	469.2	0.69	27.27	0.000
		08/05/1996	469.2	0.66	26.15	-1.122
		11/06/1997	469.2	0.69	27.28	0.008
		02/17/1998	469.2	0.69	27.28	0.016
		08/25/1998	469.2	0.69	27.27	0.004
		11/19/1998	469.2	0.69	27.26	-0.004
4054	Kansas	04/25/1996	469.5	0.69	27.33	0.000
		08/05/1996	469.5	0.67	26.55	-0.776

		11/06/1997	469.5	0.70	27.37	0.039
		02/17/1998	469.5	0.70	27.39	0.063
		08/25/1998	469.5	0.69	27.35	0.020
		11/19/1998	469.5	0.70	27.38	0.051
4054	Kansas	04/25/1996	477.0	0.71	27.87	0.000
		08/05/1996	477.0	0.71	27.86	-0.012
		11/06/1997	477.0	0.71	27.88	0.012
		02/17/1998	477.0	0.71	27.87	0.004
		08/25/1998	477.0	0.71	27.87	0.000
		11/19/1998	477.0	0.71	27.88	0.008
4054	Kansas	04/25/1996	483.9	0.72	28.35	0.000
		08/05/1996	483.9	0.72	28.36	0.008
		11/06/1997	483.9	0.72	28.37	0.016
		02/17/1998	483.9	0.72	28.37	0.016
		08/25/1998	483.9	0.72	28.40	0.043
		11/19/1998	483.9	0.72	28.37	0.012
4054	Kansas	04/25/1996	484.3	0.72	28.33	0.000
		08/05/1996	484.3	0.72	28.34	0.008
		11/06/1997	484.3	0.72	28.35	0.012
		02/17/1998	484.3	0.72	28.35	0.020
		08/25/1998	484.3	0.72	28.37	0.039
		11/19/1998	484.3	0.72	28.34	0.004
4054	Kansas	04/25/1996	493.1	0.73	28.80	0.000
		08/05/1996	493.1	0.73	28.78	-0.016
		11/06/1997	493.1	0.73	28.81	0.016
		02/17/1998	493.1	0.73	28.81	0.008
		08/25/1998	493.1	0.73	28.80	0.004
		11/19/1998	493.1	0.73	28.81	0.008
4054	Kansas	04/25/1996	500.0	0.75	29.38	0.000
		08/05/1996	500.0	0.75	29.37	-0.012
		11/06/1997	500.0	0.75	29.36	-0.024
		02/17/1998	500.0	0.75	29.38	0.000
		08/25/1998	500.0	0.75	29.37	-0.012
		11/19/1998	500.0	0.75	29.41	0.024
4054	Kansas	04/25/1996	500.3	0.75	29.47	0.000
		08/05/1996	500.3	0.75	29.48	0.004
		11/06/1997	500.3	0.75	29.50	0.031
		02/17/1998	500.3	0.75	29.52	0.043
		08/25/1998	500.3	0.75	29.49	0.016
		11/19/1998	500.3	0.75	29.52	0.047
4054	Kansas	04/25/1996	507.9	0.76	29.99	0.000

		08/05/1996	507.9	0.76	30.00	0.004
		11/06/1997	507.9	0.76	30.02	0.031
		02/17/1998	507.9	0.76	30.02	0.028
		08/25/1998	507.9	0.76	30.01	0.016
		11/19/1998	507.9	0.76	30.03	0.039
4054	Kansas	04/25/1996	515.1	0.78	30.57	0.000
		08/05/1996	515.1	0.78	30.59	0.012
		11/06/1997	515.1	0.78	30.60	0.028
		02/17/1998	515.1	0.78	30.60	0.028
		08/25/1998	515.1	0.78	30.61	0.031
		11/19/1998	515.1	0.78	30.60	0.028
4040	Minnesota	09/22/1993	385.2	0.51	19.98	0.000
		05/04/1994	385.2	0.51	19.89	-0.087
		08/25/1994	385.2	0.51	19.90	-0.079
		11/10/1994	385.2	0.50	19.88	-0.098
		03/17/1995	385.2	0.49	19.34	-0.638
		04/28/1995	385.2	0.51	19.98	-0.004
		05/11/1995	385.2	0.51	20.06	0.075
		06/16/1995	385.2	0.51	20.02	0.035
		10/09/1996	385.2	0.51	19.97	-0.008
		11/07/1996	385.2	0.51	19.98	-0.004
		04/22/1997	385.2	0.50	19.76	-0.224
		05/06/1997	385.2	0.51	20.04	0.063
		05/28/1997	385.2	0.51	20.06	0.075
		06/10/1997	385.2	0.51	20.05	0.071
		08/13/1997	385.2	0.51	19.90	-0.083
		09/09/1997	385.2	0.51	20.06	0.075
4040	Minnesota	09/22/1993	399.0	0.52	20.45	0.000
		05/04/1994	399.0	0.52	20.43	-0.020
		08/25/1994	399.0	0.52	20.39	-0.063
		11/10/1994	399.0	0.52	20.34	-0.110
		03/17/1995	399.0	0.50	19.78	-0.669
		04/28/1995	399.0	0.52	20.46	0.008
		05/11/1995	399.0	0.52	20.64	0.189
		06/16/1995	399.0	0.52	20.45	0.000
		10/09/1996	399.0	0.52	20.48	0.024
		11/07/1996	399.0	0.52	20.45	-0.004
		04/22/1997	399.0	0.51	20.24	-0.209
		05/06/1997	399.0	0.52	20.52	0.063
		05/28/1997	399.0	0.52	20.47	0.020
		06/10/1997	399.0	0.52	20.62	0.165

		08/13/1997	399.0	0.52	20.41	-0.047
		09/09/1997	399.0	0.52	20.51	0.059
4040	Minnesota	09/22/1993	412.1	0.53	21.05	0.000
		05/04/1994	412.1	0.53	21.06	0.012
		08/25/1994	412.1	0.53	21.00	-0.051
		11/10/1994	412.1	0.53	20.96	-0.083
		03/17/1995	412.1	0.52	20.46	-0.587
		04/28/1995	412.1	0.54	21.10	0.055
		05/11/1995	412.1	0.54	21.14	0.091
		06/16/1995	412.1	0.53	21.00	-0.043
		10/09/1996	412.1	0.54	21.07	0.028
		11/07/1996	412.1	0.54	21.06	0.016
		04/22/1997	412.1	0.53	20.98	-0.071
		05/06/1997	412.1	0.54	21.20	0.150
		05/28/1997	412.1	0.54	21.16	0.114
		06/10/1997	412.1	0.54	21.13	0.079
		08/13/1997	412.1	0.53	21.04	-0.012
		09/09/1997	412.1	0.54	21.15	0.098
4040	Minnesota	09/22/1993	412.4	0.54	21.10	0.000
		05/04/1994	412.4	0.54	21.12	0.016
		08/25/1994	412.4	0.53	21.04	-0.063
		11/10/1994	412.4	0.53	21.00	-0.098
		03/17/1995	412.4	0.52	20.52	-0.583
		04/28/1995	412.4	0.54	21.14	0.039
		05/11/1995	412.4	0.54	21.20	0.102
		06/16/1995	412.4	0.53	21.02	-0.087
		10/09/1996	412.4	0.54	21.13	0.028
		11/07/1996	412.4	0.54	21.12	0.016
		04/22/1997	412.4	0.53	21.03	-0.075
		05/06/1997	412.4	0.54	21.21	0.110
		05/28/1997	412.4	0.54	21.20	0.098
		06/10/1997	412.4	0.54	21.20	0.102
		08/13/1997	412.4	0.54	21.08	-0.020
		09/09/1997	412.4	0.54	21.20	0.094
4040	Minnesota	09/22/1993	425.9	0.55	21.52	0.000
		05/04/1994	425.9	0.55	21.62	0.098
		08/25/1994	425.9	0.55	21.53	0.008
		11/10/1994	425.9	0.55	21.67	0.150
		03/17/1995	425.9	0.53	20.86	-0.661
		04/28/1995	425.9	0.55	21.60	0.079
		05/11/1995	425.9	0.55	21.83	0.307

		06/16/1995	425.9	0.55	21.60	0.083
		10/09/1996	425.9	0.55	21.60	0.083
		11/07/1996	425.9	0.55	21.56	0.043
		04/22/1997	425.9	0.54	21.45	-0.067
		05/06/1997	425.9	0.55	21.73	0.209
		05/28/1997	425.9	0.55	21.63	0.106
		06/10/1997	425.9	0.55	21.81	0.295
		08/13/1997	425.9	0.55	21.52	0.004
		09/09/1997	425.9	0.55	21.62	0.102
4040	Minnesota	09/22/1993	440.0	0.57	22.27	0.000
		05/04/1994	440.0	0.57	22.34	0.071
		08/25/1994	440.0	0.56	22.24	-0.035
		11/10/1994	440.0	0.56	22.23	-0.039
		03/17/1995	440.0	0.55	21.73	-0.543
		04/28/1995	440.0	0.57	22.39	0.114
		05/11/1995	440.0	0.57	22.42	0.150
		06/16/1995	440.0	0.57	22.32	0.047
		10/09/1996	440.0	0.57	22.33	0.059
		11/07/1996	440.0	0.57	22.33	0.055
		04/22/1997	440.0	0.57	22.30	0.024
		05/06/1997	440.0	0.57	22.52	0.248
		05/28/1997	440.0	0.57	22.42	0.150
		06/10/1997	440.0	0.57	22.42	0.150
		08/13/1997	440.0	0.57	22.28	0.012
		09/09/1997	440.0	0.57	22.41	0.142
4040	Minnesota	09/22/1993	440.3	0.58	22.65	0.000
		05/04/1994	440.3	0.58	22.68	0.024
		08/25/1994	440.3	0.57	22.61	-0.043
		11/10/1994	440.3	0.57	22.61	-0.039
		03/17/1995	440.3	0.56	22.06	-0.594
		04/28/1995	440.3	0.58	22.77	0.118
		05/11/1995	440.3	0.58	22.79	0.138
		06/16/1995	440.3	0.58	22.71	0.055
		10/09/1996	440.3	0.58	22.68	0.028
		11/07/1996	440.3	0.58	22.67	0.020
		05/06/1997	440.3	0.58	22.88	0.228
		05/28/1997	440.3	0.58	22.76	0.102
		06/10/1997	440.3	0.58	22.76	0.102
		08/13/1997	440.3	0.58	22.65	-0.008
		09/09/1997	440.3	0.58	22.76	0.106
4040	Minnesota	09/22/1993	453.1	0.59	23.18	0.000

		05/04/1994	453.1	0.59	23.39	0.217
		08/25/1994	453.1	0.59	23.17	-0.004
		11/10/1994	453.1	0.59	23.31	0.134
		03/17/1995	453.1	0.57	22.41	-0.772
		04/28/1995	453.1	0.59	23.27	0.091
		05/11/1995	453.1	0.60	23.49	0.315
		06/16/1995	453.1	0.59	23.28	0.102
		10/09/1996	453.1	0.59	23.23	0.055
		11/07/1996	453.1	0.59	23.21	0.031
		04/22/1997	453.1	0.59	23.04	-0.134
		05/06/1997	453.1	0.60	23.52	0.339
		05/28/1997	453.1	0.59	23.28	0.098
		06/10/1997	453.1	0.60	23.46	0.283
		08/13/1997	453.1	0.59	23.33	0.154
		09/09/1997	453.1	0.59	23.24	0.063
4040	Minnesota	09/22/1993	465.9	0.61	23.88	0.000
		05/04/1994	465.9	0.61	23.93	0.043
		08/25/1994	465.9	0.61	23.88	-0.004
		11/10/1994	465.9	0.61	23.87	-0.016
		03/17/1995	465.9	0.59	23.21	-0.673
		04/28/1995	465.9	0.61	23.99	0.106
		05/11/1995	465.9	0.61	24.09	0.209
		06/16/1995	465.9	0.61	24.03	0.150
		10/09/1996	465.9	0.61	23.95	0.067
		11/07/1996	465.9	0.61	23.94	0.055
		04/22/1997	465.9	0.60	23.78	-0.098
		05/06/1997	465.9	0.61	24.08	0.201
		05/28/1997	465.9	0.61	24.06	0.177
4040	Minnesota	06/10/1997	465.9	0.61	24.04	0.161
		08/13/1997	465.9	0.61	23.91	0.024
		09/09/1997	465.9	0.61	24.02	0.138
		09/22/1993	466.2	0.61	23.91	0.000
		05/04/1994	466.2	0.61	23.96	0.051
		08/25/1994	466.2	0.61	23.92	0.012
		11/10/1994	466.2	0.61	23.90	-0.008
		03/17/1995	466.2	0.59	23.25	-0.657
		04/28/1995	466.2	0.61	24.02	0.118
		05/11/1995	466.2	0.61	24.11	0.209
		06/16/1995	466.2	0.61	24.06	0.157
		10/09/1996	466.2	0.61	24.01	0.102
		11/07/1996	466.2	0.61	23.98	0.075

		04/22/1997	466.2	0.60	23.81	-0.091
		05/06/1997	466.2	0.61	24.11	0.201
		05/28/1997	466.2	0.61	24.10	0.193
		06/10/1997	466.2	0.61	24.08	0.173
		08/13/1997	466.2	0.61	23.94	0.031
		09/09/1997	466.2	0.61	24.06	0.150
4040	Minnesota	09/22/1993	480.0	0.62	24.54	0.000
		05/04/1994	480.0	0.63	24.81	0.276
		08/25/1994	480.0	0.63	24.80	0.256
		11/10/1994	480.0	0.63	24.78	0.236
		03/17/1995	480.0	0.61	23.85	-0.689
		04/28/1995	480.0	0.63	24.68	0.138
		05/11/1995	480.0	0.63	24.95	0.409
		06/16/1995	480.0	0.63	24.90	0.362
		10/09/1996	480.0	0.63	24.66	0.118
		11/07/1996	480.0	0.63	24.61	0.075
		04/22/1997	480.0	0.62	24.42	-0.118
		05/06/1997	480.0	0.63	24.76	0.220
		05/28/1997	480.0	0.63	24.70	0.157
		06/10/1997	480.0	0.63	24.89	0.350
		08/13/1997	480.0	0.62	24.58	0.039
		09/09/1997	480.0	0.63	24.70	0.165
4040	Minnesota	09/22/1993	494.1	0.64	25.16	0.000
		05/04/1994	494.1	0.64	25.15	-0.012
		08/25/1994	494.1	0.64	25.18	0.024
		11/10/1994	494.1	0.64	25.15	-0.012
		03/17/1995	494.1	0.62	24.50	-0.654
		04/28/1995	494.1	0.64	25.30	0.142
		05/11/1995	494.1	0.64	25.35	0.197
		06/16/1995	494.1	0.64	25.34	0.181
		10/09/1996	494.1	0.64	25.25	0.094
		11/07/1996	494.1	0.64	25.24	0.083
		04/22/1997	494.1	0.64	25.08	-0.079
		05/06/1997	494.1	0.64	25.38	0.220
		05/28/1997	494.1	0.64	25.37	0.209
		06/10/1997	494.1	0.64	25.39	0.232
		08/13/1997	494.1	0.64	25.22	0.067
		09/09/1997	494.1	0.64	25.33	0.177
4040	Minnesota	09/22/1993	494.4	0.64	25.15	0.000
		05/04/1994	494.4	0.64	25.18	0.028
		08/25/1994	494.4	0.64	25.24	0.083

		11/10/1994	494.4	0.64	25.23	0.075
		03/17/1995	494.4	0.62	24.54	-0.614
		04/28/1995	494.4	0.64	25.36	0.209
		05/11/1995	494.4	0.65	25.63	0.476
		06/16/1995	494.4	0.65	25.40	0.244
		10/09/1996	494.4	0.64	25.30	0.150
		11/07/1996	494.4	0.64	25.28	0.130
		04/22/1997	494.4	0.64	25.11	-0.043
		05/06/1997	494.4	0.65	25.44	0.287
		05/28/1997	494.4	0.65	25.42	0.264
		06/10/1997	494.4	0.65	25.42	0.264
		08/13/1997	494.4	0.64	25.26	0.110
		09/09/1997	494.4	0.64	25.39	0.236
4040	Minnesota	09/22/1993	506.9	0.65	25.41	0.000
		05/04/1994	506.9	0.64	25.39	-0.016
		08/25/1994	506.9	0.65	25.44	0.035
		11/10/1994	506.9	0.65	25.42	0.012
		03/17/1995	506.9	0.63	24.65	-0.752
		04/28/1995	506.9	0.65	25.51	0.102
		05/11/1995	506.9	0.65	25.57	0.161
		06/16/1995	506.9	0.65	25.54	0.138
		10/09/1996	506.9	0.65	25.48	0.079
		11/07/1996	506.9	0.65	25.43	0.020
		04/22/1997	506.9	0.64	25.26	-0.142
		05/06/1997	506.9	0.65	25.59	0.185
		05/28/1997	506.9	0.65	25.56	0.150
		08/13/1997	506.9	0.65	25.43	0.020
		09/09/1997	506.9	0.65	25.55	0.142
		06/10/1997	507.2	0.65	25.55	0.142
4040	Minnesota	09/22/1993	521.0	0.66	25.89	0.000
		05/04/1994	521.0	0.66	25.91	0.012
		08/25/1994	521.0	0.66	25.87	-0.020
		11/10/1994	521.0	0.66	25.86	-0.031
		03/17/1995	521.0	0.64	25.19	-0.701
		04/28/1995	521.0	0.66	25.98	0.091
		05/11/1995	521.0	0.66	26.05	0.157
		06/16/1995	521.0	0.66	26.02	0.130
		10/09/1996	521.0	0.66	25.95	0.055
		11/07/1996	521.0	0.66	25.93	0.039
		04/22/1997	521.0	0.66	25.81	-0.083
		05/06/1997	521.0	0.61	24.11	-1.780

		05/28/1997	521.0	0.66	25.96	0.063
		06/10/1997	521.0	0.66	26.02	0.126
		08/13/1997	521.0	0.66	25.93	0.039
		09/09/1997	521.0	0.66	26.06	0.165
4143	Texas	11/18/1993	412.7	1.19	46.89	0.000
		01/18/1994	412.7	1.19	46.97	0.079
		04/19/1994	412.7	1.20	47.17	0.276
		07/11/1994	412.7	1.20	47.09	0.197
		01/10/1995	412.7	1.19	46.93	0.039
		04/10/1995	412.7	1.19	46.89	0.000
		06/05/1995	412.7	1.19	47.01	0.118
		11/19/1996	412.7	1.11	43.62	0.000
		01/28/1997	412.7	1.13	44.41	0.787
		04/24/1997	412.7	1.12	44.06	0.433
		07/09/1997	412.7	1.12	44.13	0.512
		09/25/1997	412.7	1.11	43.82	0.197
4143	Texas	11/18/1993	422.9	1.19	47.01	0.000
		01/18/1994	422.9	1.19	46.97	-0.039
		04/19/1994	422.9	1.20	47.24	0.236
		07/11/1994	422.9	1.20	47.17	0.157
		01/10/1995	422.9	1.19	46.97	-0.039
		04/10/1995	422.9	1.19	47.01	0.000
		06/05/1995	422.9	1.20	47.09	0.079
		11/19/1996	422.9	1.11	43.70	0.000
		01/28/1997	422.9	1.12	43.94	0.236
		04/24/1997	422.9	1.12	44.25	0.551
		07/09/1997	422.9	1.12	44.13	0.433
		09/25/1997	422.9	1.12	43.98	0.276
4143	Texas	11/18/1993	432.7	1.19	46.97	0.000
		01/18/1994	432.7	1.20	47.09	0.118
		04/19/1994	432.7	1.20	47.32	0.354
		07/11/1994	432.7	1.20	47.20	0.236
		01/10/1995	432.7	1.19	47.01	0.039
		04/10/1995	432.7	1.19	46.97	0.000
		06/05/1995	432.7	1.20	47.09	0.118
		11/19/1996	432.7	1.11	43.86	0.000
		01/28/1997	432.7	1.12	44.21	0.354
		04/24/1997	432.7	1.12	44.21	0.354
		07/09/1997	432.7	1.13	44.33	0.472
		09/25/1997	432.7	1.12	44.06	0.197
4143	Texas	11/18/1993	433.1	1.19	46.81	0.000

		01/18/1994	433.1	1.19	47.01	0.197
		04/19/1994	433.1	1.20	47.40	0.591
		07/11/1994	433.1	1.20	47.36	0.551
		01/10/1995	433.1	1.20	47.28	0.472
		04/10/1995	433.1	1.19	47.01	0.197
		06/05/1995	433.1	1.19	46.93	0.118
		11/19/1996	433.1	1.11	43.62	0.000
		01/28/1997	433.1	1.12	44.09	0.472
		04/24/1997	433.1	1.12	44.13	0.512
		07/09/1997	433.1	1.12	44.06	0.433
		09/25/1997	433.1	1.12	44.13	0.512
4143	Texas	11/18/1993	442.9	1.19	46.81	0.000
		01/18/1994	442.9	1.19	46.85	0.039
		04/19/1994	442.9	1.20	47.13	0.315
		07/11/1994	442.9	1.20	47.09	0.276
		01/10/1995	442.9	1.19	47.01	0.197
		04/10/1995	442.9	1.19	46.89	0.079
		06/05/1995	442.9	1.19	46.97	0.157
		11/19/1996	442.9	1.11	43.58	0.000
		01/28/1997	442.9	1.12	43.98	0.394
		04/24/1997	442.9	1.12	44.17	0.591
		07/09/1997	442.9	1.12	44.21	0.630
		09/25/1997	442.9	1.12	43.98	0.394
4143	Texas	11/18/1993	453.1	1.19	47.01	0.000
		01/18/1994	453.1	1.19	47.01	0.000
		04/19/1994	453.1	1.20	47.20	0.197
		07/11/1994	453.1	1.20	47.17	0.157
		01/10/1995	453.1	1.20	47.09	0.079
		04/10/1995	453.1	1.19	47.01	0.000
		06/05/1995	453.1	1.20	47.13	0.118
		11/19/1996	453.1	1.11	43.62	0.000
		01/28/1997	453.1	1.12	44.09	0.472
		04/24/1997	453.1	1.12	44.13	0.512
		07/09/1997	453.1	1.12	44.17	0.551
		09/25/1997	453.1	1.12	44.09	0.472
4143	Texas	11/18/1993	453.4	1.19	46.93	0.000
		01/18/1994	453.4	1.19	47.01	0.079
		04/19/1994	453.4	1.20	47.20	0.276
		07/11/1994	453.4	1.20	47.17	0.236
		01/10/1995	453.4	1.20	47.05	0.118
		04/10/1995	453.4	1.19	46.97	0.039

		06/05/1995	453.4	1.20	47.05	0.118
		11/19/1996	453.4	1.11	43.58	0.000
		01/28/1997	453.4	1.14	44.72	1.142
		04/24/1997	453.4	1.12	44.09	0.512
		07/09/1997	453.4	1.12	43.98	0.394
		09/25/1997	453.4	1.12	44.09	0.512
4143	Texas	11/18/1993	462.9	1.18	46.61	0.000
		01/18/1994	462.9	1.19	46.73	0.118
		04/19/1994	462.9	1.19	46.93	0.315
		07/11/1994	462.9	1.19	46.85	0.236
		01/10/1995	462.9	1.19	46.77	0.157
		04/10/1995	462.9	1.19	46.69	0.079
		06/05/1995	462.9	1.19	46.81	0.197
		11/19/1996	462.9	1.10	43.31	0.000
		01/28/1997	462.9	1.14	44.72	1.417
		04/24/1997	462.9	1.12	44.17	0.866
		07/09/1997	462.9	1.13	44.33	1.024
		09/25/1997	462.9	1.12	43.98	0.669
4143	Texas	11/18/1993	473.1	1.20	47.20	0.000
		01/18/1994	473.1	1.20	47.32	0.118
		04/19/1994	473.1	1.21	47.44	0.236
		07/11/1994	473.1	1.20	47.40	0.197
		01/10/1995	473.1	1.20	47.28	0.079
		04/10/1995	473.1	1.20	47.28	0.079
		06/05/1995	473.1	1.20	47.40	0.197
		11/19/1996	473.1	1.12	43.94	0.000
		01/28/1997	473.1	1.14	44.88	0.945
		04/24/1997	473.1	1.13	44.49	0.551
		07/09/1997	473.1	1.13	44.37	0.433
		09/25/1997	473.1	1.13	44.29	0.354
4143	Texas	11/18/1993	473.4	1.20	47.17	0.000
		01/18/1994	473.4	1.20	47.24	0.079
		04/19/1994	473.4	1.20	47.40	0.236
		07/11/1994	473.4	1.20	47.36	0.197
		01/10/1995	473.4	1.20	47.24	0.079
		04/10/1995	473.4	1.20	47.28	0.118
		06/05/1995	473.4	1.20	47.32	0.157
		11/19/1996	473.4	1.12	44.02	0.000
		01/28/1997	473.4	1.14	45.00	0.984
		04/24/1997	473.4	1.13	44.33	0.315
		07/09/1997	473.4	1.12	44.17	0.157

		09/25/1997	473.4	1.13	44.29	0.276
4143	Texas	11/18/1993	482.9	1.20	47.09	0.000
		01/18/1994	482.9	1.19	47.01	-0.079
		04/19/1994	482.9	1.20	47.40	0.315
		07/11/1994	482.9	1.20	47.28	0.197
		01/10/1995	482.9	1.20	47.20	0.118
		04/10/1995	482.9	1.20	47.20	0.118
		06/05/1995	482.9	1.20	47.28	0.197
		11/19/1996	482.9	1.11	43.82	0.000
		01/28/1997	482.9	1.14	44.88	1.063
		04/24/1997	482.9	1.13	44.33	0.512
		07/09/1997	482.9	1.13	44.29	0.472
		09/25/1997	482.9	1.12	44.09	0.276
4143	Texas	11/18/1993	493.1	1.20	47.32	0.000
		01/18/1994	493.1	1.20	47.36	0.039
		04/19/1994	493.1	1.21	47.68	0.354
		07/11/1994	493.1	1.21	47.68	0.354
		01/10/1995	493.1	1.21	47.48	0.157
		04/10/1995	493.1	1.21	47.48	0.157
		06/05/1995	493.1	1.21	47.56	0.236
		11/19/1996	493.1	1.12	44.25	0.000
		01/28/1997	493.1	1.16	45.51	1.260
		04/24/1997	493.1	1.14	44.76	0.512
		07/09/1997	493.1	1.14	44.72	0.472
		09/25/1997	493.1	1.13	44.57	0.315
4143	Texas	11/18/1993	493.4	1.20	47.28	0.000
		01/18/1994	493.4	1.20	47.36	0.079
		04/19/1994	493.4	1.21	47.76	0.472
		07/11/1994	493.4	1.21	47.76	0.472
		01/10/1995	493.4	1.21	47.68	0.394
		04/10/1995	493.4	1.21	47.52	0.236
		06/05/1995	493.4	1.21	47.68	0.394
		11/19/1996	493.4	1.13	44.33	0.000
		01/28/1997	493.4	1.15	45.47	1.142
		04/24/1997	493.4	1.13	44.65	0.315
		07/09/1997	493.4	1.13	44.61	0.276
		09/25/1997	493.4	1.13	44.57	0.236
4143	Texas	11/18/1993	503.3	1.21	47.60	0.000
		01/18/1994	503.3	1.21	47.64	0.039
		04/19/1994	503.3	1.22	47.87	0.276
		07/11/1994	503.3	1.22	47.83	0.236

		01/10/1995	503.3	1.21	47.64	0.039
		04/10/1995	503.3	1.21	47.76	0.157
		06/05/1995	503.3	1.21	47.76	0.157
		11/19/1996	503.3	1.13	44.37	0.000
		01/28/1997	503.3	1.16	45.51	1.142
		04/24/1997	503.3	1.14	44.72	0.354
		07/09/1997	503.3	1.14	44.72	0.354
		09/25/1997	503.3	1.14	44.72	0.354
4143	Texas	11/18/1993	513.8	1.22	47.95	0.000
		01/18/1994	513.8	1.22	47.99	0.039
		04/19/1994	513.8	1.22	48.07	0.118
		07/11/1994	513.8	1.22	48.07	0.118
		01/10/1995	513.8	1.22	47.95	0.000
		04/10/1995	513.8	1.22	47.99	0.039
		06/05/1995	513.8	1.22	48.07	0.118
		11/19/1996	513.8	1.13	44.61	0.000
		01/28/1997	513.8	1.16	45.59	0.984
		04/24/1997	513.8	1.15	45.12	0.512
		07/09/1997	513.8	1.14	44.88	0.276
		09/25/1997	513.8	1.13	44.49	-0.118
0201	North Carolina	05/15/1995	430.1	1.31	51.57	0.000
		07/12/1995	430.1	1.32	51.77	0.197
		10/16/1995	430.1	1.32	51.77	0.197
		01/23/1996	430.1	1.32	51.87	0.295
		04/23/1996	430.1	1.33	52.17	0.591
		08/20/1996	430.1	1.32	51.77	0.197
		10/03/1996	430.1	1.31	51.67	0.098
		10/06/1997	430.1	1.32	51.87	0.295
		02/19/1998	430.1	1.32	51.87	0.295
		04/23/1998	430.1	1.32	51.77	0.197
		07/16/1998	430.1	1.32	51.77	0.197
		10/15/1998	430.1	1.31	51.57	0.000
		03/14/2002	430.1	1.32	51.87	0.295
		05/20/2002	430.1	1.32	51.97	0.394
		09/19/2002	430.1	1.32	51.77	0.197
		04/22/2003	430.1	1.32	51.77	0.197
		12/11/2003	430.1	1.32	52.07	0.492
0201	North Carolina	05/15/1995	438.0	1.31	51.67	0.000
		07/12/1995	438.0	1.32	51.87	0.197
		10/16/1995	438.0	1.32	51.77	0.098
		01/23/1996	438.0	1.32	51.77	0.098

		04/23/1996	438.0	1.32	52.07	0.394
		08/20/1996	438.0	1.32	51.87	0.197
		10/03/1996	438.0	1.31	51.67	0.000
		10/06/1997	438.0	1.32	51.97	0.295
		02/19/1998	438.0	1.32	51.97	0.295
		04/23/1998	438.0	1.32	51.87	0.197
		07/16/1998	438.0	1.32	51.77	0.098
		10/15/1998	438.0	1.32	51.77	0.098
		03/14/2002	438.0	1.32	51.87	0.197
		05/20/2002	438.0	1.32	51.77	0.098
		09/19/2002	438.0	1.32	51.87	0.197
		04/22/2003	438.0	1.32	51.87	0.197
		12/11/2003	438.0	1.32	52.07	0.394
0201	North Carolina	05/15/1995	444.9	1.31	51.57	0.000
		07/12/1995	444.9	1.32	51.87	0.295
		10/16/1995	444.9	1.31	51.67	0.098
		01/23/1996	444.9	1.32	51.97	0.394
		04/23/1996	444.9	1.32	52.07	0.492
		08/20/1996	444.9	1.32	51.87	0.295
		10/03/1996	444.9	1.31	51.67	0.098
		10/06/1997	444.9	1.32	51.87	0.295
		02/19/1998	444.9	1.32	51.87	0.295
		04/23/1998	444.9	1.32	51.77	0.197
		07/16/1998	444.9	1.31	51.67	0.098
		10/15/1998	444.9	1.31	51.67	0.098
		03/14/2002	444.9	1.32	51.97	0.394
		05/20/2002	444.9	1.32	51.87	0.295
		09/19/2002	444.9	1.32	51.77	0.197
0201	North Carolina	04/22/2003	444.9	1.32	51.87	0.295
		12/11/2003	444.9	1.32	52.07	0.492
		05/15/1995	445.2	1.31	51.57	0.000
		07/12/1995	445.2	1.31	51.67	0.098
		10/16/1995	445.2	1.32	51.77	0.197
		01/23/1996	445.2	1.32	51.87	0.295
		04/23/1996	445.2	1.32	52.07	0.492
		08/20/1996	445.2	1.32	51.77	0.197
		10/03/1996	445.2	1.31	51.67	0.098
		10/06/1997	445.2	1.32	51.87	0.295
		02/19/1998	445.2	1.32	51.87	0.295
		04/23/1998	445.2	1.32	51.77	0.197
		07/16/1998	445.2	1.31	51.67	0.098

		10/15/1998	445.2	1.30	51.38	-0.197
0201	North Carolina	05/15/1995	452.4	1.31	51.67	0.000
		07/12/1995	452.4	1.32	51.87	0.197
		10/16/1995	452.4	1.32	51.77	0.098
		01/23/1996	452.4	1.32	51.87	0.197
		04/23/1996	452.4	1.32	52.07	0.394
		08/20/1996	452.4	1.32	51.77	0.098
		10/03/1996	452.4	1.31	51.48	-0.197
		10/06/1997	452.4	1.32	51.77	0.098
		02/19/1998	452.4	1.32	51.87	0.197
		04/23/1998	452.4	1.31	51.67	0.000
		07/16/1998	452.4	1.31	51.67	0.000
		10/15/1998	452.4	1.30	51.38	-0.295
		03/14/2002	452.4	1.32	51.77	0.098
		05/20/2002	452.4	1.32	51.77	0.098
		09/19/2002	452.4	1.31	51.67	0.000
		04/22/2003	452.4	1.32	51.77	0.098
		12/11/2003	452.4	1.32	51.87	0.197
0201	North Carolina	05/15/1995	460.0	1.32	51.77	0.000
		07/12/1995	460.0	1.32	51.77	0.000
		10/16/1995	460.0	1.32	51.77	0.000
		01/23/1996	460.0	1.32	51.87	0.098
		04/23/1996	460.0	1.33	52.17	0.394
		08/20/1996	460.0	1.32	51.77	0.000
		10/03/1996	460.0	1.31	51.57	-0.197
		10/06/1997	460.0	1.32	51.87	0.098
		02/19/1998	460.0	1.31	51.67	-0.098
		04/23/1998	460.0	1.32	51.77	0.000
		07/16/1998	460.0	1.31	51.67	-0.098
		10/15/1998	460.0	1.30	51.28	-0.492
		03/14/2002	460.0	1.32	51.87	0.098
		05/20/2002	460.0	1.31	51.67	-0.098
		09/19/2002	460.0	1.31	51.67	-0.098
		04/22/2003	460.0	1.32	51.87	0.098
		12/11/2003	460.0	1.32	51.97	0.197
0201	North Carolina	05/15/1995	460.3	1.31	51.67	0.000
		07/12/1995	460.3	1.32	51.77	0.098
		10/16/1995	460.3	1.31	51.67	0.000
		01/23/1996	460.3	1.32	51.87	0.197
		04/23/1996	460.3	1.33	52.17	0.492
		08/20/1996	460.3	1.31	51.67	0.000

		10/03/1996	460.3	1.31	51.57	-0.098
		10/06/1997	460.3	1.32	51.87	0.197
		02/19/1998	460.3	1.31	51.67	0.000
		04/23/1998	460.3	1.32	51.77	0.098
		07/16/1998	460.3	1.31	51.67	0.000
		10/15/1998	460.3	1.30	51.38	-0.295
0201	North Carolina	05/15/1995	467.5	1.32	51.77	0.000
		07/12/1995	467.5	1.32	51.77	0.000
		10/16/1995	467.5	1.31	51.67	-0.098
		01/23/1996	467.5	1.32	51.77	0.000
		04/23/1996	467.5	1.32	52.07	0.295
		08/20/1996	467.5	1.31	51.57	-0.197
		10/03/1996	467.5	1.31	51.48	-0.295
		10/06/1997	467.5	1.32	51.87	0.098
		02/19/1998	467.5	1.32	51.77	0.000
		04/23/1998	467.5	1.32	51.77	0.000
		07/16/1998	467.5	1.31	51.67	-0.098
		10/15/1998	467.5	1.30	51.38	-0.394
		03/14/2002	467.5	1.32	51.77	0.000
		05/20/2002	467.5	1.31	51.67	-0.098
		09/19/2002	467.5	1.31	51.57	-0.197
		04/22/2003	467.5	1.32	51.77	0.000
		12/11/2003	467.5	1.32	51.87	0.098
0201	North Carolina	05/15/1995	475.1	1.31	51.57	0.000
		07/12/1995	475.1	1.31	51.57	0.000
		10/16/1995	475.1	1.31	51.57	0.000
		01/23/1996	475.1	1.31	51.67	0.098
		04/23/1996	475.1	1.32	52.07	0.492
		08/20/1996	475.1	1.31	51.48	-0.098
		10/03/1996	475.1	1.37	53.94	2.362
		10/06/1997	475.1	1.32	51.77	0.197
		02/19/1998	475.1	1.31	51.67	0.098
		04/23/1998	475.1	1.31	51.57	0.000
		07/16/1998	475.1	1.31	51.57	0.000
		10/15/1998	475.1	1.30	51.28	-0.295
		03/14/2002	475.1	1.31	51.70	0.130
		05/20/2002	475.1	1.31	51.48	-0.098
		09/19/2002	475.1	1.31	51.48	-0.098
		04/22/2003	475.1	1.31	51.67	0.098
		12/11/2003	475.1	1.32	51.77	0.197
0201	North Carolina	05/15/1995	475.4	1.31	51.57	0.000

		07/12/1995	475.4	1.31	51.67	0.098
		10/16/1995	475.4	1.31	51.48	-0.098
		01/23/1996	475.4	1.31	51.67	0.098
		04/23/1996	475.4	1.32	52.07	0.492
		08/20/1996	475.4	1.31	51.67	0.098
		10/03/1996	475.4	1.37	53.94	2.362
		10/06/1997	475.4	1.32	51.77	0.197
		02/19/1998	475.4	1.31	51.67	0.098
		04/23/1998	475.4	1.31	51.57	0.000
		07/16/1998	475.4	1.31	51.48	-0.098
		10/15/1998	475.4	1.30	51.28	-0.295
		12/11/2003	475.4	1.31	51.57	0.000
0201	North Carolina	05/15/1995	482.6	1.31	51.48	0.000
		07/12/1995	482.6	1.31	51.57	0.098
		10/16/1995	482.6	1.31	51.48	0.000
		01/23/1996	482.6	1.31	51.48	0.000
		04/23/1996	482.6	1.32	51.97	0.492
		08/20/1996	482.6	1.30	51.38	-0.098
		10/03/1996	482.6	1.31	51.48	0.000
		10/06/1997	482.6	1.31	51.57	0.098
		02/19/1998	482.6	1.31	51.57	0.098
		04/23/1998	482.6	1.31	51.48	0.000
		07/16/1998	482.6	1.30	51.38	-0.098
		10/15/1998	482.6	1.29	50.98	-0.492
		03/14/2002	482.6	1.31	51.48	0.000
		05/20/2002	482.6	1.30	51.38	-0.098
		09/19/2002	482.6	1.30	51.28	-0.197
		04/22/2003	482.6	1.30	51.28	-0.197
0201	North Carolina	05/15/1995	490.2	1.31	51.57	0.000
		07/12/1995	490.2	1.31	51.57	0.000
		10/16/1995	490.2	1.31	51.48	-0.098
		01/23/1996	490.2	1.31	51.57	0.000
		04/23/1996	490.2	1.32	51.97	0.394
		08/20/1996	490.2	1.30	51.38	-0.197
		10/03/1996	490.2	1.31	51.67	0.098
		10/06/1997	490.2	1.32	51.77	0.197
		02/19/1998	490.2	1.31	51.67	0.098
		04/23/1998	490.2	1.31	51.57	0.000
		07/16/1998	490.2	1.31	51.57	0.000
		10/15/1998	490.2	1.30	51.38	-0.197
		03/14/2002	490.2	1.31	51.67	0.098

		05/20/2002	490.2	1.31	51.57	0.000
		09/19/2002	490.2	1.31	51.48	-0.098
		04/22/2003	490.2	1.31	51.67	0.098
0201	North Carolina	05/15/1995	490.5	1.31	51.57	0.000
		01/23/1996	490.5	1.31	51.67	0.098
		04/23/1996	490.5	1.32	51.97	0.394
		08/20/1996	490.5	1.31	51.57	0.000
		10/03/1996	490.5	1.31	51.57	0.000
		10/06/1997	490.5	1.32	51.77	0.197
		02/19/1998	490.5	1.30	51.08	-0.492
		04/23/1998	490.5	1.31	51.57	0.000
		07/16/1998	490.5	1.31	51.57	0.000
		10/15/1998	490.5	1.28	50.59	-0.984
0201	North Carolina	05/15/1995	497.7	1.30	51.38	0.000
		01/23/1996	497.7	1.30	51.38	0.000
		04/23/1996	497.7	1.31	51.67	0.295
		08/20/1996	497.7	1.30	51.38	0.000
		10/03/1996	497.7	1.31	51.48	0.098
		10/06/1997	497.7	1.31	51.48	0.098
		02/19/1998	497.7	1.29	50.98	-0.394
		04/23/1998	497.7	1.29	50.89	-0.492
		07/16/1998	497.7	1.30	51.38	0.000
		10/15/1998	497.7	1.29	50.89	-0.492
		03/14/2002	497.7	1.30	51.38	0.000
		05/20/2002	497.7	1.30	51.28	-0.098
		09/19/2002	497.7	1.30	51.18	-0.197
		04/22/2003	497.7	1.30	51.28	-0.098
0201	North Carolina	05/15/1995	504.9	1.30	51.18	0.000
		01/23/1996	504.9	1.30	51.38	0.197
		04/23/1996	504.9	1.31	51.48	0.295
		08/20/1996	504.9	1.29	50.98	-0.197
		10/03/1996	504.9	1.30	51.18	0.000
		10/06/1997	504.9	1.30	51.18	0.000
		02/19/1998	504.9	1.30	51.18	0.000
		04/23/1998	504.9	1.29	50.98	-0.197
		07/16/1998	504.9	1.30	51.18	0.000
		10/15/1998	504.9	1.29	50.69	-0.492
		03/14/2002	504.9	1.30	51.08	-0.098
		05/20/2002	504.9	1.29	50.98	-0.197
		09/19/2002	504.9	1.29	50.98	-0.197
		04/22/2003	504.9	1.29	50.98	-0.197

0201	North Carolina	05/15/1995	512.1	1.30	51.18	0.000
		08/20/1996	512.1	1.30	51.08	-0.098
		10/03/1996	512.1	1.30	51.08	-0.098
		03/14/2002	512.1	1.30	51.08	-0.098
		05/20/2002	512.1	1.29	50.89	-0.295
		09/19/2002	512.1	1.29	50.89	-0.295
		04/22/2003	512.1	1.29	50.89	-0.295
		12/11/2003	512.1	1.29	50.89	-0.295
0201	North Carolina	05/15/1995	520.0	1.29	50.79	0.000
		07/12/1995	520.0	1.23	48.43	-2.362
		10/16/1995	520.0	1.30	51.08	0.295
		08/20/1996	520.0	1.29	50.98	0.197
		10/03/1996	520.0	1.39	54.92	4.134
		03/14/2002	520.0	1.29	50.98	0.197
		05/20/2002	520.0	1.29	50.89	0.098
		09/19/2002	520.0	1.29	50.79	0.000
		04/22/2003	520.0	1.29	50.79	0.000
		12/11/2003	520.0	1.29	50.98	0.197
0204	Ohio	05/13/1998	9.8	1.06	41.63	0.000
		07/30/1998	9.8	1.06	41.58	-0.055
		09/29/1998	9.8	1.05	41.51	-0.122
		02/16/1999	9.8	1.06	41.86	0.228
		03/23/1999	9.8	1.06	41.85	0.220
0204	Ohio	05/13/1998	17.1	1.04	41.09	0.000
		07/30/1998	17.1	1.04	41.06	-0.031
		09/29/1998	17.1	1.04	40.95	-0.138
		02/16/1999	17.1	1.05	41.32	0.228
		03/23/1999	17.1	1.05	41.31	0.224
0204	Ohio	05/13/1998	24.9	1.03	40.49	0.000
		07/30/1998	24.9	1.03	40.48	-0.008
		09/29/1998	24.9	1.02	40.35	-0.142
		02/16/1999	24.9	1.03	40.69	0.201
		03/23/1999	24.9	1.03	40.66	0.173
0204	Ohio	05/13/1998	25.3	1.03	40.45	0.000
		07/30/1998	25.3	1.03	40.42	-0.035
		09/29/1998	25.3	1.02	40.33	-0.122
		02/16/1999	25.3	1.03	40.65	0.197
		03/23/1999	25.3	1.00	39.43	-1.024
0204	Ohio	05/13/1998	32.2	1.01	39.82	0.000
		07/30/1998	32.2	1.01	39.80	-0.020
		09/29/1998	32.2	1.01	39.72	-0.106

		02/16/1999	32.2	1.02	40.07	0.244
		03/23/1999	32.2	1.02	40.04	0.220
0204	Ohio	05/13/1998	40.0	1.00	39.27	0.000
		07/30/1998	40.0	1.00	39.23	-0.039
		09/29/1998	40.0	0.99	39.13	-0.138
		02/16/1999	40.0	1.00	39.46	0.189
		03/23/1999	40.0	0.97	38.35	-0.917
0204	Ohio	05/13/1998	40.4	1.00	39.26	0.000
		07/30/1998	40.4	1.00	39.19	-0.067
		09/29/1998	40.4	0.99	39.12	-0.138
		02/16/1999	40.4	1.00	39.46	0.209
		03/23/1999	40.4	0.97	38.30	-0.953
0204	Ohio	05/13/1998	46.9	1.03	40.43	0.000
		07/30/1998	46.9	0.98	38.64	-1.795
		09/29/1998	46.9	0.98	38.54	-1.898
		02/16/1999	46.9	0.99	38.89	-1.543
		03/23/1999	46.9	0.96	37.70	-2.728
0204	Ohio	05/13/1998	55.1	0.97	38.13	0.000
		07/30/1998	55.1	0.97	38.09	-0.047
		09/29/1998	55.1	0.96	37.98	-0.150
		02/16/1999	55.1	0.97	38.34	0.209
		03/23/1999	55.1	0.94	37.14	-0.996
0204	Ohio	05/13/1998	55.4	0.97	38.10	0.000
		07/30/1998	55.4	0.97	38.06	-0.035
		09/29/1998	55.4	0.96	37.97	-0.130
		02/16/1999	55.4	0.97	38.31	0.217
		03/23/1999	55.4	0.94	37.11	-0.988
0204	Ohio	05/13/1998	62.0	0.95	37.48	0.000
		07/30/1998	62.0	0.95	37.46	-0.024
		09/29/1998	62.0	0.95	37.37	-0.110
		02/16/1999	62.0	0.96	37.73	0.248
		03/23/1999	62.0	0.93	36.54	-0.937
0204	Ohio	05/13/1998	70.9	0.94	36.91	0.000
		07/30/1998	70.9	0.94	36.89	-0.016
		09/29/1998	70.9	0.93	36.79	-0.118
		02/16/1999	70.9	0.94	37.16	0.252
		03/23/1999	70.9	0.91	35.92	-0.984
0204	Ohio	05/13/1998	71.2	0.94	36.88	0.000
		07/30/1998	71.2	0.94	36.85	-0.024
		09/29/1998	71.2	0.93	36.76	-0.114
		02/16/1999	71.2	0.94	37.12	0.244

		03/23/1999	71.2	0.94	37.10	0.224
0204	Ohio	05/13/1998	77.1	0.92	36.29	0.000
		07/30/1998	77.1	0.92	36.28	-0.008
		09/29/1998	77.1	0.92	36.18	-0.110
		02/16/1999	77.1	0.93	36.53	0.236
		03/23/1999	77.1	0.93	36.51	0.220
0204	Ohio	05/13/1998	85.0	0.91	35.70	0.000
		07/30/1998	85.0	0.91	35.69	-0.008
		09/29/1998	85.0	0.90	35.58	-0.114
		02/16/1999	85.0	0.91	35.90	0.201
		03/23/1999	85.0	0.91	35.87	0.177
3002	Indiana	04/30/1996	440.9	0.76	29.82	0.000
		08/02/1996	440.9	0.76	29.82	-0.004
		07/29/1998	440.9	0.76	29.82	-0.004
		09/28/1998	440.9	0.76	29.81	-0.016
3002	Indiana	04/30/1996	450.1	0.74	28.94	0.000
		08/02/1996	450.1	0.73	28.87	-0.071
		07/29/1998	450.1	0.73	28.87	-0.071
		09/28/1998	450.1	0.73	28.88	-0.059
3002	Indiana	04/30/1996	459.0	0.71	28.00	0.000
		08/02/1996	459.0	0.71	27.97	-0.031
		07/29/1998	459.0	0.71	27.98	-0.020
		09/28/1998	459.0	0.71	27.99	-0.008
3002	Indiana	04/30/1996	459.3	0.71	27.98	0.000
		08/02/1996	459.3	0.71	27.96	-0.012
		07/29/1998	459.3	0.71	27.98	0.000
		09/28/1998	459.3	0.71	27.96	-0.012
3002	Indiana	04/30/1996	467.8	0.69	27.02	0.000
		08/02/1996	467.8	0.69	26.98	-0.047
		07/29/1998	467.8	0.68	26.96	-0.067
		09/28/1998	467.8	0.68	26.96	-0.059
3002	Indiana	04/30/1996	478.0	0.65	25.71	0.000
		08/02/1996	478.0	0.65	25.69	-0.024
		07/29/1998	478.0	0.65	25.67	-0.047
		09/28/1998	478.0	0.65	25.69	-0.028
3002	Indiana	04/30/1996	478.3	0.65	25.68	0.000
		08/02/1996	478.3	0.65	25.66	-0.024
		07/29/1998	478.3	0.65	25.65	-0.028
		09/28/1998	478.3	0.65	25.64	-0.039
3002	Indiana	04/30/1996	483.9	0.63	24.85	0.000
		08/02/1996	483.9	0.63	24.80	-0.051

		07/29/1998	483.9	0.63	24.79	-0.059
		09/28/1998	483.9	0.63	24.79	-0.055
3002	Indiana	04/30/1996	491.1	0.61	23.93	0.000
		08/02/1996	491.1	0.61	23.91	-0.016
		07/29/1998	491.1	0.61	23.94	0.016
		09/28/1998	491.1	0.61	23.91	-0.016
3002	Indiana	04/30/1996	491.5	0.61	23.91	0.000
		08/02/1996	491.5	0.61	23.89	-0.024
		07/29/1998	491.5	0.61	23.94	0.028
		09/28/1998	491.5	0.61	23.92	0.012
3002	Indiana	04/30/1996	497.0	0.59	23.31	0.000
		08/02/1996	497.0	0.59	23.28	-0.031
		07/29/1998	497.0	0.59	23.29	-0.024
		09/28/1998	497.0	0.59	23.30	-0.012
3002	Indiana	04/30/1996	503.0	0.58	22.71	0.000
		08/02/1996	503.0	0.58	22.69	-0.016
		07/29/1998	503.0	0.58	22.69	-0.016
		09/28/1998	503.0	0.58	22.69	-0.020
3002	Indiana	04/30/1996	503.3	0.58	22.70	0.000
		08/02/1996	503.3	0.58	22.71	0.008
		07/29/1998	503.3	0.58	22.68	-0.024
		09/28/1998	503.3	0.58	22.66	-0.043
3002	Indiana	08/02/1996	512.1	0.56	21.98	0.000
		07/29/1998	512.1	0.57	22.36	0.382
		09/28/1998	512.1	0.57	22.39	0.413
3002	Indiana	04/30/1996	521.0	0.53	20.70	0.000
		08/02/1996	521.0	0.53	20.71	0.012
		07/29/1998	521.0	0.53	20.70	-0.004
		09/28/1998	521.0	0.53	20.68	-0.024
3802	Manitoba	10/15/1993	441.3	0.72	28.30	0.000
		05/02/1994	441.3	0.73	28.78	0.484
		06/20/1994	441.3	0.73	28.76	0.465
		08/22/1994	441.3	0.73	28.75	0.449
		09/20/1994	441.3	0.73	28.74	0.441
		10/18/1994	441.3	0.73	28.74	0.441
		04/26/1995	441.3	0.74	29.11	0.815
		05/16/1995	441.3	0.73	28.57	0.272
		06/20/1995	441.3	0.73	28.57	0.268
		10/15/1996	441.3	0.74	29.09	0.787
		05/31/1997	441.3	0.74	29.07	0.772
		06/20/1997	441.3	0.74	29.10	0.799

		09/15/1997	441.3	0.74	29.04	0.736
		04/22/1998	441.3	0.69	27.36	-0.937
3802	Manitoba	10/15/1993	450.1	0.73	28.67	0.000
		05/02/1994	450.1	0.74	29.05	0.386
		06/20/1994	450.1	0.74	29.22	0.559
		08/22/1994	450.1	0.74	29.06	0.398
		09/20/1994	450.1	0.74	29.07	0.406
		10/18/1994	450.1	0.74	29.04	0.378
		04/26/1995	450.1	0.75	29.39	0.728
		05/16/1995	450.1	0.74	29.07	0.402
		06/20/1995	450.1	0.73	28.81	0.142
		10/15/1996	450.1	0.75	29.44	0.776
		05/31/1997	450.1	0.75	29.41	0.740
		06/20/1997	450.1	0.75	29.42	0.756
		09/15/1997	450.1	0.75	29.41	0.740
		04/22/1998	450.1	0.70	27.52	-1.146
3802	Manitoba	10/15/1993	460.0	0.73	28.66	0.000
		05/02/1994	460.0	0.74	29.08	0.421
		06/20/1994	460.0	0.74	29.16	0.496
		08/22/1994	460.0	0.74	29.12	0.461
		09/20/1994	460.0	0.74	29.07	0.406
		10/18/1994	460.0	0.74	29.11	0.449
		04/26/1995	460.0	0.75	29.63	0.969
		05/16/1995	460.0	0.74	29.05	0.390
		06/20/1995	460.0	0.74	28.96	0.295
		10/15/1996	460.0	0.75	29.47	0.807
		05/31/1997	460.0	0.74	29.31	0.654
		06/20/1997	460.0	0.75	29.50	0.839
		09/15/1997	460.0	0.75	29.43	0.764
		04/22/1998	460.0	0.70	27.72	-0.945
3802	Manitoba	10/15/1993	460.3	0.73	28.85	0.000
		05/02/1994	460.3	0.74	29.28	0.421
		06/20/1994	460.3	0.75	29.37	0.516
		08/22/1994	460.3	0.74	29.29	0.437
		09/20/1994	460.3	0.74	29.29	0.437
		10/18/1994	460.3	0.74	29.31	0.453
		04/26/1995	460.3	0.75	29.43	0.571
		05/16/1995	460.3	0.74	29.26	0.406
		06/20/1995	460.3	0.74	29.12	0.264
		10/15/1996	460.3	0.75	29.70	0.850
		05/31/1997	460.3	0.75	29.69	0.835

		06/20/1997	460.3	0.76	29.73	0.874
		09/15/1997	460.3	0.75	29.67	0.815
		04/22/1998	460.3	0.70	27.72	-1.138
3802	Manitoba	10/15/1993	466.9	0.73	28.91	0.000
		05/02/1994	466.9	0.74	29.31	0.398
		06/20/1994	466.9	0.75	29.35	0.433
		08/22/1994	466.9	0.74	29.32	0.409
		09/20/1994	466.9	0.75	29.34	0.429
		10/18/1994	466.9	0.74	29.32	0.409
		04/26/1995	466.9	0.75	29.63	0.720
		05/16/1995	466.9	0.74	29.28	0.370
		06/20/1995	466.9	0.74	29.12	0.209
		10/15/1996	466.9	0.76	29.74	0.827
		05/31/1997	466.9	0.76	29.77	0.854
		06/20/1997	466.9	0.76	29.76	0.850
		09/15/1997	466.9	0.76	29.73	0.819
		04/22/1998	466.9	0.71	27.80	-1.118
3802	Manitoba	10/15/1993	477.0	0.73	28.78	0.000
		05/02/1994	477.0	0.74	29.24	0.457
		06/20/1994	477.0	0.74	29.26	0.480
		08/22/1994	477.0	0.74	29.24	0.461
		09/20/1994	477.0	0.74	29.22	0.441
		10/18/1994	477.0	0.74	29.22	0.445
		04/26/1995	477.0	0.75	29.60	0.823
		05/16/1995	477.0	0.74	29.17	0.394
		06/20/1995	477.0	0.74	29.09	0.307
		10/15/1996	477.0	0.75	29.62	0.839
		05/31/1997	477.0	0.75	29.67	0.894
		06/20/1997	477.0	0.75	29.66	0.882
		09/15/1997	477.0	0.75	29.59	0.815
		04/22/1998	477.0	0.70	27.76	-1.024
3802	Manitoba	10/15/1993	477.4	0.73	28.78	0.000
		05/02/1994	477.4	0.74	29.23	0.445
		06/20/1994	477.4	0.74	29.26	0.480
		08/22/1994	477.4	0.74	29.22	0.441
		09/20/1994	477.4	0.74	29.23	0.445
		10/18/1994	477.4	0.74	29.24	0.453
		04/26/1995	477.4	0.75	29.56	0.772
		05/16/1995	477.4	0.74	29.17	0.386
		06/20/1995	477.4	0.74	29.06	0.280
		10/15/1996	477.4	0.75	29.62	0.839

		05/31/1997	477.4	0.75	29.66	0.878
		06/20/1997	477.4	0.75	29.67	0.882
		09/15/1997	477.4	0.75	29.61	0.823
		04/22/1998	477.4	0.70	27.76	-1.028
3802	Manitoba	10/15/1993	482.0	0.73	28.61	0.000
		05/02/1994	482.0	0.74	29.03	0.413
		06/20/1994	482.0	0.74	29.09	0.472
		08/22/1994	482.0	0.74	29.06	0.441
		09/20/1994	482.0	0.74	29.05	0.437
		10/18/1994	482.0	0.74	29.06	0.441
		04/26/1995	482.0	0.75	29.36	0.744
		05/16/1995	482.0	0.73	28.90	0.287
		06/20/1995	482.0	0.73	28.87	0.260
		10/15/1996	482.0	0.75	29.43	0.819
		05/31/1997	482.0	0.75	29.35	0.740
		06/20/1997	482.0	0.75	29.43	0.819
		09/15/1997	482.0	0.75	29.41	0.795
		04/22/1998	482.0	0.70	27.56	-1.055
3802	Manitoba	10/15/1993	490.2	0.72	28.38	0.000
		05/02/1994	490.2	0.73	28.79	0.409
		06/20/1994	490.2	0.73	28.86	0.480
		08/22/1994	490.2	0.73	28.83	0.457
		09/20/1994	490.2	0.73	28.81	0.437
		10/18/1994	490.2	0.73	28.81	0.433
		04/26/1995	490.2	0.74	29.08	0.701
		05/16/1995	490.2	0.73	28.63	0.248
		06/20/1995	490.2	0.73	28.65	0.272
		10/15/1996	490.2	0.74	29.17	0.791
		05/31/1997	490.2	0.74	29.10	0.724
		06/20/1997	490.2	0.74	29.18	0.803
		09/15/1997	490.2	0.74	29.13	0.748
		04/22/1998	490.2	0.69	27.36	-1.016
3802	Manitoba	10/15/1993	490.5	0.72	28.39	0.000
		05/02/1994	490.5	0.73	28.80	0.413
		06/20/1994	490.5	0.73	28.83	0.449
		08/22/1994	490.5	0.73	28.84	0.453
		09/20/1994	490.5	0.73	28.82	0.437
		10/18/1994	490.5	0.73	28.82	0.437
		04/26/1995	490.5	0.74	29.07	0.689
		05/16/1995	490.5	0.73	28.63	0.248
		06/20/1995	490.5	0.73	28.65	0.268

		10/15/1996	490.5	0.74	29.18	0.795
		05/31/1997	490.5	0.74	29.15	0.764
		06/20/1997	490.5	0.74	29.22	0.831
		09/15/1997	490.5	0.74	29.13	0.748
		04/22/1998	490.5	0.70	27.40	-0.984
3802	Manitoba	10/15/1993	495.1	0.72	28.46	0.000
		05/02/1994	495.1	0.81	31.98	3.520
		06/20/1994	495.1	0.73	28.88	0.421
		08/22/1994	495.1	0.73	28.90	0.441
		09/20/1994	495.1	0.73	28.90	0.441
		10/18/1994	495.1	0.73	28.92	0.461
		04/26/1995	495.1	0.74	29.12	0.661
		05/16/1995	495.1	0.73	28.65	0.193
		06/20/1995	495.1	0.73	28.69	0.232
		10/15/1996	495.1	0.74	29.24	0.776
		05/31/1997	495.1	0.74	29.16	0.701
		06/20/1997	495.1	0.74	29.21	0.752
		09/15/1997	495.1	0.74	29.22	0.760
		04/22/1998	495.1	0.70	27.56	-0.902
3802	Manitoba	10/15/1993	500.0	0.72	28.22	0.000
		05/02/1994	500.0	0.73	28.61	0.386
		06/20/1994	500.0	0.73	28.67	0.449
		08/22/1994	500.0	0.73	28.71	0.488
		09/20/1994	500.0	0.73	28.69	0.465
		10/18/1994	500.0	0.73	28.68	0.461
		04/26/1995	500.0	0.73	28.81	0.594
		05/16/1995	500.0	0.72	28.41	0.193
		06/20/1995	500.0	0.72	28.52	0.295
		10/15/1996	500.0	0.74	29.02	0.799
		05/31/1997	500.0	0.74	28.94	0.724
		06/20/1997	500.0	0.74	29.00	0.780
		09/15/1997	500.0	0.74	28.94	0.720
		04/22/1998	500.0	0.70	27.52	-0.701
3802	Manitoba	10/15/1993	500.3	0.72	28.18	0.000
		05/02/1994	500.3	0.73	28.56	0.386
		06/20/1994	500.3	0.73	28.65	0.469
		08/22/1994	500.3	0.73	28.62	0.445
		09/20/1994	500.3	0.73	28.59	0.413
		10/18/1994	500.3	0.73	28.63	0.453
		04/26/1995	500.3	0.73	28.87	0.697
		05/16/1995	500.3	0.72	28.35	0.169

		06/20/1995	500.3	0.72	28.43	0.252
		10/15/1996	500.3	0.74	28.96	0.787
		05/31/1997	500.3	0.73	28.92	0.744
		06/20/1997	500.3	0.73	28.93	0.748
		09/15/1997	500.3	0.73	28.91	0.736
		04/22/1998	500.3	0.70	27.52	-0.657
3802	Manitoba	10/15/1993	511.2	0.72	28.29	0.000
		05/02/1994	511.2	0.73	28.63	0.339
		06/20/1994	511.2	0.73	28.71	0.421
		08/22/1994	511.2	0.73	28.75	0.461
		09/20/1994	511.2	0.73	28.74	0.457
		10/18/1994	511.2	0.73	28.72	0.433
		04/26/1995	511.2	0.73	28.93	0.646
		05/16/1995	511.2	0.72	28.44	0.157
		06/20/1995	511.2	0.72	28.52	0.232
		10/15/1996	511.2	0.74	29.06	0.772
		05/31/1997	511.2	0.74	28.96	0.677
		06/20/1997	511.2	0.74	28.98	0.689
		09/15/1997	511.2	0.74	29.04	0.748
		04/22/1998	511.2	0.70	27.60	-0.689
3802	Manitoba	10/15/1993	521.0	0.72	28.25	0.000
		05/02/1994	521.0	0.73	28.62	0.370
		06/20/1994	521.0	0.73	28.68	0.433
		08/22/1994	521.0	0.73	28.75	0.500
		09/20/1994	521.0	0.73	28.72	0.476
		10/18/1994	521.0	0.73	28.69	0.445
		04/26/1995	521.0	0.73	28.93	0.685
		05/16/1995	521.0	0.72	28.44	0.197
		06/20/1995	521.0	0.72	28.52	0.268
		10/15/1996	521.0	0.74	29.01	0.764
		05/31/1997	521.0	0.74	28.96	0.717
		06/20/1997	521.0	0.74	28.99	0.740
		09/15/1997	521.0	0.73	28.93	0.677
		04/22/1998	521.0	0.70	27.60	-0.650

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5C

THE STATISTICAL ANALYSIS

MAY 2023

LIST OF TABLES

Table 5C.1 Elevation Changes Statistical Analysis for <i>AC</i> Sections	1
Table 5C.2 Elevation Changes Statistical Analysis for <i>PCC</i> Sections	9

Table 5C.1 Elevation Changes Statistical Analysis for AC Sections

Date	AL 01-0101								
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location								
	300	325	350	375	400	425	450	475	500
07/26/1995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/20/1995	0.000	0.000	0.000	0.000	0.039	0.000	0.000	-0.079	0.000
01/29/1996	0.118	0.079	0.118	0.157	0.118	0.079	0.039	-0.039	0.039
04/17/1996	0.118	0.079	0.079	0.157	0.079	0.079	0.039	-0.079	0.000
08/22/1996	0.000	0.000	0.000	0.039	0.039	-0.039	-0.039	-0.118	-0.039
10/10/1996	0.079	0.079	0.079	0.039	0.039	-0.039	-0.079	-0.118	-0.079
10/30/1997	0.157	0.079	0.118	0.079	0.118	0.079	-0.079	-0.118	0.079
01/09/1998	0.118	0.079	0.118	0.079	0.079	0.000	-0.039	-0.118	-0.039
04/25/1998	0.118	0.079	0.157	0.236	0.079	0.197	0.118	-0.079	0.118
07/20/1998	0.118	0.079	0.118	0.157	0.079	0.118	0.039	-0.079	0.039
11/11/1998	0.157	0.079	0.118	0.118	0.079	0.118	0.157	-0.039	0.118

Date	N count	Average	Std Dev	Variance
07/26/1995				
11/20/1995	9	-0.0044	0.0308	0.0009
01/29/1996	9	0.0787	0.0591	0.0035
04/17/1996	9	0.0612	0.0685	0.0047
08/22/1996	9	-0.0175	0.0487	0.0024
10/10/1996	9	0.0000	0.0787	0.0062
10/30/1997	9	0.0569	0.0926	0.0086
01/09/1998	9	0.0306	0.0830	0.0069
04/25/1998	9	0.1137	0.0890	0.0079
07/20/1998	9	0.0744	0.0694	0.0048
11/11/1998	9	0.1006	0.0594	0.0035

Date	AL 01-0102								
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location								
	300	325	350	375	400	425	450	475	<i>500</i>
07/27/1995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/21/1995	-0.039	-0.039	0.000	-0.079	0.039	-0.039	0.118	0.000	0.039
01/30/1996	-0.079	-0.118	-0.039	-0.157	-0.079	-0.157	0.079	-0.039	-0.039
04/17/1996	-0.079	-0.079	-0.039	-0.157	-0.079	-0.118	0.000	-0.039	-0.039
08/23/1996	0.000	0.000	0.000	-0.118	-0.039	-0.118	0.079	0.000	0.039
10/11/1996	0.039	0.039	0.039	-0.039	0.000	-0.157	0.000	0.000	-0.039
10/28/1997	-0.039	0.039	0.079	-0.118	0.000	-0.039	0.315	0.039	0.118
01/12/1998	-0.039	-0.039	0.000	-0.157	-0.039	-0.157	0.039	-0.039	0.000
04/30/1998	-0.079	-0.079	-0.118	-0.276	-0.079	-0.236	-0.039	-0.118	-0.079
11/21/1998	-0.079	-0.079	-0.118	-0.197	-0.157	-0.236	-0.079	-0.118	-0.118

Date	N count	Average	Std Dev	Variance
07/27/1995				
11/21/1995	9	0.0000	0.0591	0.0035
01/30/1996	9	-0.0700	0.0731	0.0053
04/17/1996	9	-0.0700	0.0473	0.0022
08/23/1996	9	-0.0175	0.0656	0.0043
10/11/1996	9	-0.0131	0.0622	0.0039
10/28/1997	9	0.0437	0.1236	0.0153
01/12/1998	9	-0.0481	0.0676	0.0046
04/30/1998	9	-0.1225	0.0798	0.0064
11/21/1998	9	-0.1312	0.0557	0.0031

Date	CO 08-1053								
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location								
	0	25	50	75	100	125	150	175	200
07/01/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12/06/1993	-0.039	-0.039	-0.079	-0.197	-0.118	-0.236	-0.079	-0.315	-0.276
03/14/1994	-0.039	0.039	0.039	-0.157	0.000	-0.079	0.000	0.000	-0.079
05/02/1994	0.039	0.079	-0.039	-0.236	-0.079	-0.236	-0.276	-0.236	-0.315
08/08/1994	-0.157	-0.079	-0.079	-0.276	0.000	-0.118	0.039	0.039	0.000
10/21/1994	-0.276	-0.118	-0.197	-0.315	-0.079	-0.197	0.000	0.000	0.000
01/17/1995	-0.118	-0.157	0.039	-0.394	-0.079	-0.079	0.039	-0.039	0.000
02/13/1995	-0.039	0.000	0.039	-0.118	0.039	0.079	0.197	0.157	-3.701
04/21/1995	-0.197	-0.079	-0.118	-0.276	-0.079	-0.079	0.000	0.000	-3.937
05/08/1995	0.039	0.000	0.039	-0.276	0.039	-0.079	0.000	-0.039	-4.213
11/14/1996	-0.315	-0.197	-0.276	-0.551	-0.157	-0.197	-0.394	-0.276	-4.055
03/07/1997	-0.276	-0.276	-0.276	-0.315	-0.236	-0.433	-0.197	-0.276	-4.173
05/21/1997	-0.079	0.079	0.000	-0.197	0.079	-0.157	0.079	-0.118	-4.016
08/05/1997	-0.039	0.118	0.236	0.000	0.276	0.157	0.197	0.118	-4.134
09/26/1997	-0.079	-0.079	0.000	-0.354	-0.039	0.039	-0.039	-0.039	-0.157

Date	N count	Average	Std Dev	Variance
07/01/1993				
12/06/1993	9	-0.1531	0.1050	0.0110
03/14/1994	9	-0.0306	0.0646	0.0042
05/02/1994	9	-0.1444	0.1460	0.0213
08/08/1994	9	-0.0700	0.1037	0.0108
10/21/1994	9	-0.1312	0.1213	0.0147
01/17/1995	9	-0.0875	0.1332	0.0177
02/13/1995	8	0.0443	1.2520	1.5675
04/21/1995	8	-0.1033	1.2809	1.6407
05/08/1995	8	-0.0344	1.3963	1.9495
11/14/1996	8	-0.2953	1.2590	1.5851
03/07/1997	8	-0.2854	1.2975	1.6836
05/21/1997	8	-0.0394	1.3297	1.7681
08/05/1997	8	0.1329	1.4259	2.0332
09/26/1997	9	-0.0831	0.1155	0.0133

Date	MT 30-8129								
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location								
	300	325	350	375	400	425	450	475	500
12/14/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
03/17/1994	-0.236	-0.394	-0.197	-0.079	0.118	0.000	0.079	**	**
04/20/1994	-0.236	-0.354	-0.197	-0.079	0.157	0.197	0.315	0.315	0.394
08/22/1994	-0.118	-0.315	-0.197	-0.197	0.039	0.000	0.039	-0.118	-0.039
10/31/1994	0.118	-0.197	-0.157	-0.079	0.157	0.276	0.433	0.394	0.354
01/23/1995	0.276	0.433	0.472	0.236	0.079	0.118	0.079	0.591	0.669
02/17/1995	-0.236	0.079	0.118	0.315	0.551	0.433	0.512	0.197	0.669
04/27/1995	0.079	0.000	0.079	0.118	0.276	1.417	0.276	0.000	0.236
05/18/1995	0.039	-0.315	-0.236	-0.039	0.118	**	0.748	0.000	0.039
01/23/1997	0.394	0.157	0.236	0.551	0.472	0.433	0.394	0.354	0.276
03/12/1997	2.441	1.614	1.339	0.709	0.236	-0.315	-0.984	-1.378	-1.850
05/28/1997	-0.118	-0.197	-0.197	-0.197	0.157	0.157	0.079	0.118	0.197
10/01/1997	-0.118	-0.236	-0.039	0.079	0.354	0.197	0.236	0.157	0.315

Date	N count	Average	Std Dev	Variance
12/14/1993				
03/17/1994	7	-0.1012	0.1845	0.0340
04/20/1994	9	0.0569	0.2771	0.0768
08/22/1994	9	-0.1006	0.1215	0.0148
10/31/1994	9	0.1444	0.2411	0.0581
01/23/1995	9	0.3281	0.2227	0.0496
02/17/1995	9	0.2931	0.2833	0.0803
04/27/1995	8	0.1329	0.1151	0.0133
05/18/1995	7	-0.0562	0.1589	0.0252
01/23/1997	9	0.3631	0.1226	0.0150
03/12/1997	9	0.2012	1.4552	2.1175
05/28/1997	9	0.0000	0.1727	0.0298
10/01/1997	9	0.1050	0.2007	0.0403

Date	NE 31-0114											
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location											
	-20	-10	-5	0	25	50	75	100	125	150	175	200
04/24/1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
08/08/1996	-0.087	-0.110	-0.138	-0.114	0.146	-0.161	-0.130	-0.098	-0.087	-0.063	-0.122	-0.177
11/05/1997	-0.280	-0.193	-0.244	-0.181	-0.138	-0.402	-0.354	-0.268	-0.220	-0.157	-0.201	-0.252
02/18/1998	-0.252	-0.256	-0.260	-0.197	-0.177	-0.417	-0.350	-0.260	-0.240	-0.185	-0.185	-0.240
09/23/1998	-0.524	-0.370	-0.437	-0.370	-0.346	-0.622	-0.520	-0.409	-0.394	-0.350	-0.406	-0.453

Date	N count	Average	Std Dev	Variance
04/24/1996				
08/08/1996	12	-0.0951	0.0824	0.0068
11/05/1997	12	-0.2408	0.0778	0.0060
02/18/1998	12	-0.2516	0.0707	0.0050
09/23/1998	12	-0.4334	0.0836	0.0070

Date	SD 46-0804											
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location											
	300	325	350	375	400	425	450	475	500	510	520	525
10/25/1994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12/20/1994	**	-0.642	-0.685	-0.677	-0.783	-0.819	-0.803	-0.866	-0.965	-0.787	-0.740	-0.736
03/23/1995	-0.831	-0.760	-0.752	-0.626	-0.551	-0.508	-0.500	-0.512	-0.496	-0.461	-0.516	-0.504
04/20/1995	-0.516	-0.449	-0.488	-0.453	-0.476	-0.461	-0.445	-0.461	-0.461	-0.421	-0.461	-0.429
06/27/1995	-0.567	-0.504	-0.504	-0.425	-0.453	-0.425	-0.398	-0.449	-0.425	-0.390	-1.110	-0.413
10/24/1996	-0.492	-0.378	-0.378	-0.343	-0.382	-0.358	-0.331	-0.319	-0.260	-0.252	-0.315	-0.295
04/29/1997	-1.110	-0.433	-0.524	-0.445	-0.500	-0.445	-0.378	-0.370	-0.331	-0.343	-0.492	-0.417
05/15/1997	-0.673	-0.504	-0.492	-0.413	-0.496	-0.441	-0.374	-0.382	-0.366	-0.402	-0.535	-0.476
07/22/1997	-0.626	-0.433	-0.465	-0.358	-0.437	-0.394	-0.315	-0.307	-0.295	-0.307	-0.433	-0.417
09/22/1997	-0.563	-0.394	-0.406	-0.343	1.717	-0.335	-0.224	-0.224	-0.209	-0.205	-0.346	-0.327
12/16/2003	-0.508	-0.220	-0.114	0.008	-0.047	-0.083	-0.114	-0.150	0.031	-0.102	-0.335	-0.303
Date	N count	Average	Std Dev	Variance								
10/25/1994												
12/20/1994	11	-0.7731	0.0924	0.0085								
03/23/1995	12	-0.5846	0.1261	0.0159								
04/20/1995	12	-0.4600	0.0253	0.0006								
06/27/1995	12	-0.5052	0.1973	0.0389								
10/24/1996	12	-0.3419	0.0643	0.0041								
04/29/1997	12	-0.4823	0.2071	0.0429								
05/15/1997	12	-0.4629	0.0873	0.0076								
07/22/1997	12	-0.3989	0.0936	0.0088								
09/22/1997	11	-0.3250	0.1081	0.0117								
12/16/2003	12	-0.1614	0.1557	0.0243								

Date	SD 46-9187										
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location										
	-25	-15	0	25	50	75	100	125	150	175	200
07/19/1994	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
09/26/1994	0.059	0.035	0.055	0.059	0.063	0.031	0.051	0.028	0.028	0.059	0.102
10/24/1994	0.091	0.098	0.087	0.417	0.016	0.043	0.039	0.024	0.008	0.047	0.091
12/19/1994	-0.425	-0.437	-0.469	-0.398	-0.425	-0.366	-0.390	-0.370	-0.299	-0.276	-0.224
03/10/1995	-0.378	-0.480	-0.508	-0.406	-0.409	-0.346	-0.390	-0.425	-0.327	-0.366	-0.382
04/07/1995	0.016	0.008	0.035	-0.051	-0.087	-0.071	-0.079	-0.083	-0.094	-0.043	-0.055
05/22/1995	0.000	0.047	0.043	0.008	-0.067	-0.035	-0.067	-0.118	-0.098	-0.083	-0.039
06/26/1995	-0.024	-0.063	-0.012	-0.008	-0.043	-0.016	-0.051	-0.071	-0.063	-0.035	0.000
10/25/1996	-0.008	0.016	-0.031	-0.016	-0.055	-0.071	-0.161	-0.122	-0.118	-0.043	-0.024
02/19/1997	-0.917	-1.000	-1.126	-1.071	-1.067	-1.138	-1.276	-1.217	-1.039	-0.937	-0.937
04/14/1997	-0.303	-0.319	-0.409	-0.370	-0.390	-0.386	-0.469	-0.425	-0.457	-0.429	-0.398
05/14/1997	-0.295	-0.280	-0.323	-0.339	-0.358	-0.339	-0.390	-0.358	-0.362	-0.291	-0.248
09/23/1997	-0.055	-0.051	-0.118	-0.126	-0.169	-0.161	-0.197	-0.177	-0.201	-0.114	-0.051

Date	N count	Average	Std Dev	Variance
07/19/1994				
09/26/1994	11	0.0519	0.0217	0.0005
10/24/1994	11	0.0873	0.1142	0.0130
12/19/1994	11	-0.3708	0.0752	0.0057
03/10/1995	11	-0.4016	0.0540	0.0029
04/07/1995	11	-0.0458	0.0453	0.0020
05/22/1995	11	-0.0372	0.0558	0.0031
06/26/1995	11	-0.0351	0.0249	0.0006
10/25/1996	11	-0.0576	0.0552	0.0030
02/19/1997	11	-1.0659	0.1165	0.0136
04/14/1997	11	-0.3958	0.0514	0.0026
05/14/1997	11	-0.3257	0.0426	0.0018
09/23/1997	11	-0.1292	0.0572	0.0033

Date	TX 48-1068								
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location								
	0	25	50	75	100	125	150	175	200
12/16/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
01/12/1994	-0.039	0.000	-0.039	-0.039	-0.039	0.000	0.000	0.079	-0.039
04/13/1994	-0.039	-0.079	-0.039	-0.039	-0.039	0.000	0.000	-0.315	0.000
07/14/1994	0.000	0.000	-0.039	0.000	-0.039	0.000	0.000	-0.197	-0.039
01/27/1995	0.000	0.000	-0.039	-0.039	-0.039	-0.039	-0.039	-0.118	-0.118
04/13/1995	-0.079	-0.079	-0.079	-0.079	-0.157	-0.118	-0.118	-0.197	-0.118
06/08/1995	0.000	0.000	-0.079	-0.079	-0.157	-0.079	-0.039	-0.315	-0.079
11/13/1996	0.039	0.118	0.039	-0.039	0.039	0.118	0.039	-0.236	0.157
01/23/1997	-0.039	0.039	0.039	0.000	-0.157	0.118	0.197	-0.236	0.315
04/21/1997	-0.157	-0.079	-0.079	-0.236	-0.157	-0.157	-0.157	-0.276	-0.354
07/03/1997	-0.118	0.000	0.000	0.039	-0.157	-0.039	-0.039	-0.315	-0.039
09/17/1997	0.039	0.079	0.079	-0.079	-0.118	-0.079	0.039	-0.276	0.039

Date	N count	Average	Std Dev	Variance
12/16/1993				
01/12/1994	9	-0.0131	0.0394	0.0016
04/13/1994	9	-0.0612	0.0986	0.0097
07/14/1994	9	-0.0350	0.0636	0.0040
01/27/1995	9	-0.0481	0.0430	0.0019
04/13/1995	9	-0.1137	0.0415	0.0017
06/08/1995	9	-0.0919	0.0964	0.0093
11/13/1996	9	0.0306	0.1161	0.0135
01/23/1997	9	0.0306	0.1691	0.0286
04/21/1997	9	-0.1837	0.0902	0.0081
07/03/1997	9	-0.0744	0.1086	0.0118
09/17/1997	9	-0.0306	0.1177	0.0139

Table 5C.2 Elevation Changes Statistical Analysis for PCC Sections

Date	KS 20-4054															
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location															
	439.0	446.9	454.1	454.4	461.9	469.2	469.5	477.0	483.9	484.3	493.1	500.0	500.3	507.9	515.1	
04/25/1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
08/05/1996	-0.020	-0.031	0.008	0.008	-0.020	-1.122	-0.776	-0.012	0.008	0.008	-0.016	-0.012	0.004	0.004	0.012	
11/06/1997	0.047	0.020	0.008	0.008	0.020	0.008	0.039	0.012	0.016	0.012	0.016	-0.024	0.031	0.031	0.028	
02/17/1998	0.083	0.035	0.028	0.012	0.016	0.016	0.063	0.004	0.016	0.020	0.008	0.000	0.043	0.028	0.028	
08/25/1998	0.020	-0.016	0.024	0.020	0.000	0.004	0.020	0.000	0.043	0.039	0.004	-0.012	0.016	0.016	0.031	
11/19/1998	0.051	0.016	0.016	0.016	0.012	-0.004	0.051	0.008	0.012	0.004	0.008	0.024	0.047	0.039	0.028	

Date	N count	Average	Std Dev	Variance
04/25/1996				
08/05/1996	13	-0.0045	0.3389	0.1149
11/06/1997	15	0.0181	0.0167	0.0003
02/17/1998	15	0.0265	0.0224	0.0005
08/25/1998	15	0.0139	0.0172	0.0003
11/19/1998	15	0.0218	0.0177	0.0003

Date	MN 27-4040														
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location														
	385.2	399.0	412.1	412.4	425.9	440.0	440.3	453.1	465.9	466.2	480.0	494.1	494.4	506.9	521.0
09/22/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/16/1993	-0.425	-0.366	-0.445	-0.445	-0.311	-0.370	-0.319	-0.287	-0.358	-0.350	-0.260	-0.346	-0.295	-0.303	-0.421
02/17/1994	-1.429	-1.413	-1.413	-1.445	-1.398	-1.244	-1.213	-1.693	-1.378	-1.374	-1.390	-1.453	-1.402	-1.512	-1.535
03/31/1994	-0.906	-0.843	-0.701	-0.748	-0.732	-0.661	-0.728	-0.925	-0.866	-0.858	-0.878	-0.886	-0.846	-0.937	-0.811
05/04/1994	-0.087	-0.020	0.012	0.016	0.098	0.071	0.024	0.217	0.043	0.051	0.276	-0.012	0.028	-0.016	0.012
08/25/1994	-0.079	-0.063	-0.051	-0.063	0.008	-0.035	-0.043	-0.004	-0.004	0.012	0.256	0.024	0.083	0.035	-0.020
11/10/1994	-0.098	-0.110	-0.083	-0.098	0.150	-0.039	-0.039	0.134	-0.016	-0.008	0.236	-0.012	0.075	0.012	-0.031
01/12/1995	-1.008	-0.358	-1.024	-1.000	-0.831	-0.933	-0.874	-0.795	-0.917	-0.933	-0.685	-0.909	-0.827	-0.929	-0.976
03/17/1995	-0.638	-0.669	-0.587	-0.583	-0.661	-0.543	-0.594	-0.772	-0.673	-0.657	-0.689	-0.654	-0.614	-0.752	-0.701
03/31/1995	-0.350	-0.370	-0.331	-0.350	-0.319	-0.264	-0.280	-0.394	-0.370	-0.350	-0.339	-0.346	-0.303	-0.413	-0.402
04/28/1995	-0.004	0.008	0.055	0.039	0.079	0.114	0.118	0.091	0.106	0.118	0.138	0.142	0.209	0.102	0.091
05/11/1995	0.075	0.189	0.091	0.102	0.307	0.150	0.138	0.315	0.209	0.209	0.409	0.197	0.476	0.161	0.157
06/16/1995	0.035	0.000	-0.043	-0.087	0.083	0.047	0.055	0.102	0.150	0.157	0.362	0.181	0.244	0.138	0.130
10/09/1996	-0.008	0.024	0.028	0.028	0.083	0.059	0.028	0.055	0.067	0.102	0.118	0.094	0.150	0.079	0.055
11/07/1996	-0.004	-0.004	0.016	0.016	0.043	0.055	0.020	0.031	0.055	0.075	0.075	0.083	0.130	0.020	0.039
04/08/1997	-0.016	-0.004	0.071	0.126	0.102	0.205	0.173	0.071	0.051	0.063	0.063	0.079	0.130	-0.047	-0.016
04/22/1997	-0.224	-0.209	-0.071	-0.075	-0.067	0.024	**	-0.134	-0.098	-0.091	-0.118	-0.079	-0.043	-0.142	-0.083
05/06/1997	0.063	0.063	0.150	0.110	0.209	0.248	0.228	0.339	0.201	0.201	0.220	0.220	0.287	0.185	-1.780
05/28/1997	0.075	0.020	0.114	0.098	0.106	0.150	0.102	0.098	0.177	0.193	0.157	0.209	0.264	0.150	0.063
06/10/1997	0.071	0.165	0.079	0.102	0.295	0.150	0.102	0.283	0.161	0.173	0.350	0.232	0.264	0.020	0.126
08/13/1997	-0.083	-0.047	-0.012	-0.020	0.004	0.012	-0.008	0.154	0.024	0.031	0.039	0.067	0.110	0.142	0.039
09/09/1997	0.075	0.059	0.098	0.094	0.102	0.142	0.106	0.063	0.138	0.150	0.165	0.177	0.236	0.142	0.165

Date	N count	Average	Std Dev	Variance
09/22/1993				
11/16/1993	15	-0.3535	0.0592	0.0035
02/17/1994	15	-1.4194	0.1127	0.0127
03/31/1994	15	-0.8218	0.0867	0.0075
05/04/1994	15	0.0475	0.0919	0.0085
08/25/1994	15	0.0037	0.0821	0.0067
11/10/1994	15	0.0047	0.1016	0.0103
01/12/1995	15	-0.8667	0.1671	0.0279
03/17/1995	15	-0.6525	0.0625	0.0039
03/31/1995	15	-0.3454	0.0424	0.0018
04/28/1995	15	0.0937	0.0540	0.0029
05/11/1995	15	0.2123	0.1164	0.0136
06/16/1995	15	0.1037	0.1130	0.0128
10/09/1996	15	0.0640	0.0416	0.0017
11/07/1996	15	0.0433	0.0364	0.0013
04/08/1997	15	0.0701	0.0712	0.0051
04/22/1997	14	-0.1007	0.0635	0.0040
05/06/1997	14	0.1946	0.5152	0.2654
05/28/1997	15	0.1318	0.0627	0.0039
06/10/1997	15	0.1717	0.0949	0.0090
08/13/1997	15	0.0302	0.0661	0.0044
09/09/1997	15	0.1276	0.0484	0.0023

Date	TX 48-4143														
	PE - Pavement Edge: Elevation Changes (inches) at Time and Station Location														
	412.7	422.9	432.4	433.1	442.9	453.1	453.4	462.9	473.1	473.4	482.9	493.1	493.4	503.3	513.8
11/18/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
01/18/1994	0.079	-0.039	0.118	0.197	0.039	0.000	0.079	0.118	0.118	0.079	-0.079	0.039	0.079	0.039	0.039
04/19/1994	0.276	0.236	0.354	0.591	0.315	0.197	0.276	0.315	0.236	0.236	0.315	0.354	0.472	0.276	0.118
07/11/1994	0.197	0.157	0.236	0.551	0.276	0.157	0.236	0.236	0.197	0.197	0.197	0.354	0.472	0.236	0.118
01/10/1995	0.039	-0.039	0.039	0.472	0.197	0.079	0.118	0.157	0.079	0.079	0.118	0.157	0.394	0.039	0.000
04/10/1995	0.000	0.000	0.000	0.197	0.079	0.000	0.039	0.079	0.079	0.118	0.118	0.157	0.236	0.157	0.039
06/05/1995	0.118	0.079	0.118	0.118	0.157	0.118	0.118	0.197	0.197	0.157	0.197	0.236	0.394	0.157	0.118
11/19/1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
01/28/1997	0.787	0.236	0.354	0.472	0.394	0.472	1.142	1.417	0.945	0.984	1.063	1.260	1.142	1.142	0.984
04/24/1997	0.433	0.551	0.354	0.512	0.591	0.512	0.512	0.866	0.551	0.315	0.512	0.512	0.315	0.354	0.512
07/09/1997	0.512	0.433	0.472	0.433	0.630	0.551	0.394	1.024	0.433	0.157	0.472	0.472	0.276	0.354	0.276
09/25/1997	0.197	0.276	0.197	0.512	0.394	0.472	0.512	0.669	0.354	0.276	0.276	0.315	0.236	0.354	-0.118

Date	N count	Average	Std Dev	Variance
11/18/1993				
01/18/1994	15	0.0604	0.0680	0.0046
04/19/1994	15	0.3045	0.1128	0.0127
07/11/1994	15	0.2546	0.1189	0.0141
01/10/1995	15	0.1286	0.1392	0.0194
04/10/1995	15	0.0866	0.0762	0.0058
06/05/1995	15	0.1654	0.0762	0.0058
11/19/1996	15	0.0000	0.0000	0.0000
01/28/1997	15	0.4528	0.3737	0.1396
04/24/1997	15	0.4934	0.1371	0.0188
07/09/1997	15	0.4593	0.1955	0.0382
09/25/1997	15	0.3281	0.1814	0.0329

Date	NC 37-0201																
	PE - Pavement Edge: Elevation Changes (inches) at Time and Station Location																
	430.1	438.0	444.9	445.2	452.4	460.0	460.3	467.5	475.1	475.4	482.6	490.2	490.5	497.7	504.9	512.1	520.0
05/15/1995	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
07/12/1995	0.197	0.197	0.295	0.098	0.197	0.000	0.098	0.000	0.000	0.098	0.098	0.000	**	**	**	**	-2.362
10/16/1995	0.197	0.098	0.098	0.197	0.098	0.000	0.000	-0.098	0.000	-0.098	0.000	-0.098	**	**	**	**	0.295
01/23/1996	0.295	0.098	0.394	0.295	0.197	0.098	0.197	0.000	0.098	0.098	0.000	0.000	0.098	0.000	0.197	**	**
04/23/1996	0.591	0.394	0.492	0.492	0.394	0.394	0.492	0.295	0.492	0.492	0.492	0.394	0.394	0.295	0.295	**	**
08/20/1996	0.197	0.197	0.295	0.197	0.098	0.000	0.000	-0.197	-0.098	0.098	-0.098	-0.197	0.000	0.000	-0.197	-0.098	0.197
10/03/1996	0.098	0.000	0.098	0.098	-0.197	-0.197	-0.098	-0.295	2.362	2.362	0.000	0.098	0.000	0.098	0.000	-0.098	4.134
10/06/1997	0.295	0.295	0.295	0.295	0.098	0.098	0.197	0.098	0.197	0.197	0.098	0.197	0.197	0.098	0.000	**	**
02/19/1998	0.295	0.295	0.295	0.295	0.197	-0.098	0.000	0.000	0.098	0.098	0.098	0.098	-0.492	-0.394	0.000	**	**
04/23/1998	0.197	0.197	0.197	0.197	0.000	0.000	0.098	0.000	0.000	0.000	0.000	0.000	0.000	-0.492	-0.197	**	**
07/16/1998	0.197	0.098	0.098	0.098	0.000	-0.098	0.000	-0.098	0.000	-0.098	-0.098	0.000	0.000	0.000	0.000	**	**
10/15/1998	0.000	0.098	0.098	-0.197	-0.295	-0.492	-0.295	-0.394	-0.295	-0.295	-0.492	-0.197	-0.984	-0.492	-0.492	**	**
03/14/2002	0.295	0.197	0.394	**	0.098	0.098	**	0.000	0.130	**	0.000	0.098	**	0.000	-0.098	-0.098	0.197
05/20/2002	0.394	0.098	0.295	**	0.098	-0.098	**	-0.098	-0.098	**	-0.098	0.000	**	-0.098	-0.197	-0.295	0.098
09/19/2002	0.197	0.197	0.197	**	0.000	-0.098	**	-0.197	-0.098	**	-0.197	-0.098	**	-0.197	-0.197	-0.295	0.000
04/22/2003	0.197	0.197	0.295	**	0.098	0.098	**	0.000	0.098	**	-0.197	0.098	**	-0.098	-0.197	-0.295	0.000
12/11/2003	0.492	0.394	0.492	**	0.197	0.197	**	0.098	0.197	0.000	**	**	**	**	**	-0.295	0.197

Date	N count	Average	Std Dev	Variance
05/15/1995				
07/12/1995	12	0.1066	0.0981	0.0096
10/16/1995	13	0.0530	0.1246	0.0155
01/23/1996	15	0.1378	0.1223	0.0149
04/23/1996	14	0.4265	0.0886	0.0078
08/20/1996	17	0.0232	0.1577	0.0249
10/03/1996	14	-0.0281	0.1305	0.0170
10/06/1997	15	0.1772	0.0926	0.0086
02/19/1998	15	0.0525	0.2378	0.0566
04/23/1998	15	0.0131	0.1779	0.0316
07/16/1998	15	0.0066	0.0870	0.0076
10/15/1998	14	-0.2672	0.2094	0.0439
03/14/2002	13	0.1008	0.1451	0.0211
05/20/2002	13	0.0000	0.1927	0.0371
09/19/2002	13	-0.0606	0.1683	0.0283
04/22/2003	13	0.0227	0.1759	0.0309
12/11/2003	10	0.1969	0.2366	0.0560

Date	OH 39-0204														
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location														
	9.8	17.1	24.9	25.3	32.2	40.0	40.4	46.9	55.1	55.4	62.0	70.9	71.2	77.1	85.0
05/13/1998	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
07/30/1998	-0.055	-0.031	-0.008	-0.035	-0.020	-0.039	-0.067	-1.795	-0.047	-0.035	-0.024	-0.016	-0.024	-0.008	-0.008
09/29/1998	-0.122	-0.138	-0.142	-0.122	-0.106	-0.138	-0.138	-1.898	-0.150	-0.130	-0.110	-0.118	-0.114	-0.110	-0.114
02/16/1999	0.228	0.228	0.201	0.197	0.244	0.189	0.209	-1.543	0.209	0.217	0.248	0.252	0.244	0.236	0.201
03/23/1999	0.220	0.224	0.173	-1.024	0.220	-0.917	-0.953	-2.728	-0.996	-0.988	-0.937	-0.984	0.224	0.220	0.177

Date	N count	Average	Std Dev	Variance
05/13/1998				
07/30/1998	14	-0.0298	0.0182	0.0003
09/29/1998	14	-0.1251	0.0138	0.0002
02/16/1999	14	0.2216	0.0212	0.0004
03/23/1999	7	0.2087	0.0230	0.0005

Date	IN 18-3002														
	PE -Pavement Edge: Elevation Changes (inches) at Time and Station Location														
	440.9	450.1	459.0	459.3	467.8	478.0	478.3	483.9	491.1	491.5	497.0	503.0	503.3	512.1	521.0
04/30/1996	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**	0.000
08/02/1996	-0.004	-0.071	-0.031	-0.012	-0.047	-0.024	-0.024	-0.051	-0.016	-0.024	-0.031	-0.016	0.008	0.000	0.012
07/29/1998	-0.004	-0.071	-0.020	0.000	-0.067	-0.047	-0.028	-0.059	0.016	0.028	-0.024	-0.016	-0.024	0.382	-0.004
09/28/1998	-0.016	-0.059	-0.008	-0.012	-0.059	-0.028	-0.039	-0.055	-0.016	0.012	-0.012	-0.020	-0.043	0.413	-0.024

Date	N count	Average	Std Dev	Variance
04/30/1996				
08/02/1996	14	-0.0236	0.0225	0.0005
07/29/1998	14	-0.0228	0.0298	0.0009
09/28/1998	14	-0.0270	0.0213	0.0005

Date	MB 83-3802														
	PE - Pavement Edge: Elevation Changes (inches) at Time and Station Location														
	441.3	450.1	460.0	460.3	466.9	477.0	477.4	482.0	490.2	490.5	495.1	500.0	500.3	511.2	521.0
10/15/1993	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11/15/1993	-0.201	-0.228	-0.205	-0.197	-0.205	-0.209	-0.213	-0.209	-0.213	-0.232	-0.240	-0.244	-0.236	-0.197	-0.224
12/14/1993	-0.402	-0.346	-0.358	-0.358	-0.343	-0.323	-0.335	-0.319	-0.295	-0.323	-0.327	-0.307	-0.295	-0.283	-0.264
02/15/1994	-0.173	-0.390	-0.394	-0.398	-0.445	-1.327	-1.291	-0.433	-0.406	-0.433	-0.469	-0.677	-0.445	-0.433	-0.350
03/15/1994	-0.299	-0.484	-0.579	-0.563	-0.591	-0.575	-0.587	-0.579	-0.567	-0.594	-0.602	-0.610	-0.594	-0.587	-0.563
03/29/1994	-0.398	-0.598	-0.646	-0.646	-0.685	-0.606	-0.638	-0.657	-0.626	-0.638	-0.673	-0.654	-0.626	-0.339	-0.610
04/12/1994	-0.043	-0.209	-0.228	-0.260	-0.264	-0.197	-0.217	-0.272	-0.252	-0.256	-0.291	-0.283	-0.272	-0.295	-0.268
05/02/1994	0.484	0.386	0.421	0.421	0.398	0.457	0.445	0.413	0.409	0.413	3.520	0.386	0.386	0.339	0.370
06/20/1994	0.465	0.559	0.496	0.516	0.433	0.480	0.480	0.472	0.480	0.449	0.421	0.449	0.469	0.421	0.433
08/22/1994	0.449	0.398	0.461	0.437	0.409	0.461	0.441	0.441	0.457	0.453	0.441	0.488	0.445	0.461	0.500
09/20/1994	0.441	0.406	0.406	0.437	0.429	0.441	0.445	0.437	0.437	0.437	0.441	0.465	0.413	0.457	0.476
10/18/1994	0.441	0.378	0.449	0.453	0.409	0.445	0.453	0.441	0.433	0.437	0.461	0.461	0.453	0.433	0.445
02/14/1995	0.303	0.232	0.240	0.228	0.177	0.185	0.189	0.157	0.157	0.138	0.098	0.098	0.185	-0.039	0.110
03/29/1995	0.346	0.201	0.228	0.244	0.201	0.260	0.236	0.177	0.157	0.165	0.138	0.165	0.118	0.130	0.142
04/26/1995	0.815	0.728	0.969	0.571	0.720	0.823	0.772	0.744	0.701	0.689	0.661	0.594	0.697	0.646	0.685
05/16/1995	0.272	0.402	0.390	0.406	0.370	0.394	0.386	0.287	0.248	0.248	0.193	0.193	0.169	0.157	0.197
06/20/1995	0.268	0.142	0.295	0.264	0.209	0.307	0.280	0.260	0.272	0.268	0.232	0.295	0.252	0.232	0.268
10/15/1996	0.787	0.776	0.807	0.850	0.827	0.839	0.839	0.819	0.791	0.795	0.776	0.799	0.787	0.772	0.764
12/10/1996	0.484	0.433	0.433	0.492	0.469	0.449	0.480	0.476	0.469	0.484	0.492	0.516	0.516	0.516	0.480
04/16/1997	0.354	0.213	0.248	0.264	0.260	0.315	0.287	0.213	0.177	0.205	0.165	0.181	0.165	0.150	0.193
05/31/1997	0.772	0.740	0.654	0.835	0.854	0.894	0.878	0.740	0.724	0.764	0.701	0.724	0.744	0.677	0.717
06/20/1997	0.799	0.756	0.839	0.874	0.850	0.882	0.882	0.819	0.803	0.831	0.752	0.780	0.748	0.689	0.740
09/15/1997	0.736	0.740	0.764	0.815	0.819	0.815	0.823	0.795	0.748	0.748	0.760	0.720	0.736	0.748	0.677
04/22/1998	-0.937	-1.146	-0.945	-1.138	-1.118	-1.024	-1.028	-1.055	-1.016	-0.984	-0.902	-0.701	-0.657	-0.689	-0.650

Date	N count	Average	Std Dev	Variance
10/15/1993				
11/15/1993	15	-0.2168	0.0161	0.0003
12/14/1993	15	-0.3252	0.0344	0.0012
02/15/1994	15	-0.5375	0.3287	0.1080
03/15/1994	15	-0.5583	0.0773	0.0060
03/29/1994	15	-0.6026	0.0987	0.0097
04/12/1994	15	-0.2404	0.0621	0.0039
05/02/1994	15	0.6165	0.8039	0.6463
06/20/1994	15	0.4682	0.0372	0.0014
08/22/1994	15	0.4493	0.0256	0.0007
09/20/1994	15	0.4378	0.0196	0.0004
10/18/1994	15	0.4394	0.0213	0.0005
02/14/1995	15	0.1640	0.0799	0.0064
03/29/1995	15	0.1940	0.0610	0.0037
04/26/1995	15	0.7210	0.0981	0.0096
05/16/1995	15	0.2874	0.0947	0.0090
06/20/1995	15	0.2562	0.0409	0.0017
10/15/1996	15	0.8018	0.0271	0.0007
12/10/1996	15	0.4793	0.0265	0.0007
04/16/1997	15	0.2260	0.0602	0.0036
05/31/1997	15	0.7612	0.0725	0.0053
06/20/1997	15	0.8029	0.0582	0.0034
09/15/1997	15	0.7630	0.0422	0.0018
04/22/1998	15	-0.9325	0.1760	0.0310

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5D

PREDICTED VS MEASURED DATA

MAY 2023

LIST OF TABLES

Table 5D.1 Predicted vs Measured Data for <i>AC</i> Sections	1
Table 5D.2 Predicted vs Measured Data for <i>PCC</i> Sections.....	5

Table 5D.1 Predicted vs Measured Data for AC Sections

AL 01-0101			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
11/20/1995	-0.0044	0.0131	-0.0044
01/29/1996	0.0787	0.0081	-0.0094
04/17/1996	0.0612	0.0014	-0.0161
08/22/1996	-0.0175	0.0033	-0.0142
10/10/1996	0.0000	0.0015	-0.0161
10/30/1997	0.0569	0.0005	-0.0170
01/09/1998	0.0306	0.0017	-0.0158
04/25/1998	0.1137	-0.0078	-0.0253
07/20/1998	0.0744	-0.0090	-0.0265
11/11/1998	0.1006	-0.0061	-0.0236
Normalizing Value		0.0175	

AL 01-0102			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
11/21/1995	0.0000	-0.0177	0.0000
01/30/1996	-0.0700	0.0597	0.0774
04/17/1996	-0.0700	0.0250	0.0427
08/23/1996	-0.0175	0.0201	0.0378
10/11/1996	-0.0131	0.0475	0.0652
10/28/1997	0.0437	0.0200	0.0377
01/12/1998	-0.0481	0.0999	0.1176
04/30/1998	-0.1225	0.0198	0.0375
11/21/1998	-0.1312	0.0189	0.0366
Normalizing Value		-0.0177	

CO 08-1053			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
12/06/1993	-0.1531	-0.1389	-0.1531
03/14/1994	-0.0306	-0.1735	-0.1877
05/02/1994	-0.1444	-0.2115	-0.2257
08/08/1994	-0.0700	-0.2289	-0.2431
10/21/1994	-0.1312	-0.2227	-0.2369
01/17/1995	-0.0875	-0.1261	-0.1403
02/13/1995	0.0443	-0.1018	-0.1160
04/21/1995	-0.1033	-0.0031	-0.0173
05/08/1995	-0.0344	0.0009	-0.0134
11/14/1996	-0.2953	-0.1933	-0.2075
03/07/1997	-0.2854	-0.0379	-0.0522
05/21/1997	-0.0394	0.0093	-0.0049
08/05/1997	0.1329	0.0351	0.0209
09/26/1997	-0.0831	0.0024	-0.0118
Normalizing Value		0.0142	

MT 30-8129			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
04/20/1994	0.0569	-0.0441	0.0569
03/17/1994	-0.1012	-0.0171	0.0839
08/22/1994	-0.1006	-0.0524	0.0485
10/31/1994	0.1444	-0.0437	0.0572
01/23/1995	0.3281	-0.0365	0.0644
02/17/1995	0.2931	-0.0199	0.0811
04/27/1995	0.2756	-0.0256	0.0753
05/18/1995	0.0394	-0.0237	0.0772
01/23/1997	0.3631	-0.0267	0.0742
03/12/1997	0.2012	-0.0006	0.1004
05/28/1997	0.0000	0.0062	0.1071
10/01/1997	0.1050	0.0447	0.1456
Normalizing Value		-0.1009	

NE 31-0114			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
08/08/1996	-0.0951	-0.0768	-0.0951
11/05/1997	-0.2408	0.1317	0.1133
02/18/1998	-0.2516	0.1244	0.1060
09/23/1998	-0.4334	-0.1027	-0.1210
	Normalizing Value	0.0183	

SD 46-0804			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
12/20/1994	-0.7731	-0.0369	-0.4795
03/23/1995	-0.5846	-0.0166	-0.4592
04/20/1995	-0.4600	-0.0174	-0.4600
06/27/1995	-0.5052	-0.0089	-0.4515
10/24/1996	-0.3419	-0.0333	-0.4759
04/29/1997	-0.4823	-0.0258	-0.4683
05/15/1997	-0.4629	-0.0447	-0.4872
07/22/1997	-0.3989	-0.0614	-0.5039
09/22/1997	-0.3250	-0.0726	-0.5152
12/16/2003	-0.1614	0.0089	-0.4337
	Normalizing Value	0.4426	

SD 46-9187			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
09/26/1994	0.0519	-0.1170	0.0519
10/24/1994	0.0873	-0.1135	0.0554
12/19/1994	-0.3708	-0.0832	0.0857
03/10/1995	-0.4016	-0.0021	0.1668
04/07/1995	-0.0458	0.0307	0.1996
05/22/1995	-0.0372	0.0452	0.2141
06/26/1995	-0.0351	0.0509	0.2198
10/25/1996	-0.0576	-0.0623	0.1066
02/19/1997	-1.0659	-0.0327	0.1362
04/14/1997	-0.3958	-0.0334	0.1355
05/14/1997	-0.3257	-0.0407	0.1282
09/23/1997	-0.1292	-0.0952	0.0737
Normalizing Value		-0.1689	

TX 48-1068			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
01/12/1994	-0.0131	-0.0235	-0.0131
04/13/1994	-0.0612	-0.0029	0.0074
07/14/1994	-0.0350	0.0108	0.0212
01/27/1995	-0.0481	0.0095	0.0198
04/13/1995	-0.1137	-0.0010	0.0094
06/08/1995	-0.0919	-0.0154	-0.0050
11/13/1996	0.0306	0.0438	0.0542
01/23/1997	0.0306	0.0548	0.0652
04/21/1997	-0.1837	0.0377	0.0480
07/03/1997	-0.0744	-0.0109	-0.0005
09/17/1997	-0.0306	-0.0367	-0.0263
Normalizing Value		-0.0104	

Table 5D.2 Predicted vs Measured Data for PCC Sections

KS 20-4054			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
08/05/1996	-0.0045	-0.0533	-0.0045
11/06/1997	0.0181	0.0039	0.0527
02/17/1998	0.0265	-0.0018	0.0470
08/25/1998	0.0139	0.0195	0.0683
11/19/1998	0.0218	0.0121	0.0608
	Normalizing Value	-0.0488	

MN 27-4040			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
11/16/1993	-0.3535	0.0133	0.0310
02/17/1994	-1.4194	0.0056	0.0233
03/31/1994	-0.8218	0.0041	0.0218
05/04/1994	0.0475	-0.0021	0.0156
08/25/1994	0.0037	-0.0140	0.0037
11/10/1994	0.0047	-0.0216	-0.0039
01/12/1995	-0.8667	-0.0225	-0.0048
03/17/1995	-0.6525	-0.0220	-0.0042
03/31/1995	-0.3454	-0.0220	-0.0042
04/28/1995	0.0937	-0.0212	-0.0035
05/11/1995	0.2123	-0.0200	-0.0023
06/16/1995	0.1037	-0.0186	-0.0009
10/09/1996	0.0640	-0.0065	0.0112
11/07/1996	0.0433	-0.0083	0.0094
04/08/1997	0.0701	-0.0175	0.0003
04/22/1997	-0.1007	-0.0175	0.0003
05/06/1997	0.1946	-0.0186	-0.0009
05/28/1997	0.1318	-0.0186	-0.0009
06/10/1997	0.1717	-0.0194	-0.0017
08/13/1997	0.0302	-0.0194	-0.0017
09/09/1997	0.1276	-0.0186	-0.0009
	Normalizing Value	-0.0177	

TX 48-4143			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
01/18/1994	0.0604	-0.0273	0.0604
04/19/1994	0.3045	-0.0234	0.0643
07/11/1994	0.2546	-0.0210	0.0667
01/10/1995	0.1286	-0.0159	0.0717
04/10/1995	0.0866	-0.0173	0.0703
06/05/1995	0.1654	-0.0156	0.0720
01/28/1997	0.8530	-0.0052	0.0824
04/24/1997	0.4934	0.0014	0.0891
07/09/1997	0.4593	0.0101	0.0978
09/25/1997	0.3281	0.0164	0.1041
Normalizing Value		-0.0877	

NC 37-0201			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
07/12/1995	0.1066	0.0102	0.1066
10/16/1995	0.0530	0.0521	0.1485
01/23/1996	0.1378	0.0184	0.1148
04/23/1996	0.4265	-0.0176	0.0788
08/20/1996	0.0232	-0.0385	0.0579
10/03/1996	-0.0281	-0.0430	0.0534
10/06/1997	0.1772	-0.0407	0.0558
02/19/1998	0.0525	-0.0498	0.0467
04/23/1998	0.0131	-0.0543	0.0421
07/16/1998	0.0066	-0.0568	0.0397
10/15/1998	-0.2672	-0.0573	0.0392
03/14/2002	0.1008	-0.0210	0.0754
05/20/2002	0.0000	-0.0109	0.0855
09/19/2002	-0.0606	0.0338	0.1302
04/22/2003	0.0227	0.0922	0.1886
12/11/2003	0.1969	0.0115	0.1079
Normalizing Value		-0.0964	

OH 39-0204			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
07/30/1998	-0.0298	-0.0717	-0.0298
09/29/1998	-0.1251	-0.0536	-0.0117
02/16/1999	0.2216	0.0283	0.0702
03/23/1999	0.2087	0.0083	0.0502
	Normalizing Value	-0.0419	

IN 18-3002			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
08/02/1996	-0.0236	0.0182	-0.0236
07/29/1998	-0.0228	-0.0192	-0.0610
09/28/1998	-0.0270	-0.0141	-0.0560
	Normalizing Value	0.0419	

MB 83-3802			
Date	Measured	Scenario 2 (Date of Construction)	Normalized to the Measured Values
	PE M	PE 2	PE 2 Norm.
11/15/1993	-0.2168	-0.0261	0.5501
12/14/1993	-0.3252	-0.0307	0.5455
02/15/1994	-0.5375	-0.0522	0.5240
03/15/1994	-0.5583	-0.0664	0.5098
03/29/1994	-0.6026	-0.0664	0.5098
04/12/1994	-0.2404	-0.0812	0.4950
05/02/1994	0.6165	-0.0954	0.4808
06/20/1994	0.4682	-0.1079	0.4682
08/22/1994	0.4493	-0.1249	0.4513
09/20/1994	0.4378	-0.1286	0.4476
10/18/1994	0.4394	-0.1292	0.4469
02/14/1995	0.1640	-0.0986	0.4775
03/29/1995	0.1940	-0.0935	0.4827
04/26/1995	0.7210	-0.0746	0.5016
05/16/1995	0.2874	-0.0873	0.4889
06/20/1995	0.2562	-0.1008	0.4754
10/15/1996	0.8018	-0.0897	0.4865
12/10/1996	0.4793	-0.0977	0.4785
04/16/1997	0.2260	-0.1207	0.4555
05/31/1997	0.7612	-0.1244	0.4518
06/20/1997	0.8029	-0.1265	0.4497
09/15/1997	0.7630	-0.1094	0.4668
04/22/1998	-0.9325	-0.1019	0.4743
	Normalizing Value	-0.5762	

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5E

SMP CALIBRATION SECTION PROFILES

MAY 2023

LIST OF TABLES

Table 5E.1 Pavement Layers and Thicknesses for Calibration SMP Sections	1
---	---

Table 5E.1 Pavement Layers and Thicknesses for Calibration SMP Sections

AL 01-0101		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	7.4
	Base (in)	7.9
	Total	15.3
AL 01-0102		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	4.2
	Base (in)	12
	Total	16.2
CO 08-1053		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	6.8
	Base (in)	5.4
	Subbase (in)	23.5
	Total (in)	35.7
MT 30-1053		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	7.4
	Base (in)	22.8
	Total (in)	30.2
NE 31-0114		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	6.4
	Base (in)	12
	Subbase (in)	24
	Total	42.4
SD 46-0804		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	9.1
	Base (in)	12
	Total (in)	21.1
SD 46-9187		
Pavement Layers	Type	Flexible <u>(AC)</u>
	Surface (in)	5.9
	Base (in)	6
	Subbase	3
	Total	14.9

TX 48-1068		
Pavement Layers	Type	Flexible (<u>AC</u>)
	Surface (in)	12.5
	Base (in)	6
	Subbase	8
	Total	26.5
KS 20-4054		
Pavement Layers	Type	<u>PCC-CRCP</u>
	Surface (in)	9.5
	Base (in)	3.4
	Total	12.9
MN 27-4040		
Pavement Layers	Type	<u>PCC-CRCP</u>
	Surface (in)	8.1
	Base (in)	6
	Total	14.1
TX 48-4143		
Pavement Layers	Type	<u>PCC-JRCP</u>
	Surface (in)	10.4
	Base (in)	4.5
	Subbase (in)	5.5
	Total	20.4
NC 37-0201		
Pavement Layers	Type	<u>PCC-JPCP</u>
	Surface (in)	9.2
	Base (in)	9.3
	Subbase (in)	8
	Total	26.5
OH 39-0204		
Pavement Layers	Type	<u>PCC-JPCP</u>
	Surface (in)	11.1
	Base (in)	5.8
	Subbase (in)	16
	Total	32.9
IN 18-3002		
Pavement Layers	Type	<u>PCC-JPCP Covered with AC</u>
	Surface (AC) (in)	4.1
	JPCP (in)	9.6
	Base (in)	5.5
	Total	19.2

MB 83-3802		
Pavement Layers	Type	<u>PCC-JPCP Covered with AC</u>
	Surface (AC) (in)	6
	JPCP (in)	9.8
	Base (in)	4.9
	Subbase (in)	5.9
	Total	26.6

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5F

**FROST PENETRATION RECORDS FOR SMP SECTIONS USED IN THE HIGH-VOLUME
CHANGE CALIBRATION MODELS**

MAY 2023

LIST OF TABLES

Table 5F.1 Frost Penetration Records for Calibration SMP Sections..... 1

Table 5F.1 Frost Penetration Records for Calibration SMP Sections

CO 08-1053					
STATE_CODE_ EXP	SHRP_ ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Colorado	1053	12/21/1993	1	6.7	8.7
Colorado	1053	12/22/1993	1	6.7	10.6
Colorado	1053	12/23/1993	1	6.7	8.7
Colorado	1053	12/24/1993	1	6.7	10.6
Colorado	1053	12/25/1993	1	6.7	14.6
Colorado	1053	12/26/1993	1	6.7	14.6
Colorado	1053	12/27/1993	1	6.7	14.6
Colorado	1053	12/28/1993	1	6.7	12.6
Colorado	1053	12/29/1993	1	6.7	10.6
Colorado	1053	12/31/1993	1	6.7	8.7
Colorado	1053	1/1/1994	1	6.7	10.6
Colorado	1053	1/2/1994	1	6.7	14.6
Colorado	1053	1/3/1994	1	6.7	8.7
Colorado	1053	1/10/1994	1	6.7	10.6
Colorado	1053	1/11/1994	1	6.7	10.6
Colorado	1053	1/12/1994	1	6.7	14.6
Colorado	1053	1/13/1994	1	6.7	14.6
Colorado	1053	1/14/1994	1	6.7	10.6
Colorado	1053	1/15/1994	1	6.7	8.7
Colorado	1053	2/1/1994	1	6.7	8.7
Colorado	1053	2/2/1994	1	6.7	14.6
Colorado	1053	2/3/1994	1	6.7	12.6
Colorado	1053	2/4/1994	1	6.7	12.6
Colorado	1053	2/5/1994	1	6.7	14.6
Colorado	1053	12/18/1996	1	6.7	10.6
Colorado	1053	12/19/1996	1	6.7	10.6
Colorado	1053	12/20/1996	1	6.7	12.6
Colorado	1053	12/21/1996	1	6.7	14.6
Colorado	1053	1/8/1997	1	6.7	8.7

MT 30-8129					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Montana	8129	12/6/1992	1	6.3	22.4
Montana	8129	12/7/1992	1	4.7	22.4
Montana	8129	11/23/1993	1	10.2	14.6
Montana	8129	11/24/1993	1	10.2	18.1
Montana	8129	11/25/1993	1	10.2	22.4
Montana	8129	11/26/1993	1	10.2	24.4
Montana	8129	11/27/1993	1	10.2	24.4
Montana	8129	11/28/1993	1	10.2	24.4
Montana	8129	11/29/1993	1	10.2	22.4
Montana	8129	11/30/1993	1	10.2	20.5
Montana	8129	12/1/1993	1	10.2	20.5
Montana	8129	12/2/1993	1	10.2	18.1
Montana	8129	12/3/1993	1	10.2	18.1
Montana	8129	12/7/1993	1	10.2	14.6
Montana	8129	12/8/1993	1	10.2	16.5
Montana	8129	12/9/1993	1	10.2	14.6
Montana	8129	12/10/1993	1	10.2	14.6
Montana	8129	12/14/1993	1	4.7	10.2
Montana	8129	12/15/1993	1	4.7	12.2
Montana	8129	12/16/1993	1	4.7	12.2
Montana	8129	12/17/1993	1	4.7	14.6
Montana	8129	12/18/1993	1	4.7	16.5
Montana	8129	12/19/1993	1	4.7	18.1
Montana	8129	12/20/1993	1	4.7	20.5
Montana	8129	12/21/1993	1	4.7	20.5
Montana	8129	12/22/1993	1	4.7	22.4
Montana	8129	12/23/1993	1	4.7	22.4
Montana	8129	12/24/1993	1	4.7	22.4
Montana	8129	12/25/1993	1	4.7	22.4
Montana	8129	12/26/1993	1	8.3	20.5
Montana	8129	12/27/1993	1	4.7	20.5
Montana	8129	12/28/1993	1	4.7	18.1
Montana	8129	12/29/1993	1	4.7	18.1
Montana	8129	12/30/1993	1	4.7	18.1
Montana	8129	12/31/1993	1	4.7	18.1
Montana	8129	1/1/1994	1	4.7	18.1
Montana	8129	1/2/1994	1	4.7	16.5
Montana	8129	1/4/1994	1	4.7	8.3
Montana	8129	1/5/1994	1	4.7	6.7
Montana	8129	1/6/1994	1	4.7	14.6
Montana	8129	1/7/1994	1	4.7	20.5

Montana	8129	1/8/1994	1	4.7	22.4
Montana	8129	1/9/1994	1	4.7	24.4
Montana	8129	1/10/1994	1	4.7	24.4
Montana	8129	1/11/1994	1	4.7	26.4
Montana	8129	1/12/1994	1	4.7	24.4
Montana	8129	1/13/1994	1	4.7	24.4
Montana	8129	1/14/1994	1	4.7	24.4
Montana	8129	1/15/1994	1	4.7	22.4
Montana	8129	1/16/1994	1	4.7	22.4
Montana	8129	1/17/1994	1	4.7	24.4
Montana	8129	1/18/1994	1	4.7	28.3
Montana	8129	1/19/1994	1	4.7	30.3
Montana	8129	1/20/1994	1	4.7	32.3
Montana	8129	1/21/1994	1	4.7	32.3
Montana	8129	1/22/1994	1	4.7	32.3
Montana	8129	1/23/1994	1	4.7	32.3
Montana	8129	1/24/1994	1	4.7	32.3
Montana	8129	1/25/1994	1	4.7	32.3
Montana	8129	1/26/1994	1	4.7	30.3
Montana	8129	1/27/1994	1	4.7	30.3
Montana	8129	1/28/1994	1	4.7	30.3
Montana	8129	1/29/1994	1	4.7	30.3
Montana	8129	1/30/1994	1	4.7	30.3
Montana	8129	1/31/1994	1	4.7	28.3
Montana	8129	2/1/1994	1	4.7	30.3
Montana	8129	2/2/1994	1	4.7	30.3
Montana	8129	2/3/1994	1	4.7	30.3
Montana	8129	2/4/1994	1	4.7	32.3
Montana	8129	2/5/1994	1	4.7	32.3
Montana	8129	2/6/1994	1	4.7	32.3
Montana	8129	2/7/1994	1	4.7	34.3
Montana	8129	2/8/1994	1	4.7	36.2
Montana	8129	2/9/1994	1	4.7	38.2
Montana	8129	2/10/1994	1	4.7	40.6
Montana	8129	2/11/1994	1	4.7	40.6
Montana	8129	2/12/1994	1	4.7	40.6
Montana	8129	2/13/1994	1	4.7	42.5
Montana	8129	2/14/1994	1	4.7	42.5
Montana	8129	2/15/1994	1	4.7	42.5
Montana	8129	2/16/1994	1	4.7	42.5
Montana	8129	2/17/1994	1	8.3	42.5
Montana	8129	2/18/1994	1	12.6	42.5
Montana	8129	2/19/1994	1	4.7	42.5

Montana	8129	2/20/1994	1	4.7	42.5
Montana	8129	2/21/1994	1	4.7	42.5
Montana	8129	2/22/1994	1	4.7	40.6
Montana	8129	2/23/1994	1	4.7	40.6
Montana	8129	2/24/1994	1	4.7	40.6
Montana	8129	2/25/1994	1	4.7	40.6
Montana	8129	2/26/1994	1	4.7	42.5
Montana	8129	2/27/1994	1	4.7	42.5
Montana	8129	2/28/1994	1	10.2	42.5
Montana	8129	3/1/1994	1	14.6	42.5
Montana	8129	3/2/1994	1	20.5	42.5
Montana	8129	3/3/1994	1	24.4	42.5
Montana	8129	3/4/1994	1	26.4	42.5
Montana	8129	3/5/1994	1	28.3	42.5
Montana	8129	3/6/1994	1	32.3	42.5
Montana	8129	3/7/1994	1	32.3	42.5
Montana	8129	11/18/1994	1	4.7	8.3
Montana	8129	11/19/1994	1	4.7	14.6
Montana	8129	11/20/1994	1	4.7	14.6
Montana	8129	11/21/1994	1	4.7	14.6
Montana	8129	11/22/1994	1	4.7	16.5
Montana	8129	11/23/1994	1	4.7	16.5
Montana	8129	11/24/1994	1	4.7	16.5
Montana	8129	11/25/1994	1	4.7	14.6
Montana	8129	11/26/1994	1	4.7	12.2
Montana	8129	11/27/1994	1	4.7	12.2
Montana	8129	11/28/1994	1	4.7	12.2
Montana	8129	11/29/1994	1	4.7	14.6
Montana	8129	11/30/1994	1	4.7	14.6
Montana	8129	12/3/1994	1	4.7	6.7
Montana	8129	12/4/1994	1	4.7	12.2
Montana	8129	12/5/1994	1	4.7	16.5
Montana	8129	12/6/1994	1	4.7	20.5
Montana	8129	12/7/1994	1	4.7	22.4
Montana	8129	12/8/1994	1	4.7	24.4
Montana	8129	12/9/1994	1	4.7	24.4
Montana	8129	12/10/1994	1	4.7	26.4
Montana	8129	12/11/1994	1	4.7	28.3
Montana	8129	12/12/1994	1	4.7	28.3
Montana	8129	12/13/1994	1	4.7	28.3
Montana	8129	12/14/1994	1	4.7	28.3
Montana	8129	12/15/1994	1	4.7	30.3
Montana	8129	12/16/1994	1	4.7	30.3

Montana	8129	12/17/1994	1	4.7	32.3
Montana	8129	12/18/1994	1	4.7	32.3
Montana	8129	12/19/1994	1	4.7	30.3
Montana	8129	12/20/1994	1	4.7	30.3
Montana	8129	12/21/1994	1	4.7	30.3
Montana	8129	12/22/1994	1	4.7	30.3
Montana	8129	12/23/1994	1	4.7	30.3
Montana	8129	12/24/1994	1	4.7	30.3
Montana	8129	12/25/1994	1	4.7	30.3
Montana	8129	12/26/1994	1	4.7	30.3
Montana	8129	12/27/1994	1	4.7	30.3
Montana	8129	12/28/1994	1	4.7	30.3
Montana	8129	12/29/1994	1	4.7	28.3
Montana	8129	12/30/1994	1	4.7	28.3
Montana	8129	12/31/1994	1	4.7	28.3
Montana	8129	1/1/1995	1	4.7	30.3
Montana	8129	1/2/1995	1	4.7	30.3
Montana	8129	1/3/1995	1	4.7	32.3
Montana	8129	1/4/1995	1	4.7	32.3
Montana	8129	1/5/1995	1	4.7	34.3
Montana	8129	1/6/1995	1	4.7	34.3
Montana	8129	1/7/1995	1	4.7	36.2
Montana	8129	1/8/1995	1	4.7	38.2
Montana	8129	1/9/1995	1	4.7	38.2
Montana	8129	1/10/1995	1	4.7	38.2
Montana	8129	1/11/1995	1	4.7	38.2
Montana	8129	1/12/1995	1	4.7	38.2
Montana	8129	1/13/1995	1	4.7	38.2
Montana	8129	1/14/1995	1	4.7	38.2
Montana	8129	1/15/1995	1	4.7	38.2
Montana	8129	1/16/1995	1	4.7	38.2
Montana	8129	1/17/1995	1	4.7	36.2
Montana	8129	1/18/1995	1	4.7	36.2
Montana	8129	1/19/1995	1	4.7	36.2
Montana	8129	1/20/1995	1	4.7	36.2
Montana	8129	1/21/1995	1	4.7	36.2
Montana	8129	1/22/1995	1	4.7	36.2
Montana	8129	1/23/1995	1	4.7	34.3
Montana	8129	1/24/1995	1	4.7	34.3
Montana	8129	1/25/1995	1	4.7	34.3
Montana	8129	1/26/1995	1	4.7	34.3
Montana	8129	1/27/1995	1	4.7	34.3
Montana	8129	1/28/1995	1	8.3	34.3

Montana	8129	1/29/1995	1	4.7	34.3
Montana	8129	1/30/1995	1	8.3	34.3
Montana	8129	1/31/1995	1	12.6	34.3
Montana	8129	2/1/1995	1	14.6	32.3
Montana	8129	2/2/1995	1	16.1	32.3
Montana	8129	2/3/1995	1	18.5	32.3
Montana	8129	2/4/1995	1	20.5	32.3
Montana	8129	2/5/1995	1	22.4	32.3
Montana	8129	2/7/1995	1	4.7	10.2
Montana	8129	2/10/1995	1	4.7	12.2
Montana	8129	2/11/1995	1	4.7	18.1
Montana	8129	2/12/1995	1	4.7	22.4
Montana	8129	2/13/1995	1	4.7	26.4
Montana	8129	2/14/1995	1	4.7	28.3
Montana	8129	2/15/1995	1	4.7	30.3
Montana	8129	2/16/1995	1	4.7	32.3
Montana	8129	2/17/1995	1	4.7	32.3
Montana	8129	2/18/1995	1	12.6	32.3
Montana	8129	2/19/1995	1	14.6	32.3
Montana	8129	2/20/1995	1	20.5	32.3
Montana	8129	2/21/1995	1	26.4	32.3
Montana	8129	2/28/1995	1	4.7	8.3
Montana	8129	3/1/1995	1	4.7	10.2
Montana	8129	3/2/1995	1	4.7	14.6
Montana	8129	3/3/1995	1	4.7	14.6
Montana	8129	3/4/1995	1	4.7	14.6
Montana	8129	3/5/1995	1	4.7	18.1
Montana	8129	3/6/1995	1	4.7	22.4
Montana	8129	3/7/1995	1	4.7	24.4
Montana	8129	3/8/1995	1	4.7	26.4
Montana	8129	3/9/1995	1	6.3	28.3
Montana	8129	3/10/1995	1	14.6	28.3
Montana	8129	3/11/1995	1	20.5	28.3
Montana	8129	11/21/1996	1	4.7	10.2
Montana	8129	12/17/1996	1	4.7	24.4
Montana	8129	1/23/1997	1	4.7	32.3
Montana	8129	2/21/1997	1	16.1	34.3

NE 31-0114					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Nebraska	0114	12/9/1995	1	22.0	24.0
Nebraska	0114	12/10/1995	1	22.0	26.0
Nebraska	0114	12/11/1995	1	22.0	24.0
Nebraska	0114	12/12/1995	1	22.0	24.0
Nebraska	0114	12/13/1995	1	22.0	24.0
Nebraska	0114	12/23/1995	1	22.0	24.0
Nebraska	0114	12/24/1995	1	22.0	26.0
Nebraska	0114	12/25/1995	1	22.0	26.0
Nebraska	0114	12/26/1995	1	22.0	26.0
Nebraska	0114	12/28/1995	1	22.0	24.0
Nebraska	0114	1/5/1996	1	22.0	26.0
Nebraska	0114	1/6/1996	1	22.0	31.9
Nebraska	0114	1/7/1996	1	22.0	33.9
Nebraska	0114	1/8/1996	1	22.0	35.8
Nebraska	0114	1/9/1996	1	22.0	35.8
Nebraska	0114	1/10/1996	1	22.0	33.9
Nebraska	0114	1/11/1996	1	28.0	31.9
Nebraska	0114	1/18/1996	1	22.0	24.0
Nebraska	0114	1/19/1996	1	22.0	31.9
Nebraska	0114	1/20/1996	1	22.0	33.9
Nebraska	0114	1/21/1996	1	22.0	35.8
Nebraska	0114	1/22/1996	1	22.0	35.8
Nebraska	0114	1/23/1996	1	22.0	33.9
Nebraska	0114	1/24/1996	1	22.0	35.8
Nebraska	0114	1/25/1996	1	22.0	35.8
Nebraska	0114	1/26/1996	1	22.0	35.8
Nebraska	0114	1/27/1996	1	22.0	37.8
Nebraska	0114	1/28/1996	1	22.0	40.2
Nebraska	0114	1/29/1996	1	22.0	40.2
Nebraska	0114	1/30/1996	1	22.0	40.2
Nebraska	0114	1/31/1996	1	22.0	42.1
Nebraska	0114	2/1/1996	1	22.0	44.1
Nebraska	0114	2/2/1996	1	22.0	44.1
Nebraska	0114	2/3/1996	1	22.0	44.1
Nebraska	0114	2/4/1996	1	22.0	46.1
Nebraska	0114	2/5/1996	1	22.0	46.1
Nebraska	0114	2/6/1996	1	22.0	46.1
Nebraska	0114	2/7/1996	1	24.0	46.1
Nebraska	0114	2/8/1996	1	29.9	46.1
Nebraska	0114	2/9/1996	1	31.9	46.1
Nebraska	0114	2/10/1996	1	35.8	44.1

Nebraska	0114	2/11/1996	1	38.2	44.1
Nebraska	0114	3/7/1996	1	22.0	24.0
Nebraska	0114	3/8/1996	1	22.0	28.0
Nebraska	0114	3/9/1996	1	22.0	29.9
Nebraska	0114	1/10/1998	1	22.0	28.0
Nebraska	0114	1/11/1998	1	22.0	29.9
Nebraska	0114	1/12/1998	1	22.0	31.9
Nebraska	0114	1/13/1998	1	22.0	31.9
Nebraska	0114	1/14/1998	1	22.0	33.9
Nebraska	0114	1/15/1998	1	22.0	33.9
Nebraska	0114	1/16/1998	1	22.0	33.9
Nebraska	0114	1/17/1998	1	22.0	31.9
Nebraska	0114	1/18/1998	1	22.0	31.9
Nebraska	0114	1/19/1998	1	22.0	31.9
Nebraska	0114	1/20/1998	1	22.0	29.9
Nebraska	0114	1/21/1998	1	22.0	29.9
Nebraska	0114	1/22/1998	1	22.0	29.9
Nebraska	0114	1/23/1998	1	22.0	29.9
Nebraska	0114	1/24/1998	1	22.0	29.9
Nebraska	0114	1/25/1998	1	22.0	29.9
Nebraska	0114	3/9/1998	1	22.0	26.0
Nebraska	0114	3/10/1998	1	22.0	29.9
Nebraska	0114	3/11/1998	1	22.0	29.9
Nebraska	0114	3/12/1998	1	22.0	31.9
Nebraska	0114	3/13/1998	1	22.0	29.9
Nebraska	0114	1/2/2002	1	22.0	24.0
Nebraska	0114	1/3/2002	1	22.0	26.0

SD 46-0804					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
South Dakota	0804	11/28/1994	1	20.5	22.4
South Dakota	0804	11/29/1994	1	20.5	26.4
South Dakota	0804	11/30/1994	1	20.5	26.4
South Dakota	0804	12/1/1994	1	20.5	26.4
South Dakota	0804	12/4/1994	1	20.5	22.4
South Dakota	0804	12/5/1994	1	20.5	28.3
South Dakota	0804	12/6/1994	1	20.5	30.3
South Dakota	0804	12/7/1994	1	20.5	32.3
South Dakota	0804	12/8/1994	1	20.5	32.3
South Dakota	0804	12/9/1994	1	20.5	34.6
South Dakota	0804	12/10/1994	1	20.5	34.6
South Dakota	0804	12/11/1994	1	20.5	36.6
South Dakota	0804	12/12/1994	1	20.5	36.6
South Dakota	0804	12/13/1994	1	20.5	36.6
South Dakota	0804	12/14/1994	2	36.6	38.6
South Dakota	0804	12/14/1994	1	20.5	36.6
South Dakota	0804	12/15/1994	2	36.6	38.6
South Dakota	0804	12/15/1994	1	20.5	36.6
South Dakota	0804	12/16/1994	2	36.6	38.6
South Dakota	0804	12/16/1994	1	20.5	36.6
South Dakota	0804	12/17/1994	1	20.5	38.6
South Dakota	0804	12/18/1994	2	38.6	40.6
South Dakota	0804	12/18/1994	1	20.5	38.6
South Dakota	0804	12/19/1994	2	38.6	40.6
South Dakota	0804	12/19/1994	1	20.5	38.6
South Dakota	0804	12/20/1994	2	38.6	40.6
South Dakota	0804	12/20/1994	1	20.5	38.6
South Dakota	0804	12/21/1994	2	38.6	40.6
South Dakota	0804	12/21/1994	1	20.5	38.6
South Dakota	0804	12/22/1994	2	38.6	40.6
South Dakota	0804	12/22/1994	1	20.5	38.6
South Dakota	0804	12/23/1994	2	38.6	40.6
South Dakota	0804	12/23/1994	1	20.5	38.6
South Dakota	0804	12/24/1994	2	38.6	40.6
South Dakota	0804	12/24/1994	1	20.5	38.6
South Dakota	0804	12/25/1994	2	38.6	40.6
South Dakota	0804	12/25/1994	1	20.5	38.6
South Dakota	0804	12/26/1994	2	38.6	40.6
South Dakota	0804	12/26/1994	1	20.5	38.6
South Dakota	0804	12/27/1994	2	38.6	40.6
South Dakota	0804	12/27/1994	1	20.5	38.6

South Dakota	0804	12/28/1994	2	38.6	40.6
South Dakota	0804	12/28/1994	1	20.5	38.6
South Dakota	0804	12/29/1994	2	38.6	40.6
South Dakota	0804	12/29/1994	1	20.5	38.6
South Dakota	0804	12/30/1994	2	38.6	40.6
South Dakota	0804	12/30/1994	1	20.5	38.6
South Dakota	0804	12/31/1994	2	38.6	40.6
South Dakota	0804	12/31/1994	1	20.5	38.6
South Dakota	0804	1/1/1995	2	38.6	40.6
South Dakota	0804	1/1/1995	1	20.5	38.6
South Dakota	0804	1/2/1995	1	20.5	40.6
South Dakota	0804	1/3/1995	1	20.5	42.5
South Dakota	0804	1/4/1995	1	20.5	42.5
South Dakota	0804	1/5/1995	1	20.5	44.5
South Dakota	0804	1/6/1995	1	20.5	44.5
South Dakota	0804	1/7/1995	1	20.5	46.5
South Dakota	0804	1/8/1995	1	20.5	46.5
South Dakota	0804	1/9/1995	1	20.5	48.4
South Dakota	0804	1/10/1995	1	20.5	48.4
South Dakota	0804	1/11/1995	1	20.5	48.4
South Dakota	0804	1/12/1995	1	20.5	48.4
South Dakota	0804	1/13/1995	1	20.5	48.4
South Dakota	0804	1/14/1995	1	20.5	50.4
South Dakota	0804	1/15/1995	1	20.5	50.4
South Dakota	0804	1/16/1995	1	20.5	50.4
South Dakota	0804	1/17/1995	1	20.5	50.4
South Dakota	0804	1/18/1995	1	20.5	50.4
South Dakota	0804	1/19/1995	1	20.5	50.4
South Dakota	0804	1/20/1995	1	20.5	50.4
South Dakota	0804	1/21/1995	1	20.5	50.4
South Dakota	0804	1/22/1995	1	20.5	50.4
South Dakota	0804	1/23/1995	1	20.5	52.4
South Dakota	0804	1/24/1995	1	20.5	52.4
South Dakota	0804	1/25/1995	1	20.5	52.4
South Dakota	0804	1/26/1995	1	20.5	52.4
South Dakota	0804	1/27/1995	1	20.5	52.4
South Dakota	0804	1/28/1995	1	20.5	52.4
South Dakota	0804	1/29/1995	1	20.5	52.4
South Dakota	0804	1/30/1995	2	52.4	54.3
South Dakota	0804	1/30/1995	1	20.5	52.4
South Dakota	0804	1/31/1995	2	52.4	54.3
South Dakota	0804	1/31/1995	1	20.5	52.4
South Dakota	0804	2/1/1995	2	52.4	54.3

South Dakota	0804	2/1/1995	1	20.5	52.4
South Dakota	0804	2/2/1995	2	52.4	54.3
South Dakota	0804	2/2/1995	1	20.5	52.4
South Dakota	0804	2/3/1995	2	52.4	54.3
South Dakota	0804	2/3/1995	1	20.5	52.4
South Dakota	0804	2/4/1995	2	52.4	54.3
South Dakota	0804	2/4/1995	1	20.5	52.4
South Dakota	0804	2/5/1995	2	52.4	54.3
South Dakota	0804	2/5/1995	1	20.5	52.4
South Dakota	0804	2/6/1995	1	20.5	52.4
South Dakota	0804	2/7/1995	2	52.4	54.3
South Dakota	0804	2/7/1995	1	20.5	52.4
South Dakota	0804	2/8/1995	2	52.4	54.3
South Dakota	0804	2/8/1995	1	20.5	52.4
South Dakota	0804	2/9/1995	2	52.4	54.3
South Dakota	0804	2/9/1995	1	20.5	52.4
South Dakota	0804	2/10/1995	2	52.4	54.3
South Dakota	0804	2/10/1995	1	20.5	52.4
South Dakota	0804	2/11/1995	2	52.4	54.3
South Dakota	0804	2/11/1995	1	20.5	52.4
South Dakota	0804	2/12/1995	2	52.4	54.3
South Dakota	0804	2/12/1995	1	20.5	52.4
South Dakota	0804	2/13/1995	2	52.4	54.3
South Dakota	0804	2/13/1995	1	20.5	52.4
South Dakota	0804	2/14/1995	1	20.5	56.3
South Dakota	0804	2/15/1995	1	20.5	56.3
South Dakota	0804	2/16/1995	1	20.5	56.3
South Dakota	0804	2/17/1995	1	20.5	56.3
South Dakota	0804	2/18/1995	1	20.5	58.7
South Dakota	0804	2/19/1995	1	20.5	58.7
South Dakota	0804	2/20/1995	1	20.5	58.7
South Dakota	0804	2/21/1995	1	22.4	58.7
South Dakota	0804	2/22/1995	1	26.4	58.7
South Dakota	0804	2/23/1995	1	26.4	58.7
South Dakota	0804	2/24/1995	1	26.4	58.7
South Dakota	0804	2/25/1995	1	28.3	58.7
South Dakota	0804	2/26/1995	1	20.5	58.7
South Dakota	0804	2/27/1995	1	20.5	58.7
South Dakota	0804	2/28/1995	1	20.5	58.7
South Dakota	0804	3/1/1995	1	20.5	58.7
South Dakota	0804	3/2/1995	1	20.5	58.7
South Dakota	0804	3/3/1995	1	20.5	58.7
South Dakota	0804	3/4/1995	1	20.5	58.7

South Dakota	0804	3/5/1995	1	20.5	58.7
South Dakota	0804	3/6/1995	1	20.5	58.7
South Dakota	0804	3/7/1995	1	20.5	58.7
South Dakota	0804	3/8/1995	1	20.5	58.7
South Dakota	0804	3/9/1995	1	20.5	58.7
South Dakota	0804	3/10/1995	1	20.5	58.7
South Dakota	0804	3/11/1995	1	20.5	60.6
South Dakota	0804	3/12/1995	1	22.4	60.6
South Dakota	0804	3/13/1995	1	26.4	60.6
South Dakota	0804	3/14/1995	1	28.3	60.6
South Dakota	0804	3/15/1995	1	30.3	60.6
South Dakota	0804	3/16/1995	1	34.6	36.6
South Dakota	0804	3/16/1995	2	36.6	60.6
South Dakota	0804	3/17/1995	1	34.6	36.6
South Dakota	0804	3/17/1995	2	36.6	60.6
South Dakota	0804	3/18/1995	1	34.6	36.6
South Dakota	0804	3/18/1995	2	36.6	60.6
South Dakota	0804	3/19/1995	1	36.6	58.7
South Dakota	0804	3/20/1995	1	36.6	38.6
South Dakota	0804	3/20/1995	2	38.6	58.7
South Dakota	0804	3/21/1995	1	36.6	40.6
South Dakota	0804	3/21/1995	2	40.6	58.7
South Dakota	0804	3/22/1995	1	38.6	40.6
South Dakota	0804	3/22/1995	2	40.6	58.7
South Dakota	0804	3/23/1995	1	38.6	40.6
South Dakota	0804	3/23/1995	2	40.6	58.7
South Dakota	0804	3/24/1995	1	40.6	58.7
South Dakota	0804	3/25/1995	1	40.6	58.7
South Dakota	0804	3/26/1995	1	40.6	58.7
South Dakota	0804	3/27/1995	1	40.6	58.7
South Dakota	0804	3/28/1995	1	38.6	40.6
South Dakota	0804	3/28/1995	2	40.6	58.7
South Dakota	0804	3/29/1995	1	36.6	40.6
South Dakota	0804	3/29/1995	2	40.6	58.7
South Dakota	0804	3/30/1995	1	38.6	40.6
South Dakota	0804	3/30/1995	2	40.6	56.3
South Dakota	0804	3/31/1995	1	40.6	56.3
South Dakota	0804	4/1/1995	1	42.5	56.3
South Dakota	0804	4/2/1995	1	44.5	56.3
South Dakota	0804	4/3/1995	1	46.5	56.3
South Dakota	0804	11/14/1996	1	20.5	22.4
South Dakota	0804	11/15/1996	1	20.5	24.4
South Dakota	0804	11/16/1996	1	20.5	24.4

South Dakota	0804	11/17/1996	1	20.5	26.4
South Dakota	0804	11/21/1996	1	20.5	32.3
South Dakota	0804	11/22/1996	1	20.5	34.6
South Dakota	0804	11/23/1996	1	20.5	34.6
South Dakota	0804	11/24/1996	1	20.5	34.6
South Dakota	0804	11/25/1996	1	20.5	36.6
South Dakota	0804	11/26/1996	1	20.5	36.6
South Dakota	0804	11/27/1996	2	36.6	38.6
South Dakota	0804	11/27/1996	1	20.5	36.6
South Dakota	0804	11/28/1996	2	36.6	38.6
South Dakota	0804	11/28/1996	1	20.5	36.6
South Dakota	0804	11/29/1996	2	36.6	38.6
South Dakota	0804	11/29/1996	1	20.5	36.6
South Dakota	0804	11/30/1996	2	36.6	38.6
South Dakota	0804	11/30/1996	1	20.5	36.6
South Dakota	0804	12/1/1996	2	36.6	38.6
South Dakota	0804	12/1/1996	1	20.5	36.6
South Dakota	0804	12/2/1996	2	36.6	38.6
South Dakota	0804	12/2/1996	1	20.5	36.6
South Dakota	0804	12/3/1996	2	36.6	38.6
South Dakota	0804	12/3/1996	1	20.5	36.6
South Dakota	0804	12/4/1996	2	36.6	40.6
South Dakota	0804	12/4/1996	1	20.5	36.6
South Dakota	0804	12/5/1996	2	36.6	40.6
South Dakota	0804	12/5/1996	1	20.5	36.6
South Dakota	0804	12/6/1996	2	38.6	40.6
South Dakota	0804	12/6/1996	1	20.5	38.6
South Dakota	0804	12/7/1996	2	38.6	40.6
South Dakota	0804	12/7/1996	1	20.5	38.6
South Dakota	0804	12/8/1996	2	38.6	40.6
South Dakota	0804	12/8/1996	1	20.5	38.6
South Dakota	0804	12/9/1996	2	38.6	40.6
South Dakota	0804	12/9/1996	1	20.5	38.6
South Dakota	0804	12/10/1996	2	38.6	40.6
South Dakota	0804	12/10/1996	1	20.5	38.6
South Dakota	0804	12/11/1996	2	38.6	40.6
South Dakota	0804	12/11/1996	1	20.5	38.6
South Dakota	0804	12/12/1996	2	38.6	40.6
South Dakota	0804	12/12/1996	1	20.5	38.6
South Dakota	0804	12/13/1996	2	40.6	42.5
South Dakota	0804	12/13/1996	1	20.5	40.6
South Dakota	0804	12/14/1996	2	40.6	42.5
South Dakota	0804	12/14/1996	1	20.5	40.6

South Dakota	0804	12/15/1996	2	40.6	42.5
South Dakota	0804	12/15/1996	1	20.5	40.6
South Dakota	0804	12/16/1996	2	40.6	42.5
South Dakota	0804	12/16/1996	1	20.5	40.6
South Dakota	0804	12/17/1996	1	20.5	44.5
South Dakota	0804	12/18/1996	1	20.5	44.5
South Dakota	0804	12/19/1996	1	20.5	46.5
South Dakota	0804	12/20/1996	1	20.5	46.5
South Dakota	0804	12/21/1996	1	20.5	48.4
South Dakota	0804	12/22/1996	1	20.5	48.4
South Dakota	0804	12/23/1996	1	20.5	48.4
South Dakota	0804	12/24/1996	1	20.5	50.4
South Dakota	0804	12/25/1996	1	20.5	52.4
South Dakota	0804	12/26/1996	1	20.5	52.4
South Dakota	0804	12/27/1996	1	20.5	54.3
South Dakota	0804	12/28/1996	1	20.5	54.3
South Dakota	0804	12/29/1996	1	20.5	54.3
South Dakota	0804	12/30/1996	1	20.5	56.3
South Dakota	0804	12/31/1996	1	20.5	56.3
South Dakota	0804	1/1/1997	1	20.5	58.7
South Dakota	0804	1/2/1997	1	20.5	58.7
South Dakota	0804	1/3/1997	1	20.5	58.7
South Dakota	0804	1/4/1997	1	20.5	58.7
South Dakota	0804	1/5/1997	1	20.5	58.7
South Dakota	0804	1/6/1997	1	20.5	58.7
South Dakota	0804	1/7/1997	1	20.5	58.7
South Dakota	0804	1/8/1997	1	20.5	60.6
South Dakota	0804	1/9/1997	1	20.5	60.6
South Dakota	0804	1/10/1997	1	20.5	60.6
South Dakota	0804	1/11/1997	1	20.5	60.6
South Dakota	0804	1/12/1997	1	20.5	62.6
South Dakota	0804	1/13/1997	1	20.5	62.6
South Dakota	0804	1/14/1997	1	20.5	62.6
South Dakota	0804	1/15/1997	1	20.5	64.6
South Dakota	0804	1/16/1997	1	20.5	64.6
South Dakota	0804	1/17/1997	1	20.5	66.5
South Dakota	0804	1/18/1997	1	20.5	66.5
South Dakota	0804	1/19/1997	1	20.5	66.5
South Dakota	0804	1/20/1997	1	20.5	68.5
South Dakota	0804	1/21/1997	1	20.5	68.5
South Dakota	0804	1/22/1997	1	20.5	70.5
South Dakota	0804	1/23/1997	1	20.5	70.5
South Dakota	0804	1/24/1997	1	20.5	70.5

South Dakota	0804	1/25/1997	1	20.5	72.4
South Dakota	0804	1/26/1997	1	20.5	72.4
South Dakota	0804	1/27/1997	1	20.5	72.4
South Dakota	0804	1/28/1997	1	20.5	72.4
South Dakota	0804	1/29/1997	1	20.5	74.4
South Dakota	0804	1/30/1997	1	20.5	74.4
South Dakota	0804	1/31/1997	1	20.5	74.4
South Dakota	0804	2/1/1997	1	20.5	74.4
South Dakota	0804	2/2/1997	1	20.5	74.4
South Dakota	0804	2/3/1997	1	20.5	76.4
South Dakota	0804	2/4/1997	1	20.5	76.4
South Dakota	0804	2/5/1997	1	20.5	76.4
South Dakota	0804	2/6/1997	1	20.5	76.4
South Dakota	0804	2/7/1997	1	20.5	76.4
South Dakota	0804	2/8/1997	1	20.5	76.4
South Dakota	0804	2/9/1997	1	20.5	76.4
South Dakota	0804	2/10/1997	1	20.5	76.4
South Dakota	0804	2/11/1997	1	20.5	76.4
South Dakota	0804	2/12/1997	1	20.5	76.4
South Dakota	0804	2/13/1997	1	20.5	76.4
South Dakota	0804	2/14/1997	1	20.5	76.4
South Dakota	0804	2/15/1997	1	20.5	76.4
South Dakota	0804	2/16/1997	1	20.5	76.4
South Dakota	0804	2/17/1997	1	20.5	76.4
South Dakota	0804	2/18/1997	1	20.5	76.4
South Dakota	0804	2/19/1997	1	20.5	76.4
South Dakota	0804	2/20/1997	1	20.5	76.4
South Dakota	0804	2/21/1997	1	20.5	76.4
South Dakota	0804	2/22/1997	1	20.5	76.4
South Dakota	0804	2/23/1997	1	20.5	76.4
South Dakota	0804	2/24/1997	1	20.5	76.4
South Dakota	0804	2/25/1997	1	20.5	76.4
South Dakota	0804	2/26/1997	1	20.5	76.4
South Dakota	0804	2/27/1997	1	20.5	76.4
South Dakota	0804	2/28/1997	1	20.5	76.4
South Dakota	0804	3/1/1997	1	20.5	76.4
South Dakota	0804	3/2/1997	1	20.5	76.4
South Dakota	0804	3/3/1997	1	20.5	76.4
South Dakota	0804	3/4/1997	1	20.5	76.4
South Dakota	0804	3/5/1997	1	20.5	76.4
South Dakota	0804	3/6/1997	1	20.5	76.4
South Dakota	0804	3/7/1997	1	20.5	76.4
South Dakota	0804	3/8/1997	1	20.5	76.4

South Dakota	0804	3/9/1997	1	20.5	76.4
South Dakota	0804	3/10/1997	1	20.5	76.4
South Dakota	0804	3/11/1997	1	20.5	76.4
South Dakota	0804	3/12/1997	1	20.5	76.4
South Dakota	0804	3/13/1997	2	76.4	78.3
South Dakota	0804	3/13/1997	1	20.5	76.4
South Dakota	0804	3/14/1997	1	20.5	76.4
South Dakota	0804	3/15/1997	2	76.4	78.3
South Dakota	0804	3/15/1997	1	20.5	76.4
South Dakota	0804	3/16/1997	1	20.5	76.4
South Dakota	0804	3/17/1997	1	20.5	76.4
South Dakota	0804	3/18/1997	1	20.5	76.4
South Dakota	0804	3/19/1997	1	20.5	76.4
South Dakota	0804	3/20/1997	1	24.4	76.4
South Dakota	0804	3/21/1997	1	28.3	76.4
South Dakota	0804	3/22/1997	1	28.3	76.4
South Dakota	0804	3/23/1997	1	30.3	76.4
South Dakota	0804	3/24/1997	1	30.3	76.4
South Dakota	0804	3/25/1997	1	32.7	76.4
South Dakota	0804	3/26/1997	1	34.6	76.4
South Dakota	0804	3/27/1997	1	36.6	76.4
South Dakota	0804	3/28/1997	1	36.6	76.4
South Dakota	0804	3/29/1997	1	38.6	76.4
South Dakota	0804	3/30/1997	1	40.6	76.4
South Dakota	0804	3/31/1997	1	40.6	76.4
South Dakota	0804	4/1/1997	1	40.6	76.4
South Dakota	0804	4/2/1997	1	42.5	76.4
South Dakota	0804	4/3/1997	1	42.5	76.4
South Dakota	0804	4/4/1997	1	44.5	76.4
South Dakota	0804	4/5/1997	1	46.5	76.4
South Dakota	0804	4/6/1997	1	44.5	46.5
South Dakota	0804	4/6/1997	2	46.5	76.4
South Dakota	0804	4/7/1997	1	20.5	24.4
South Dakota	0804	4/7/1997	2	24.4	26.4
South Dakota	0804	4/7/1997	3	38.6	46.5
South Dakota	0804	4/7/1997	4	46.5	76.4
South Dakota	0804	4/8/1997	1	20.5	24.4
South Dakota	0804	4/8/1997	2	24.4	46.5
South Dakota	0804	4/8/1997	3	46.5	76.4
South Dakota	0804	4/9/1997	1	20.5	26.4
South Dakota	0804	4/9/1997	2	26.4	46.5
South Dakota	0804	4/9/1997	3	46.5	76.4
South Dakota	0804	4/10/1997	1	20.5	24.4

South Dakota	0804	4/10/1997	2	24.4	46.5
South Dakota	0804	4/10/1997	3	46.5	74.4
South Dakota	0804	4/11/1997	1	22.4	24.4
South Dakota	0804	4/11/1997	2	24.4	46.5
South Dakota	0804	4/11/1997	3	46.5	74.4
South Dakota	0804	4/12/1997	1	26.4	46.5
South Dakota	0804	4/12/1997	2	46.5	74.4
South Dakota	0804	4/13/1997	1	40.6	46.5
South Dakota	0804	4/13/1997	2	46.5	74.4
South Dakota	0804	4/14/1997	1	44.5	46.5
South Dakota	0804	4/14/1997	2	46.5	74.4
South Dakota	0804	4/15/1997	1	46.5	74.4
South Dakota	0804	4/16/1997	1	46.5	74.4
South Dakota	0804	4/17/1997	1	48.4	74.4
South Dakota	0804	4/18/1997	1	50.4	74.4
South Dakota	0804	4/19/1997	1	52.4	74.4
South Dakota	0804	4/20/1997	1	54.3	72.4
South Dakota	0804	4/21/1997	1	54.3	74.4
South Dakota	0804	4/22/1997	1	56.7	72.4
South Dakota	0804	4/23/1997	1	58.7	72.4
South Dakota	0804	4/24/1997	1	60.6	72.4
South Dakota	0804	4/25/1997	1	62.6	72.4
South Dakota	0804	12/16/1999	1	20.5	26.4
South Dakota	0804	12/17/1999	1	20.5	30.3
South Dakota	0804	12/18/1999	1	20.5	30.3
South Dakota	0804	12/19/1999	1	20.5	30.3
South Dakota	0804	12/20/1999	1	20.5	30.3
South Dakota	0804	12/21/1999	1	20.5	34.6
South Dakota	0804	12/22/1999	2	34.6	36.6
South Dakota	0804	12/22/1999	1	20.5	34.6
South Dakota	0804	12/23/1999	2	34.6	36.6
South Dakota	0804	12/23/1999	1	20.5	34.6
South Dakota	0804	12/24/1999	2	34.6	36.6
South Dakota	0804	12/24/1999	1	20.5	34.6
South Dakota	0804	12/25/1999	1	20.5	36.6
South Dakota	0804	12/26/1999	1	20.5	34.6
South Dakota	0804	12/27/1999	1	20.5	34.6
South Dakota	0804	12/28/1999	1	22.4	34.6
South Dakota	0804	12/29/1999	1	24.4	34.6
South Dakota	0804	12/30/1999	1	20.5	32.7
South Dakota	0804	12/31/1999	1	20.5	32.7
South Dakota	0804	1/1/2000	2	24.4	32.7
South Dakota	0804	1/1/2000	1	20.5	24.4

South Dakota	0804	1/2/2000	2	26.4	30.3
South Dakota	0804	1/2/2000	1	20.5	26.4
South Dakota	0804	1/3/2000	2	28.7	30.3
South Dakota	0804	1/3/2000	1	20.5	28.7
South Dakota	0804	1/4/2000	2	30.3	32.7
South Dakota	0804	1/4/2000	1	20.5	30.3
South Dakota	0804	1/5/2000	2	32.7	34.6
South Dakota	0804	1/5/2000	1	20.5	32.7
South Dakota	0804	1/6/2000	2	32.7	34.6
South Dakota	0804	1/6/2000	1	20.5	32.7
South Dakota	0804	1/7/2000	2	34.6	36.6
South Dakota	0804	1/7/2000	1	20.5	34.6
South Dakota	0804	1/8/2000	2	34.6	36.6
South Dakota	0804	1/8/2000	1	20.5	34.6
South Dakota	0804	1/9/2000	2	34.6	36.6
South Dakota	0804	1/9/2000	1	20.5	34.6
South Dakota	0804	1/10/2000	1	20.5	34.6
South Dakota	0804	1/11/2000	2	34.6	36.6
South Dakota	0804	1/11/2000	1	20.5	34.6
South Dakota	0804	1/12/2000	2	34.6	36.6
South Dakota	0804	1/12/2000	1	20.5	34.6
South Dakota	0804	1/13/2000	1	20.5	38.6
South Dakota	0804	1/14/2000	1	20.5	38.6
South Dakota	0804	1/15/2000	1	20.5	38.6
South Dakota	0804	1/16/2000	1	20.5	40.6
South Dakota	0804	1/17/2000	1	20.5	40.6
South Dakota	0804	1/18/2000	1	20.5	40.6
South Dakota	0804	1/19/2000	1	20.5	40.6
South Dakota	0804	1/20/2000	1	20.5	42.5
South Dakota	0804	1/21/2000	1	20.5	42.5
South Dakota	0804	1/22/2000	1	20.5	42.5
South Dakota	0804	1/23/2000	1	20.5	42.5
South Dakota	0804	1/24/2000	1	20.5	44.5
South Dakota	0804	1/25/2000	1	20.5	44.5
South Dakota	0804	1/26/2000	1	20.5	44.5
South Dakota	0804	1/27/2000	2	44.5	46.5
South Dakota	0804	1/27/2000	1	20.5	44.5
South Dakota	0804	1/28/2000	2	44.5	46.5
South Dakota	0804	1/28/2000	1	20.5	44.5
South Dakota	0804	1/29/2000	2	44.5	46.5
South Dakota	0804	1/29/2000	1	20.5	44.5
South Dakota	0804	1/30/2000	2	44.5	46.5
South Dakota	0804	1/30/2000	1	20.5	44.5

South Dakota	0804	1/31/2000	2	44.5	46.5
South Dakota	0804	1/31/2000	1	20.5	44.5
South Dakota	0804	2/1/2000	2	44.5	46.5
South Dakota	0804	2/1/2000	1	20.5	44.5
South Dakota	0804	2/2/2000	2	44.5	46.5
South Dakota	0804	2/2/2000	1	20.5	44.5
South Dakota	0804	2/3/2000	2	44.5	46.5
South Dakota	0804	2/3/2000	1	20.5	44.5
South Dakota	0804	2/4/2000	2	44.5	46.5
South Dakota	0804	2/4/2000	1	20.5	44.5
South Dakota	0804	2/5/2000	2	44.5	46.5
South Dakota	0804	2/5/2000	1	20.5	44.5
South Dakota	0804	2/6/2000	2	44.5	46.5
South Dakota	0804	2/6/2000	1	20.5	44.5
South Dakota	0804	2/7/2000	2	44.5	46.5
South Dakota	0804	2/7/2000	1	20.5	44.5
South Dakota	0804	2/8/2000	2	44.5	46.5
South Dakota	0804	2/8/2000	1	20.5	44.5
South Dakota	0804	2/9/2000	2	44.5	46.5
South Dakota	0804	2/9/2000	1	20.5	44.5
South Dakota	0804	2/10/2000	2	44.5	46.5
South Dakota	0804	2/10/2000	1	20.5	44.5
South Dakota	0804	2/11/2000	1	20.5	44.5
South Dakota	0804	2/12/2000	2	44.5	46.5
South Dakota	0804	2/12/2000	1	20.5	44.5
South Dakota	0804	2/13/2000	1	20.5	44.5
South Dakota	0804	2/14/2000	2	44.5	46.5
South Dakota	0804	2/14/2000	1	20.5	44.5
South Dakota	0804	2/15/2000	2	44.5	46.5
South Dakota	0804	2/15/2000	1	20.5	44.5
South Dakota	0804	2/16/2000	2	44.5	46.5
South Dakota	0804	2/16/2000	1	20.5	44.5
South Dakota	0804	2/17/2000	2	44.5	46.5
South Dakota	0804	2/17/2000	1	20.5	44.5
South Dakota	0804	2/18/2000	2	44.5	46.5
South Dakota	0804	2/18/2000	1	20.5	44.5
South Dakota	0804	2/19/2000	2	44.5	46.5
South Dakota	0804	2/19/2000	1	20.5	44.5
South Dakota	0804	2/20/2000	2	44.5	48.4
South Dakota	0804	2/20/2000	1	20.5	44.5
South Dakota	0804	2/21/2000	2	44.5	48.4
South Dakota	0804	2/21/2000	1	20.5	44.5
South Dakota	0804	2/22/2000	2	44.5	48.4

South Dakota	0804	2/22/2000	1	24.4	44.5
South Dakota	0804	2/23/2000	2	44.5	48.4
South Dakota	0804	2/23/2000	1	26.4	44.5
South Dakota	0804	2/24/2000	2	44.5	48.4
South Dakota	0804	2/24/2000	1	28.3	44.5
South Dakota	0804	2/25/2000	2	44.5	46.5
South Dakota	0804	2/25/2000	1	30.3	44.5
South Dakota	0804	2/26/2000	2	44.5	46.5
South Dakota	0804	2/26/2000	1	32.7	44.5
South Dakota	0804	2/27/2000	2	44.5	46.5
South Dakota	0804	2/27/2000	1	32.7	44.5
South Dakota	0804	2/28/2000	2	44.5	46.5
South Dakota	0804	2/28/2000	1	34.6	44.5
South Dakota	0804	2/29/2000	2	44.5	46.5
South Dakota	0804	2/29/2000	1	36.6	44.5
South Dakota	0804	3/1/2000	2	44.5	46.5
South Dakota	0804	3/1/2000	1	36.6	44.5
South Dakota	0804	3/2/2000	2	44.5	46.5
South Dakota	0804	3/2/2000	1	36.6	44.5
South Dakota	0804	3/3/2000	2	44.5	46.5
South Dakota	0804	3/3/2000	1	38.6	44.5
South Dakota	0804	3/4/2000	1	40.6	44.5
South Dakota	0804	3/5/2000	1	42.5	44.5
South Dakota	0804	11/13/2000	1	20.5	22.4
South Dakota	0804	11/14/2000	1	20.5	24.4
South Dakota	0804	11/15/2000	1	20.5	24.4
South Dakota	0804	11/16/2000	1	20.5	24.4
South Dakota	0804	11/17/2000	1	20.5	28.3
South Dakota	0804	11/18/2000	1	20.5	28.3
South Dakota	0804	11/19/2000	1	20.5	26.4
South Dakota	0804	11/20/2000	1	20.5	28.3
South Dakota	0804	11/21/2000	1	20.5	30.3
South Dakota	0804	11/22/2000	1	20.5	30.3
South Dakota	0804	11/23/2000	1	20.5	32.3
South Dakota	0804	11/24/2000	1	20.5	32.3
South Dakota	0804	11/25/2000	1	20.5	30.3
South Dakota	0804	11/26/2000	1	20.5	30.3
South Dakota	0804	11/27/2000	1	20.5	30.3
South Dakota	0804	11/28/2000	1	20.5	30.3
South Dakota	0804	11/29/2000	1	20.5	28.3
South Dakota	0804	11/30/2000	1	20.5	28.3
South Dakota	0804	12/1/2000	1	20.5	30.3
South Dakota	0804	12/2/2000	1	20.5	30.3

South Dakota	0804	12/3/2000	1	20.5	30.3
South Dakota	0804	12/4/2000	1	20.5	30.3
South Dakota	0804	12/5/2000	2	30.3	32.7
South Dakota	0804	12/5/2000	1	20.5	30.3
South Dakota	0804	12/6/2000	2	30.3	34.6
South Dakota	0804	12/6/2000	1	20.5	30.3
South Dakota	0804	12/7/2000	2	30.3	32.7
South Dakota	0804	12/7/2000	1	20.5	30.3
South Dakota	0804	12/8/2000	2	30.3	32.7
South Dakota	0804	12/8/2000	1	20.5	30.3
South Dakota	0804	12/9/2000	2	30.3	32.7
South Dakota	0804	12/9/2000	1	20.5	30.3
South Dakota	0804	12/10/2000	2	32.7	34.6
South Dakota	0804	12/10/2000	1	20.5	32.7
South Dakota	0804	12/11/2000	1	20.5	36.6
South Dakota	0804	12/12/2000	1	20.5	36.6
South Dakota	0804	12/13/2000	1	20.5	38.6
South Dakota	0804	12/14/2000	1	20.5	40.6
South Dakota	0804	12/15/2000	1	20.5	42.5
South Dakota	0804	12/16/2000	1	20.5	42.5
South Dakota	0804	12/17/2000	1	20.5	42.5
South Dakota	0804	12/18/2000	1	20.5	44.5
South Dakota	0804	12/19/2000	1	20.5	46.5
South Dakota	0804	12/20/2000	1	20.5	46.5
South Dakota	0804	12/21/2000	1	20.5	46.5
South Dakota	0804	12/22/2000	1	20.5	48.4
South Dakota	0804	12/23/2000	1	20.5	48.4
South Dakota	0804	12/24/2000	1	20.5	50.4
South Dakota	0804	12/25/2000	1	20.5	50.4
South Dakota	0804	12/26/2000	1	20.5	52.4
South Dakota	0804	12/27/2000	1	20.5	52.4
South Dakota	0804	12/28/2000	1	20.5	52.4
South Dakota	0804	12/29/2000	1	20.5	54.3
South Dakota	0804	12/30/2000	1	20.5	54.3
South Dakota	0804	12/31/2000	1	20.5	54.3
South Dakota	0804	1/1/2001	1	20.5	54.3
South Dakota	0804	1/2/2001	1	20.5	54.3
South Dakota	0804	1/3/2001	1	20.5	54.3
South Dakota	0804	1/4/2001	2	54.3	56.7
South Dakota	0804	1/4/2001	1	20.5	54.3
South Dakota	0804	1/5/2001	2	54.3	56.7
South Dakota	0804	1/5/2001	1	20.5	54.3
South Dakota	0804	1/6/2001	2	54.3	56.7

South Dakota	0804	1/6/2001	1	20.5	54.3
South Dakota	0804	1/7/2001	2	54.3	56.7
South Dakota	0804	1/7/2001	1	20.5	54.3
South Dakota	0804	1/8/2001	2	54.3	56.7
South Dakota	0804	1/8/2001	1	20.5	54.3
South Dakota	0804	1/9/2001	2	54.3	56.7
South Dakota	0804	1/9/2001	1	20.5	54.3
South Dakota	0804	1/10/2001	2	54.3	56.7
South Dakota	0804	1/10/2001	1	20.5	54.3
South Dakota	0804	1/11/2001	2	54.3	56.7
South Dakota	0804	1/11/2001	1	20.5	54.3
South Dakota	0804	1/12/2001	2	54.3	56.7
South Dakota	0804	1/12/2001	1	20.5	54.3
South Dakota	0804	1/13/2001	2	54.3	56.7
South Dakota	0804	1/13/2001	1	20.5	54.3
South Dakota	0804	1/14/2001	2	54.3	56.7
South Dakota	0804	1/14/2001	1	20.5	54.3
South Dakota	0804	1/15/2001	2	54.3	56.7
South Dakota	0804	1/15/2001	1	20.5	54.3
South Dakota	0804	1/16/2001	2	54.3	56.7
South Dakota	0804	1/16/2001	1	20.5	54.3
South Dakota	0804	1/17/2001	2	54.3	56.7
South Dakota	0804	1/17/2001	1	20.5	54.3
South Dakota	0804	1/18/2001	2	54.3	56.7
South Dakota	0804	1/18/2001	1	20.5	54.3
South Dakota	0804	1/19/2001	2	54.3	56.7
South Dakota	0804	1/19/2001	1	20.5	54.3
South Dakota	0804	1/20/2001	2	54.3	56.7
South Dakota	0804	1/20/2001	1	20.5	54.3
South Dakota	0804	1/21/2001	1	20.5	56.3
South Dakota	0804	1/22/2001	1	20.5	56.3
South Dakota	0804	1/23/2001	2	56.7	58.7
South Dakota	0804	1/23/2001	1	20.5	56.7
South Dakota	0804	1/24/2001	2	56.7	58.7
South Dakota	0804	1/24/2001	1	20.5	56.7
South Dakota	0804	1/25/2001	2	56.7	58.7
South Dakota	0804	1/25/2001	1	20.5	56.7
South Dakota	0804	1/26/2001	2	56.7	58.7
South Dakota	0804	1/26/2001	1	20.5	56.7
South Dakota	0804	1/27/2001	2	56.7	58.7
South Dakota	0804	1/27/2001	1	20.5	56.7
South Dakota	0804	1/28/2001	2	56.7	58.7
South Dakota	0804	1/28/2001	1	20.5	56.7

South Dakota	0804	1/29/2001	2	56.7	58.7
South Dakota	0804	1/29/2001	1	20.5	56.7
South Dakota	0804	1/30/2001	2	56.7	58.7
South Dakota	0804	1/30/2001	1	20.5	56.7
South Dakota	0804	1/31/2001	2	56.7	58.7
South Dakota	0804	1/31/2001	1	20.5	56.7
South Dakota	0804	2/1/2001	2	56.7	58.7
South Dakota	0804	2/1/2001	1	20.5	56.7
South Dakota	0804	2/2/2001	2	56.7	58.7
South Dakota	0804	2/2/2001	1	20.5	56.7
South Dakota	0804	2/3/2001	2	58.7	60.6
South Dakota	0804	2/3/2001	1	20.5	58.7
South Dakota	0804	2/4/2001	2	58.7	60.6
South Dakota	0804	2/4/2001	1	20.5	58.7
South Dakota	0804	2/5/2001	2	58.7	60.6
South Dakota	0804	2/5/2001	1	20.5	58.7
South Dakota	0804	2/6/2001	2	58.7	60.6
South Dakota	0804	2/6/2001	1	20.5	58.7
South Dakota	0804	2/7/2001	2	58.7	60.6
South Dakota	0804	2/7/2001	1	20.5	58.7
South Dakota	0804	2/8/2001	2	58.7	60.6
South Dakota	0804	2/8/2001	1	20.5	58.7
South Dakota	0804	2/9/2001	2	58.7	60.6
South Dakota	0804	2/9/2001	1	20.5	58.7
South Dakota	0804	2/10/2001	2	58.7	60.6
South Dakota	0804	2/10/2001	1	20.5	58.7
South Dakota	0804	2/11/2001	1	20.5	60.6
South Dakota	0804	2/12/2001	1	20.5	60.6
South Dakota	0804	2/13/2001	1	20.5	62.6
South Dakota	0804	2/14/2001	1	20.5	62.6
South Dakota	0804	2/15/2001	1	20.5	62.6
South Dakota	0804	2/16/2001	1	20.5	64.6
South Dakota	0804	2/17/2001	1	20.5	64.6
South Dakota	0804	2/18/2001	1	20.5	64.6
South Dakota	0804	2/19/2001	1	20.5	66.5
South Dakota	0804	2/20/2001	1	20.5	66.5
South Dakota	0804	2/21/2001	1	20.5	66.5
South Dakota	0804	2/22/2001	1	20.5	66.5
South Dakota	0804	2/23/2001	1	20.5	66.5
South Dakota	0804	2/24/2001	1	20.5	68.5
South Dakota	0804	2/25/2001	1	20.5	68.5
South Dakota	0804	2/26/2001	1	20.5	68.5
South Dakota	0804	2/27/2001	1	20.5	68.5

South Dakota	0804	2/28/2001	1	20.5	68.5
South Dakota	0804	3/1/2001	1	20.5	70.5
South Dakota	0804	3/2/2001	1	20.5	70.5
South Dakota	0804	3/3/2001	1	20.5	70.5
South Dakota	0804	3/4/2001	1	20.5	70.5
South Dakota	0804	3/5/2001	1	20.5	70.5
South Dakota	0804	3/6/2001	1	20.5	22.4
South Dakota	0804	3/6/2001	2	22.4	70.5
South Dakota	0804	3/7/2001	1	20.5	24.4
South Dakota	0804	3/7/2001	2	24.4	70.5
South Dakota	0804	3/8/2001	1	20.5	26.4
South Dakota	0804	3/8/2001	2	26.4	70.5
South Dakota	0804	3/9/2001	1	20.5	26.4
South Dakota	0804	3/9/2001	2	26.4	70.5
South Dakota	0804	3/10/2001	1	22.4	28.7
South Dakota	0804	3/10/2001	2	28.7	68.5
South Dakota	0804	3/11/2001	1	20.5	28.7
South Dakota	0804	3/11/2001	2	28.7	68.5
South Dakota	0804	3/12/2001	1	22.4	28.7
South Dakota	0804	3/12/2001	2	28.7	68.5
South Dakota	0804	3/13/2001	1	26.4	28.7
South Dakota	0804	3/13/2001	2	28.7	68.5
South Dakota	0804	3/14/2001	1	28.3	68.5
South Dakota	0804	11/28/2001	1	20.5	22.4
South Dakota	0804	11/29/2001	1	20.5	24.4
South Dakota	0804	11/30/2001	1	20.5	24.4
South Dakota	0804	12/1/2001	1	20.5	24.4
South Dakota	0804	12/2/2001	1	20.5	24.4
South Dakota	0804	12/3/2001	1	20.5	24.4
South Dakota	0804	12/4/2001	1	20.5	22.4
South Dakota	0804	12/12/2001	1	20.5	22.4
South Dakota	0804	12/13/2001	1	20.5	24.4
South Dakota	0804	12/14/2001	1	20.5	26.4
South Dakota	0804	12/15/2001	1	20.5	26.4
South Dakota	0804	12/16/2001	1	20.5	26.4
South Dakota	0804	12/17/2001	1	20.5	24.4
South Dakota	0804	12/18/2001	1	20.5	24.4
South Dakota	0804	12/19/2001	1	20.5	26.4
South Dakota	0804	12/20/2001	1	20.5	28.3
South Dakota	0804	12/21/2001	1	20.5	28.3
South Dakota	0804	12/22/2001	1	20.5	30.3
South Dakota	0804	12/23/2001	1	20.5	30.3
South Dakota	0804	12/24/2001	1	20.5	32.3

South Dakota	0804	12/25/2001	1	20.5	34.6
South Dakota	0804	12/26/2001	1	20.5	36.6
South Dakota	0804	12/27/2001	1	20.5	36.6
South Dakota	0804	12/28/2001	1	20.5	36.6
South Dakota	0804	12/29/2001	1	20.5	36.6
South Dakota	0804	12/30/2001	1	20.5	38.6
South Dakota	0804	12/31/2001	1	20.5	38.6
South Dakota	0804	1/1/2002	1	20.5	40.6
South Dakota	0804	1/2/2002	1	20.5	40.6
South Dakota	0804	1/3/2002	1	20.5	40.6
South Dakota	0804	1/4/2002	2	40.6	42.5
South Dakota	0804	1/4/2002	1	20.5	40.6
South Dakota	0804	1/5/2002	2	40.6	42.5
South Dakota	0804	1/5/2002	1	20.5	40.6
South Dakota	0804	1/6/2002	2	40.6	42.5
South Dakota	0804	1/6/2002	1	20.5	40.6
South Dakota	0804	1/7/2002	2	40.6	42.5
South Dakota	0804	1/7/2002	1	20.5	40.6
South Dakota	0804	1/8/2002	2	40.6	42.5
South Dakota	0804	1/8/2002	1	20.5	40.6
South Dakota	0804	1/9/2002	2	22.4	40.6
South Dakota	0804	1/9/2002	1	20.5	22.4
South Dakota	0804	1/9/2002	3	40.6	42.5
South Dakota	0804	1/10/2002	1	20.5	22.4
South Dakota	0804	1/10/2002	2	22.4	40.6
South Dakota	0804	1/11/2002	1	20.5	22.4
South Dakota	0804	1/11/2002	2	22.4	40.6
South Dakota	0804	1/12/2002	1	20.5	22.4
South Dakota	0804	1/12/2002	2	22.4	40.6
South Dakota	0804	1/13/2002	1	20.5	36.6
South Dakota	0804	1/13/2002	2	36.6	40.6
South Dakota	0804	1/14/2002	1	20.5	40.6
South Dakota	0804	1/15/2002	2	22.4	40.6
South Dakota	0804	1/15/2002	1	20.5	22.4
South Dakota	0804	1/16/2002	2	30.3	40.6
South Dakota	0804	1/16/2002	1	20.5	30.3
South Dakota	0804	1/17/2002	2	36.6	40.6
South Dakota	0804	1/17/2002	1	20.5	36.6
South Dakota	0804	1/18/2002	1	20.5	40.6
South Dakota	0804	1/19/2002	2	40.6	42.5
South Dakota	0804	1/19/2002	1	20.5	40.6
South Dakota	0804	1/20/2002	2	40.6	42.5
South Dakota	0804	1/20/2002	1	20.5	40.6

South Dakota	0804	1/21/2002	2	40.6	42.5
South Dakota	0804	1/21/2002	1	20.5	40.6
South Dakota	0804	1/22/2002	2	40.6	42.5
South Dakota	0804	1/22/2002	1	20.5	40.6
South Dakota	0804	1/23/2002	2	40.6	42.5
South Dakota	0804	1/23/2002	1	20.5	40.6
South Dakota	0804	1/24/2002	2	40.6	42.5
South Dakota	0804	1/24/2002	1	20.5	40.6
South Dakota	0804	1/25/2002	2	40.6	42.5
South Dakota	0804	1/25/2002	1	20.5	40.6
South Dakota	0804	1/26/2002	2	40.6	42.5
South Dakota	0804	1/26/2002	1	20.5	40.6
South Dakota	0804	1/27/2002	2	40.6	42.5
South Dakota	0804	1/27/2002	1	20.5	40.6
South Dakota	0804	1/28/2002	2	40.6	42.5
South Dakota	0804	1/28/2002	1	20.5	40.6
South Dakota	0804	1/29/2002	2	40.6	42.5
South Dakota	0804	1/29/2002	1	20.5	40.6
South Dakota	0804	1/30/2002	2	42.5	44.5
South Dakota	0804	1/30/2002	1	20.5	42.5
South Dakota	0804	1/31/2002	2	42.5	44.5
South Dakota	0804	1/31/2002	1	20.5	42.5
South Dakota	0804	2/1/2002	2	42.5	44.5
South Dakota	0804	2/1/2002	1	20.5	42.5
South Dakota	0804	2/2/2002	2	44.5	46.5
South Dakota	0804	2/2/2002	1	20.5	44.5
South Dakota	0804	2/3/2002	2	44.5	46.5
South Dakota	0804	2/3/2002	1	20.5	44.5
South Dakota	0804	2/4/2002	2	44.5	48.4
South Dakota	0804	2/4/2002	1	20.5	44.5
South Dakota	0804	2/5/2002	2	44.5	48.4
South Dakota	0804	2/5/2002	1	20.5	44.5
South Dakota	0804	2/6/2002	2	44.5	48.4
South Dakota	0804	2/6/2002	1	20.5	44.5
South Dakota	0804	2/7/2002	2	44.5	48.4
South Dakota	0804	2/7/2002	1	20.5	44.5
South Dakota	0804	2/8/2002	2	44.5	48.4
South Dakota	0804	2/8/2002	1	20.5	44.5
South Dakota	0804	2/9/2002	2	44.5	48.4
South Dakota	0804	2/9/2002	1	20.5	44.5
South Dakota	0804	2/10/2002	2	44.5	48.4
South Dakota	0804	2/10/2002	1	20.5	44.5
South Dakota	0804	2/11/2002	2	44.5	48.4

South Dakota	0804	2/11/2002	1	20.5	44.5
South Dakota	0804	2/12/2002	2	44.5	48.4
South Dakota	0804	2/12/2002	1	20.5	44.5
South Dakota	0804	2/13/2002	2	44.5	48.4
South Dakota	0804	2/13/2002	1	20.5	44.5
South Dakota	0804	2/14/2002	1	20.5	48.4
South Dakota	0804	2/15/2002	1	20.5	48.4
South Dakota	0804	2/16/2002	1	20.5	48.4
South Dakota	0804	2/17/2002	1	22.4	46.5
South Dakota	0804	2/18/2002	1	24.4	46.5
South Dakota	0804	2/19/2002	1	26.4	46.5
South Dakota	0804	2/20/2002	1	26.4	46.5
South Dakota	0804	2/21/2002	1	26.4	46.5
South Dakota	0804	2/22/2002	1	28.7	46.5
South Dakota	0804	2/23/2002	1	32.7	46.5
South Dakota	0804	2/24/2002	1	32.7	46.5
South Dakota	0804	2/25/2002	2	26.4	44.5
South Dakota	0804	2/25/2002	1	20.5	26.4
South Dakota	0804	2/26/2002	2	30.3	44.5
South Dakota	0804	2/26/2002	1	20.5	30.3
South Dakota	0804	2/27/2002	2	32.7	44.5
South Dakota	0804	2/27/2002	1	20.5	32.7
South Dakota	0804	2/28/2002	2	34.6	44.5
South Dakota	0804	2/28/2002	1	20.5	34.6
South Dakota	0804	3/1/2002	2	36.6	44.5
South Dakota	0804	3/1/2002	1	20.5	36.6
South Dakota	0804	3/2/2002	2	40.6	44.5
South Dakota	0804	3/2/2002	1	20.5	40.6
South Dakota	0804	3/3/2002	2	40.6	44.5
South Dakota	0804	3/3/2002	1	20.5	40.6
South Dakota	0804	3/4/2002	2	42.5	44.5
South Dakota	0804	3/4/2002	1	20.5	42.5
South Dakota	0804	3/5/2002	2	42.5	44.5
South Dakota	0804	3/5/2002	1	20.5	42.5
South Dakota	0804	3/6/2002	2	42.5	44.5
South Dakota	0804	3/6/2002	1	20.5	42.5
South Dakota	0804	3/7/2002	2	42.5	44.5
South Dakota	0804	3/7/2002	1	20.5	42.5
South Dakota	0804	3/8/2002	2	42.5	46.5
South Dakota	0804	3/8/2002	1	20.5	42.5
South Dakota	0804	3/9/2002	2	42.5	46.5
South Dakota	0804	3/9/2002	1	20.5	42.5
South Dakota	0804	3/10/2002	2	44.5	46.5

South Dakota	0804	3/10/2002	1	20.5	44.5
South Dakota	0804	3/11/2002	2	44.5	48.4
South Dakota	0804	3/11/2002	1	20.5	44.5
South Dakota	0804	3/12/2002	2	44.5	48.4
South Dakota	0804	3/12/2002	1	20.5	44.5
South Dakota	0804	3/13/2002	1	20.5	48.4
South Dakota	0804	3/14/2002	1	20.5	48.4
South Dakota	0804	3/15/2002	1	20.5	48.4
South Dakota	0804	3/16/2002	1	20.5	48.4
South Dakota	0804	3/17/2002	1	24.4	48.4
South Dakota	0804	3/18/2002	1	24.4	48.4
South Dakota	0804	3/19/2002	1	20.5	48.4
South Dakota	0804	3/20/2002	1	20.5	48.4
South Dakota	0804	3/21/2002	2	24.4	46.5
South Dakota	0804	3/21/2002	1	20.5	24.4
South Dakota	0804	3/22/2002	2	40.6	46.5
South Dakota	0804	3/22/2002	1	20.5	40.6
South Dakota	0804	3/23/2002	2	40.6	46.5
South Dakota	0804	3/23/2002	1	20.5	40.6
South Dakota	0804	3/24/2002	1	20.5	46.5
South Dakota	0804	3/25/2002	1	20.5	46.5
South Dakota	0804	3/26/2002	1	20.5	46.5
South Dakota	0804	3/27/2002	1	24.4	46.5
South Dakota	0804	3/28/2002	2	40.6	46.5
South Dakota	0804	3/28/2002	1	28.3	40.6
South Dakota	0804	3/29/2002	1	30.3	46.5
South Dakota	0804	3/30/2002	1	32.7	46.5
South Dakota	0804	3/31/2002	1	34.6	46.5
South Dakota	0804	4/1/2002	1	34.6	46.5
South Dakota	0804	4/2/2002	1	34.6	46.5
South Dakota	0804	4/3/2002	1	30.3	46.5
South Dakota	0804	4/4/2002	1	34.6	46.5
South Dakota	0804	4/5/2002	1	36.6	46.5
South Dakota	0804	4/6/2002	1	40.6	46.5
South Dakota	0804	4/7/2002	1	42.5	46.5
South Dakota	0804	11/27/2002	1	20.5	22.4
South Dakota	0804	11/28/2002	1	20.5	22.4
South Dakota	0804	12/3/2002	1	20.5	24.4
South Dakota	0804	12/4/2002	1	20.5	28.3
South Dakota	0804	12/5/2002	1	20.5	32.3
South Dakota	0804	12/6/2002	1	20.5	32.3
South Dakota	0804	12/7/2002	1	20.5	32.3
South Dakota	0804	12/8/2002	1	20.5	34.6

South Dakota	0804	12/9/2002	1	20.5	34.6
South Dakota	0804	12/10/2002	1	20.5	34.6
South Dakota	0804	12/11/2002	1	20.5	34.6
South Dakota	0804	12/12/2002	1	20.5	32.3
South Dakota	0804	12/13/2002	1	20.5	32.3
South Dakota	0804	12/14/2002	1	20.5	32.3
South Dakota	0804	12/15/2002	1	20.5	32.3
South Dakota	0804	12/16/2002	1	20.5	32.3
South Dakota	0804	12/17/2002	1	20.5	22.4
South Dakota	0804	12/17/2002	2	22.4	32.3
South Dakota	0804	12/18/2002	1	20.5	22.4
South Dakota	0804	12/18/2002	2	22.4	32.3
South Dakota	0804	12/19/2002	1	20.5	26.4
South Dakota	0804	12/19/2002	2	26.4	30.3
South Dakota	0804	12/20/2002	1	20.5	30.3
South Dakota	0804	12/21/2002	2	24.4	28.7
South Dakota	0804	12/21/2002	1	20.5	24.4
South Dakota	0804	12/22/2002	2	28.7	30.3
South Dakota	0804	12/22/2002	1	20.5	28.7
South Dakota	0804	12/23/2002	1	20.5	32.3
South Dakota	0804	12/24/2002	1	20.5	32.3
South Dakota	0804	12/25/2002	1	20.5	34.6
South Dakota	0804	12/26/2002	2	34.6	36.6
South Dakota	0804	12/26/2002	1	20.5	34.6
South Dakota	0804	12/27/2002	2	34.6	36.6
South Dakota	0804	12/27/2002	1	20.5	34.6
South Dakota	0804	12/28/2002	2	34.6	36.6
South Dakota	0804	12/28/2002	1	20.5	34.6
South Dakota	0804	12/29/2002	2	34.6	36.6
South Dakota	0804	12/29/2002	1	20.5	34.6
South Dakota	0804	12/30/2002	2	34.6	36.6
South Dakota	0804	12/30/2002	1	20.5	34.6
South Dakota	0804	12/31/2002	2	34.6	36.6
South Dakota	0804	12/31/2002	1	20.5	34.6
South Dakota	0804	1/1/2003	2	34.6	36.6
South Dakota	0804	1/1/2003	1	20.5	34.6
South Dakota	0804	1/2/2003	2	34.6	36.6
South Dakota	0804	1/2/2003	1	20.5	34.6
South Dakota	0804	1/3/2003	2	34.6	36.6
South Dakota	0804	1/3/2003	1	20.5	34.6
South Dakota	0804	1/4/2003	2	34.6	36.6
South Dakota	0804	1/4/2003	1	20.5	34.6
South Dakota	0804	1/5/2003	2	34.6	36.6

South Dakota	0804	1/5/2003	1	20.5	34.6
South Dakota	0804	1/6/2003	2	34.6	36.6
South Dakota	0804	1/6/2003	1	20.5	34.6
South Dakota	0804	1/7/2003	2	30.3	36.6
South Dakota	0804	1/7/2003	1	20.5	30.3
South Dakota	0804	1/8/2003	1	20.5	36.6
South Dakota	0804	1/9/2003	1	20.5	34.6
South Dakota	0804	1/10/2003	2	28.7	36.6
South Dakota	0804	1/10/2003	1	20.5	28.7
South Dakota	0804	1/11/2003	2	34.6	36.6
South Dakota	0804	1/11/2003	1	20.5	34.6
South Dakota	0804	1/12/2003	1	20.5	36.6
South Dakota	0804	1/13/2003	1	20.5	38.6
South Dakota	0804	1/14/2003	1	20.5	38.6
South Dakota	0804	1/15/2003	1	20.5	40.6
South Dakota	0804	1/16/2003	1	20.5	42.5
South Dakota	0804	1/17/2003	1	20.5	42.5
South Dakota	0804	1/18/2003	1	20.5	42.5
South Dakota	0804	1/19/2003	1	20.5	44.5
South Dakota	0804	1/20/2003	1	20.5	44.5
South Dakota	0804	1/21/2003	1	20.5	44.5
South Dakota	0804	1/22/2003	1	20.5	46.5
South Dakota	0804	1/23/2003	1	20.5	46.5
South Dakota	0804	1/24/2003	1	20.5	48.4
South Dakota	0804	1/25/2003	1	20.5	48.4
South Dakota	0804	1/26/2003	1	20.5	50.4
South Dakota	0804	1/27/2003	1	20.5	50.4
South Dakota	0804	1/28/2003	1	20.5	50.4
South Dakota	0804	1/29/2003	2	50.4	52.4
South Dakota	0804	1/29/2003	1	20.5	50.4
South Dakota	0804	1/30/2003	2	50.4	52.4
South Dakota	0804	1/30/2003	1	20.5	50.4
South Dakota	0804	1/31/2003	2	50.4	52.4
South Dakota	0804	1/31/2003	1	20.5	50.4
South Dakota	0804	2/1/2003	2	50.4	52.4
South Dakota	0804	2/1/2003	1	20.5	50.4
South Dakota	0804	2/2/2003	1	20.5	52.4
South Dakota	0804	2/3/2003	1	20.5	52.4
South Dakota	0804	2/4/2003	2	50.4	52.4
South Dakota	0804	2/4/2003	1	20.5	50.4
South Dakota	0804	2/5/2003	2	50.4	52.4
South Dakota	0804	2/5/2003	1	20.5	50.4
South Dakota	0804	2/6/2003	2	50.4	52.4

South Dakota	0804	2/6/2003	1	20.5	50.4
South Dakota	0804	2/7/2003	2	50.4	52.4
South Dakota	0804	2/7/2003	1	20.5	50.4
South Dakota	0804	2/8/2003	2	50.4	52.4
South Dakota	0804	2/8/2003	1	20.5	50.4
South Dakota	0804	2/9/2003	1	20.5	52.4
South Dakota	0804	2/10/2003	2	52.4	54.3
South Dakota	0804	2/10/2003	1	20.5	52.4
South Dakota	0804	2/11/2003	2	52.4	54.3
South Dakota	0804	2/11/2003	1	20.5	52.4
South Dakota	0804	2/12/2003	2	52.4	54.3
South Dakota	0804	2/12/2003	1	20.5	52.4
South Dakota	0804	2/13/2003	2	52.4	54.3
South Dakota	0804	2/13/2003	1	20.5	52.4
South Dakota	0804	2/14/2003	2	52.4	54.3
South Dakota	0804	2/14/2003	1	20.5	52.4
South Dakota	0804	2/15/2003	2	52.4	56.7
South Dakota	0804	2/15/2003	1	20.5	52.4
South Dakota	0804	2/16/2003	2	52.4	56.7
South Dakota	0804	2/16/2003	1	20.5	52.4
South Dakota	0804	2/17/2003	2	52.4	56.7
South Dakota	0804	2/17/2003	1	20.5	52.4
South Dakota	0804	2/18/2003	2	52.4	56.7
South Dakota	0804	2/18/2003	1	20.5	52.4
South Dakota	0804	2/19/2003	2	52.4	56.7
South Dakota	0804	2/19/2003	1	20.5	52.4
South Dakota	0804	2/20/2003	2	52.4	56.7
South Dakota	0804	2/20/2003	1	20.5	52.4
South Dakota	0804	2/21/2003	2	52.4	56.7
South Dakota	0804	2/21/2003	1	20.5	52.4
South Dakota	0804	2/22/2003	2	52.4	56.7
South Dakota	0804	2/22/2003	1	20.5	52.4
South Dakota	0804	2/23/2003	2	54.3	56.7
South Dakota	0804	2/23/2003	1	20.5	54.3
South Dakota	0804	2/24/2003	2	54.3	56.7
South Dakota	0804	2/24/2003	1	20.5	54.3
South Dakota	0804	2/25/2003	2	54.3	56.7
South Dakota	0804	2/25/2003	1	20.5	54.3
South Dakota	0804	2/26/2003	2	54.3	58.7
South Dakota	0804	2/26/2003	1	20.5	54.3
South Dakota	0804	2/27/2003	2	54.3	58.7
South Dakota	0804	2/27/2003	1	20.5	54.3
South Dakota	0804	2/28/2003	2	56.7	58.7

South Dakota	0804	2/28/2003	1	20.5	56.7
South Dakota	0804	3/1/2003	2	56.7	58.7
South Dakota	0804	3/1/2003	1	20.5	56.7
South Dakota	0804	3/2/2003	2	56.7	58.7
South Dakota	0804	3/2/2003	1	20.5	56.7
South Dakota	0804	3/3/2003	1	20.5	60.6
South Dakota	0804	3/4/2003	1	20.5	60.6
South Dakota	0804	3/5/2003	1	20.5	60.6
South Dakota	0804	3/6/2003	1	20.5	60.6
South Dakota	0804	3/7/2003	1	20.5	60.6
South Dakota	0804	3/8/2003	1	20.5	60.6
South Dakota	0804	3/9/2003	1	20.5	62.6
South Dakota	0804	3/10/2003	1	20.5	62.6
South Dakota	0804	3/11/2003	1	20.5	62.6
South Dakota	0804	3/12/2003	1	20.5	64.6
South Dakota	0804	3/13/2003	1	20.5	64.6
South Dakota	0804	3/14/2003	1	20.5	64.6
South Dakota	0804	3/15/2003	1	22.4	64.6
South Dakota	0804	3/16/2003	1	26.4	64.6
South Dakota	0804	3/17/2003	1	28.3	64.6
South Dakota	0804	3/18/2003	1	30.3	64.6
South Dakota	0804	3/19/2003	1	30.3	64.6
South Dakota	0804	3/20/2003	1	32.7	64.6
South Dakota	0804	3/21/2003	1	34.6	64.6
South Dakota	0804	3/22/2003	1	36.6	64.6
South Dakota	0804	3/23/2003	1	36.6	64.6
South Dakota	0804	3/24/2003	1	38.6	62.6
South Dakota	0804	3/25/2003	1	40.6	62.6
South Dakota	0804	3/26/2003	1	40.6	62.6
South Dakota	0804	3/27/2003	1	40.6	62.6
South Dakota	0804	3/28/2003	1	40.6	62.6
South Dakota	0804	3/29/2003	1	40.6	62.6
South Dakota	0804	3/30/2003	1	40.6	62.6
South Dakota	0804	3/31/2003	1	42.5	62.6
South Dakota	0804	4/1/2003	1	42.5	62.6
South Dakota	0804	4/2/2003	1	46.5	60.6
South Dakota	0804	4/3/2003	1	46.5	48.4
South Dakota	0804	4/3/2003	2	48.4	60.6
South Dakota	0804	4/4/2003	1	46.5	48.4
South Dakota	0804	4/4/2003	2	48.4	60.6
South Dakota	0804	4/5/2003	1	44.5	48.4
South Dakota	0804	4/5/2003	2	48.4	60.6
South Dakota	0804	4/6/2003	1	44.5	48.4

South Dakota	0804	4/6/2003	2	48.4	60.6
South Dakota	0804	4/7/2003	1	46.5	48.4
South Dakota	0804	4/7/2003	2	48.4	60.6
South Dakota	0804	4/8/2003	1	48.4	60.6
South Dakota	0804	4/9/2003	1	50.4	60.6
South Dakota	0804	4/10/2003	1	52.4	60.6
South Dakota	0804	4/11/2003	1	54.3	58.7
South Dakota	0804	11/6/2003	1	20.5	22.4
South Dakota	0804	11/7/2003	1	20.5	22.4
South Dakota	0804	11/8/2003	1	20.5	24.4
South Dakota	0804	11/9/2003	1	20.5	24.4
South Dakota	0804	11/10/2003	1	20.5	22.4
South Dakota	0804	11/24/2003	1	20.5	26.4
South Dakota	0804	11/25/2003	1	20.5	28.3
South Dakota	0804	11/26/2003	1	20.5	28.3
South Dakota	0804	11/27/2003	1	20.5	30.3
South Dakota	0804	11/28/2003	1	20.5	30.3
South Dakota	0804	11/29/2003	1	20.5	32.3
South Dakota	0804	11/30/2003	1	20.5	30.3
South Dakota	0804	12/1/2003	1	20.5	30.3
South Dakota	0804	12/2/2003	1	20.5	30.3
South Dakota	0804	12/3/2003	1	20.5	28.3
South Dakota	0804	12/4/2003	1	20.5	28.3
South Dakota	0804	12/5/2003	1	20.5	28.3
South Dakota	0804	12/6/2003	1	20.5	30.3
South Dakota	0804	12/7/2003	1	20.5	30.3
South Dakota	0804	12/8/2003	1	20.5	30.3
South Dakota	0804	12/9/2003	1	20.5	30.3
South Dakota	0804	12/10/2003	1	20.5	32.3
South Dakota	0804	12/11/2003	1	20.5	34.6
South Dakota	0804	12/12/2003	1	20.5	34.6
South Dakota	0804	12/13/2003	1	20.5	36.6
South Dakota	0804	12/14/2003	1	20.5	36.6
South Dakota	0804	12/15/2003	1	20.5	36.6
South Dakota	0804	12/16/2003	1	20.5	36.6

SD 46-9187					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
South Dakota	9187	11/20/1994	1	15.7	17.7
South Dakota	9187	11/22/1994	1	15.7	17.7
South Dakota	9187	11/23/1994	1	15.7	19.7
South Dakota	9187	11/24/1994	1	15.7	19.7
South Dakota	9187	11/25/1994	1	15.7	19.7
South Dakota	9187	11/28/1994	1	15.7	17.7
South Dakota	9187	11/29/1994	1	15.7	19.7
South Dakota	9187	11/30/1994	1	15.7	19.7
South Dakota	9187	12/1/1994	1	15.7	19.7
South Dakota	9187	12/4/1994	1	15.7	17.7
South Dakota	9187	12/5/1994	1	15.7	21.7
South Dakota	9187	12/6/1994	1	15.7	25.6
South Dakota	9187	12/7/1994	1	15.7	25.6
South Dakota	9187	12/8/1994	1	15.7	27.6
South Dakota	9187	12/9/1994	1	15.7	27.6
South Dakota	9187	12/10/1994	1	15.7	27.6
South Dakota	9187	12/11/1994	1	15.7	29.9
South Dakota	9187	12/12/1994	1	15.7	29.9
South Dakota	9187	12/13/1994	1	15.7	29.9
South Dakota	9187	12/14/1994	1	15.7	31.9
South Dakota	9187	12/15/1994	1	15.7	31.9
South Dakota	9187	12/16/1994	1	15.7	31.9
South Dakota	9187	12/17/1994	1	15.7	31.9
South Dakota	9187	12/18/1994	1	15.7	31.9
South Dakota	9187	12/19/1994	1	15.7	31.9
South Dakota	9187	12/20/1994	1	15.7	31.9
South Dakota	9187	12/21/1994	1	15.7	31.9
South Dakota	9187	12/22/1994	1	15.7	31.9
South Dakota	9187	12/23/1994	1	15.7	31.9
South Dakota	9187	12/24/1994	1	15.7	31.9
South Dakota	9187	12/25/1994	1	15.7	31.9
South Dakota	9187	12/26/1994	1	15.7	31.9
South Dakota	9187	12/27/1994	1	15.7	31.9
South Dakota	9187	12/28/1994	1	15.7	29.9
South Dakota	9187	12/29/1994	1	15.7	29.9
South Dakota	9187	12/30/1994	1	15.7	29.9
South Dakota	9187	12/31/1994	1	15.7	29.9
South Dakota	9187	1/1/1995	1	15.7	31.9
South Dakota	9187	1/2/1995	1	15.7	31.9
South Dakota	9187	1/3/1995	1	15.7	33.9
South Dakota	9187	1/4/1995	1	15.7	33.9

South Dakota	9187	1/5/1995	1	15.7	35.8
South Dakota	9187	1/6/1995	1	15.7	35.8
South Dakota	9187	1/7/1995	1	15.7	37.8
South Dakota	9187	1/8/1995	1	15.7	37.8
South Dakota	9187	1/9/1995	1	15.7	39.8
South Dakota	9187	1/10/1995	1	15.7	39.8
South Dakota	9187	1/11/1995	1	15.7	39.8
South Dakota	9187	1/12/1995	1	15.7	39.8
South Dakota	9187	1/13/1995	1	15.7	39.8
South Dakota	9187	1/14/1995	1	15.7	39.8
South Dakota	9187	1/15/1995	1	15.7	39.8
South Dakota	9187	1/16/1995	1	15.7	39.8
South Dakota	9187	1/17/1995	1	15.7	39.8
South Dakota	9187	1/18/1995	1	15.7	39.8
South Dakota	9187	1/19/1995	1	15.7	39.8
South Dakota	9187	1/20/1995	1	15.7	39.8
South Dakota	9187	2/20/1995	1	21.7	43.7
South Dakota	9187	2/21/1995	1	23.6	43.7
South Dakota	9187	2/22/1995	1	25.6	43.7
South Dakota	9187	2/23/1995	1	25.6	43.7
South Dakota	9187	2/24/1995	1	25.6	43.7
South Dakota	9187	2/25/1995	1	28.0	43.7
South Dakota	9187	2/26/1995	1	29.9	43.7
South Dakota	9187	2/27/1995	1	15.7	43.7
South Dakota	9187	2/28/1995	1	15.7	43.7
South Dakota	9187	3/1/1995	1	15.7	43.7
South Dakota	9187	3/2/1995	1	15.7	43.7
South Dakota	9187	3/3/1995	1	15.7	41.7
South Dakota	9187	3/4/1995	1	15.7	41.7
South Dakota	9187	3/5/1995	1	15.7	41.7
South Dakota	9187	3/6/1995	1	15.7	41.7
South Dakota	9187	3/7/1995	1	15.7	41.7
South Dakota	9187	3/8/1995	1	15.7	41.7
South Dakota	9187	3/9/1995	1	15.7	41.7
South Dakota	9187	3/10/1995	1	15.7	43.7
South Dakota	9187	3/11/1995	1	17.7	43.7
South Dakota	9187	3/12/1995	1	21.7	43.7
South Dakota	9187	3/13/1995	1	23.6	43.7
South Dakota	9187	3/14/1995	1	25.6	43.7
South Dakota	9187	3/15/1995	1	28.0	43.7
South Dakota	9187	3/16/1995	1	31.9	43.7
South Dakota	9187	3/17/1995	1	31.9	43.7
South Dakota	9187	3/18/1995	1	31.9	43.7

South Dakota	9187	3/19/1995	1	35.8	43.7
South Dakota	9187	11/14/1996	1	15.7	17.7
South Dakota	9187	11/16/1996	1	15.7	17.7
South Dakota	9187	11/17/1996	1	15.7	21.7
South Dakota	9187	11/18/1996	1	15.7	21.7
South Dakota	9187	11/19/1996	1	15.7	25.6
South Dakota	9187	11/20/1996	1	15.7	25.6
South Dakota	9187	11/21/1996	1	15.7	25.6
South Dakota	9187	11/22/1996	1	15.7	27.6
South Dakota	9187	11/23/1996	1	15.7	29.9
South Dakota	9187	11/24/1996	1	15.7	29.9
South Dakota	9187	11/25/1996	1	15.7	31.9
South Dakota	9187	11/26/1996	1	15.7	35.8
South Dakota	9187	11/27/1996	1	15.7	35.8
South Dakota	9187	11/28/1996	1	15.7	35.8
South Dakota	9187	11/29/1996	1	15.7	33.9
South Dakota	9187	11/30/1996	1	15.7	33.9
South Dakota	9187	12/1/1996	1	15.7	31.9
South Dakota	9187	12/2/1996	1	15.7	31.9
South Dakota	9187	12/3/1996	1	15.7	31.9
South Dakota	9187	12/4/1996	1	15.7	31.9
South Dakota	9187	12/5/1996	1	15.7	33.9
South Dakota	9187	12/6/1996	1	15.7	33.9
South Dakota	9187	12/7/1996	1	15.7	31.9
South Dakota	9187	12/8/1996	1	15.7	31.9
South Dakota	9187	12/9/1996	1	15.7	31.9
South Dakota	9187	12/10/1996	1	15.7	31.9
South Dakota	9187	12/11/1996	1	15.7	31.9
South Dakota	9187	12/12/1996	1	15.7	29.9
South Dakota	9187	12/13/1996	1	15.7	29.9
South Dakota	9187	12/14/1996	1	15.7	29.9
South Dakota	9187	12/15/1996	1	15.7	29.9
South Dakota	9187	12/16/1996	1	15.7	29.9
South Dakota	9187	12/17/1996	1	15.7	31.9
South Dakota	9187	12/18/1996	1	15.7	33.9
South Dakota	9187	12/19/1996	1	15.7	35.8
South Dakota	9187	12/20/1996	1	15.7	37.8
South Dakota	9187	12/21/1996	1	15.7	39.8
South Dakota	9187	12/22/1996	1	15.7	39.8
South Dakota	9187	12/23/1996	1	15.7	41.7
South Dakota	9187	12/24/1996	1	15.7	41.7
South Dakota	9187	12/25/1996	1	15.7	43.7
South Dakota	9187	12/26/1996	1	15.7	43.7

South Dakota	9187	12/27/1996	1	15.7	45.7
South Dakota	9187	12/28/1996	1	15.7	45.7
South Dakota	9187	12/29/1996	1	15.7	47.6
South Dakota	9187	12/30/1996	1	15.7	47.6
South Dakota	9187	12/31/1996	1	15.7	47.6
South Dakota	9187	1/1/1997	1	15.7	49.6
South Dakota	9187	1/2/1997	1	15.7	49.6
South Dakota	9187	1/3/1997	1	15.7	49.6
South Dakota	9187	1/4/1997	1	15.7	49.6
South Dakota	9187	1/5/1997	1	15.7	49.6
South Dakota	9187	1/6/1997	1	15.7	49.6
South Dakota	9187	1/7/1997	1	15.7	49.6
South Dakota	9187	1/8/1997	1	15.7	51.6
South Dakota	9187	1/9/1997	1	15.7	51.6
South Dakota	9187	1/10/1997	1	15.7	51.6
South Dakota	9187	1/11/1997	1	15.7	51.6
South Dakota	9187	1/12/1997	1	15.7	51.6
South Dakota	9187	1/13/1997	1	15.7	53.5
South Dakota	9187	1/14/1997	1	15.7	53.5
South Dakota	9187	1/15/1997	1	15.7	55.9
South Dakota	9187	1/16/1997	1	15.7	57.9
South Dakota	9187	1/17/1997	1	15.7	57.9
South Dakota	9187	1/18/1997	1	15.7	59.8
South Dakota	9187	1/19/1997	1	15.7	59.8
South Dakota	9187	1/20/1997	1	15.7	61.8
South Dakota	9187	1/21/1997	1	15.7	61.8
South Dakota	9187	1/22/1997	1	15.7	61.8
South Dakota	9187	1/23/1997	1	15.7	61.8
South Dakota	9187	1/24/1997	1	15.7	61.8
South Dakota	9187	1/25/1997	1	15.7	61.8
South Dakota	9187	1/26/1997	1	15.7	61.8
South Dakota	9187	1/27/1997	1	15.7	63.8
South Dakota	9187	1/28/1997	1	15.7	63.8
South Dakota	9187	1/29/1997	1	15.7	63.8
South Dakota	9187	1/30/1997	1	15.7	63.8
South Dakota	9187	1/31/1997	1	15.7	63.8
South Dakota	9187	2/1/1997	1	15.7	65.7
South Dakota	9187	2/2/1997	1	15.7	65.7
South Dakota	9187	2/3/1997	1	15.7	65.7
South Dakota	9187	2/4/1997	1	15.7	65.7
South Dakota	9187	2/5/1997	1	15.7	65.7
South Dakota	9187	2/6/1997	1	15.7	65.7
South Dakota	9187	2/7/1997	1	15.7	65.7

South Dakota	9187	2/8/1997	1	15.7	65.7
South Dakota	9187	2/9/1997	1	15.7	67.7
South Dakota	9187	2/10/1997	1	15.7	67.7
South Dakota	9187	2/11/1997	1	15.7	67.7
South Dakota	9187	2/12/1997	1	15.7	67.7
South Dakota	9187	2/13/1997	1	15.7	67.7
South Dakota	9187	2/14/1997	1	15.7	67.7
South Dakota	9187	2/15/1997	1	15.7	67.7
South Dakota	9187	2/16/1997	1	15.7	67.7
South Dakota	9187	2/17/1997	1	15.7	67.7
South Dakota	9187	2/18/1997	1	15.7	65.7
South Dakota	9187	2/19/1997	1	23.6	65.7
South Dakota	9187	2/20/1997	1	25.6	65.7
South Dakota	9187	2/21/1997	1	29.9	65.7
South Dakota	9187	2/22/1997	1	28.0	65.7
South Dakota	9187	2/23/1997	1	15.7	65.7
South Dakota	9187	2/24/1997	1	15.7	65.7
South Dakota	9187	2/25/1997	1	15.7	65.7
South Dakota	9187	2/26/1997	1	19.7	65.7
South Dakota	9187	2/27/1997	1	15.7	65.7
South Dakota	9187	2/28/1997	1	15.7	65.7
South Dakota	9187	3/1/1997	1	15.7	65.7
South Dakota	9187	3/2/1997	1	15.7	65.7
South Dakota	9187	3/3/1997	1	15.7	65.7
South Dakota	9187	3/4/1997	1	15.7	65.7
South Dakota	9187	3/5/1997	1	15.7	65.7
South Dakota	9187	3/6/1997	1	15.7	65.7
South Dakota	9187	3/7/1997	1	15.7	65.7
South Dakota	9187	3/8/1997	1	19.7	65.7
South Dakota	9187	3/9/1997	1	21.7	65.7
South Dakota	9187	3/10/1997	1	23.6	65.7
South Dakota	9187	3/11/1997	1	23.6	65.7
South Dakota	9187	3/12/1997	1	21.7	67.7
South Dakota	9187	3/13/1997	1	15.7	67.7
South Dakota	9187	3/14/1997	1	15.7	69.7
South Dakota	9187	3/15/1997	1	15.7	71.7
South Dakota	9187	3/16/1997	1	15.7	67.7
South Dakota	9187	3/17/1997	1	17.7	65.7
South Dakota	9187	3/18/1997	1	17.7	65.7
South Dakota	9187	3/19/1997	1	21.7	65.7
South Dakota	9187	3/20/1997	1	23.6	63.8
South Dakota	9187	3/21/1997	1	28.0	63.8
South Dakota	9187	3/22/1997	1	28.0	63.8

South Dakota	9187	3/23/1997	1	28.0	63.8
South Dakota	9187	3/24/1997	1	29.9	63.8
South Dakota	9187	3/25/1997	1	29.9	63.8
South Dakota	9187	3/26/1997	1	31.9	63.8
South Dakota	9187	3/27/1997	1	33.9	63.8
South Dakota	9187	3/28/1997	1	33.9	63.8
South Dakota	9187	3/29/1997	1	35.8	63.8
South Dakota	9187	3/30/1997	1	37.8	63.8
South Dakota	9187	3/31/1997	1	37.8	61.8
South Dakota	9187	4/1/1997	1	39.8	63.8
South Dakota	9187	4/2/1997	1	39.8	61.8
South Dakota	9187	4/3/1997	1	41.7	61.8
South Dakota	9187	4/4/1997	1	43.7	61.8
South Dakota	9187	4/5/1997	1	43.7	61.8
South Dakota	9187	4/6/1997	1	43.7	61.8
South Dakota	9187	4/7/1997	1	15.7	19.7
South Dakota	9187	4/7/1997	2	41.7	61.8
South Dakota	9187	4/8/1997	1	15.7	25.6
South Dakota	9187	4/8/1997	2	37.8	61.8
South Dakota	9187	4/9/1997	1	15.7	61.8
South Dakota	9187	4/10/1997	1	15.7	61.8
South Dakota	9187	4/11/1997	1	15.7	61.8
South Dakota	9187	4/12/1997	1	15.7	61.8
South Dakota	9187	4/13/1997	1	17.7	59.8
South Dakota	9187	4/14/1997	1	21.7	59.8
South Dakota	9187	4/15/1997	1	35.8	59.8
South Dakota	9187	4/16/1997	1	41.7	57.9
South Dakota	9187	4/17/1997	1	43.7	57.9
South Dakota	9187	4/18/1997	1	49.6	57.9

KS 20-4054					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Kansas	4054	1/7/1996	1	33.5	35.4
Kansas	4054	1/8/1996	1	33.5	35.4
Kansas	4054	1/20/1996	1	33.5	35.4
Kansas	4054	2/1/1996	1	33.5	35.4
Kansas	4054	2/2/1996	1	33.5	35.4
Kansas	4054	2/3/1996	1	33.5	37.4
Kansas	4054	2/4/1996	1	33.5	39.4
Kansas	4054	2/5/1996	1	33.5	41.3
Kansas	4054	2/6/1996	1	33.5	39.4
Kansas	4054	2/7/1996	1	33.5	39.4
Kansas	4054	2/8/1996	1	33.5	37.4

MN 27-4040					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Minnesota	4040	11/12/1993	1	20.9	22.8
Minnesota	4040	11/25/1993	1	27.2	29.1
Minnesota	4040	11/26/1993	1	27.2	29.1
Minnesota	4040	11/27/1993	1	27.2	29.1
Minnesota	4040	11/28/1993	1	27.2	31.1
Minnesota	4040	11/29/1993	1	27.2	33.1
Minnesota	4040	11/30/1993	1	27.2	33.1
Minnesota	4040	12/1/1993	1	27.2	35.0
Minnesota	4040	12/2/1993	1	27.2	35.0
Minnesota	4040	12/3/1993	1	27.2	35.0
Minnesota	4040	12/4/1993	1	27.2	35.0
Minnesota	4040	12/5/1993	1	27.2	35.0
Minnesota	4040	12/6/1993	1	27.2	35.0
Minnesota	4040	12/7/1993	1	27.2	35.0
Minnesota	4040	12/8/1993	1	27.2	35.0
Minnesota	4040	12/9/1993	1	27.2	37.0
Minnesota	4040	12/10/1993	1	27.2	37.0
Minnesota	4040	12/11/1993	1	27.2	39.0
Minnesota	4040	12/12/1993	1	27.2	39.0
Minnesota	4040	12/13/1993	1	27.2	40.9
Minnesota	4040	12/14/1993	1	27.2	40.9
Minnesota	4040	12/15/1993	1	27.2	40.9
Minnesota	4040	12/16/1993	1	20.9	40.9
Minnesota	4040	12/17/1993	1	20.9	40.9
Minnesota	4040	12/18/1993	1	20.9	40.9
Minnesota	4040	12/19/1993	1	20.9	40.9
Minnesota	4040	12/20/1993	1	20.9	40.9
Minnesota	4040	12/21/1993	1	20.9	40.9
Minnesota	4040	12/22/1993	1	20.9	40.9
Minnesota	4040	12/23/1993	1	20.9	42.9
Minnesota	4040	12/24/1993	1	20.9	42.9
Minnesota	4040	12/25/1993	1	20.9	44.9
Minnesota	4040	12/26/1993	1	20.9	46.9
Minnesota	4040	12/27/1993	1	20.9	46.9
Minnesota	4040	12/28/1993	1	20.9	49.2
Minnesota	4040	12/29/1993	1	20.9	51.2
Minnesota	4040	12/30/1993	1	20.9	53.1
Minnesota	4040	12/31/1993	1	20.9	53.1
Minnesota	4040	1/1/1994	1	20.9	55.1
Minnesota	4040	1/2/1994	1	20.9	57.1
Minnesota	4040	1/3/1994	1	20.9	57.1

Minnesota	4040	1/4/1994	1	20.9	59.1
Minnesota	4040	1/5/1994	1	20.9	59.1
Minnesota	4040	1/6/1994	1	20.9	59.1
Minnesota	4040	1/7/1994	1	20.9	61.0
Minnesota	4040	1/8/1994	1	20.9	61.0
Minnesota	4040	1/9/1994	1	20.9	63.0
Minnesota	4040	1/10/1994	1	20.9	63.0
Minnesota	4040	1/11/1994	1	20.9	65.0
Minnesota	4040	1/12/1994	1	20.9	65.0
Minnesota	4040	1/13/1994	1	20.9	65.0
Minnesota	4040	1/14/1994	1	20.9	66.9
Minnesota	4040	1/15/1994	1	20.9	66.9
Minnesota	4040	1/16/1994	1	20.9	68.9
Minnesota	4040	1/17/1994	1	20.9	68.9
Minnesota	4040	1/18/1994	1	20.9	68.9
Minnesota	4040	1/19/1994	1	20.9	70.9
Minnesota	4040	1/20/1994	1	20.9	70.9
Minnesota	4040	1/21/1994	1	20.9	72.8
Minnesota	4040	1/22/1994	1	20.9	72.8
Minnesota	4040	1/23/1994	1	20.9	75.2
Minnesota	4040	1/24/1994	1	20.9	75.2
Minnesota	4040	1/25/1994	1	20.9	77.2
Minnesota	4040	1/26/1994	1	20.9	77.2
Minnesota	4040	1/27/1994	1	20.9	79.1
Minnesota	4040	1/28/1994	1	20.9	79.1
Minnesota	4040	1/29/1994	1	20.9	79.1
Minnesota	4040	1/30/1994	1	20.9	81.1
Minnesota	4040	1/31/1994	1	20.9	81.1
Minnesota	4040	2/1/1994	1	20.9	81.1
Minnesota	4040	2/2/1994	1	20.9	83.1
Minnesota	4040	2/3/1994	1	20.9	83.1
Minnesota	4040	2/4/1994	1	20.9	83.1
Minnesota	4040	2/5/1994	1	20.9	83.1
Minnesota	4040	2/6/1994	1	20.9	85.0
Minnesota	4040	2/7/1994	1	20.9	85.0
Minnesota	4040	2/8/1994	1	20.9	85.0
Minnesota	4040	2/9/1994	1	20.9	87.0
Minnesota	4040	2/10/1994	1	20.9	87.0
Minnesota	4040	2/11/1994	1	20.9	87.0
Minnesota	4040	2/12/1994	1	20.9	89.0
Minnesota	4040	2/13/1994	1	20.9	89.0
Minnesota	4040	2/14/1994	1	20.9	89.0
Minnesota	4040	2/15/1994	1	20.9	89.0

Minnesota	4040	2/16/1994	1	20.9	90.9
Minnesota	4040	2/17/1994	1	20.9	90.9
Minnesota	4040	2/18/1994	1	20.9	90.9
Minnesota	4040	2/19/1994	1	20.9	90.9
Minnesota	4040	2/20/1994	1	20.9	90.9
Minnesota	4040	2/21/1994	1	20.9	90.9
Minnesota	4040	2/22/1994	1	20.9	90.9
Minnesota	4040	2/23/1994	1	20.9	90.9
Minnesota	4040	2/24/1994	1	20.9	90.9
Minnesota	4040	2/25/1994	1	20.9	90.9
Minnesota	4040	2/26/1994	1	20.9	90.9
Minnesota	4040	2/27/1994	1	20.9	90.9
Minnesota	4040	2/28/1994	1	20.9	90.9
Minnesota	4040	3/1/1994	1	20.9	90.9
Minnesota	4040	3/2/1994	1	20.9	90.9
Minnesota	4040	3/3/1994	1	20.9	90.9
Minnesota	4040	3/4/1994	1	20.9	90.9
Minnesota	4040	3/5/1994	1	20.9	90.9
Minnesota	4040	3/6/1994	1	20.9	90.9
Minnesota	4040	3/7/1994	1	20.9	90.9
Minnesota	4040	3/8/1994	1	20.9	90.9
Minnesota	4040	3/9/1994	1	20.9	90.9
Minnesota	4040	3/10/1994	1	20.9	90.9
Minnesota	4040	3/11/1994	1	20.9	90.9
Minnesota	4040	3/12/1994	1	20.9	90.9
Minnesota	4040	3/13/1994	1	20.9	90.9
Minnesota	4040	3/14/1994	1	24.8	90.9
Minnesota	4040	3/15/1994	1	20.9	24.8
Minnesota	4040	3/15/1994	2	24.8	90.9
Minnesota	4040	3/16/1994	1	20.9	24.8
Minnesota	4040	3/16/1994	2	24.8	90.9
Minnesota	4040	3/17/1994	1	20.9	24.8
Minnesota	4040	3/17/1994	2	24.8	90.9
Minnesota	4040	3/18/1994	1	20.9	24.8
Minnesota	4040	3/18/1994	2	24.8	90.9
Minnesota	4040	3/19/1994	1	22.8	24.8
Minnesota	4040	3/19/1994	2	24.8	90.9
Minnesota	4040	3/20/1994	1	22.0	24.8
Minnesota	4040	3/20/1994	2	24.8	90.9
Minnesota	4040	3/21/1994	1	24.8	90.9
Minnesota	4040	3/22/1994	1	27.2	90.9
Minnesota	4040	3/23/1994	1	22.8	27.2
Minnesota	4040	3/23/1994	2	27.2	90.9

Minnesota	4040	3/24/1994	1	22.8	27.2
Minnesota	4040	3/24/1994	2	27.2	90.9
Minnesota	4040	3/25/1994	1	24.8	27.2
Minnesota	4040	3/25/1994	2	27.2	90.9
Minnesota	4040	3/26/1994	1	27.2	90.9
Minnesota	4040	3/27/1994	1	24.8	27.2
Minnesota	4040	3/27/1994	2	27.2	90.9
Minnesota	4040	3/28/1994	1	22.8	27.2
Minnesota	4040	3/28/1994	2	27.2	90.9
Minnesota	4040	3/29/1994	1	24.8	27.2
Minnesota	4040	3/29/1994	2	27.2	90.9
Minnesota	4040	3/30/1994	1	27.2	90.9
Minnesota	4040	3/31/1994	1	29.1	90.9
Minnesota	4040	4/1/1994	1	31.1	90.9
Minnesota	4040	4/2/1994	1	31.1	90.9
Minnesota	4040	4/3/1994	1	31.1	90.9
Minnesota	4040	4/4/1994	1	31.1	90.9
Minnesota	4040	4/5/1994	1	29.1	31.1
Minnesota	4040	4/5/1994	2	31.1	90.9
Minnesota	4040	4/6/1994	1	31.1	90.9
Minnesota	4040	4/7/1994	1	33.1	90.9
Minnesota	4040	4/8/1994	1	35.0	90.9
Minnesota	4040	4/9/1994	1	35.0	90.9
Minnesota	4040	4/10/1994	1	35.0	90.9
Minnesota	4040	4/11/1994	1	37.0	90.9
Minnesota	4040	4/12/1994	1	39.0	90.9
Minnesota	4040	4/13/1994	1	40.9	90.9
Minnesota	4040	4/14/1994	1	42.9	90.9
Minnesota	4040	4/15/1994	1	42.9	90.9
Minnesota	4040	4/16/1994	1	44.9	90.9
Minnesota	4040	4/17/1994	1	47.2	90.9
Minnesota	4040	4/18/1994	1	47.2	90.9
Minnesota	4040	4/19/1994	1	49.2	90.9
Minnesota	4040	4/20/1994	1	51.2	90.9
Minnesota	4040	4/21/1994	1	51.2	90.9
Minnesota	4040	4/22/1994	1	53.1	90.9
Minnesota	4040	4/23/1994	1	55.1	90.9
Minnesota	4040	4/24/1994	1	55.1	90.9
Minnesota	4040	4/25/1994	1	57.1	90.9
Minnesota	4040	4/26/1994	1	59.1	90.9
Minnesota	4040	4/27/1994	1	59.1	90.9
Minnesota	4040	4/28/1994	1	59.1	90.9
Minnesota	4040	4/29/1994	1	59.1	90.9

Minnesota	4040	4/30/1994	1	61.0	90.9
Minnesota	4040	5/1/1994	1	61.0	90.9
Minnesota	4040	5/2/1994	1	61.0	90.9
Minnesota	4040	5/3/1994	1	63.0	90.9
Minnesota	4040	5/4/1994	1	65.0	90.9
Minnesota	4040	5/5/1994	1	65.0	90.9
Minnesota	4040	5/6/1994	1	66.9	90.9
Minnesota	4040	5/7/1994	1	66.9	90.9
Minnesota	4040	5/8/1994	1	68.9	90.9
Minnesota	4040	5/9/1994	1	68.9	90.9
Minnesota	4040	5/10/1994	1	70.9	90.9
Minnesota	4040	5/11/1994	1	73.2	90.9
Minnesota	4040	5/12/1994	1	73.2	90.9
Minnesota	4040	5/13/1994	1	75.2	90.9
Minnesota	4040	5/14/1994	1	77.2	90.9
Minnesota	4040	5/15/1994	1	79.1	89.0
Minnesota	4040	11/26/1994	1	20.9	22.8
Minnesota	4040	11/27/1994	1	20.9	22.8
Minnesota	4040	11/28/1994	1	20.9	22.8
Minnesota	4040	11/29/1994	1	20.9	24.8
Minnesota	4040	11/30/1994	1	20.9	24.8
Minnesota	4040	12/1/1994	1	20.9	24.8
Minnesota	4040	12/2/1994	1	20.9	24.8
Minnesota	4040	12/3/1994	1	20.9	24.8
Minnesota	4040	12/4/1994	1	20.9	24.8
Minnesota	4040	12/5/1994	1	20.9	24.8
Minnesota	4040	12/6/1994	1	20.9	26.8
Minnesota	4040	12/7/1994	1	20.9	31.1
Minnesota	4040	12/8/1994	1	20.9	31.1
Minnesota	4040	12/9/1994	1	20.9	33.1
Minnesota	4040	12/10/1994	1	20.9	33.1
Minnesota	4040	12/11/1994	1	20.9	35.0
Minnesota	4040	12/12/1994	1	20.9	37.0
Minnesota	4040	12/13/1994	1	20.9	37.0
Minnesota	4040	12/14/1994	1	20.9	39.0
Minnesota	4040	12/15/1994	1	20.9	40.9
Minnesota	4040	12/16/1994	1	20.9	40.9
Minnesota	4040	12/17/1994	1	20.9	40.9
Minnesota	4040	12/18/1994	1	20.9	40.9
Minnesota	4040	12/19/1994	1	20.9	42.9
Minnesota	4040	12/20/1994	1	20.9	42.9
Minnesota	4040	12/21/1994	1	20.9	42.9
Minnesota	4040	12/22/1994	1	20.9	42.9

Minnesota	4040	12/23/1994	1	20.9	42.9
Minnesota	4040	12/24/1994	1	20.9	42.9
Minnesota	4040	12/25/1994	1	20.9	42.9
Minnesota	4040	12/26/1994	1	20.9	42.9
Minnesota	4040	12/27/1994	1	20.9	42.9
Minnesota	4040	12/28/1994	1	20.9	42.9
Minnesota	4040	12/29/1994	1	20.9	42.9
Minnesota	4040	12/30/1994	1	20.9	42.9
Minnesota	4040	12/31/1994	1	20.9	42.9
Minnesota	4040	1/1/1995	1	20.9	44.9
Minnesota	4040	1/2/1995	1	20.9	44.9
Minnesota	4040	1/3/1995	1	20.9	46.9
Minnesota	4040	1/4/1995	1	20.9	46.9
Minnesota	4040	1/5/1995	1	20.9	46.9
Minnesota	4040	1/6/1995	1	20.9	49.2
Minnesota	4040	1/7/1995	1	20.9	51.2
Minnesota	4040	1/8/1995	1	20.9	51.2
Minnesota	4040	1/9/1995	1	20.9	53.1
Minnesota	4040	1/10/1995	1	20.9	53.1
Minnesota	4040	1/11/1995	1	20.9	55.1
Minnesota	4040	1/12/1995	1	20.9	55.1
Minnesota	4040	1/13/1995	1	20.9	57.1
Minnesota	4040	1/14/1995	1	20.9	57.1
Minnesota	4040	1/15/1995	1	20.9	57.1
Minnesota	4040	1/16/1995	1	20.9	57.1
Minnesota	4040	1/17/1995	1	20.9	59.1
Minnesota	4040	1/18/1995	1	20.9	59.1
Minnesota	4040	1/19/1995	1	20.9	59.1
Minnesota	4040	1/20/1995	1	20.9	59.1
Minnesota	4040	1/21/1995	1	20.9	59.1
Minnesota	4040	1/22/1995	1	20.9	61.0
Minnesota	4040	1/23/1995	1	20.9	61.0
Minnesota	4040	1/24/1995	1	20.9	61.0
Minnesota	4040	1/25/1995	1	20.9	61.0
Minnesota	4040	1/26/1995	1	20.9	61.0
Minnesota	4040	1/27/1995	1	20.9	61.0
Minnesota	4040	1/28/1995	1	20.9	63.0
Minnesota	4040	1/29/1995	1	20.9	63.0
Minnesota	4040	1/30/1995	1	20.9	63.0
Minnesota	4040	1/31/1995	1	20.9	65.0
Minnesota	4040	2/1/1995	1	20.9	65.0
Minnesota	4040	2/2/1995	1	20.9	65.0
Minnesota	4040	2/3/1995	1	20.9	65.0

Minnesota	4040	2/4/1995	1	20.9	65.0
Minnesota	4040	2/5/1995	1	20.9	65.0
Minnesota	4040	2/6/1995	1	20.9	66.9
Minnesota	4040	2/7/1995	1	20.9	66.9
Minnesota	4040	2/8/1995	1	20.9	66.9
Minnesota	4040	2/9/1995	1	20.9	66.9
Minnesota	4040	2/10/1995	1	20.9	66.9
Minnesota	4040	2/11/1995	1	20.9	68.9
Minnesota	4040	2/12/1995	1	20.9	68.9
Minnesota	4040	2/13/1995	1	20.9	68.9
Minnesota	4040	2/14/1995	1	20.9	68.9
Minnesota	4040	2/15/1995	1	20.9	70.9
Minnesota	4040	2/16/1995	1	20.9	70.9
Minnesota	4040	2/17/1995	1	20.9	70.9
Minnesota	4040	2/18/1995	1	20.9	72.8
Minnesota	4040	2/19/1995	1	20.9	72.8
Minnesota	4040	2/20/1995	1	20.9	72.8
Minnesota	4040	2/21/1995	1	20.9	72.8
Minnesota	4040	2/22/1995	1	20.9	72.8
Minnesota	4040	2/23/1995	1	20.9	72.8
Minnesota	4040	2/24/1995	1	20.9	75.2
Minnesota	4040	2/25/1995	1	20.9	75.2
Minnesota	4040	2/26/1995	1	20.9	75.2
Minnesota	4040	2/27/1995	1	20.9	75.2
Minnesota	4040	2/28/1995	1	20.9	75.2
Minnesota	4040	3/1/1995	1	20.9	75.2
Minnesota	4040	3/2/1995	1	20.9	77.2
Minnesota	4040	3/3/1995	1	20.9	77.2
Minnesota	4040	3/4/1995	1	20.9	77.2
Minnesota	4040	3/5/1995	1	20.9	77.2
Minnesota	4040	3/6/1995	1	20.9	77.2
Minnesota	4040	3/7/1995	1	20.9	77.2
Minnesota	4040	3/8/1995	1	20.9	79.1
Minnesota	4040	3/9/1995	1	20.9	79.1
Minnesota	4040	3/10/1995	1	20.9	79.1
Minnesota	4040	3/11/1995	1	20.9	79.1
Minnesota	4040	3/12/1995	1	20.9	79.1
Minnesota	4040	3/13/1995	1	20.9	79.1
Minnesota	4040	3/14/1995	1	22.8	79.1
Minnesota	4040	3/15/1995	1	24.8	79.1
Minnesota	4040	3/16/1995	1	24.8	79.1
Minnesota	4040	3/17/1995	1	27.2	81.1
Minnesota	4040	3/18/1995	1	29.1	81.1

Minnesota	4040	3/19/1995	1	29.1	81.1
Minnesota	4040	3/20/1995	1	29.1	81.1
Minnesota	4040	3/21/1995	1	29.1	81.1
Minnesota	4040	3/22/1995	1	29.1	81.1
Minnesota	4040	3/23/1995	1	31.1	81.1
Minnesota	4040	3/24/1995	1	31.1	81.1
Minnesota	4040	3/25/1995	1	33.1	81.1
Minnesota	4040	3/26/1995	1	31.1	81.1
Minnesota	4040	3/27/1995	1	31.1	79.1
Minnesota	4040	3/28/1995	1	33.1	79.1
Minnesota	4040	3/29/1995	1	35.0	79.1
Minnesota	4040	3/30/1995	1	35.0	79.1
Minnesota	4040	3/31/1995	1	37.0	79.1
Minnesota	4040	4/1/1995	1	37.0	79.1
Minnesota	4040	4/2/1995	1	37.0	79.1
Minnesota	4040	4/3/1995	1	37.0	79.1
Minnesota	4040	4/4/1995	1	20.9	79.1
Minnesota	4040	4/5/1995	1	20.9	79.1
Minnesota	4040	4/6/1995	1	20.9	79.1
Minnesota	4040	4/7/1995	1	22.8	79.1
Minnesota	4040	4/8/1995	1	29.1	79.1
Minnesota	4040	4/9/1995	1	35.0	79.1
Minnesota	4040	4/10/1995	1	37.0	79.1
Minnesota	4040	4/11/1995	1	37.0	79.1
Minnesota	4040	4/12/1995	1	35.0	77.2
Minnesota	4040	4/13/1995	1	33.1	77.2
Minnesota	4040	4/14/1995	1	39.0	77.2
Minnesota	4040	4/15/1995	1	40.9	77.2
Minnesota	4040	4/16/1995	1	42.9	77.2
Minnesota	4040	4/17/1995	1	40.9	77.2
Minnesota	4040	4/18/1995	1	42.9	77.2
Minnesota	4040	4/19/1995	1	42.9	77.2
Minnesota	4040	4/20/1995	1	44.9	77.2
Minnesota	4040	4/21/1995	1	47.2	77.2
Minnesota	4040	4/22/1995	1	49.2	77.2
Minnesota	4040	4/23/1995	1	49.2	77.2
Minnesota	4040	4/24/1995	1	51.2	77.2
Minnesota	4040	4/25/1995	1	53.1	77.2
Minnesota	4040	4/26/1995	1	53.1	75.2
Minnesota	4040	4/27/1995	1	55.1	75.2
Minnesota	4040	4/28/1995	1	55.1	75.2
Minnesota	4040	4/29/1995	1	57.1	75.2
Minnesota	4040	4/30/1995	1	57.1	75.2

Minnesota	4040	5/1/1995	1	59.1	75.2
Minnesota	4040	5/2/1995	1	61.0	75.2
Minnesota	4040	5/3/1995	1	63.0	72.8
Minnesota	4040	11/20/1996	1	20.9	22.8
Minnesota	4040	11/21/1996	1	20.9	24.8
Minnesota	4040	11/22/1996	1	20.9	24.8
Minnesota	4040	11/23/1996	1	20.9	26.8
Minnesota	4040	11/24/1996	1	20.9	26.8
Minnesota	4040	11/25/1996	1	20.9	29.1
Minnesota	4040	11/26/1996	1	20.9	31.1
Minnesota	4040	11/27/1996	1	20.9	33.1
Minnesota	4040	11/28/1996	1	20.9	35.0
Minnesota	4040	11/29/1996	1	20.9	37.0
Minnesota	4040	11/30/1996	1	20.9	37.0
Minnesota	4040	12/1/1996	1	20.9	37.0
Minnesota	4040	12/2/1996	1	20.9	37.0
Minnesota	4040	12/3/1996	1	20.9	39.0
Minnesota	4040	12/4/1996	1	20.9	39.0
Minnesota	4040	12/5/1996	1	20.9	40.9
Minnesota	4040	12/6/1996	1	20.9	40.9
Minnesota	4040	12/7/1996	1	20.9	40.9
Minnesota	4040	12/8/1996	1	20.9	40.9
Minnesota	4040	12/9/1996	1	20.9	40.9
Minnesota	4040	12/10/1996	1	20.9	42.9
Minnesota	4040	12/11/1996	1	20.9	42.9
Minnesota	4040	12/12/1996	1	20.9	42.9
Minnesota	4040	12/13/1996	1	20.9	42.9
Minnesota	4040	12/14/1996	1	20.9	40.9
Minnesota	4040	12/15/1996	1	20.9	42.9
Minnesota	4040	12/16/1996	1	20.9	42.9
Minnesota	4040	12/17/1996	1	20.9	42.9
Minnesota	4040	12/18/1996	1	20.9	44.9
Minnesota	4040	12/19/1996	1	20.9	44.9
Minnesota	4040	12/20/1996	1	20.9	44.9
Minnesota	4040	12/21/1996	1	20.9	46.9
Minnesota	4040	12/22/1996	1	20.9	46.9
Minnesota	4040	12/23/1996	1	20.9	49.2
Minnesota	4040	12/24/1996	1	20.9	51.2
Minnesota	4040	12/25/1996	1	20.9	51.2
Minnesota	4040	12/26/1996	1	20.9	53.1
Minnesota	4040	12/27/1996	1	20.9	53.1
Minnesota	4040	12/28/1996	1	20.9	55.1
Minnesota	4040	12/29/1996	1	20.9	57.1

Minnesota	4040	12/30/1996	1	20.9	57.1
Minnesota	4040	12/31/1996	1	20.9	59.1
Minnesota	4040	1/1/1997	1	20.9	59.1
Minnesota	4040	1/2/1997	1	20.9	61.0
Minnesota	4040	1/3/1997	1	20.9	61.0
Minnesota	4040	1/4/1997	1	20.9	61.0
Minnesota	4040	1/5/1997	1	20.9	61.0
Minnesota	4040	1/6/1997	1	20.9	61.0
Minnesota	4040	1/7/1997	1	20.9	63.0
Minnesota	4040	1/8/1997	1	20.9	63.0
Minnesota	4040	1/9/1997	1	20.9	63.0
Minnesota	4040	1/10/1997	1	20.9	65.0
Minnesota	4040	1/11/1997	1	20.9	65.0
Minnesota	4040	1/12/1997	1	20.9	65.0
Minnesota	4040	1/13/1997	1	20.9	65.0
Minnesota	4040	1/14/1997	1	20.9	66.9
Minnesota	4040	1/15/1997	1	20.9	66.9
Minnesota	4040	1/16/1997	1	20.9	66.9
Minnesota	4040	1/17/1997	1	20.9	68.9
Minnesota	4040	1/18/1997	1	20.9	68.9
Minnesota	4040	1/19/1997	1	20.9	68.9
Minnesota	4040	1/20/1997	1	20.9	70.9
Minnesota	4040	1/21/1997	1	20.9	70.9
Minnesota	4040	1/22/1997	1	20.9	70.9
Minnesota	4040	1/23/1997	1	20.9	70.9
Minnesota	4040	1/24/1997	1	20.9	72.8
Minnesota	4040	1/25/1997	1	20.9	72.8
Minnesota	4040	1/26/1997	1	20.9	72.8
Minnesota	4040	1/27/1997	1	20.9	72.8
Minnesota	4040	1/28/1997	1	20.9	75.2
Minnesota	4040	1/29/1997	1	20.9	75.2
Minnesota	4040	1/30/1997	1	20.9	75.2
Minnesota	4040	1/31/1997	1	20.9	77.2
Minnesota	4040	2/1/1997	1	20.9	77.2
Minnesota	4040	2/2/1997	1	20.9	77.2
Minnesota	4040	2/3/1997	1	20.9	79.1
Minnesota	4040	2/4/1997	1	20.9	79.1
Minnesota	4040	2/5/1997	1	20.9	79.1
Minnesota	4040	2/6/1997	1	20.9	79.1
Minnesota	4040	2/7/1997	1	20.9	79.1
Minnesota	4040	2/8/1997	1	20.9	81.1
Minnesota	4040	2/9/1997	1	20.9	81.1
Minnesota	4040	2/10/1997	1	20.9	81.1

Minnesota	4040	2/11/1997	1	20.9	81.1
Minnesota	4040	2/12/1997	1	20.9	81.1
Minnesota	4040	2/13/1997	1	20.9	83.1
Minnesota	4040	2/14/1997	1	20.9	83.1
Minnesota	4040	2/15/1997	1	20.9	83.1
Minnesota	4040	2/16/1997	1	20.9	83.1
Minnesota	4040	2/17/1997	1	20.9	83.1
Minnesota	4040	2/18/1997	1	20.9	85.0
Minnesota	4040	2/19/1997	1	20.9	85.0
Minnesota	4040	2/20/1997	1	20.9	85.0
Minnesota	4040	2/21/1997	1	20.9	85.0
Minnesota	4040	2/22/1997	1	20.9	85.0
Minnesota	4040	2/23/1997	1	20.9	85.0
Minnesota	4040	2/24/1997	1	20.9	85.0
Minnesota	4040	2/25/1997	1	20.9	85.0
Minnesota	4040	2/26/1997	1	20.9	87.0
Minnesota	4040	2/27/1997	1	20.9	87.0
Minnesota	4040	2/28/1997	1	20.9	87.0
Minnesota	4040	3/1/1997	1	20.9	87.0
Minnesota	4040	3/2/1997	1	20.9	87.0
Minnesota	4040	3/3/1997	1	20.9	87.0
Minnesota	4040	3/4/1997	1	20.9	87.0
Minnesota	4040	3/5/1997	1	20.9	87.0
Minnesota	4040	3/6/1997	1	20.9	87.0
Minnesota	4040	3/7/1997	1	20.9	87.0
Minnesota	4040	3/8/1997	1	20.9	87.0
Minnesota	4040	3/9/1997	1	20.9	87.0
Minnesota	4040	3/10/1997	1	20.9	87.0
Minnesota	4040	3/11/1997	1	20.9	87.0
Minnesota	4040	3/12/1997	1	20.9	87.0
Minnesota	4040	3/13/1997	1	20.9	87.0
Minnesota	4040	3/14/1997	1	20.9	87.0
Minnesota	4040	3/15/1997	1	20.9	87.0
Minnesota	4040	3/16/1997	1	20.9	87.0
Minnesota	4040	3/17/1997	1	20.9	87.0
Minnesota	4040	4/8/1997	1	20.9	89.0
Minnesota	4040	4/9/1997	1	20.9	87.0
Minnesota	4040	4/10/1997	1	22.8	87.0
Minnesota	4040	4/11/1997	1	31.1	87.0
Minnesota	4040	4/12/1997	1	37.0	87.0
Minnesota	4040	4/13/1997	1	37.0	87.0
Minnesota	4040	4/14/1997	1	39.0	87.0
Minnesota	4040	4/15/1997	1	40.9	87.0

Minnesota	4040	4/16/1997	1	40.9	87.0
Minnesota	4040	4/17/1997	1	40.9	87.0
Minnesota	4040	4/18/1997	1	42.9	87.0
Minnesota	4040	4/19/1997	1	44.9	87.0
Minnesota	4040	4/20/1997	1	47.2	87.0
Minnesota	4040	4/21/1997	1	49.2	87.0
Minnesota	4040	4/22/1997	1	49.2	87.0
Minnesota	4040	4/23/1997	1	51.2	87.0
Minnesota	4040	4/24/1997	1	53.1	87.0
Minnesota	4040	4/25/1997	1	55.1	87.0
Minnesota	4040	4/26/1997	1	55.1	87.0
Minnesota	4040	4/27/1997	1	57.1	87.0
Minnesota	4040	4/28/1997	1	59.1	87.0
Minnesota	4040	4/29/1997	1	59.1	87.0
Minnesota	4040	4/30/1997	1	61.0	87.0
Minnesota	4040	5/1/1997	1	61.0	87.0
Minnesota	4040	5/2/1997	1	63.0	85.0
Minnesota	4040	5/3/1997	1	65.0	85.0
Minnesota	4040	5/4/1997	1	66.9	85.0
Minnesota	4040	5/5/1997	1	66.9	85.0
Minnesota	4040	5/6/1997	1	68.9	85.0
Minnesota	4040	5/7/1997	1	70.9	85.0
Minnesota	4040	5/8/1997	1	73.2	83.1

OH 39-0204					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Ohio	0204	1/5/1999	1	19.7	21.7
Ohio	0204	1/6/1999	1	19.7	23.6
Ohio	0204	1/7/1999	1	19.7	23.6
Ohio	0204	1/8/1999	1	19.7	25.6
Ohio	0204	1/9/1999	1	19.7	25.6
Ohio	0204	1/10/1999	1	19.7	25.6
Ohio	0204	1/11/1999	1	19.7	27.6
Ohio	0204	1/12/1999	1	19.7	27.6
Ohio	0204	1/13/1999	1	19.7	27.6
Ohio	0204	1/14/1999	1	19.7	27.6
Ohio	0204	1/15/1999	1	19.7	25.6
Ohio	0204	1/16/1999	1	19.7	27.6
Ohio	0204	1/17/1999	1	19.7	25.6
Ohio	0204	1/18/1999	1	19.7	25.6
Ohio	0204	1/19/1999	1	19.7	25.6
Ohio	0204	1/20/1999	1	19.7	25.6
Ohio	0204	1/21/1999	1	19.7	25.6

IN 18-3002					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE_ TO (in)
Indiana	3002	12/12/1995	1	31.5	33.5
Indiana	3002	12/13/1995	1	31.5	33.5
Indiana	3002	12/14/1995	1	31.5	33.5
Indiana	3002	1/5/1996	1	31.5	33.5
Indiana	3002	1/6/1996	1	31.5	35.4
Indiana	3002	1/7/1996	1	31.5	35.4
Indiana	3002	1/8/1996	1	31.5	37.4
Indiana	3002	1/9/1996	1	31.5	37.4
Indiana	3002	1/10/1996	1	31.5	39.8
Indiana	3002	1/11/1996	1	31.5	39.8
Indiana	3002	1/12/1996	1	31.5	39.8
Indiana	3002	1/13/1996	1	31.5	39.8
Indiana	3002	1/14/1996	1	31.5	37.4
Indiana	3002	1/15/1996	1	31.5	37.4
Indiana	3002	1/16/1996	1	31.5	37.4
Indiana	3002	1/17/1996	1	31.5	37.4
Indiana	3002	1/21/1996	1	31.5	33.5
Indiana	3002	1/22/1996	1	31.5	33.5
Indiana	3002	1/23/1996	1	31.5	33.5
Indiana	3002	1/29/1996	1	31.5	33.5
Indiana	3002	1/30/1996	1	31.5	33.5
Indiana	3002	1/31/1996	1	31.5	35.4
Indiana	3002	2/1/1996	1	31.5	37.4
Indiana	3002	2/2/1996	1	31.5	41.7
Indiana	3002	2/3/1996	1	31.5	41.7
Indiana	3002	2/4/1996	1	31.5	43.7
Indiana	3002	2/5/1996	1	31.5	45.7
Indiana	3002	2/6/1996	1	31.5	47.6
Indiana	3002	2/7/1996	1	31.5	47.6
Indiana	3002	2/8/1996	1	31.5	47.6
Indiana	3002	2/9/1996	1	31.5	45.7
Indiana	3002	2/10/1996	1	31.5	45.7
Indiana	3002	2/11/1996	1	31.5	45.7
Indiana	3002	2/12/1996	1	31.5	45.7
Indiana	3002	2/13/1996	1	31.5	45.7
Indiana	3002	2/14/1996	1	31.5	45.7
Indiana	3002	2/15/1996	1	31.5	43.7
Indiana	3002	2/16/1996	1	31.5	43.7
Indiana	3002	2/17/1996	1	31.5	43.7
Indiana	3002	2/18/1996	1	31.5	43.7
Indiana	3002	2/19/1996	1	31.5	43.7

Indiana	3002	2/20/1996	1	31.5	43.7
Indiana	3002	2/21/1996	1	31.5	41.7
Indiana	3002	2/22/1996	1	33.5	39.8
Indiana	3002	2/23/1996	1	37.8	39.8

MB 83-3802					
STATE_CODE_ EXP	SHRP _ID	SMP_DATE	FROZEN_ LAYER_NO	FREEZE_ FROM (in)	FREEZE _TO (in)
Manitoba	3802	11/9/1993	1	25.2	27.2
Manitoba	3802	11/10/1993	1	25.2	29.5
Manitoba	3802	11/11/1993	1	25.2	29.5
Manitoba	3802	11/12/1993	1	25.2	27.2
Manitoba	3802	11/13/1993	1	25.2	27.2
Manitoba	3802	11/14/1993	1	25.2	29.5
Manitoba	3802	11/15/1993	1	25.2	29.5
Manitoba	3802	12/14/1993	1	25.2	51.2
Manitoba	3802	1/18/1994	1	25.2	73.2
Manitoba	3802	1/19/1994	1	25.2	73.2
Manitoba	3802	1/20/1994	1	25.2	75.2
Manitoba	3802	1/21/1994	1	25.2	75.2
Manitoba	3802	1/22/1994	1	25.2	77.2
Manitoba	3802	1/23/1994	1	25.2	77.2
Manitoba	3802	1/24/1994	1	25.2	77.2
Manitoba	3802	1/25/1994	1	25.2	79.1
Manitoba	3802	1/26/1994	1	25.2	79.1
Manitoba	3802	1/27/1994	1	25.2	81.5
Manitoba	3802	1/28/1994	1	25.2	81.5
Manitoba	3802	1/29/1994	1	25.2	81.5
Manitoba	3802	1/30/1994	1	25.2	83.5
Manitoba	3802	1/31/1994	1	25.2	83.5
Manitoba	3802	2/1/1994	1	25.2	83.5
Manitoba	3802	2/2/1994	1	25.2	83.5
Manitoba	3802	2/3/1994	1	25.2	85.4
Manitoba	3802	2/4/1994	1	25.2	85.4
Manitoba	3802	2/5/1994	1	25.2	85.4
Manitoba	3802	2/6/1994	1	25.2	85.4
Manitoba	3802	2/7/1994	1	25.2	87.4
Manitoba	3802	2/8/1994	1	25.2	87.4
Manitoba	3802	2/9/1994	1	25.2	87.4
Manitoba	3802	2/10/1994	1	25.2	89.4
Manitoba	3802	2/11/1994	1	25.2	89.4
Manitoba	3802	2/12/1994	1	25.2	89.4
Manitoba	3802	2/13/1994	1	25.2	89.4
Manitoba	3802	2/14/1994	1	25.2	89.4
Manitoba	3802	2/15/1994	1	25.2	91.3
Manitoba	3802	2/16/1994	1	25.2	91.3
Manitoba	3802	2/17/1994	1	25.2	93.3

Manitoba	3802	2/18/1994	1	25.2	93.3
Manitoba	3802	2/19/1994	1	25.2	93.3
Manitoba	3802	2/20/1994	1	25.2	95.3
Manitoba	3802	2/21/1994	1	25.2	95.3
Manitoba	3802	2/22/1994	1	25.2	95.3
Manitoba	3802	2/23/1994	1	25.2	95.3
Manitoba	3802	2/24/1994	1	25.2	95.3
Manitoba	3802	2/25/1994	1	25.2	95.3
Manitoba	3802	2/26/1994	1	25.2	95.3
Manitoba	3802	2/27/1994	1	25.2	95.3
Manitoba	3802	2/28/1994	1	25.2	95.3
Manitoba	3802	3/1/1994	1	25.2	95.3
Manitoba	3802	3/2/1994	1	25.2	95.3
Manitoba	3802	3/3/1994	1	25.2	95.3
Manitoba	3802	3/4/1994	1	25.2	95.3
Manitoba	3802	3/5/1994	1	25.2	95.3
Manitoba	3802	3/6/1994	1	25.2	95.3
Manitoba	3802	3/7/1994	1	25.2	95.3
Manitoba	3802	3/8/1994	1	25.2	95.3
Manitoba	3802	3/9/1994	1	25.2	95.3
Manitoba	3802	3/10/1994	1	25.2	95.3
Manitoba	3802	3/11/1994	1	25.2	95.3
Manitoba	3802	3/12/1994	1	25.2	95.3
Manitoba	3802	3/13/1994	1	25.2	95.3
Manitoba	3802	3/14/1994	1	25.2	95.3
Manitoba	3802	3/15/1994	1	25.2	95.3
Manitoba	3802	3/16/1994	1	25.2	95.3
Manitoba	3802	3/17/1994	1	25.2	95.3
Manitoba	3802	3/18/1994	1	25.2	95.3
Manitoba	3802	3/19/1994	1	25.2	95.3
Manitoba	3802	3/20/1994	1	25.2	95.3
Manitoba	3802	3/21/1994	1	25.2	95.3
Manitoba	3802	3/22/1994	1	25.2	95.3
Manitoba	3802	3/23/1994	1	25.2	95.3
Manitoba	3802	3/24/1994	1	25.2	95.3
Manitoba	3802	3/25/1994	1	25.2	95.3
Manitoba	3802	3/26/1994	1	25.2	95.3
Manitoba	3802	3/27/1994	1	25.2	95.3
Manitoba	3802	3/28/1994	1	25.2	95.3
Manitoba	3802	3/29/1994	1	25.2	95.3
Manitoba	3802	3/30/1994	1	27.6	95.3
Manitoba	3802	3/31/1994	1	29.5	95.3
Manitoba	3802	4/1/1994	1	31.5	95.3

Manitoba	3802	4/2/1994	1	29.5	95.3
Manitoba	3802	4/3/1994	1	31.5	95.3
Manitoba	3802	4/4/1994	1	31.5	95.3
Manitoba	3802	4/5/1994	1	25.2	95.3
Manitoba	3802	4/6/1994	1	29.5	95.3
Manitoba	3802	4/7/1994	1	31.5	95.3
Manitoba	3802	4/8/1994	1	33.5	95.3
Manitoba	3802	4/9/1994	1	33.5	95.3
Manitoba	3802	4/10/1994	1	35.4	95.3
Manitoba	3802	4/11/1994	1	37.4	95.3
Manitoba	3802	4/12/1994	1	39.4	95.3
Manitoba	3802	4/13/1994	1	41.3	95.3
Manitoba	3802	4/14/1994	1	41.3	95.3
Manitoba	3802	4/15/1994	1	41.3	95.3
Manitoba	3802	4/16/1994	1	41.3	95.3
Manitoba	3802	4/17/1994	1	41.3	95.3
Manitoba	3802	4/18/1994	1	43.3	95.3
Manitoba	3802	4/19/1994	1	45.3	95.3
Manitoba	3802	4/20/1994	1	45.3	95.3
Manitoba	3802	4/21/1994	1	45.3	95.3
Manitoba	3802	4/22/1994	1	47.2	95.3
Manitoba	3802	4/23/1994	1	47.2	95.3
Manitoba	3802	4/24/1994	1	47.2	95.3
Manitoba	3802	4/25/1994	1	49.2	95.3
Manitoba	3802	4/26/1994	1	51.2	95.3
Manitoba	3802	4/27/1994	1	51.2	95.3
Manitoba	3802	4/28/1994	1	51.2	95.3
Manitoba	3802	4/29/1994	1	51.2	95.3
Manitoba	3802	4/30/1994	1	51.2	95.3
Manitoba	3802	5/1/1994	1	51.2	95.3
Manitoba	3802	5/2/1994	1	53.5	95.3
Manitoba	3802	5/3/1994	1	53.5	95.3
Manitoba	3802	5/4/1994	1	53.5	95.3
Manitoba	3802	5/5/1994	1	55.5	95.3
Manitoba	3802	5/6/1994	1	55.5	95.3
Manitoba	3802	5/7/1994	1	57.5	95.3
Manitoba	3802	5/8/1994	1	57.5	95.3
Manitoba	3802	5/9/1994	1	57.5	95.3
Manitoba	3802	5/10/1994	1	59.4	95.3
Manitoba	3802	5/11/1994	1	59.4	95.3
Manitoba	3802	5/12/1994	1	59.4	95.3
Manitoba	3802	5/13/1994	1	61.4	95.3
Manitoba	3802	5/14/1994	1	63.4	95.3

Manitoba	3802	5/15/1994	1	63.4	95.3
Manitoba	3802	5/16/1994	1	65.4	95.3
Manitoba	3802	5/17/1994	1	65.4	95.3
Manitoba	3802	5/18/1994	1	65.4	95.3
Manitoba	3802	5/19/1994	1	65.4	95.3
Manitoba	3802	5/20/1994	1	67.3	95.3
Manitoba	3802	5/21/1994	1	69.3	95.3
Manitoba	3802	5/22/1994	1	69.3	95.3
Manitoba	3802	5/23/1994	1	71.3	95.3
Manitoba	3802	5/24/1994	1	71.3	95.3
Manitoba	3802	5/25/1994	1	71.3	95.3
Manitoba	3802	5/26/1994	1	71.3	95.3
Manitoba	3802	5/27/1994	1	75.2	95.3
Manitoba	3802	5/28/1994	1	75.2	95.3
Manitoba	3802	5/29/1994	1	75.2	95.3
Manitoba	3802	5/30/1994	1	77.2	95.3
Manitoba	3802	5/31/1994	1	77.2	95.3
Manitoba	3802	11/20/1994	1	25.2	27.2
Manitoba	3802	11/21/1994	1	25.2	27.2
Manitoba	3802	11/22/1994	1	25.2	27.2
Manitoba	3802	11/23/1994	1	25.2	29.5
Manitoba	3802	11/24/1994	1	25.2	29.5
Manitoba	3802	11/25/1994	1	25.2	29.5
Manitoba	3802	11/26/1994	1	25.2	33.5
Manitoba	3802	11/27/1994	1	25.2	33.5
Manitoba	3802	11/28/1994	1	25.2	33.5
Manitoba	3802	11/29/1994	1	25.2	35.4
Manitoba	3802	11/30/1994	1	25.2	37.4
Manitoba	3802	12/1/1994	1	25.2	37.4
Manitoba	3802	12/2/1994	1	25.2	37.4
Manitoba	3802	12/3/1994	1	25.2	37.4
Manitoba	3802	12/4/1994	1	25.2	37.4
Manitoba	3802	12/5/1994	1	25.2	39.4
Manitoba	3802	12/6/1994	1	25.2	39.4
Manitoba	3802	12/7/1994	1	25.2	41.3
Manitoba	3802	12/8/1994	1	25.2	41.3
Manitoba	3802	12/9/1994	1	25.2	41.3
Manitoba	3802	12/10/1994	1	25.2	43.3
Manitoba	3802	12/11/1994	1	25.2	45.3
Manitoba	3802	12/12/1994	1	25.2	45.3
Manitoba	3802	12/13/1994	1	25.2	45.3
Manitoba	3802	12/14/1994	1	25.2	47.2
Manitoba	3802	12/15/1994	1	25.2	47.2

Manitoba	3802	12/16/1994	1	25.2	49.2
Manitoba	3802	12/17/1994	1	25.2	49.2
Manitoba	3802	12/18/1994	1	25.2	49.2
Manitoba	3802	12/19/1994	1	25.2	51.2
Manitoba	3802	12/20/1994	1	25.2	51.2
Manitoba	3802	12/21/1994	1	25.2	51.2
Manitoba	3802	12/22/1994	1	25.2	51.2
Manitoba	3802	12/23/1994	1	25.2	51.2
Manitoba	3802	12/24/1994	1	25.2	53.1
Manitoba	3802	12/25/1994	1	25.2	53.1
Manitoba	3802	12/26/1994	1	25.2	53.1
Manitoba	3802	12/27/1994	1	25.2	53.1
Manitoba	3802	12/28/1994	1	25.2	53.1
Manitoba	3802	12/29/1994	1	25.2	53.1
Manitoba	3802	12/30/1994	1	25.2	53.1
Manitoba	3802	12/31/1994	1	25.2	53.1
Manitoba	3802	1/1/1995	1	25.2	53.1
Manitoba	3802	1/2/1995	1	25.2	55.5
Manitoba	3802	1/3/1995	1	25.2	55.5
Manitoba	3802	1/4/1995	1	25.2	55.5
Manitoba	3802	1/5/1995	1	25.2	55.5
Manitoba	3802	1/6/1995	1	25.2	57.5
Manitoba	3802	1/7/1995	1	25.2	57.5
Manitoba	3802	1/8/1995	1	25.2	59.4
Manitoba	3802	1/9/1995	1	25.2	59.4
Manitoba	3802	1/10/1995	1	25.2	59.4
Manitoba	3802	1/11/1995	1	25.2	61.4
Manitoba	3802	1/12/1995	1	25.2	61.4
Manitoba	3802	1/13/1995	1	25.2	61.4
Manitoba	3802	1/14/1995	1	25.2	63.4
Manitoba	3802	1/15/1995	1	25.2	63.4
Manitoba	3802	1/16/1995	1	25.2	63.4
Manitoba	3802	1/17/1995	1	25.2	65.4
Manitoba	3802	1/18/1995	1	25.2	65.4
Manitoba	3802	1/19/1995	1	25.2	65.4
Manitoba	3802	1/20/1995	1	25.2	65.4
Manitoba	3802	1/21/1995	1	25.2	67.3
Manitoba	3802	1/22/1995	1	25.2	67.3
Manitoba	3802	1/23/1995	1	25.2	67.3
Manitoba	3802	1/24/1995	1	25.2	67.3
Manitoba	3802	1/25/1995	1	25.2	69.3
Manitoba	3802	1/26/1995	1	25.2	69.3
Manitoba	3802	1/27/1995	1	25.2	69.3

Manitoba	3802	1/28/1995	1	25.2	69.3
Manitoba	3802	1/29/1995	1	25.2	71.3
Manitoba	3802	1/30/1995	1	25.2	71.3
Manitoba	3802	1/31/1995	1	25.2	71.3
Manitoba	3802	2/1/1995	1	25.2	71.3
Manitoba	3802	2/2/1995	1	25.2	71.3
Manitoba	3802	2/3/1995	1	25.2	73.2
Manitoba	3802	2/4/1995	1	25.2	73.2
Manitoba	3802	2/5/1995	1	25.2	73.2
Manitoba	3802	2/6/1995	1	25.2	73.2
Manitoba	3802	2/7/1995	1	25.2	75.2
Manitoba	3802	2/8/1995	1	25.2	75.2
Manitoba	3802	2/9/1995	1	25.2	75.2
Manitoba	3802	2/10/1995	1	25.2	75.2
Manitoba	3802	2/11/1995	1	25.2	75.2
Manitoba	3802	2/12/1995	1	25.2	77.2
Manitoba	3802	2/13/1995	1	25.2	77.2
Manitoba	3802	2/14/1995	1	25.2	77.2
Manitoba	3802	2/15/1995	1	25.2	77.2
Manitoba	3802	2/16/1995	1	25.2	77.2
Manitoba	3802	2/17/1995	1	25.2	77.2
Manitoba	3802	2/18/1995	1	25.2	77.2
Manitoba	3802	2/19/1995	1	25.2	79.1
Manitoba	3802	2/20/1995	1	25.2	79.1
Manitoba	3802	2/21/1995	1	25.2	79.1
Manitoba	3802	2/22/1995	1	25.2	81.5
Manitoba	3802	2/23/1995	1	25.2	81.5
Manitoba	3802	2/24/1995	1	25.2	81.5
Manitoba	3802	2/25/1995	1	25.2	81.5
Manitoba	3802	2/26/1995	1	25.2	83.5
Manitoba	3802	2/27/1995	1	25.2	83.5
Manitoba	3802	2/28/1995	1	25.2	83.5
Manitoba	3802	3/1/1995	1	25.2	83.5
Manitoba	3802	3/2/1995	1	25.2	83.5
Manitoba	3802	3/3/1995	1	25.2	83.5
Manitoba	3802	3/4/1995	1	25.2	85.4
Manitoba	3802	3/5/1995	1	25.2	85.4
Manitoba	3802	3/6/1995	1	25.2	85.4
Manitoba	3802	3/7/1995	1	25.2	85.4
Manitoba	3802	3/8/1995	1	25.2	85.4
Manitoba	3802	3/9/1995	1	25.2	87.4
Manitoba	3802	3/10/1995	1	25.2	87.4
Manitoba	3802	3/11/1995	1	25.2	87.4

Manitoba	3802	3/12/1995	1	25.2	87.4
Manitoba	3802	3/13/1995	1	25.2	87.4
Manitoba	3802	3/14/1995	1	25.2	87.4
Manitoba	3802	3/15/1995	1	25.2	89.4
Manitoba	3802	3/16/1995	1	25.2	89.4
Manitoba	3802	3/17/1995	1	25.2	89.4
Manitoba	3802	3/18/1995	1	25.2	89.4
Manitoba	3802	3/19/1995	1	25.2	89.4
Manitoba	3802	3/20/1995	1	25.2	89.4
Manitoba	3802	3/21/1995	1	25.2	89.4
Manitoba	3802	3/22/1995	1	25.2	89.4
Manitoba	3802	3/23/1995	1	25.2	91.3
Manitoba	3802	3/24/1995	1	27.6	91.3
Manitoba	3802	3/25/1995	1	27.6	91.3
Manitoba	3802	3/26/1995	1	27.6	91.3
Manitoba	3802	3/27/1995	1	29.5	91.3
Manitoba	3802	3/28/1995	1	29.5	91.3
Manitoba	3802	3/29/1995	1	31.5	91.3
Manitoba	3802	3/30/1995	1	31.5	91.3
Manitoba	3802	3/31/1995	1	31.5	91.3
Manitoba	3802	4/1/1995	1	29.5	91.3
Manitoba	3802	4/2/1995	1	31.5	93.3
Manitoba	3802	4/3/1995	1	29.5	93.3
Manitoba	3802	4/4/1995	1	25.2	93.3
Manitoba	3802	4/5/1995	1	25.2	93.3
Manitoba	3802	4/6/1995	1	25.2	93.3
Manitoba	3802	4/7/1995	1	25.2	93.3
Manitoba	3802	4/8/1995	1	25.2	93.3
Manitoba	3802	4/9/1995	1	25.2	93.3
Manitoba	3802	4/10/1995	1	25.2	93.3
Manitoba	3802	4/11/1995	1	25.2	93.3
Manitoba	3802	4/12/1995	1	27.6	93.3
Manitoba	3802	4/13/1995	1	31.5	93.3
Manitoba	3802	4/14/1995	1	33.5	93.3
Manitoba	3802	4/15/1995	1	35.4	93.3
Manitoba	3802	4/16/1995	1	37.4	93.3
Manitoba	3802	4/17/1995	1	37.4	93.3
Manitoba	3802	4/18/1995	1	39.4	93.3
Manitoba	3802	4/19/1995	1	39.4	93.3
Manitoba	3802	4/20/1995	1	41.3	93.3
Manitoba	3802	4/21/1995	1	41.3	93.3
Manitoba	3802	4/22/1995	1	41.3	93.3
Manitoba	3802	4/23/1995	1	41.3	93.3

Manitoba	3802	4/24/1995	1	43.3	93.3
Manitoba	3802	4/25/1995	1	45.3	93.3
Manitoba	3802	4/26/1995	1	45.3	93.3
Manitoba	3802	4/27/1995	1	45.3	93.3
Manitoba	3802	4/28/1995	1	45.3	93.3
Manitoba	3802	4/29/1995	1	45.3	93.3
Manitoba	3802	4/30/1995	1	45.3	93.3
Manitoba	3802	5/1/1995	1	47.2	93.3
Manitoba	3802	5/2/1995	1	47.2	93.3
Manitoba	3802	5/3/1995	1	49.2	93.3
Manitoba	3802	5/4/1995	1	51.2	93.3
Manitoba	3802	5/5/1995	1	51.2	93.3
Manitoba	3802	5/6/1995	1	51.2	93.3
Manitoba	3802	5/7/1995	1	53.5	93.3
Manitoba	3802	5/8/1995	1	53.5	93.3
Manitoba	3802	5/9/1995	1	53.5	93.3
Manitoba	3802	5/10/1995	1	55.5	93.3
Manitoba	3802	5/11/1995	1	57.5	93.3
Manitoba	3802	5/12/1995	1	57.5	93.3
Manitoba	3802	5/13/1995	1	59.4	93.3
Manitoba	3802	5/14/1995	1	59.4	93.3
Manitoba	3802	5/15/1995	1	59.4	93.3
Manitoba	3802	5/16/1995	1	61.4	93.3
Manitoba	3802	5/17/1995	1	63.4	93.3
Manitoba	3802	5/18/1995	1	63.4	93.3
Manitoba	3802	5/19/1995	1	63.4	93.3
Manitoba	3802	5/20/1995	1	65.4	93.3
Manitoba	3802	5/21/1995	1	65.4	93.3
Manitoba	3802	5/22/1995	1	65.4	93.3
Manitoba	3802	5/23/1995	1	67.3	93.3
Manitoba	3802	5/24/1995	1	69.3	93.3
Manitoba	3802	5/25/1995	1	69.3	93.3
Manitoba	3802	5/26/1995	1	69.3	93.3
Manitoba	3802	5/27/1995	1	71.3	93.3
Manitoba	3802	5/28/1995	1	71.3	93.3
Manitoba	3802	5/29/1995	1	71.3	93.3
Manitoba	3802	5/30/1995	1	73.2	93.3
Manitoba	3802	5/31/1995	1	75.2	93.3
Manitoba	3802	12/10/1996	1	25.2	47.2
Manitoba	3802	4/16/1997	1	27.6	95.3
Manitoba	3802	4/17/1997	1	27.6	41.3
Manitoba	3802	4/18/1997	1	29.5	41.3
Manitoba	3802	4/19/1997	1	31.5	41.3

Manitoba	3802	4/20/1997	1	35.4	41.3
Manitoba	3802	4/21/1997	1	37.4	41.3
Manitoba	3802	4/22/1997	1	39.4	41.3
Manitoba	3802	4/23/1997	1	39.4	41.3
Manitoba	3802	5/31/1997	1	85.4	95.3
Manitoba	3802	3/25/1998	1	25.2	41.3
Manitoba	3802	3/26/1998	1	27.6	41.3
Manitoba	3802	3/27/1998	1	29.5	41.3
Manitoba	3802	3/28/1998	1	31.5	41.3
Manitoba	3802	3/29/1998	1	33.5	41.3
Manitoba	3802	3/30/1998	1	35.4	41.3
Manitoba	3802	3/31/1998	1	35.4	41.3
Manitoba	3802	4/1/1998	1	37.4	41.3
Manitoba	3802	4/2/1998	1	39.4	41.3
Manitoba	3802	4/3/1998	1	39.4	41.3

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5G

TDR PROBES DEPTH DATA

MAY 2023

LIST OF TABLES

Table 5G.1 The Depth of TDR Probes from Surface and the First Probe in the Subgrade for the
Calibration SMP Sections 1

Table 5G.1 The Depth of TDR Probes from Surface and the First Probe in the Subgrade for the Calibration SMP Sections

AL 01-0101 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	11.35	0.95
2	17.35	1.45
3	23.35	1.95
4	29.35	2.45
5	35.35	2.95
6	41.35	3.45
7	47.35	3.95
8	53.35	4.45
9	65.35	5.45
10	77.35	6.45
AL 01-0102 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	10.2	0.85
2	16.2	1.35
3	22.2	1.85
4	28.2	2.35
5	34.2	2.85
6	40.2	3.35
7	46.2	3.85
8	52.2	4.35
9	64.2	5.35
10	76.2	6.35
CO 08-1053 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	9.5	0.79
2	15.5	1.29
3	21.5	1.79
4	27.5	2.29
5	33.5	2.79
6	39.5	3.29
7	45.5	3.79
8	51.5	4.29
9	63.5	5.29
10	75.5	6.29

MT 30-1053 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	13.4	1.12
2	19.4	1.62
3	25.4	2.12
4	31.4	2.62
5	37.4	3.12
6	43.4	3.62
7	49.4	4.12
8	55.4	4.62
9	67.4	5.62
10	79.4	6.62
NE 31-0114 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	12.4	1.03
2	18.4	1.53
3	24.4	2.03
4	30.4	2.53
5	36.4	3.03
6	42.4	3.53
7	48.4	4.03
8	54.4	4.53
9	66.4	5.53
10	78.4	6.53
SD 46 -0804 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	15.1	1.26
2	21.1	1.76
3	27.1	2.26
4	33.1	2.76
5	39.1	3.26
6	45.1	3.76
7	51.1	4.26
8	57.1	4.76
9	69.1	5.76
10	81.1	6.76

SD 46-9187 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	8.9	0.74
2	14.9	1.24
3	20.9	1.74
4	26.9	2.24
5	32.9	2.74
6	38.9	3.24
7	44.9	3.74
8	50.9	4.24
9	62.9	5.24
10	74.9	6.24
TX 48-1068 (AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	15.5	1.29
2	21.5	1.79
3	27.5	2.29
4	33.5	2.79
5	39.5	3.29
6	45.5	3.79
7	51.5	4.29
8	57.5	4.79
9	69.5	5.79
10	81.5	6.79
KS 20-4054 (PCC-CRCP)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	11.2	0.93
2	17.2	1.43
3	23.2	1.93
4	29.2	2.43
5	35.2	2.93
6	41.2	3.43
7	47.2	3.93
8	53.2	4.43
9	65.2	5.43
10	77.2	6.43

MN 27-4040 (PCC-CRCP)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	11.1	0.93
2	17.1	1.43
3	23.1	1.93
4	29.1	2.43
5	35.1	2.93
6	41.1	3.43
7	47.1	3.93
8	53.1	4.43
9	65.1	5.43
10	77.1	6.43
TX 48-4143 (PCC-CRCP)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	12.65	1.05
2	18.65	1.55
3	24.65	2.05
4	30.65	2.55
5	36.65	3.05
6	42.65	3.55
7	48.65	4.05
8	54.65	4.55
9	66.65	5.55
10	78.65	6.55
NC 37-0201 (PCC-JPCP)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	13.85	1.15
2	19.85	1.65
3	25.85	2.15
4	31.85	2.65
5	37.85	3.15
6	43.85	3.65
7	49.85	4.15
8	55.85	4.65
9	67.85	5.65
10	79.85	6.65

OH 39-0204 (PCC-JPCP)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	14	1.17
2	20	1.67
3	26	2.17
4	32	2.67
5	38	3.17
6	44	3.67
7	50	4.17
8	56	4.67
9	68	5.67
10	80	6.67
IN 18-3002 (PCC-JPCP Covered with AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	12.35	1.03
2	18.35	1.53
3	24.35	2.03
4	30.35	2.53
5	36.35	3.03
6	42.35	3.53
7	48.35	4.03
8	54.35	4.53
9	66.35	5.53
10	78.35	6.53
MB 83-3802 (PCC-JPCP Covered with AC)		
Probe	Depth from the surface (in)	Depth from the surface (ft)
1	18.25	1.52
2	24.25	2.02
3	30.25	2.52
4	36.25	3.02
5	42.25	3.52
6	48.25	4.02
7	54.25	4.52
8	60.25	5.02
9	72.25	6.02
10	84.25	7.02

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5H

TDR VOLUMETRIC MOISTURE CONTENT MEASURED DATA

MAY 2023

LIST OF TABLES

Table 5H.1 Volumetric Moisture Content Measured Using the TDR for Calibration SMP Sections	1
--	---

Table 5H.1 Volumetric Moisture Content Measured Using the TDR for Calibration SMP Sections

Section	AL 01-0101									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC MOISTURE_CONTENT									
7/26/1995-(0701-0707)	13.5	25.9	24.6	22.0	32.2	31.2	36.1	27.5	28.1	24.3
7/26/1995-(1108-1110)	13.5	25.8	24.6	21.3	32.0	31.4	36.1	27.5	27.8	24.3
9/11/1995-(0704-0709)	13.5	22.5	24.8	21.3	32.0	30.8	36.2	27.5	28.1	24.4
9/11/1995-(1110-1113)	13.5	22.5	24.6	21.2	32.0	30.8	36.1	27.5	28.1	24.4
9/11/1995-(1514-1516)	13.5	22.5	24.6	21.2	33.1	30.8	36.1	27.5	28.1	24.4
11/20/1995-(0643-0648)	13.5	27.7	27.0	22.1	32.6	30.6	36.4	27.5	28.1	24.3
11/20/1995-(1049-1051)	13.5	27.4	26.8	21.3	32.1	31.2	36.4	27.5	28.0	24.4
11/20/1995-(1452-1455)	13.5	27.3	26.8	21.1	32.1	30.6		27.5	28.1	24.2
12/11/1995-(0713-0718)	13.5	30.0	28.0	21.8	32.5	31.3		27.5	28.2	24.2
1/29/1996-(0657-0701)	13.6	29.4	28.1	20.5	32.5	30.8	36.4	27.5	28.1	24.5
1/29/1996-(1102-1104)	13.6	30.0	28.1	20.5	32.5	30.8	36.4	27.6	28.9	24.3
1/29/1996-(1505-1507)	13.5	29.3	27.7	21.8	32.7	30.8	36.4	27.5	28.1	24.3
3/22/1996-(0745-0750)	15.3	29.6	28.1	22.2	32.5	30.8	36.1	27.5	28.1	24.3
3/22/1996-(1151-1153)	16.1	27.2	27.6	21.3	33.1	30.8	36.1	27.5	28.0	24.3
3/22/1996-(1554-1556)	14.7	30.4	28.1	21.3	32.8	30.8	36.1	27.5	28.0	24.3
4/16/1996-(0655-0700)	15.5	27.6	27.6	21.2	32.9	30.8		27.5	27.9	24.3
4/16/1996-(0714-0719)	13.5	29.6	28.1	21.1	32.8	31.4	36.1	27.5	28.9	24.3
4/16/1996-(1120-1123)	14.9	27.2	28.2	21.2	32.1	30.8	36.0	27.5	29.0	24.3
4/16/1996-(1524-1526)	15.1	29.9	28.2	21.4	32.0	30.8	36.1	27.5	28.0	24.3
5/17/1996-(0655-0700)	14.9	27.6	28.1	21.4	32.0	31.6	36.1	27.5	28.2	24.3
5/17/1996-(1101-1103)	15.6	27.5	28.1	21.5	32.1	31.6	36.1	27.5	28.0	24.2
5/17/1996-(1504-1506)	15.6	27.5	28.1	21.5	32.0	30.6	36.2	27.5	28.0	24.1
6/6/1996-(0720-0725)	15.6	27.0	28.1	21.5	32.1	31.3	36.1	27.5	28.2	24.2
6/6/1996-(1126-1129)	13.7	27.5	28.1	21.5	32.1	31.6	36.3	27.5	28.2	24.2
6/6/1996-(1530-1532)	13.7	27.5	28.1	21.4	32.0	31.7	36.1	27.5	28.2	24.2
8/22/1996-(0910-0915)	13.5	26.0	26.7	22.2	33.0	30.8	36.1	27.5	28.2	24.4
8/22/1996-(1316-1318)	13.7	27.1	27.1	21.5	32.0	30.8	36.1	27.5	28.0	24.2
9/27/1996-(0827-0832)	13.5	27.5	26.8	21.2	32.5	31.2		27.5	28.1	24.4
10/9/1996-(0805-0811)	13.5	27.6	26.9	21.9	32.2	30.6	36.1	27.5	28.1	24.1
10/9/1996-(1212-1215)	13.6	27.6	25.8	21.7	32.7	30.4	36.1	27.5	28.0	24.2
10/9/1996-(1616-1618)	13.5	27.6	26.3	21.7	32.7	30.4	36.1	27.5	28.0	24.2
10/30/1997-(0929-0934)	14.9	27.4	28.0					26.6	28.1	24.4
10/30/1997-(0950-0955)	14.9	27.6	27.9	21.3	33.1	30.7	36.1	26.7	28.2	24.3
10/30/1997-(1357-1359)	14.9	27.4	27.9	21.3	33.0	31.5	36.1	27.5	28.1	24.4
11/21/1997-(0821-0826)	13.5	27.6	28.1	21.3	32.1	30.7	36.1	26.6	28.0	24.3
12/16/1997-(0913-0918)	15.6	27.4	28.2	22.0	32.0	30.8	36.3	27.5	28.0	24.3
12/16/1997-(1320-1323)	15.2	27.7	28.0	22.1	31.7	30.7	36.1	27.5	27.9	24.3

1/9/1998-(0836-0841)	14.9	27.4	28.1	21.2	32.1	30.7		26.6	28.0	24.2
1/9/1998-(1243-1246)	15.0	27.4	28.1	21.3	32.1	30.7	36.1	27.5	28.0	24.3
3/2/1998-(0912-0917)	15.4	26.1	28.1	22.2	32.9	30.1		26.6	28.1	24.3
3/2/1998-(1319-1322)	15.7	25.9	27.9	21.2	33.1	31.6	35.4	26.7	28.0	24.3
3/24/1998-(1506-1512)	14.8	27.4	27.9	21.9	32.2	31.3	36.1	27.5	28.0	24.2
3/24/1998-(1524-1529)	15.9	27.6	28.0	21.3	32.1	31.3	36.3	27.5	28.1	24.3
3/24/1998-(1602-1607)	14.9	27.6	28.0	21.2	32.1	31.3	36.1	26.6	28.0	24.3
4/25/1998-(0830-0835)	13.5	27.6	27.9	22.2	32.9	30.8	36.1	27.5	28.1	24.3
4/25/1998-(0944-0949)	13.5	27.3	28.0	21.4	32.0		36.1	27.4	28.1	24.2
4/25/1998-(1006-1011)	15.0	27.3	27.9	21.4	32.2		36.1	27.7	28.2	24.3
4/25/1998-(1037-1042)	16.8	27.5	28.1	21.3	33.1		36.3	27.5	28.2	24.2
5/12/1998-(0829-0834)	13.5	27.3	27.8	22.2	32.9		36.3	26.6	28.1	24.3
5/12/1998-(0849-0854)	13.5	27.4	28.1	21.3	33.0		36.3	27.5	28.2	24.3
5/12/1998-(1256-1258)	13.5	27.6	28.1	21.3	33.1		36.1	27.5	28.0	24.2
7/20/1998-(0816-0819)	13.5	27.6	28.1	21.7	32.9	30.7				
7/20/1998-(0849-0854)	13.5	27.4	26.6		32.0	31.6		26.6	28.0	24.4
7/20/1998-(0909-0914)	13.5	27.2	28.0		33.0	31.4		26.8	28.1	24.3
8/10/1998-(0903-0907)	13.8	27.2	28.1		33.0	30.6		26.7		
8/10/1998-(0919-0924)	13.6	27.7	27.7		32.2	30.8		26.6		
9/10/1998-(0851-0856)	13.8	27.7	28.0	21.7	32.5	31.4	36.1	27.5	28.1	24.2
9/10/1998-(1258-1300)	13.5	27.2	26.0	22.1	32.2	31.6	36.1	26.6	28.1	24.4
10/23/1998-(0914-0919)	13.5	27.6	25.8		32.8	30.8		27.5	28.1	24.4
10/23/1998-(0931-0936)	13.7	27.5	27.0		32.8	30.3		27.5	28.0	
10/23/1998-(1338-1340)	13.5	27.5	26.3		31.7	31.5		26.6	28.1	
11/17/1998-(0824-0829)	13.5		27.7		32.1	31.3	36.1		28.0	24.4
Section	AL 01-0102									
TDR_PROBE_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
7/27/1995-(0633-0638)	14.3	34.5	31.4	24.3	30.4	13.5	35.2	32.8	13.8	22.2
7/27/1995-(1039-1042)	14.3	34.4	31.4	24.3	30.4	13.5	34.6	32.8	13.8	22.3
9/12/1995-(0657-0702)	14.2	34.4	32.6	26.0	31.5	14.9	36.1	33.4	13.8	22.2
9/12/1995-(1103-1106)	14.3	34.4	33.1	26.0	31.2	15.7	36.1	33.4	13.8	22.2
9/12/1995-(1507-1509)	14.2	34.5	32.7	26.0	31.2	15.6	36.1	33.2	13.8	22.2
10/24/1995-(0658-0703)	14.3	35.8	33.1	25.9		17.0		32.8	13.8	22.2
10/24/1995-(1104-1107)	14.4	36.1	32.9	26.0		16.9	36.5	32.8	13.8	23.7
11/21/1995-(0625-0629)	14.3	35.9	35.3	26.1	32.9	16.6	36.3	32.6	13.8	22.2
11/21/1995-(1030-1032)	14.3	36.0	35.1	25.9	33.0	16.6	36.6	32.6	13.8	22.2
11/21/1995-(1433-1435)	14.3	35.8	34.7	25.9	33.0	16.9	36.6	32.8	13.8	22.2
12/12/1995-(0605-0701)	14.4	36.1	35.4	25.9	32.9	16.9	34.5	33.2	13.7	23.5
12/12/1995-(1102-1106)	14.1	36.2	35.3	26.0	32.9	16.6	34.5	32.5	13.8	22.2
12/12/1995-(1507-1510)	14.3	36.2	35.3	25.9	32.9	16.6	36.3	33.2	13.8	22.4
1/30/1996-(0815-0820)	16.2	38.7	34.8	26.2	33.0	17.0	36.2	34.5	13.8	22.3

1/30/1996-(1221-1223)	16.2	38.4	35.4	25.9	33.0	17.0	36.3	34.5	13.8	22.2
3/23/1996-(0712-0717)	16.2			28.9	33.2	16.9		36.1	15.3	22.3
3/23/1996-(1118-1121)	14.8			28.7	32.9	18.4		34.4	16.9	22.2
3/23/1996-(1522-1524)	14.8			26.1	32.9	17.0		34.4	16.0	22.2
4/17/1996-(0641-0646)	14.8			28.8	33.0	17.0		36.3	17.3	23.8
4/17/1996-(1047-1050)	16.0			28.4	32.7	17.0		36.1	17.2	25.6
4/17/1996-(1451-1454)	16.0			28.4	33.2	17.0		36.0	16.9	23.8
5/20/1996-(0746-0751)	15.0			28.4	32.9	18.4		35.7	17.3	25.3
6/7/1996-(0729-0734)	14.8			28.4	33.2	18.4		36.0	16.9	25.6
6/7/1996-(1135-1138)	15.1			28.5	32.9	18.3		36.0	17.3	25.7
8/23/1996-(0829-0834)	14.9	36.2		28.7	32.9	17.0			15.3	25.8
8/23/1996-(1235-1239)	14.9	36.0		27.9	32.9	17.0			15.3	23.6
10/11/1996-(0812-0817)	14.8			25.7	32.8	16.8			15.5	23.6
10/11/1996-(1218-1222)	14.9			25.9	32.5	20.8			15.3	23.8
10/11/1996-(1623-1626)	14.8			26.1	32.9	20.8			15.3	23.6
10/29/1997-(1359-1404)	14.9	38.7	36.0	28.7	33.0	17.0	36.5	36.0	15.2	23.6
11/24/1997-(0802-0807)	14.8	38.7	35.6	28.6	33.0	18.3	37.5	36.0	15.3	23.8
11/24/1997-(1209-1213)	14.9	39.0	35.7	28.5	32.9	21.2	38.0	34.4	15.3	24.2
12/15/1997-(0909-0914)	14.8	38.4	35.4	28.4	35.8	23.4	38.3	34.2	15.3	23.7
12/15/1997-(1316-1318)	15.9	38.8	35.7	28.5	35.8	23.2	37.9	34.4	17.0	23.3
1/12/1998-(0822-0827)	17.2	38.4	38.0	28.4	35.0	23.7	40.6	34.4	19.1	27.0
1/12/1998-(1229-1231)	15.9	38.8	37.7	28.5	35.0	23.5	40.6	34.2	18.6	23.8
3/3/1998-(0846-0851)	16.2	38.4	37.6	31.2	35.8	23.2			23.8	34.6
3/3/1998-(1253-1256)	17.2	38.6	37.6	31.0	35.8	23.2	40.4		23.8	32.2
3/23/1998-(0815-0820)	14.9	38.8	37.7	31.0	35.0	23.2	40.6		23.8	31.9
3/23/1998-(1222-1226)	14.9	38.4	41.3	31.0	35.5	23.2	40.5		23.9	32.3
4/30/1998-(0920-0925)	14.8			31.0					23.5	32.2
4/30/1998-(0943-0948)	16.9	38.8	40.9	30.8	35.8	25.8	40.5	38.5	23.5	30.2
4/30/1998-(1014-1019)	14.8	38.6	39.9	30.6	35.5	25.0	40.6	37.9	23.5	29.8
5/13/1998-(0839-0845)	14.8	38.8	41.4	30.8	35.8	26.5	40.6	38.1	23.5	29.6
5/13/1998-(1246-1248)	14.9	38.6	41.3	30.8	35.7	25.3	40.8	38.5	24.1	29.0
7/20/1998-(1351-1356)	14.8	35.8	37.9	30.9	35.7	23.2	40.4	36.2	19.0	25.6
7/20/1998-(1410-1415)	15.1	36.1	38.1	31.2	35.8	23.2	40.4	38.0	18.8	25.7
8/11/1998-(0814-0819)	14.9	35.9	37.7		35.1	23.4	37.9	35.9		23.7
8/11/1998-(0832-0837)	14.8	34.6	37.9	31.2	35.1	23.4	38.2	36.5	18.8	23.9
8/11/1998-(1239-1243)	14.8	34.2	37.5	31.2	35.5	23.2	40.6	36.4	18.8	24.4
9/11/1998-(0921-0927)	14.9	34.2		31.1	33.0			36.0	17.2	22.4
9/11/1998-(1329-1331)	14.9	34.2		31.1	32.9			34.2	17.3	22.2
10/26/1998-(0820-0825)	14.9	40.6	31.5		32.9	20.9	37.8	35.8		22.3
10/26/1998-(0838-0843)	14.8	40.8	31.2	30.7	33.2	21.2	37.8	36.2	17.2	22.3
10/26/1998-(1245-1247)	14.8	40.8	31.3	30.8	33.2	21.3	37.8	35.9	17.3	22.3
11/20/1998-(1026-1030)			31.3	24.5	29.7	13.5	34.1	32.5	16.2	22.3
11/20/1998-(1050-1054)			31.4	24.6	29.4	13.5	35.3	32.5	14.9	22.3

11/21/1998-(0828-0833)	15.0	34.4	37.9	30.8	33.0	21.2	37.7	36.3		22.3
Section	CO 08-1053									
TDR_PROBE_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
12/6/1993-(0941-0946)	11.2	11.4	9.3	11.9	14.7	24.7	25.1	24.5	44.4	42.2
3/14/1994-(1238-1240)	11.3	11.4		11.9	14.8	24.7	24.8	25.2	43.8	42.3
8/8/1994-(0925-0930)	11.3	11.4					35.7	32.7	43.8	42.2
10/21/1994-(1646-1648)	11.4	11.4					30.6	27.5	44.2	42.2
1/17/1995-(0932-0936)		10.2					24.1	24.8	43.8	42.6
2/13/1995-(0902-0902)		10.3					24.1	22.4	44.2	42.1
4/21/1995-(0849-0853)		10.5					25.0	22.4	43.8	42.1
5/8/1995-(0829-0833)		10.6					25.2	25.2	43.8	42.1
11/14/1996-(0853-0857)		10.2					25.0	21.0	43.7	42.2
3/7/1997-(0858-0902)		10.2					25.0	19.0	43.8	42.4
8/5/1997-(1152-1156)		10.2					29.8	20.7	43.7	42.2
9/26/1997-(1231-1233)		10.2				27.3	24.8	20.7		42.2
Section	MT 30-8129									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
10/20/1993-(1459-1500)		7.4	7.0		25.8	25.4	29.8	35.5		
10/20/1993-(1510-1512)	8.6	6.6	6.9		25.8	25.4	29.4	36.7		
10/20/1993-(1522-1523)		6.3	7.0		24.9		29.5	36.7		
11/15/1993-(1123-1127)		6.5	6.0		21.7	22.9	27.2	36.6	34.5	42.6
11/15/1993-(1528-1530)		6.5	6.3		21.5	22.9	27.2	36.2	34.7	
12/14/1993-(0908-0912)		6.5	6.1		21.6	23.2	27.1	32.7	34.3	37.5
12/14/1993-(1313-1315)		6.6	6.0		21.5		27.3	33.1	34.7	41.3
1/25/1994-(0836-0840)			6.2		21.6	23.0	24.6	33.6	34.7	37.1
1/25/1994-(1241-1243)		6.2	5.8		21.5		24.8	32.7	34.4	37.5
2/22/1994-(0916-0917)								33.2	34.1	35.4
3/17/1994-(0949-0949)		6.4	6.0		21.6	23.2	27.3	33.1	30.0	37.1
3/17/1994-(1352-1352)		6.4	6.0		21.7		27.2	33.1	34.4	37.1
3/31/1994-(0833-0833)		6.3	6.0		21.5	22.9	27.6	33.0	34.7	37.1
3/31/1994-(1236-1236)			6.1		21.6	23.1	27.2	35.8	34.2	37.1
4/20/1994-(1106-1106)		6.5	6.2		21.5	22.3	27.4	36.7	34.6	41.4
4/20/1994-(1233-1233)		6.5	6.1		21.5	22.8	27.5	36.9	34.3	41.0
4/20/1994-(1552-1556)		6.5	6.1		21.5	22.8	27.3	37.1	34.7	37.5
5/5/1994-(0841-0845)		6.6	6.2		24.9	25.4	29.4	36.7	39.8	40.2
5/5/1994-(1246-1248)		7.4					29.8	36.8	39.8	
5/5/1994-(1649-1651)		7.4	6.0		25.3		29.8	36.9	39.8	42.7
6/6/1994-(0846-0850)		6.6	6.2		23.0	25.4	32.1	32.7	41.4	41.7
6/6/1994-(1251-1254)	8.7	7.4	7.0		23.0	25.4	32.1	32.6	41.2	41.7
6/6/1994-(1709-1714)	8.3	6.6	6.2		23.0	25.6	32.7	33.0	41.8	41.7
7/22/1994-(0857-0901)	8.3	6.6	7.0		25.4		34.4	32.7		

7/22/1994-(1305-1305)		7.4	7.0		25.6		34.1	32.7	34.2	37.9
7/22/1994-(1708-1708)	8.5		7.1		25.4		34.4	33.1	34.3	37.9
8/22/1994-(1650-1650)		6.2	6.2		23.1			32.9	34.2	37.9
9/23/1994-(0916-0916)	8.6		6.0		21.5	25.7	29.5	32.7	34.8	
9/23/1994-(1319-1319)	8.3				21.6		32.1	32.7		
9/23/1994-(1722-1722)					21.5		32.7	32.9		42.5
10/31/1994-(0946-0946)		6.5	7.0		23.3	25.0	29.4	36.7		42.7
10/31/1994-(1350-1350)			7.0		23.2		29.4	36.7		42.9
11/15/1994-(0853-0853)		6.4	7.0		22.9	23.1	27.2	36.8		43.1
11/15/1994-(1254-1256)	8.7		7.0		22.9		27.2	36.7		42.6
11/15/1994-(1613-1613)		6.4	7.0		22.9	23.1	27.5	36.8	39.6	42.9
12/9/1994-(0904-0904)			6.2		21.2	22.9	27.5	32.7		37.4
12/9/1994-(1307-1307)			6.1		21.4	22.9	27.1	33.0		37.1
1/23/1995-(1027-1027)							24.6	33.1		37.2
1/23/1995-(1431-1431)							24.6	32.7		37.1
2/17/1995-(0844-0844)							27.3	32.7		37.2
2/17/1995-(1247-1247)			5.8				27.2	33.1		37.1
3/7/1995-(1056-1057)							27.4	33.0		37.2
3/7/1995-(1458-1501)		6.2	6.1		21.5		27.3	33.1		37.1
3/23/1995-(0845-0846)			6.2				27.2	35.0		37.2
3/23/1995-(1247-1250)		6.6	6.2				27.2	35.1		37.5
4/10/1995-(0912-0916)			7.4				27.3	34.7		39.0
4/10/1995-(1317-1319)			7.2		22.9		26.5	35.0		37.4
4/27/1995-(0839-0843)		6.7	7.0		22.8		27.3	36.8		41.4
4/27/1995-(1244-1246)	8.3	6.4	7.0		22.9		27.3	36.8		41.0
5/18/1995-(0823-0827)			9.4		23.5		29.4	36.9		43.1
5/18/1995-(1228-1231)		7.3	7.0		23.1		29.5	36.8		41.9
11/21/1996-(1228-1232)	8.3	9.0	8.9	6.2	21.6	22.9	24.6			
12/17/1996-(0913-0917)	8.3	9.6	8.4	6.5	21.7	21.6		34.7		
1/23/1997-(0915-0915)		6.2	5.8		18.1	19.6	23.1	33.1		37.2
1/23/1997-(1339-1339)		6.2	5.8		18.0	19.5	23.0	32.7		37.2
3/12/1997-(1220-1220)	8.3	6.6	7.0	6.4	22.9	22.9	24.9	34.7		37.1
3/25/1997-(0852-0852)	8.6	6.2	7.0	6.1	22.9	22.8	27.1	35.8		39.0
4/11/1997-(0855-0855)	8.3	6.6	6.9	6.1	23.0	22.8	27.2			39.0
4/28/1997-(0926-0926)	8.5	6.6	7.0	6.2	21.6	22.9	27.6	36.7		40.3
4/28/1997-(1328-1329)	8.6	6.4	7.0	6.1	22.4	22.8	27.3			
5/28/1997-(0846-0846)	8.4	6.5	7.0	6.5	25.6	25.6	29.7	36.7		41.5
5/28/1997-(1250-1250)	8.5	6.5	7.1	6.5	25.4	25.7	29.7	36.9	34.4	41.5
6/18/1997-(1115-1115)	8.7	6.5	7.0	6.5	25.8	25.6	31.5			45.0
6/18/1997-(1517-1519)	8.6	6.5	7.0	6.5	25.7	25.7	29.7	36.9		44.8
8/11/1997-(0929-0934)	8.3	6.6	7.0	6.1	22.9	25.6	32.1			44.8
8/11/1997-(1336-1339)	8.6	6.6	6.9	6.1	22.9	25.6	33.7			44.8
10/1/1997-(0827-0827)	8.3	6.6	6.2	6.1	21.4	23.0	29.5	36.7		45.2

Section	NE 31-0114									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
08/08/1995-(1040-1040)	9.3	9.1	30.0	35.0	41.0	43.1	42.3	42.4	29.3	41.2
08/08/1995-(1111-1111)	9.2	9.1	29.7	37.3	42.6	43.3	42.3	42.6	29.7	42.7
08/08/1995-(1259-1259)	9.3	9.1	29.9	37.3	43.3	43.1	42.3	42.6	29.8	42.7
9/20/1995-(0853-0853)	8.5	8.4	29.8	37.1	41.1	44.0	42.6	40.0	30.0	42.3
9/20/1995-(1138-1138)	8.3	8.7	30.0	37.3	43.3	43.1	42.3	39.2	30.0	41.8
10/17/1995-(0738-0738)	8.3	8.3	29.2	37.7	41.2	39.2	40.1	36.9	30.0	42.2
10/17/1995-(1141-1141)		8.6	30.0	37.7	41.2	40.7	40.1	37.4	30.0	41.8
11/15/1995-(0856-0900)	8.6	8.5	33.7	39.4	38.3	38.9	38.9	32.0	27.2	38.1
11/15/1995-(1301-1303)	8.4	8.6	34.7	37.3	37.3	39.1	37.3	32.0	27.2	39.7
12/12/1995-(0743-0748)	8.5	8.5	32.1	37.3	35.6	35.3	35.0	27.6	23.9	27.7
12/12/1995-(1152-1152)		8.5	32.1	37.7	35.5	39.8	32.6	29.2	25.8	29.7
1/23/1996-(1003-1008)		8.3	29.4	37.4	35.8	35.1	32.4	25.8	23.8	26.8
1/23/1996-(1017-1021)		8.3	29.9	37.5	33.4	35.4	32.3	27.0	23.9	26.1
3/7/1996-(0826-0831)	8.5	8.5	32.4	39.9	35.9	38.5	34.8	29.3	22.3	25.8
3/7/1996-(1130-1130)	8.5	9.1	32.3	40.7	36.0	37.8	34.8	29.2	24.5	27.7
3/7/1996-(1147-1152)	8.0	8.7	31.1	37.3	35.6	37.9	34.7	29.4	23.6	28.0
4/24/1996-(0759-0759)	8.4	8.5	33.9	37.2	43.3	43.1	36.8	36.2	27.1	34.1
4/24/1996-(0842-0842)	8.1	8.6	33.9	37.3	43.5	43.1	38.9	38.5	27.3	34.4
4/24/1996-(1245-1245)	8.5	8.6	34.8	37.6	43.3	43.1	38.1	38.4	27.1	34.1
4/24/1996-(1322-1322)	8.4	8.6	33.9	37.3	43.3	43.1	39.5	38.4	27.2	34.1
8/8/1996-(0841-0841)	8.5	8.6	33.9	37.8	41.1	43.4	39.5	43.0	37.5	41.8
8/8/1996-(1242-1244)	8.5	8.5	34.3	37.3	41.6	43.1	40.1	41.9	37.5	42.2
11/5/1997-(1227-1232)	8.4	8.4	37.6	37.8	39.5	43.3	38.8	34.5	29.2	42.4
12/9/1997-(0855-0855)	8.4	8.4	37.0	35.3	37.8	40.7	34.4	32.0	27.2	36.8
2/18/1998-(0932-0932)	9.3	8.5	37.5	37.1	43.5	41.2	34.6	31.9	29.9	34.3
2/18/1998-(1339-1339)					43.7	41.2	34.9	32.2	30.0	34.3
3/12/1998-(1125-1125)		8.3	34.7		41.6	40.9	38.6	32.0	30.2	34.3
6/23/1998-(1247-1247)	8.3	8.7	36.0	37.3	43.3	44.2	41.5	39.7	40.9	41.8
7/15/1998-(0813-0813)	8.5	9.1	37.1	37.3	43.7	43.1	41.8	39.5	40.9	41.1
7/15/1998-(1217-1217)	8.5	9.3	36.2	37.3	43.7	43.1	42.7	39.9	40.7	42.3
8/26/1998-(0854-0854)	8.2	9.1	36.2	37.6	44.9	45.1	42.3	39.7	39.9	42.1
9/23/1998-(0918-0918)			32.1	35.4	41.5		40.1	38.1	37.5	39.7
9/23/1998-(0959-0959)	8.5	8.6	32.1	35.0	41.0	44.2	40.1	38.1	37.5	39.6
9/23/1998-(1409-1409)					41.1			38.4	37.0	40.2
11/18/1998-(0901-0901)	8.5	10.6	32.1	37.3	35.5	40.7	35.2	34.3	32.4	40.0
11/18/1998-(1305-1305)	8.2	9.1	32.0	37.3	35.6	40.7	34.6	34.9	32.0	36.3
Section	SD 46-0804									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
07/15/1994-(0812-0812)	10.0	11.7	26.4	44.8	37.9	44.7	42.9	44.5	41.1	41.9

07/15/1994-(1215-1215)	9.9	11.7	26.2	42.8	37.9	45.4	43.3	44.5	41.9	41.9
8/12/1994-(0759-0759)	10.0	11.6	31.1	45.3	38.2	44.1	42.5	44.5	41.8	42.5
8/12/1994-(1202-1202)	10.1	11.9	31.7	44.8	38.2	44.1	42.5	44.2	41.8	42.3
9/27/1994-(0817-0817)	10.1	11.6	28.7	45.3	38.1	44.9	42.5	44.7	40.6	42.2
9/27/1994-(1220-1220)	10.1	11.7	29.0	44.2	38.2	44.1	42.5	44.7	39.1	42.2
10/25/1994-(0929-0934)	10.0	11.7	26.4	42.8	38.2	43.2	41.7	41.5	38.9	41.8
10/25/1994-(1159-1204)	10.3	11.7	26.3	42.9	38.1	43.6	41.9	40.7	41.7	41.3
11/22/1994-(0845-0850)	10.0	11.6	26.3	43.0	35.8	40.9	42.5	39.9	42.0	42.5
11/22/1994-(0902-0907)	10.0	11.6	26.2	42.8	35.8	41.2	42.5	39.1	41.7	42.5
12/20/1994-(0825-0830)	8.8	10.7	20.5	40.8	35.8	41.0	39.8	35.9	41.6	40.7
12/20/1994-(1231-1233)	9.4	10.8	20.4	40.9	35.5	41.0	40.3	35.9	41.9	40.7
2/21/1995-(0821-0826)	9.1	10.9	20.5	33.2	29.9	36.1	37.8	36.1	41.1	39.2
2/21/1995-(1227-1229)	9.1	10.8	20.6	33.2	30.0	36.7	37.6	35.3	40.6	39.6
3/9/1995-(0857-0902)	9.2	10.9	20.6	33.3	29.9	39.0	37.8	36.0	41.4	40.7
3/9/1995-(0911-0916)	9.2	10.9	20.5	33.2	30.0	38.8	37.8	35.8	40.2	40.7
3/9/1995-(1317-1319)	9.2	10.9	20.6	33.2	30.0	38.7	37.9	35.8	40.2	40.9
3/23/1995-(0931-0931)	10.1	15.1	29.1	40.6	29.9	38.4	37.5	36.5	40.7	40.7
3/23/1995-(1334-1334)	10.0	15.1	29.0	40.2	29.7	39.1	37.4	35.9	41.1	40.8
4/20/1995-(0809-0814)	10.1	11.7	26.4	42.8	36.1	40.8	40.2	37.4	41.9	40.9
4/20/1995-(1217-1217)	10.3	11.7	26.6	42.8	36.1	41.0	39.9	40.7	41.9	40.9
5/23/1995-(0743-0743)	10.3	11.6	28.9	42.8	36.2	43.6	42.9	41.3	44.0	41.1
5/23/1995-(1146-1146)	10.0	11.7	25.6	43.0	35.8	44.9	43.4	41.3	43.4	41.9
5/23/1995-(1253-1253)	10.2	11.7	26.2	42.8					43.7	41.9
6/27/1995-(0921-0921)	10.1	11.6	28.8	43.1	38.4	45.5	45.3	44.5	43.7	40.9
6/27/1995-(1324-1324)	10.1	11.7	28.9	43.1	38.4	43.6	45.3	44.5	43.8	40.9
6/27/1995-(1429-1429)	10.0	11.6	29.1	42.8	38.1	43.7	45.4	44.5	43.7	40.9
10/24/1996-(0825-0830)	10.0	11.6	26.5	40.8	35.9	41.0	43.1	40.1	39.6	38.6
10/24/1996-(1051-1051)	10.1	11.6	26.3	43.3	36.2	43.7	42.5	41.3	39.0	38.8
10/24/1996-(1454-1454)	10.1	11.7	26.2	42.8	35.9	43.6	42.5	41.5	39.0	38.3
2/18/1997-(1104-1104)	8.3	9.9						33.7	40.0	39.2
3/31/1997-(0021-0021)								33.1	40.8	38.7
3/31/1997-(0424-0424)								33.7	40.3	38.7
4/15/1997-(0827-0832)	10.1	12.9	28.8	43.0	35.4				33.9	40.5
4/15/1997-(1233-1235)	10.0	13.1	28.5	42.8	35.4				33.4	41.2
4/29/1997-(0906-0906)	10.0	11.7	28.8	40.8	35.5	41.0	39.8	35.9	40.5	40.7
4/29/1997-(1311-1311)			11.6	26.2	40.8	35.3	41.0	39.9	36.0	40.0
5/15/1997-(1240-1240)			11.6	28.3	40.6	35.9	41.2	39.9	38.5	41.6
6/5/1997-(0848-0852)	10.1	11.6	29.2	42.8	35.8	43.6	43.3			
6/5/1997-(1255-1256)	10.0	11.7	28.9	42.8	35.7	43.6	43.3			
6/24/1997-(0840-0840)	10.0	13.1	31.4	42.8	36.1	44.6	43.0	45.3	44.1	41.9
6/24/1997-(1244-1244)	10.0	13.9	28.9	42.8	35.8	44.6	43.0	45.3	43.6	41.9
7/22/1997-(0803-0803)	10.0	11.6	31.1	43.0	35.9	44.9	45.3	45.3	43.6	41.9
7/22/1997-(1207-1207)	10.0	11.6	28.8	42.9		45.2	45.3	45.3	43.6	41.9

8/24/1997-(0945-0945)	10.0	11.6	28.9	43.0	36.0	44.8	45.3	45.3	43.6	41.9
9/22/1997-(1304-1304)	10.1	15.0	31.3	42.8	35.8	45.6	45.4	41.8	43.6	41.9
12/15/2003-(0623-0626)	8.3	9.9	24.9	32.0	33.7	41.4	39.8	38.4	41.8	41.9
12/15/2003-(1823-1826)	8.3	9.9		32.0	33.3	41.4	39.9	40.1	41.8	41.9
12/16/2003-(0623-0626)	8.3	10.9	24.8	32.0	33.4	41.3	39.8	40.1	41.8	41.9
12/16/2003-(1342-1342)	8.3	9.9	24.8	32.0	33.4	41.4	39.7	40.1	41.8	42.5
12/16/2003-(1823-1826)	9.2	9.9	24.7	32.0	33.4	41.3	39.8	40.1	41.7	41.9
Section	SD 46-9187									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
07/19/1994-(0721-0721)	18.8	14.1	41.5	45.0	49.5	44.2	36.7	42.3	33.1	35.3
07/19/1994-(0915-0920)	18.6	14.8	40.4	45.2	49.5	43.3	36.7	42.3	33.0	36.8
8/11/1994-(0750-0750)	17.3	14.1	38.4	45.0	50.8	43.3	43.0	45.4	41.7	36.7
8/11/1994-(1153-1153)	16.9	14.1	38.4	45.2	50.8	44.1	43.0	45.8	41.6	36.7
9/26/1994-(0744-0749)	16.8	14.1	41.8	41.7	51.1	42.5	43.0	45.6	42.0	38.6
9/26/1994-(1152-1152)	17.6	14.1	41.8	41.7	51.5	42.2	43.0	45.6	41.7	38.7
10/24/1994-(0809-0814)	16.7	14.1	40.8	37.2	49.5	40.9	41.3	44.7	38.5	36.8
10/24/1994-(1217-1217)	16.6	14.1	38.4	36.3	51.1	40.9	41.3	44.0	38.7	36.7
11/21/1994-(0741-0746)	16.7	12.6		36.9	48.0	37.9	39.3	42.3	33.2	35.0
11/21/1994-(0815-0820)	16.8	14.1	38.6	36.3	49.5	38.4	39.4	42.4	33.1	35.0
12/19/1994-(0743-0748)	14.5	11.7	28.3	36.3	49.5	37.7	37.1	37.2	30.2	35.5
12/19/1994-(1149-1151)	15.3	11.7	28.1	36.5	49.5	37.6	36.8	37.2	33.4	34.5
1/20/1995-(0848-0853)	15.3	11.8	28.3	33.7	49.5	37.6	36.8	36.9	31.0	32.6
2/20/1995-(0837-0842)	16.7	12.6	28.0	31.4	47.8	35.6	34.7	36.9	30.8	32.4
2/20/1995-(0944--0949)	17.6	12.6	29.2	31.4	47.8	35.4	34.2	37.3	30.8	32.4
3/10/1995-(0807-0812)	14.4	11.8	28.1	31.5	49.5	35.4	34.6	37.1	31.0	32.7
3/10/1995-(1215-1215)	14.5	11.6	28.9	31.4	49.5	35.3	36.5	37.2	31.2	32.8
3/24/1995-(0831-0836)	17.0	15.0	40.7	38.9	49.8	37.7	36.7	36.9	31.0	32.2
3/24/1995-(1043-1048)	16.7	14.2	40.4	38.9	49.7	37.9	37.1	37.2	30.8	32.4
4/21/1995-(0746-0751)	17.0	14.1	41.5	38.5	49.5	37.7	40.2	38.7	32.9	32.4
4/21/1995-(1154-1154)	16.7	14.0	41.8	41.0	51.1	37.6	39.4	38.7	33.0	32.5
5/22/1995-(0836-0836)			44.5	40.2	49.5	38.2	43.0	44.0	35.7	35.2
5/22/1995-(1038-1038)	16.6	15.0	45.4	39.9	51.2	39.3	43.1	44.0	36.9	35.3
5/22/1995-(1405-1405)	16.7	14.4	44.7	38.9	51.6	41.5	43.0	44.0	35.7	35.0
6/26/1995-(0753-0753)	16.8	14.6	39.4	36.7	46.5	41.8	37.1	37.2	35.7	36.7
6/26/1995-(1156-1156)	16.5	15.1	40.0	36.3	46.3	41.5	36.5	36.7	38.3	36.6
6/26/1995-(1453-1453)	16.8	15.1	39.1	36.8	45.0	41.5	36.7	36.7	37.2	36.6
10/25/1996-(1033-1034)	17.4	15.0	41.5							
10/25/1996-(1221-1221)	17.7	12.6	41.5	36.6	46.5	37.7	37.5	36.9	32.9	39.2
2/19/1997-(0900-0900)	14.4	11.7	28.3	28.1	36.1	31.3	30.5	30.4	31.0	32.8
4/14/1997-(0738-0743)	17.2	13.0	40.7	44.1	49.5	40.2	34.5	36.9	28.2	32.4
4/14/1997-(1144-1146)	16.8	12.7	36.8	45.0	49.5	41.0	34.6	37.1	30.7	32.6
4/28/1997-(0828-0833)	16.6	14.4	41.5	45.2	50.1	44.2	41.4	44.4	33.4	35.0

4/28/1997-(1237-1237)		14.4	43.2	45.2	50.1	44.2	41.0	44.4	33.4	35.3
5/14/1997-(0808-0808)	16.6	14.8	43.3	44.8	50.1	44.0	43.0	43.8	35.6	35.0
5/14/1997-(1213-1213)		14.2	44.4	45.7	50.0	44.4	43.0	44.0	42.4	35.6
6/23/1997-(0836-0836)	17.3	14.1	45.1	47.2	49.5	46.1	42.2	44.0	43.0	37.0
6/23/1997-(1301-1301)	17.3	15.0	45.4	46.8	49.9	45.4	42.2	44.2	44.0	37.0
7/21/1997-(1138-1138)	17.7	15.0		45.0	49.5			43.9		39.8
7/21/1997-(1223-1223)	18.6	14.8	45.4	45.2	49.5	45.8	43.0	44.2	43.6	40.1
9/23/1997-(0840-0840)	17.5	12.6	42.7	45.0	49.2	43.1	41.3	44.0	38.6	39.8
Section	TX 48-1068									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
12/16/1993-(0657-0659)	14.3	36.1		43.5						
12/16/1993-(1103-1104)	14.5	36.1		43.3						
12/16/1993-(1506-1507)	14.3	36.1		43.5						
2/11/1994-(0737-0739)	16.3	35.9		43.3						
2/11/1994-(1143-1143)	16.2	36.1		43.6						
4/13/1994-(0646-0647)	16.2	36.2								
4/13/1994-(1052-1052)	16.2	36.0								
4/13/1994-(1455-1455)	16.2	36.0								
5/16/1994-(0620-0621)	14.3	36.2								
5/16/1994-(1025-1025)	16.4	35.9								
5/16/1994-(1427-1427)	16.2	36.2								
6/27/1994-(0657-0658)	14.3	35.9								
6/27/1994-(1102-1102)	14.3	35.9								
6/27/1994-(1505-1505)	14.9	35.9								
6/27/1994-(1907-1907)	14.3	36.3								
7/14/1994-(0552-0553)	14.3	36.0								
7/14/1994-(0958-0958)	14.2	35.9								
7/14/1994-(1400-1400)	14.2	36.1								
8/15/1994-(0549-0550)	14.2	36.1								
8/15/1994-(0954-0954)	16.2	35.9								
8/15/1994-(1356-1356)	14.0	36.2								
8/15/1994-(1758-1758)	14.3	36.2								
9/15/1994-(0550-0551)	14.3	35.9								
9/15/1994-(0955-0955)	14.3	36.1								
9/15/1994-(1357-1357)	15.8	35.8								
10/20/1994-(0714-0715)	15.9	36.1								
10/20/1994-(1119-1119)	13.9	36.1								
11/10/1994-(0557-0558)	15.9	36.1								
11/10/1994-(1002-1002)	16.3	36.1								
11/10/1994-(1405-1405)	14.7	35.9								
12/29/1994-(0647-0648)	15.2	35.9								
12/29/1994-(1053-1053)	16.2	35.9								

1/27/1995-(0648-0649)	15.0	36.0								
1/27/1995-(1054-1054)	14.9	36.0								
2/24/1995-(0625-0626)	14.9	36.0								
2/24/1995-(1031-1031)	14.9	35.9								
3/9/1995-(0603-0604)	16.0	36.1								
3/9/1995-(1009-1009)	16.1	36.4								
4/13/1995-(0609-0610)	16.0	36.4								
4/13/1995-(1015-1015)	16.2	36.1								
4/13/1995-(1418-1418)	16.2	36.1								
5/12/1995-(0605-0606)	14.9	36.2								
5/12/1995-(1011-1011)	14.9	36.2								
6/8/1995-(0551-0552)	16.3	36.2								
6/8/1995-(0957-0957)	16.4	36.2								
7/3/1997-(0805-0806)	14.3	35.9								
7/3/1997-(1212-1212)		37.1								
8/21/1997-(0927-0932)	15.2	34.5	31.0	36.1	32.1	26.9	27.2		33.7	
8/21/1997-(1336-1341)			26.9	28.5	21.7	21.0	21.2	27.1	26.4	
9/17/1997-(0849-0849)	14.2									
9/17/1997-(1257-1257)	15.1									
12/17/1999-(1011-1011)	14.1									
12/17/1999-(1012-1012)										35.9
Section	KS 20-4054									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
08/25/1995-(0747-0752)	37.9	43.7	29.6	32.3	30.4	33.2	33.5	31.4	31.5	36.9
08/25/1995-(0858-0858)	39.4	44.3	29.4	30.1	30.0	33.2	33.5	30.9	31.3	36.4
9/21/1995-(0832-0837)	41.0	43.7	29.8	30.2	32.4	33.0	33.4	31.7	31.7	36.3
9/21/1995-(1030-1035)	39.2	43.7	29.6	30.1	32.8	35.4	33.9	31.8	31.0	36.5
10/18/1995-(0753-0753)	40.8	43.7	29.5	30.3	29.8	33.0	33.4	31.7	31.6	36.7
10/18/1995-(1154-1156)	40.5	43.6	29.6	30.0	30.1	32.7	31.2	31.4	31.3	36.5
11/16/1995-(0809-0814)	37.9	42.0	29.9	30.2	30.5	32.9	31.4	31.4	29.1	34.6
11/16/1995-(1216-1218)	37.3	41.7	29.6	30.5	30.1	33.0	31.6	31.3	29.1	34.8
12/11/1995-(0745-0750)	37.3	41.7	29.3	30.2	30.7	33.2	31.7	31.3	29.0	34.5
12/11/1995-(1153-1153)	35.5	42.0	29.4	30.1	30.1	33.4	31.3	28.9	29.0	34.7
1/24/1996-(0819-0824)	37.3	41.1	29.8	30.2	30.1	32.3	31.8	28.8	28.6	34.8
1/24/1996-(1226-1228)	35.2	40.3	29.0	30.1	30.4	33.2	31.5	28.8	29.4	35.0
1/24/1996-(1433-1438)	34.4	39.1	29.8	30.2	30.1	33.0	31.4	29.4	29.2	34.8
3/8/1996-(0826-0831)	36.8	39.9	29.4	30.3	30.2	32.9	31.2	28.8	29.0	34.6
3/8/1996-(1232-1234)	37.4	40.9	29.5	30.1	30.4	33.1	31.3	28.9	29.2	34.5
3/8/1996-(1336-1341)	35.4	42.0	29.0	30.4	30.4	33.2	31.4	29.1	28.9	34.8
3/8/1996-(0802-0802)	41.0	43.7	29.4	30.1	30.1	33.0	31.5	31.7	29.0	34.7
4/25/1996-(0837-0837)	40.4	43.7	29.4	30.1	30.1	32.9	31.2	31.7	29.1	34.3
4/25/1996-(1240-1240)	40.9	43.7	29.5	30.0	30.1	33.0	31.2	31.5	29.1	34.7

8/5/1996-(0805-0810)	41.7	44.0	31.4	32.3	32.4	32.9	33.5	31.7	31.3	36.7
8/5/1996-(1211-1213)	41.2	43.7	31.4	32.3	32.7	35.4	33.5	31.4	31.3	36.7
11/6/1997-(1112-1117)	37.3	43.3	29.5	30.3	30.1	33.2	30.8	31.4	31.8	36.5
12/10/1997-(1020-1020)	37.5	42.6	29.4	30.0	30.1	33.2	31.2	31.7	29.2	36.5
1/20/1998-(0942-0947)	37.3	42.6	29.1	30.0	30.2	33.2	31.3	29.3	29.4	35.0
2/17/1998-(0923-0928)	37.3	42.1	29.6	29.8	30.2	32.6	31.4	31.8	29.2	34.5
2/17/1998-(1332-1332)	37.6	41.7	29.5	30.1	30.3	33.3	31.5	29.0	29.0	34.6
3/11/1998-(0245-0245)			29.9	30.1	30.5	32.5	31.2	31.5	29.0	34.0
6/23/1998-(0932-0937)	41.8	42.3	31.7	32.3	32.5	33.2	33.5	33.9	31.3	34.6
7/14/1998-(0853-0858)	43.3	42.3	31.5	32.3	32.5	35.4	33.5	31.8	31.3	36.5
8/25/1998-(1308-1308)	43.2	41.7	31.7	32.5	32.4	35.2	33.5	31.7	31.3	36.5
9/22/1998-(0841-0846)	40.0	42.0	31.5	32.6	32.4	35.2	33.5	31.7	31.9	36.5
9/22/1998-(1250-1250)	41.9	42.1	31.9	32.5	32.4	35.4	33.5	31.9	31.6	36.5
10/20/1998-(0933-0933)	40.8	43.6	29.7					31.7	31.3	36.5
11/19/1998-(1521-1521)	37.6	43.0	29.5	30.1	30.1	33.2	30.8	31.4	31.2	
Section	MN 27-4040									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
09/22/1993-(0820-0825)	15.4	35.7	34.5	35.8	37.3	43.3	36.1	38.5	43.1	43.6
9/22/1993-(1220-1222)	15.4	35.7	34.5	35.4	37.3	44.0	36.1	38.8	43.3	44.8
10/18/1993-(0900-0905)	13.1	35.6	32.9	33.9	37.2	43.0	34.5	37.1	43.5	43.9
10/18/1993-(1300-1302)	13.3	34.2	33.3	33.9	37.2	43.2	34.4	38.1	42.8	43.9
11/16/1993-(0916-0921)	11.2	34.2		34.1	37.1	40.3	33.9	35.8	43.5	42.2
11/16/1993-(1322-1324)	11.1	34.2	29.1	33.8	35.0	38.9	34.7	35.8	43.1	44.0
12/16/1993-(0804-0809)	11.2	26.5	27.1	31.9	35.3	40.2	34.7	35.9	41.6	42.3
1/19/1994-(1108-1113)	9.9	25.7	26.2	26.7	28.5	31.8	27.9	29.9	36.7	37.5
1/19/1994-(1130-1113)	9.7	26.1	26.3	26.8	28.5	31.7	27.5	29.5	36.7	36.2
1/19/1994-(1145-1150)	9.9	25.5	26.2	26.8	28.5	31.8	26.9	29.9	36.7	37.7
2/17/1994-(0904-0909)	10.8	26.5	26.3	26.8	28.5	31.6	26.9	27.9	35.4	40.1
2/17/1994-(1139-1139)	11.1	26.5	26.3	26.7	28.4	31.6	26.9	27.8	35.4	40.3
2/17/1994-(1531-1531)	11.1	26.5	26.3	26.8	28.6	31.6	26.8		35.2	39.5
3/17/1994-(0758-0803)	13.2	27.3	28.0	28.2	29.2	31.5	26.6	28.5	35.3	37.6
3/17/1994-(1052-1057)	13.3	27.4	27.0	29.1	29.1	31.6	26.8	27.9	35.3	37.5
3/31/1994-(0753-0758)	15.2	34.4	27.1	28.2	29.8	33.5	27.6	29.4	37.1	37.6
3/31/1994-(1159-1201)	15.3	33.6	27.1	28.3	30.1	31.7	26.8	28.3	36.8	37.7
4/14/1994-(0732-0732)	12.9	33.6	32.9	34.1	31.2	33.6	26.9	29.4	36.7	37.5
4/14/1994-(1135-1135)	13.4	34.5	33.2	34.1	31.2	33.6	27.7	29.8	36.7	37.7
5/4/1994-(0011-0011)	13.0	35.9	33.2	34.1	37.2	40.1	34.5	35.6	36.7	42.2
5/4/1994-(0030-0030)	13.5	35.8	33.2	33.9	35.2	40.0	34.8	35.7	36.6	42.2
5/4/1994-(0433-0433)	14.2	35.7	32.9	34.1	35.1	40.0	34.5	35.6	36.7	42.2
5/18/1994-(0728-0728)	14.1	35.7	33.3	34.0	37.2	41.4	34.5	35.7	44.0	42.2
5/18/1994-(1131-1131)	14.0	35.6	33.2	35.4	35.2	43.2	34.2	35.7	43.6	42.4
6/23/1994-(0721-0726)	15.5	35.6	33.3	35.5	37.2	43.8	37.2	35.5	43.1	43.6

6/23/1994-(1049-1049)	15.3	35.7	33.3	35.3	37.2	43.3	37.0	35.5	44.8	43.2
7/28/1994-(0709-0709)	13.4	35.8	34.5	35.3	39.2	44.1	37.7		44.5	45.0
7/28/1994-(1112-1112)	13.3	35.6	34.5	35.3	39.1	43.8	37.8		44.5	45.0
8/25/1994-(0749-0749)	15.4		32.9	35.3	39.1	43.8	37.2		44.5	45.0
8/25/1994-(1152-1152)	15.5			35.3	39.1	43.8	37.2		44.7	45.0
9/30/1994-(0759-0759)	16.7	34.5		33.7	37.4	45.0	34.7		44.5	45.2
9/30/1994-(1200-1202)	16.7	34.5	33.1	33.7	37.5	43.8	34.4		45.4	43.6
10/13/1994-(0740-0745)	16.7	34.2		34.1	37.2	43.0	34.7		44.6	45.0
10/13/1994-(1148-1148)	16.6	34.2	33.1	35.5	37.2	42.7	34.7		44.5	44.5
11/10/1994-(0715-0720)	17.0	34.4			37.2	42.4	34.5		44.2	43.9
11/10/1994-(1121-1123)	16.6	34.3			37.2	43.1	34.5		43.9	43.9
12/8/1994-(0750-0755)	10.8	28.4		34.0	37.4	40.0	34.5	29.8	39.2	40.2
1/12/1995-(0805-0810)	10.9	27.3	26.3	26.9	29.1	34.9	34.5	34.0	41.5	42.2
1/12/1995-(1211-1213)	11.1	27.3	26.2	26.7	29.0	35.0	34.5	31.2	39.4	42.4
2/9/1995-(0905-0909)	11.1	27.3	26.3	26.8	29.1	33.5	28.8			
3/17/1995-(0734-0739)	14.3	34.4	28.0	29.2	29.2	31.5	26.9	28.8	38.8	42.2
3/17/1995-(1140-1142)	13.3	35.9	27.1	26.8	29.2	31.4	26.8	29.8	38.7	42.2
3/31/1995-(0752-0757)	14.1	32.1	30.4	30.2	31.2	33.6	28.9	27.9	39.3	40.1
3/31/1995-(1200-1200)	13.4	34.2	30.6	29.9	31.2	33.7	28.9	29.7	38.9	42.3
4/14/1995-(0800-0800)	13.8	34.2			32.9	33.6	28.5	28.8	39.4	42.2
4/14/1995-(1216-1216)	13.0	34.4	32.9		30.9	33.7	28.6	29.7	41.9	42.2
4/28/1995-(0828-0833)	13.1	34.2		34.1	36.7	39.9	33.3	29.8	41.6	42.2
4/28/1995-(1234-1236)	13.0	34.3	32.9	34.0	37.3	39.9	34.4	31.3	41.8	42.4
5/11/1995-(0802-0802)	14.2	34.2		34.0	37.1	39.8	34.4		41.9	42.2
5/11/1995-(1205-1205)	13.4	34.4		34.0	37.4	39.6	34.5		43.7	42.2
5/11/1995-(1413-1413)	13.4	34.4		34.1	37.2	39.9	34.5		43.7	42.2
6/16/1995-(0842-0842)	16.9				38.4	42.3				
6/16/1995-(0952-0952)	16.5	35.8	34.5	35.1	38.7	43.9		38.8	44.1	43.2
6/16/1995-(1323-1323)	16.8	37.2	34.8	35.4	38.7	43.8	36.1	38.9	44.5	43.2
10/9/1996-(0831-0834)	13.0				38.2	43.0				
10/9/1996-(0914-0919)	13.4	35.6	34.3	35.2	37.2	44.0	37.0	38.3	44.5	45.0
10/9/1996-(1323-1323)	13.5	35.7	34.7	35.5	37.2	43.8	36.7	38.7	44.5	45.1
12/3/1996-(0948-0953)	11.1	27.3		34.0	37.2	39.9	34.7	34.0	41.8	40.5
2/5/1997-(1242-1242)					30.1	31.7	27.0		35.1	40.4
4/8/1997-(1445-1445)	11.9	35.4		34.0	31.3	33.7	28.6		35.4	
4/22/1997-(0840-0840)	13.2		36.0	35.5	37.2		28.8		36.6	
5/6/1997-(1046-1046)	13.4	35.7		35.4	37.2	42.3	34.5		39.5	42.2
5/6/1997-(1450-1450)		35.6		35.6	37.3	39.9	34.5		39.2	42.2
5/28/1997-(0848-0848)	13.4	35.8		35.3	37.2	41.7	34.5		43.1	42.4
5/28/1997-(1252-1252)	13.5	35.8		35.3	38.4	41.7	36.1		44.4	43.6
6/10/1997-(0917-0917)	13.4	35.8		37.1	38.2		36.1		44.5	43.4
6/10/1997-(1320-1320)	13.4	35.7		37.6	38.3	43.8	35.9		44.5	43.4
7/11/1997-(0831-0831)	14.1	36.8		36.6	39.4	43.8	37.0		44.5	45.1

8/13/1997-(0837-0837)	13.4	37.2		37.9	38.7	45.4	36.8		44.6	45.1
9/9/1997-(0852-0852)	14.3	37.2			38.7	45.4	36.1		44.6	45.1
Section	TX 48-4143									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
11/18/1993-(0751-0755)		41.2	42.1	37.4	37.7	39.9	39.7	41.6	45.5	46.8
11/18/1993-(1156-1158)	45.8	41.2	41.9	37.2	38.1	39.9	39.6	41.9	46.0	46.8
1/18/1994-(0700-0705)	46.1		40.6	38.8	37.2	38.3	39.6	41.6	45.5	46.9
1/18/1994-(1106-1108)	46.1		41.1	38.8	37.2	38.1	38.9	41.9	45.5	46.9
1/18/1994-(1509-1511)	46.1		40.2	40.0	37.2	37.7	39.3	41.9	46.1	46.9
3/22/1994-(0645-0649)			42.1		36.6	37.7	38.9	41.9	46.0	46.7
3/22/1994-(1050-1052)			40.9		38.1	37.7	38.9	41.9	46.0	46.9
4/19/1994-(0651-0655)			41.8		37.2	37.8	39.2	41.9	46.0	46.9
4/19/1994-(1056-1058)			41.8		36.6	37.7	38.9	41.8	46.0	46.9
4/19/1994-(1459-1501)			41.8		38.1	38.2	38.9	41.9	46.0	46.9
5/19/1994-(0750-0754)			41.8		37.2	37.7	38.9	41.9	46.0	46.8
5/19/1994-(1154-1156)			41.8		38.1	37.7	38.9	41.9	46.0	46.8
6/29/1994-(0550-0554)			44.2		37.8	39.9	38.9	41.9	45.5	48.2
6/29/1994-(0954-0957)			44.2		37.5	39.7	38.9	42.6	46.0	48.2
7/11/1994-(0600-0604)			43.7		37.2	40.3	38.9	42.0	45.7	48.3
7/11/1994-(1004-1006)			43.7		38.0	39.9	38.9	42.1	46.0	48.3
7/11/1994-(1406-1408)			44.2		37.2	39.5	38.9	42.1	45.9	48.4
8/9/1994-(0600-0604)			43.8		38.4	39.9	40.0	42.0	46.0	48.3
8/9/1994-(1004-1006)			43.3		38.1	40.3	40.0	42.0	45.7	48.9
9/12/1994-(0545-0549)			44.0		36.6	39.9	39.6	41.9	46.0	48.3
9/12/1994-(0949-0951)			44.0		36.6	39.7	40.1	41.9	46.0	48.6
10/17/1994-(1056-1100)			41.4		38.1	38.1		41.4	46.0	48.3
10/17/1994-(1500-1503)			42.3		38.4	38.3	37.3	42.0	45.9	48.3
11/6/1994-(1258-1302)			41.8		37.4	38.4	37.4	40.5	45.9	48.2
11/6/1994-(1702-1704)			41.8		37.6	38.4	37.3	40.9	46.0	48.2
11/6/1994-(2104-2106)			41.8		37.6	38.4	37.3	40.9	46.0	48.2
12/12/1994-(0629-0633)			41.8		35.6	37.8	37.3	40.9	46.0	46.8
12/12/1994-(1034-1036)			39.6		35.8	37.9	37.5	41.2	46.0	47.0
12/12/1994-(1437-1439)			38.0		35.8	37.7	37.5	41.3	46.0	47.0
1/10/1995-(0635-0639)			39.6		35.6	38.2	37.3	41.2	44.0	46.8
1/10/1995-(0652-0656)			39.6		35.6	37.7	37.3	41.3	44.0	46.5
1/10/1995-(1057-1059)			39.6		35.6	37.7	37.5	41.3	43.6	46.7
1/10/1995-(1500-1502)			40.5		35.7	37.7	37.5	41.3	44.0	46.5
2/13/1995-(0640-0644)			40.0		35.6	37.9	37.6	41.6	43.6	46.8
2/13/1995-(1045-1047)			39.0		35.6	37.9	37.6		43.6	46.8
3/6/1995-(0614-0618)			39.8		35.6	38.1	37.6	41.3	43.6	47.0
3/6/1995-(1019-1022)			39.1		35.6	37.8		41.7	44.0	47.0
4/10/1995-(0627-0631)			41.8		35.8	38.1	37.6	41.3	44.0	46.8

4/10/1995-(1032-1034)			42.1		35.8	37.9	37.4	41.3	43.2	46.8
5/9/1995-(0549-0553)			40.2		36.8	37.8	37.5	41.4	43.2	46.5
5/9/1995-(0608-0612)			40.2		37.2	37.8	37.6	41.4	43.2	46.5
5/9/1995-(1013-1017)			41.4		36.7	37.8	37.4	40.9	43.2	46.7
5/9/1995-(1418-1420)			41.4		36.7	37.8	37.4	41.0	43.2	46.7
6/5/1995-(0618-0620)					36.8	39.9	37.6	41.3	43.2	48.2
6/5/1995-(1022-1023)					37.2	39.9	37.6	41.9	43.2	48.2
11/18/1996-(1219-1219)							32.5			
11/18/1996-(1310-1310)							32.1			
11/18/1996-(1335-1335)							32.1			
11/19/1996-(0915-0915)						38.1				
12/17/1996-(0832-0834)					37.9	37.9	37.4	42.0	45.3	45.8
1/28/1997-(1101-1106)	46.0		41.9	40.3	35.8	38.4	38.6	40.6	44.2	
2/18/1997-(0830-0832)					35.8	37.9		38.9	43.1	
2/18/1997-(0845-0847)					35.8	37.9		39.7	43.1	
3/25/1997-(0846-0848)						38.1		39.7	43.4	
3/25/1997-(1250-1251)						38.0		40.4	43.4	
4/24/1997-(0829-0831)						38.1		39.0	44.0	
4/24/1997-(1251-1253)						38.1		39.7	44.0	
5/18/1997-(0903-0905)						40.6		36.9	45.2	
5/18/1997-(1308-1309)						40.6		36.9	45.2	
6/27/1997-(0941-0946)	48.1		43.7	40.4	37.2	40.6	38.3	41.6	45.3	48.3
6/27/1997-(1348-1350)	48.3		43.7	42.1	37.2	40.9	38.3	41.0	45.7	48.0
7/9/1997-(0820-0825)	48.1		43.7	41.9	36.7	40.6	38.9	40.9	44.8	46.7
7/9/1997-(1112-1118)	48.1		43.7	41.9	37.2	41.2	38.9	40.2	44.8	45.8
8/18/1997-(1231-1236)		29.9	31.3		27.8				36.1	35.5
8/19/1997-(0838-0843)	35.8	40.7	30.9	37.3	33.5	33.0	37.4	37.0	44.0	46.7
9/25/1997-(0821-0823)						40.4		37.1	44.0	45.6
9/25/1997-(1226-1227)						39.9		37.0	44.0	45.6
Section	NC 37-0201									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
8/31/1994-(1320-1325)	16.3	49.9		45.3	43.0	48.0	44.1	43.7	42.8	44.0
5/15/1995-(1746-1751)	16.2	48.8	48.4	51.1	43.5	48.0	44.1	45.9	42.8	44.1
9/12/1995-(1208-1213)	16.2	48.5	50.4	45.0	43.2	48.0	44.1	45.9	42.6	45.8
10/16/1995-(1011-1016)	15.9	50.9	51.1	50.6	43.1	48.2	44.0	44.1	42.9	43.8
10/16/1995-(1416-1418)	16.0	50.9	50.1	47.2	43.1	47.9	44.3	43.2	42.5	43.8
11/14/1995-(1532-1537)	15.9	50.6	50.8	50.6	42.7	48.2	43.9	45.8	42.5	43.9
11/14/1995-(1554-1559)	15.9	50.3	50.9	49.2	43.0	48.2	44.0	45.8	42.8	43.8
11/28/1995-(0834-0838)		50.3	50.1	47.4	43.0	48.3	44.0	45.8	42.6	43.8
11/28/1995-(1238-1240)		48.5	50.1	47.2	43.0	47.8	44.1	44.0	42.7	45.1
12/19/1995-(0917-0921)		49.5	50.2	47.6	43.0	48.4	43.8	43.7	42.5	43.9
1/23/1996-(0848-0853)		51.0	50.3	47.2	43.1	48.2	44.2	43.7	43.0	45.4

1/23/1996-(1308-1310)		51.1	50.1	49.8	43.1	48.2	44.1	45.8		43.8
2/20/1996-(1004-1008)		51.2	50.1	48.9	43.2	48.3	44.1	45.8		44.0
4/23/1996-(0857-0902)	15.2	50.3	49.2	51.3	43.4	48.2	43.6	45.9		44.0
4/23/1996-(1411-1415)		50.6	50.6	51.3	42.9	47.9	43.6	45.9	42.5	45.7
5/16/1996-(1125-1130)	16.9	49.4	49.5	47.0	43.2	47.9	44.0	46.2	42.8	45.7
7/23/1996-(0828-0833)	15.9	50.6	44.3	44.8	43.1	47.9	44.4	46.2	42.4	45.7
7/23/1996-(1233-1235)	15.9	50.3	44.2	44.8	42.9	47.9	44.1	45.9	42.9	44.0
8/20/1996-(0859-0905)	16.2	50.9	46.6	45.2	43.1	47.9	44.0	43.7	42.6	43.8
8/20/1996-(1305-1307)	16.0	50.9	46.5	47.7	42.8	48.2	44.3	43.7	42.9	44.0
10/3/1996-(0912-0917)	18.7	50.9	47.1	47.2	43.0	47.9	44.1	43.8	42.8	45.1
10/3/1996-(1317-1320)	18.0	50.9	48.5	45.0	43.2	48.2	44.4	45.9	42.8	43.8
10/28/1996-(1128-1133)	16.3	50.6	44.6	44.8	43.0	48.0	44.0	45.9	42.5	44.0
3/11/1997-(1154-1200)	16.8	50.9	50.3	51.3	43.2	47.8	43.8	40.9	42.6	45.4
10/6/1997-(0920-0925)	15.5	49.2	44.4	45.4	43.0	47.9	44.0	45.9	42.8	45.4
10/6/1997-(1326-1328)	15.9	50.2	44.8	44.8	42.9	47.9	44.1	45.9	40.9	43.9
11/20/1997-(1036-1041)	15.5	49.3	44.5	45.1	42.6	48.4	44.0	45.8	43.0	44.1
11/20/1997-(1442-1445)	15.5	49.8	44.4	45.3	42.6	48.2	43.8	45.9		44.0
12/11/1997-(1028-1033)	16.9	50.3	44.3	45.1	43.1	47.9	44.6	45.9	43.0	44.0
12/11/1997-(1434-1436)	16.9	50.3	44.3	45.1	43.1	48.2	44.0	46.3	42.6	43.9
1/15/1998-(0836-0841)	18.5	50.3	44.2	45.0	42.9	48.2	44.0	46.2	41.2	45.4
2/19/1998-(0939-0945)	16.9	50.2	43.7	44.8	43.0	48.2	44.1	44.0	42.5	43.8
2/19/1998-(1346-1348)	16.9	49.9	43.7	45.3	42.9	48.3	44.0	45.8		44.1
3/12/1998-(0952-0957)	16.9	49.2	44.4	45.2	43.0	47.9	44.1	43.8	42.4	44.1
3/12/1998-(1358-1400)	16.9	50.4	44.2	45.1	43.0	48.2	44.1	44.0	42.5	45.1
4/2/1998-(1801-1807)	16.1	50.3	44.4	45.1	43.3	48.0	44.3	46.2	42.6	45.3
4/23/1998-(0928-0933)	16.9	48.3	46.4	44.8	42.6	48.2	44.7	45.9	42.5	44.2
4/23/1998-(1334-1336)	16.9	50.3	46.9	45.1	43.0	48.2	44.3	45.9	41.3	45.4
5/14/1998-(0917-0922)	17.0	50.9	46.4	47.4	43.1	48.4	44.3	45.9	42.6	45.1
5/14/1998-(1323-1325)	16.9	51.0	46.4	45.0	43.0	48.0	43.9	46.2	42.8	45.3
6/25/1998-(0920-0926)	16.9	50.8	46.5	47.2	42.9	48.6	44.4	45.9	42.7	45.1
6/25/1998-(1326-1328)	16.9	50.9	46.8	47.2	43.1	48.4	44.1	45.9	42.7	45.3
7/16/1998-(0843-0848)	16.2	50.6	44.3	45.2	43.1	48.0	44.0	45.9		44.0
7/16/1998-(1249-1252)	16.2	50.2	44.3	45.2	43.0	47.9	44.1	46.3	42.5	45.4
8/20/1998-(0845-0851)	16.8	50.9	46.8	45.1	42.6	48.0	44.3	45.9	42.5	45.5
8/20/1998-(1251-1253)	16.1	50.9	46.6	47.2	43.1	48.0	43.9	45.8	42.4	43.7
9/24/1998-(0930-0935)	16.8	50.9	44.2	45.2	43.0	47.9	43.9	45.9	42.5	44.1
9/24/1998-(1350-1356)	16.9	50.9	44.6	45.2	43.0	48.2	43.5	45.9	42.4	44.0
10/15/1998-(0914-0919)	15.5	50.3	44.2	45.0	43.0	48.2	44.0	45.9	42.6	43.9
10/15/1998-(1320-1322)	15.9	50.2	44.3	45.0	43.0	48.4	44.1	43.7	42.5	44.0
11/10/1999-(1437-1440)				44.6	43.0	48.3	44.1	46.2	42.8	43.8
11/10/1999-(1511-1516)	16.1	50.9	44.2	45.2	43.0	48.3	44.1	45.8	42.7	43.8
11/10/1999-(1530-1535)	16.2	50.2	44.2	45.2	43.0	48.0	44.1	43.6	42.7	43.8
11/10/1999-(1559-1604)	16.2	50.9	44.2	45.1	43.0	48.3	44.2	43.9	42.2	43.8

11/10/1999-(1617-1622)	16.2	50.9	44.1	45.2	43.0	48.3	44.2	46.2	42.4	45.4
1/20/2000-(1049-1053)		46.7	41.5			51.9		45.9	41.3	44.1
1/20/2000-(1106-1110)		46.7	41.6	44.8	45.8	50.6	42.7	46.1	42.8	44.1
2/3/2000-(0934-0939)	18.1	50.2	44.8	45.0	43.2	48.4	44.1	46.3	42.5	45.4
2/3/2000-(1341-1343)	16.8	50.5	44.6	45.5	43.2	48.5	43.9	45.9	42.5	43.9
3/21/2000-(1012-1018)	19.2	50.2	44.2	45.0	43.1	48.0	44.0		42.5	43.7
3/21/2000-(1047-1052)	19.2	49.3	44.3	45.0	43.0	48.2	44.0	45.9	42.3	44.0
3/21/2000-(1158-1203)	19.5	49.9	44.3	45.2	43.0	48.2	44.2	46.1	41.2	44.0
3/21/2000-(1357-1402)	19.5	49.9	44.3	45.0	43.0	48.3	44.1	45.9	42.5	43.8
5/16/2000-(0905-0910)	16.2		44.4	44.8		47.9			41.1	45.4
5/16/2000-(0933-0938)	16.2	49.3		45.1	43.1	47.9	43.8	46.2	42.5	44.8
5/16/2000-(1010-1015)	16.2	50.3		47.8	43.2	48.0	43.6	45.8	42.9	44.2
5/16/2000-(1101-1106)	16.3	48.3	44.6	47.2	42.8	48.2	44.4	45.9	42.9	43.9
5/16/2000-(1344-1349)	16.2	49.3	44.6	47.8	43.2	48.2	44.0	45.8	42.6	43.9
7/20/2000-(0923-0926)	16.1	50.9	44.2	47.2	43.0					
7/20/2000-(0940-0945)	16.1	48.8	44.2	47.5	43.0	48.1		43.6	42.5	
7/20/2000-(1246-1251)	16.9	50.4	44.2	47.3	43.2	48.8	44.0	45.9		45.9
7/20/2000-(1301-1306)	17.0	50.9	43.6	47.8	43.0	48.3	44.3	43.7	42.7	45.9
7/20/2000-(1322-1327)	16.9	51.0	44.4	44.9	43.2	48.3	44.3	45.9	42.5	43.9
9/19/2000-(1013-1014)								46.2	43.0	43.7
9/19/2000-(1433-1453)	18.5	50.1	44.2	45.0	43.0	48.2	42.6	46.2	42.6	45.4
12/5/2000-(1013-1018)	16.2	50.2	41.6	45.2	43.1	47.9		46.2	42.1	44.0
12/5/2000-(1420-1422)	16.3	50.3	41.7	45.1	43.1	48.1		43.8	42.9	43.8
1/16/2001-(1051-1056)	16.9	48.5	41.7	45.2	43.2	48.1		43.1	41.2	43.7
1/30/2001-(1040-1045)	19.5	50.4	44.4	45.2	43.0	48.2		43.6	41.2	44.0
4/5/2001-(1151-1155)	16.9	49.3		44.8	40.5	48.2		45.9	41.1	44.0
4/5/2001-(1225-1231)	18.0	49.3	43.7	45.0		48.0	44.1	45.9	41.2	44.2
4/5/2001-(1419-1424)	16.9	50.3	44.8	45.0	43.0	48.0	44.0	46.1	41.2	43.9
4/5/2001-(1516-1521)	16.9	50.3	43.8	45.0	43.1	48.0	44.0	43.8	41.2	44.2
4/5/2001-(1559-1604)	16.9	49.3	44.3	45.0	43.0	48.0	44.0	43.8	41.1	43.9
5/24/2001-(1010-1015)	16.8	49.5	44.4	45.2	43.1	48.0	44.1	46.6	42.8	44.0
5/24/2001-(1417-1419)	16.8	50.2	44.4	45.2	43.2	47.9	43.9	46.6	42.8	43.7
5/24/2001-(1437-1442)	16.9	50.2	44.4	44.3	43.0	47.9	43.5	43.8	42.5	43.7
7/19/2001-(1109-1114)	16.9	48.3	44.2	45.2	43.3	48.0	43.5	45.9	41.1	43.7
7/19/2001-(1359-1404)	16.9	48.3	44.4	44.8	43.4	48.3	44.0	45.9	42.6	43.7
9/20/2001-(1321-1325)		51.0		45.1	43.2			43.2	42.6	44.0
10/2/2001-(0923-0927)		49.3	43.9	44.8	43.0			43.8	41.0	44.0
10/2/2001-(0956-1002)	16.3	50.3			43.2	48.4		43.8	41.2	43.7
10/2/2001-(1020-1026)	16.2	50.9	43.8	45.1	43.2	48.0		46.5	41.2	44.2
10/2/2001-(1117-1123)	16.1	50.9	43.8	44.8	43.4	48.0		46.6	42.7	45.4
11/29/2001-(1026-1031)	16.2	49.9	41.6	44.2	43.4	48.4	43.9	43.9	42.7	44.0
11/29/2001-(1441-1446)	16.2	49.2	44.6	44.8	43.0	48.0	43.8	43.9	42.5	43.9
1/24/2002-(1023-1029)	19.5	50.9	44.2	45.4	43.3	48.0	44.0	43.9	40.9	44.2

3/14/2002-(0940-0945)	18.7	49.2	44.8	45.2	43.1	48.0		43.9	41.1	43.9
5/20/2002-(0912-0915)	16.9	50.3	44.3	45.0	43.2	48.4	44.1			43.9
5/20/2002-(0941-0946)	17.0	50.2	44.4	45.0	43.2	47.9	44.0	49.3	42.7	43.9
5/20/2002-(1348-1350)	16.9	50.9	44.4	45.0	43.1	48.4	44.4	43.7	42.7	43.9
7/25/2002-(0951-0956)	15.9	50.9	44.6	45.0	43.2	48.0	44.1	45.8	42.4	44.2
7/25/2002-(1308-1313)	15.5	50.1	44.4	45.0	43.2	48.6	43.9	43.6	40.9	44.2
9/19/2002-(1016-1020)		50.9	44.4	46.9	43.0	48.0	44.2	45.9	42.5	43.9
9/19/2002-(1035-1039)		48.8	44.4	44.4	43.2	48.0	44.2	46.3	40.9	43.9
4/22/2003-(1553-1558)		50.9	46.6	45.0	42.8	48.1		46.2	41.1	43.9
4/22/2003-(1609-1613)		51.0		45.2	42.9	48.1		43.9	40.9	45.2
5/15/2003-(1434-1438)		48.3			43.0	48.3		46.2	43.0	45.2
5/15/2003-(0913-0917)		51.0			42.9	48.1		43.7	42.5	43.8
12/11/2003-(1035-1039)		51.1	44.4	45.1	42.9	47.9		43.9	42.5	45.3
12/11/2003-(1306-1311)		50.6	44.5		43.0	47.9		45.9	42.6	45.3
Section	OH 39-0204									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
3/18/1998-(1211-1211)	13.0	29.9	34.9	36.6	38.0	36.2	35.8	35.9	34.1	36.6
4/14/1998-(0901-0901)	12.8	29.9	37.5	37.0	37.9	38.5	35.3	35.8	34.7	34.7
5/13/1998-(0853-0853)	13.0	27.2	34.9	32.8	33.4	36.3	35.4	38.3	41.0	38.2
6/17/1998-0914-0914)	13.0	29.4	42.1	37.8	38.0	38.6	35.8	38.5	34.9	36.7
7/30/1998-(1406-1406)	12.7	31.5	42.3	39.9	40.1	38.7	37.7	38.3	37.2	36.5
9/29/1998-(0833-0833)	12.7	29.8	38.8	39.1	39.3	38.3	38.2	38.0	37.5	36.8
1/26/1999-(0919-0919)	14.6	29.6	34.8	35.4	36.4	36.5	35.5	36.0	34.7	36.8
2/16/1999-(1519-1519)	12.6	29.6		35.2	36.2	36.5	35.5	35.9	34.9	36.5
6/10/1999-(1039-1039)	12.9	33.6	44.0	39.8	39.9	38.6	37.8	38.0	35.0	36.6
10/14/1999-(1155-1155)	12.9	29.8	42.6	39.5	40.1	38.6	38.2	38.0	37.3	37.6
Section	IN 18-3002									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
9/8/1995-(0833-0833)	16.0	27.8	34.9	37.1		36.9	35.4	33.0	25.4	24.7
9/8/1995-(0931-0936)	16.3	29.5	35.3	37.1	43.8	36.8	35.4	33.4	25.4	24.9
10/13/1995-(0728-0728)	14.0	29.8	34.9	37.1	43.1	37.0	33.7	31.0	25.7	24.6
10/13/1995-(1131-1131)		29.9	34.9	37.3	43.2	36.5	34.0	30.9	25.5	24.6
11/20/1995-(0819-0824)	16.6	27.2	35.3	37.2	43.0	33.9	34.1	30.8	25.4	24.6
11/20/1995-(1227-1227)	16.4	27.3	35.2	37.3	45.1	33.9	34.2	31.2	25.6	24.6
12/8/1995-(0834-0839)	13.8	27.5	34.9	36.9	42.9	36.1	34.1	30.7	24.0	24.6
12/8/1995-(1156-1201)	14.1	27.4	35.2	37.0	43.1	36.6	34.2	30.8	24.0	24.6
1/26/1996-(0757-0802)	16.3	24.4	35.1	36.3	42.7	34.2	33.6	30.5	25.4	24.4
1/26/1996-(1204-1206)	16.3	23.2	34.9	36.9	43.0	33.9	34.0	30.7	25.3	24.6
1/26/1996-(1322-1327)	15.2	23.1	34.9	37.1	42.9	36.3	34.0	30.8	25.5	24.6
3/11/1996-(0757-0802)	15.4	24.5	35.5	37.1	42.8	33.9	34.0	30.6	23.8	25.1
3/11/1996-(1206-1206)	16.1	22.9	35.1	37.6	43.1	33.8	34.1	30.9	24.0	24.6

3/11/1996-(1258-1258)	15.4	22.9	35.3	37.2	42.9	33.9	34.2	30.9	25.4	24.9
4/30/1996-(0748-0753)	16.1	29.9	35.1	37.2	42.9	36.2	34.0	30.5	25.5	24.6
4/30/1996-(0810-0815)	16.0	29.8	35.2	37.2	42.8	36.2	33.9	30.7	25.3	24.5
4/30/1996-(1218-1218)	15.4	30.0	35.2	36.9	43.0	33.9	34.1	30.9	25.1	24.6
8/2/1996-(0905-0905)	15.3	34.1	35.2	37.1	44.9	36.5	33.9	31.0	25.7	24.6
8/2/1996-(1308-1308)	15.3	33.9	35.1	38.8	45.1	36.1	35.4	33.3	25.7	24.6
6/16/1998-(0953-0953)	18.6	34.2	35.1	37.0	44.2	36.8	35.4	30.8	25.3	25.0
7/29/1998-(0913-0913)			35.1	38.8	45.7	36.5	35.3	33.4	25.6	24.6
7/29/1998-(1321-1321)			35.1	38.8	45.6	35.9	35.7	33.3	25.6	24.9
8/31/1998-(1552-1552)	18.6	34.3	34.9	38.8	45.5	36.8	35.5	33.4	25.3	24.6
9/28/1998-(1507-1507)	18.8	34.5	35.1	38.8	45.5	36.7	35.5	33.6	25.4	24.6
Section	MB 83-3802									
TDR_NO	1	2	3	4	5	6	7	8	9	10
Date-(Time)	VOLUMETRIC_MOISTURE_CONTENT									
10/15/1993-(0830-0835)	12.3	23.5	48.3	51.2	43.1	51.7	51.9	49.6	50.0	49.8
10/15/1993-(1230-1232)	12.3	22.9	47.3	52.1	42.8	51.7	51.8	49.6	50.0	49.8
11/12/1993-(0941-0946)	12.3	18.1	38.2	39.5	34.1	42.1	43.2	42.9	40.5	40.8
11/12/1993-(1347-1349)	12.3	18.1	37.4	40.1	32.7	41.7	43.1	43.2	43.1	43.8
11/15/1993-(1331-1336)	11.5	19.6	47.9	51.4	38.9	47.3	45.6	44.8	45.4	49.4
12/14/1993-(0752-0757)	11.5	18.2	39.2	42.6	38.8	44.9	42.6	44.8	43.3	45.9
12/14/1993-(1158-1200)	11.5	18.2	39.3	42.7	36.8	44.4		43.0	43.4	43.9
1/18/1994-(1335-1335)	10.6	18.1	36.0	39.5	31.5	38.1	39.0	38.7	39.2	39.8
1/18/1994-(1356-1356)	10.2	18.2	35.9	39.9		36.3	39.0	38.6	39.3	39.8
2/15/1994-(0912-0917)	11.4	18.1	37.8	39.4	30.6	36.2	39.1	38.3	39.2	43.4
2/15/1994-(1019-1024)	11.1	18.1	35.9	39.5	30.5	36.1	39.0	38.7	39.3	46.0
2/15/1994-(1425-1427)	11.1	18.1	37.1	39.5	31.0	36.3	39.0	38.6	39.1	46.5
3/15/1994-(0800-0805)	11.5	18.1	38.1	40.4	30.6	38.1	39.0	38.7	39.3	44.2
3/15/1994-(1206-1208)	11.5	18.1	37.4	40.0	30.8	36.1	38.9	38.7	39.1	43.4
3/29/1994-(0809-0814)	12.3	19.2	39.4	41.1	30.8	38.2	38.9	38.7	39.0	41.1
3/29/1994-(1215-1217)	12.3	19.6	39.4	41.3	30.9	38.2	38.8	38.7	40.9	41.4
3/29/1994-(1618-1620)	12.4	19.6	39.4	39.3	30.5	36.7	39.0	38.7	39.2	40.9
4/12/1994-(0733-0738)	15.7	27.8	48.8	41.1	30.7	37.9	38.7	38.4	40.6	43.8
4/12/1994-(1141-1141)	13.4	27.8	48.6	41.4	30.6	38.2	38.7	40.3	41.0	43.7
5/2/1994-(0748-0753)	12.3	22.9	48.6	51.5	40.9	51.9	40.3	40.0	40.5	44.0
5/2/1994-(1156-1156)	12.3	22.9	48.6	51.2	42.8	51.6	40.6	40.2	40.5	44.0
5/2/1994-(1559-1559)	12.3	22.9	48.6	51.2	44.3	51.5	40.4	40.0	40.4	43.6
5/16/1994-(0732-0737)	12.3	22.9	48.6	51.2	44.4	51.5	50.6	44.7	40.5	43.6
5/16/1994-(1140-1140)	12.3	23.1	50.7	51.5	44.4	51.6	50.3	45.0	40.8	43.8
6/20/1994-(0700-0700)	13.9	27.8	50.0	51.3	46.6	51.3	51.9	51.5	51.4	49.8
6/20/1994-(1103-1103)	13.8	27.7	50.2	51.3	46.6	51.6	51.9	50.9	51.4	51.2
7/26/1994-(0706-0711)	14.1	27.9	50.0	51.2	46.6	51.6	51.9	51.5	52.0	51.2
7/26/1994-(1100-1100)	13.9	27.8	50.2	51.2	46.7	51.6	51.9	50.9	52.0	51.2
8/22/1994-(0740-0740)	13.6	27.8	50.0	51.2	46.6	51.6	51.9	50.9	51.4	51.8

8/22/1994-(1143-1143)	13.9	27.8	50.2	51.3	46.7	51.6	51.9	50.9	51.4	51.4
8/22/1994-(1546-1546)	13.8	27.8	50.2	51.3	46.7	51.6	51.9	50.9	51.4	51.4
9/20/1994-(0802-0802)	13.7	28.0	50.0	51.3	46.6	51.6	50.4	51.2	51.4	51.8
9/20/1994-(1205-1205)	13.8	28.0	50.0	51.2	46.6	51.6	50.4	51.2	51.4	51.8
10/18/1994-(0800-0800)	15.8	27.8	50.0	51.5	46.6	51.6	50.4	51.5	51.4	49.8
10/18/1994-(1201-1203)	17.5	27.7		51.5	46.7	51.6	50.4	51.5	51.4	49.8
11/15/1994-(0744-0749)	13.8	27.8	48.6	51.2	44.8	51.8	51.4	48.9	50.0	50.7
11/15/1994-(1150-1152)	13.8	27.8	50.0	51.2	44.4	51.6	50.4	50.5	50.0	49.8
12/13/1994-(1532-1537)	11.1	18.1	39.2	42.5	42.8	51.1	49.2	40.3	43.4	43.7
12/13/1994-(1545-1550)	11.1	18.1	39.3	42.7	42.8	50.0	49.2	40.0	43.4	43.7
1/26/1995-(0938-0942)		18.1	38.3	39.4	30.8	38.0	43.2			
1/26/1995-(1021-1026)		18.1	37.4	39.4	31.2	38.0	40.2	44.9		
2/14/1995-(0833-0838)		18.1	37.4	39.3	30.6	38.2	39.0	40.3	50.0	49.0
2/14/1995-(1239-1240)		18.1	37.4	39.4	31.2	38.1	40.8	36.8		
3/15/1995-(0828-0833)	15.8	18.3	37.4	39.1	30.9	38.2	39.0	38.6	40.8	49.2
3/15/1995-(1234-1236)	13.8	18.1	39.0	39.6	30.9	38.2	39.0	38.7	40.9	48.8
3/29/1995-(0846-0846)	15.5	29.8	39.2	41.5	32.8	37.9	38.9	40.0	40.5	49.8
3/29/1995-(1247-1249)	15.7	30.4	39.0	41.4	32.6	38.2	39.0	40.0	40.7	49.7
4/26/1995-(0757-0802)	13.5	27.8	48.5	51.2	34.1	39.9	40.2	39.9	40.5	49.6
4/26/1995-(1205-1205)	13.8	28.0	48.7	51.2	34.1	39.1	40.7	40.3	42.6	48.7
5/16/1995-(0947-0952)	15.8	28.0	50.1	52.1	44.7	51.6	50.4	42.9	43.5	49.2
5/16/1995-(1353-1355)	15.3	28.0	50.0	52.0	43.3	51.6	50.4	42.3	43.4	48.5
6/20/1995-(0853-0853)	14.6	25.4								
6/20/1995-(1254-1254)	13.8	25.6								
6/20/1995-(1528-1528)	14.5	24.9								
10/15/1996-(1036-1036)	13.8	25.6	51.3		48.5					46.2
10/15/1996-(1439-1439)	14.7	24.9	51.4		48.2					46.2
12/10/1996-(0907-0912)	11.7	18.1	37.2	41.1				37.7	37.2	37.8
4/16/1997-(0828-0828)	15.4	21.5	39.3	41.0			38.9	38.7	39.0	41.5
4/16/1997-(1231-1231)	16.2	21.5	39.4	41.5			39.0	38.5	39.2	43.2
5/31/1997-(1221-1221)	13.7	28.0	51.2		46.6					
6/20/1997-(0826-0826)	15.8	27.8	51.4		46.5					45.9
6/20/1997-(1230-1230)	15.8	28.1	51.3		46.6					46.2
7/17/1997-(0824-0824)	16.9	31.7			46.6					
8/18/1997-(0858-0858)	15.8	28.4			48.1					
9/15/1997-(1006-1006)	13.0	25.8	51.4		46.6					
9/15/1997-(1410-1410)	13.8	25.6	51.4		47.2					

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5I

VOLUMETRIC MOISTURE CONTENT AS FUNCTION OF TIME

MAY 2023

LIST OF FIGURES

Figure 5I.1 Time (Date) vs Volumetric Moisture Content (VMC) for Section AL 01-0101 Where Probe 2 is the First in the Subgrade.....	1
Figure 5I.2 Time (Date) vs Volumetric Moisture Content (VMC) for Section AL 01-0102 Where Probe 2 is the First in the Subgrade.....	2
Figure 5I.3 Time (Date) vs Volumetric Moisture Content (VMC) for Section CO 08-1053 Where Probe 6 is the First in the Subgrade.....	3
Figure 5I.4 Time (Date) vs Volumetric Moisture Content (VMC) for Section MT 30-8129 Where Probe 4 is the First in the Subgrade.....	4
Figure 5I.5 Time (Date) vs Volumetric Moisture Content (VMC) for Section NE 31-0114 Where Probe 6 or 7 is the First in the Subgrade	5
Figure 5I.6 Time (Date) vs Volumetric Moisture Content (VMC) for Section SD 46-0804 Where Probe 2 or 3 is the First in the Subgrade	6
Figure 5I.7 Time (Date) vs Volumetric Moisture Content (VMC) for Section SD 46-9187 Where Probe 2 or 3 is the First in the Subgrade	7
Figure 5I.8 Time (Date) vs Volumetric Moisture Content (VMC) for Section TX 48-1068 Where Probe 3 is the First in the Subgrade.....	8
Figure 5I.9 Time (Date) vs Volumetric Moisture Content (VMC) for Section KS 20-4054 Where Probe 2 is the First in the Subgrade.....	9
Figure 5I.10 Time (Date) vs Volumetric Moisture Content (VMC) for Section MN 27-4040 Where Probe 2 is the First in the Subgrade.....	10
Figure 5I.11 Time (Date) vs Volumetric Moisture Content (VMC) for Section TX 48-4143 Where Probe 3 is the First in the Subgrade.....	11
Figure 5I.12 Time (Date) vs Volumetric Moisture Content (VMC) for Section NC 37-0201 Where Probe 4 is the First in the Subgrade.....	12
Figure 5I.13 Time (Date) vs Volumetric Moisture Content (VMC) for Section OH 39-0204 Where Probe 5 is the First in the Subgrade.....	13
Figure 5I.14 Time (Date) vs Volumetric Moisture Content (VMC) for Section IN 18-3002 Where Probe 2 is the First in the Subgrade.....	14
Figure 5I.15 Time (Date) vs Volumetric Moisture Content (VMC) for Section MB 83-3802 Where Probe 3 is the First in the Subgrade.....	15

I-15

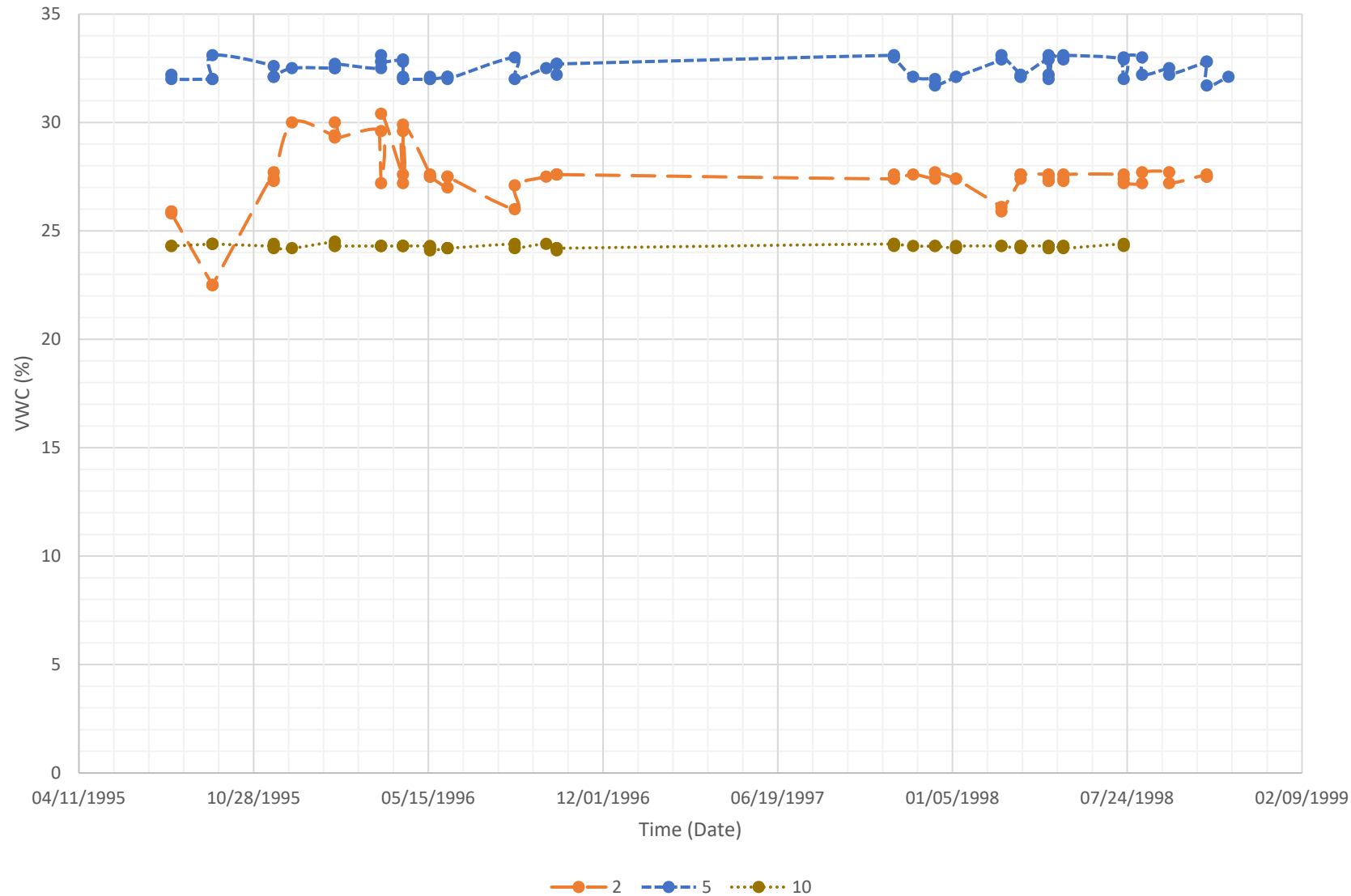
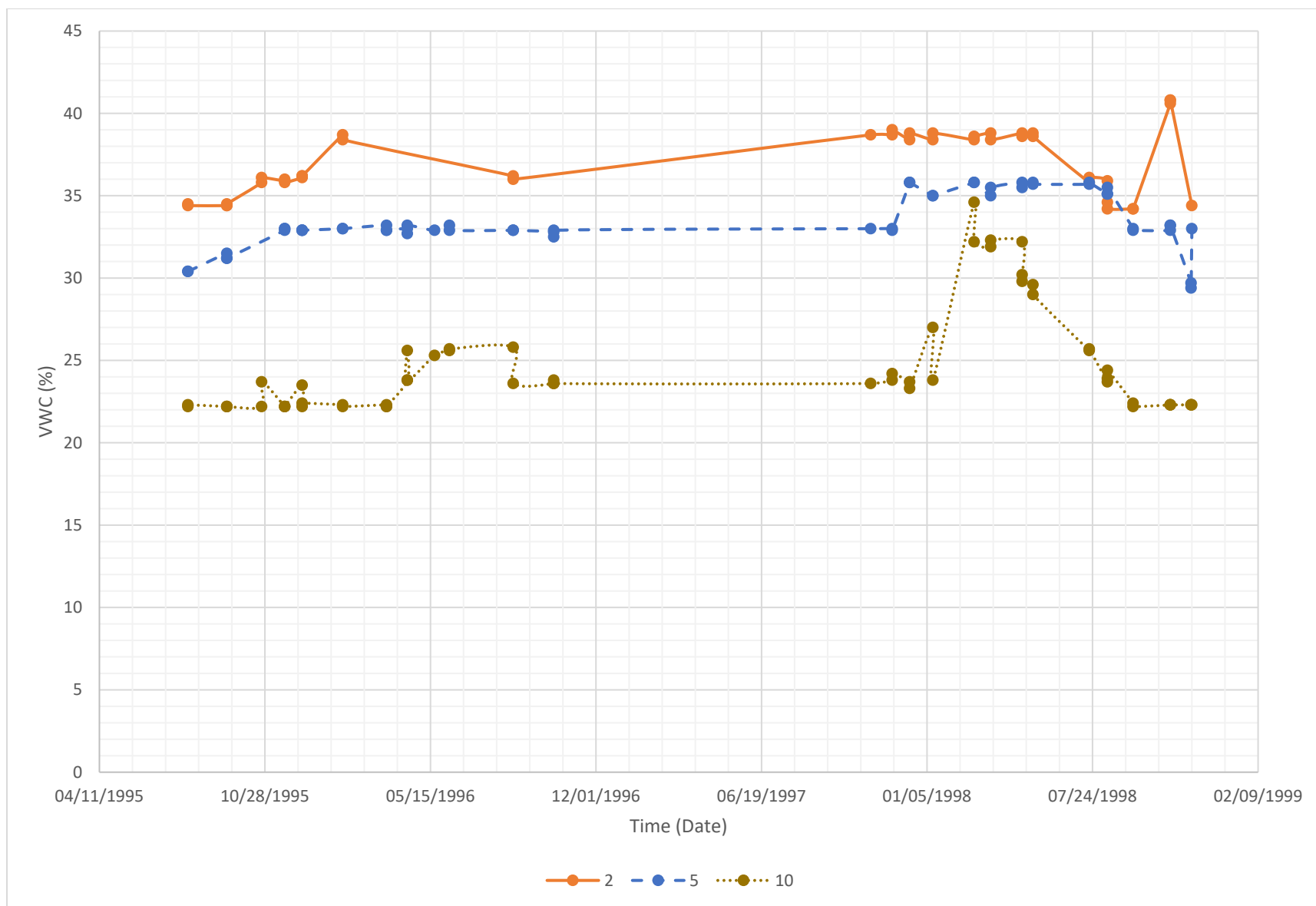


Figure 5L.1 Time (Date) vs Volumetric Moisture Content (VMC) for Section AL 01-0101 Where Probe 2 is the First in the Subgrade



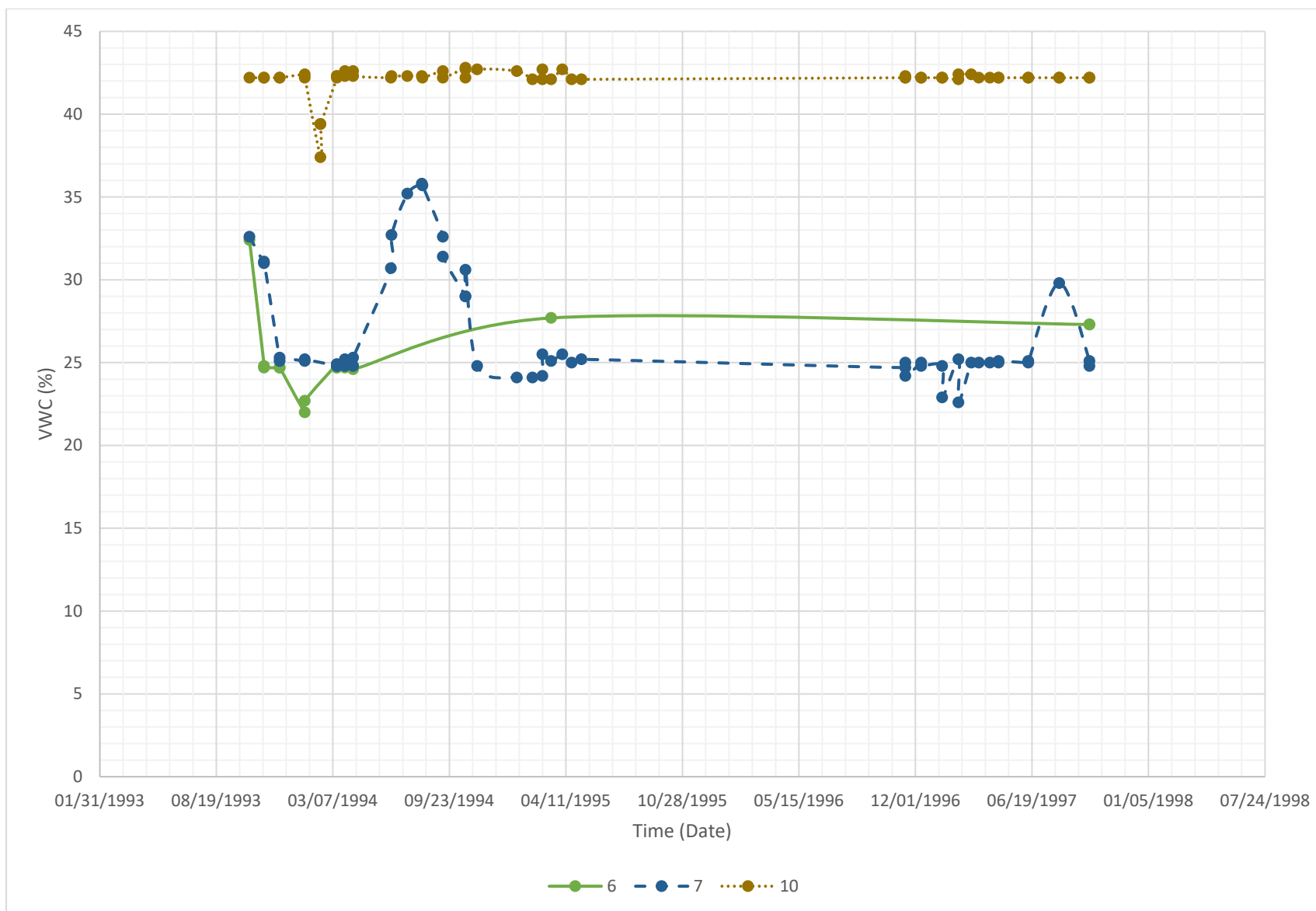


Figure 5I.3 Time (Date) vs Volumetric Moisture Content (VMC) for Section CO 08-1053 Where Probe 6 is the First in the Subgrade

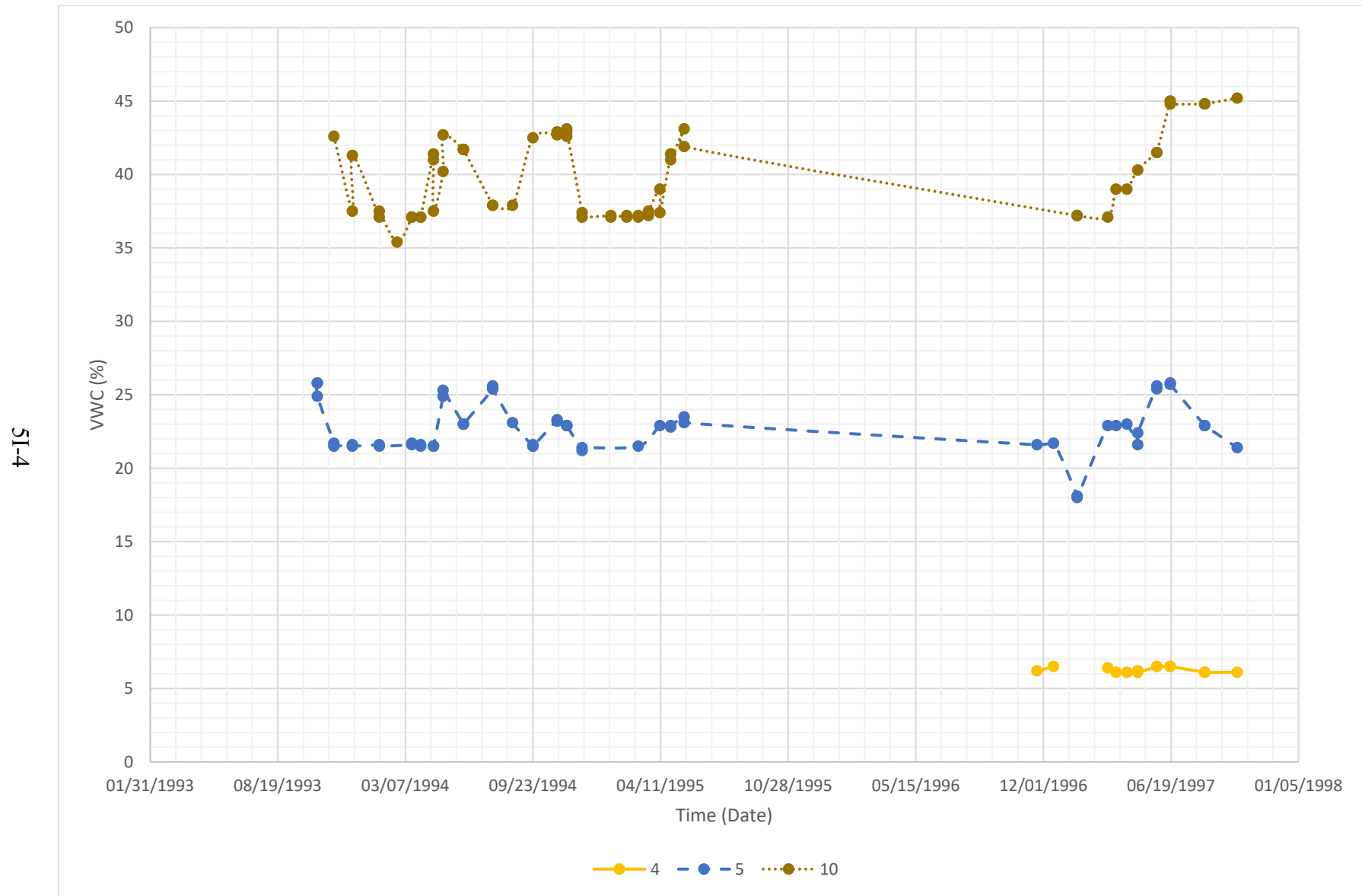


Figure 5I.4 Time (Date) vs Volumetric Moisture Content (VMC) for Section MT 30-8129 Where Probe 4 is the First in the Subgrade

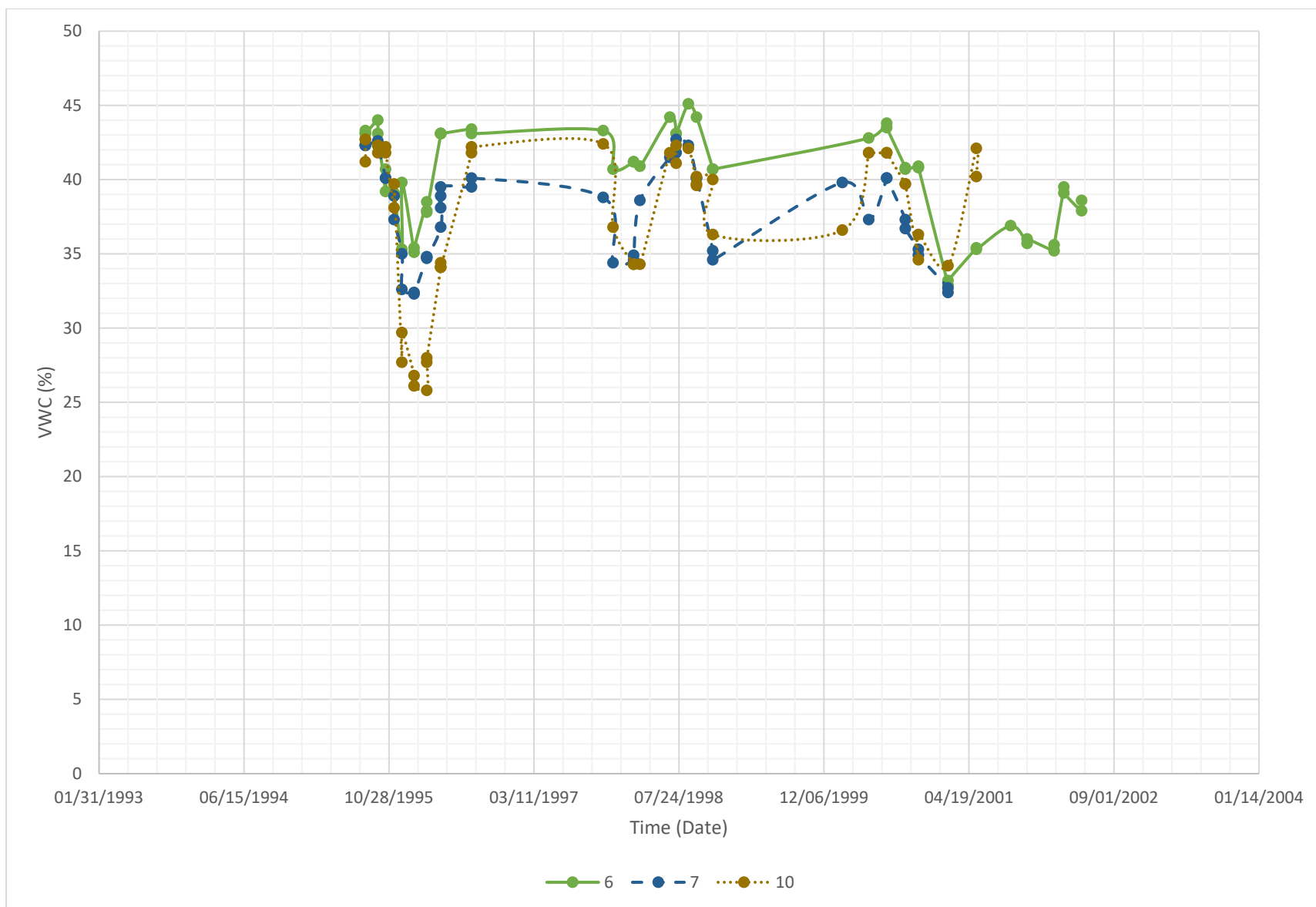


Figure 51.5 Time (Date) vs Volumetric Moisture Content (VMC) for Section NE 31-0114 Where Probe 6 or 7 is the First in the Subgrade

9-15

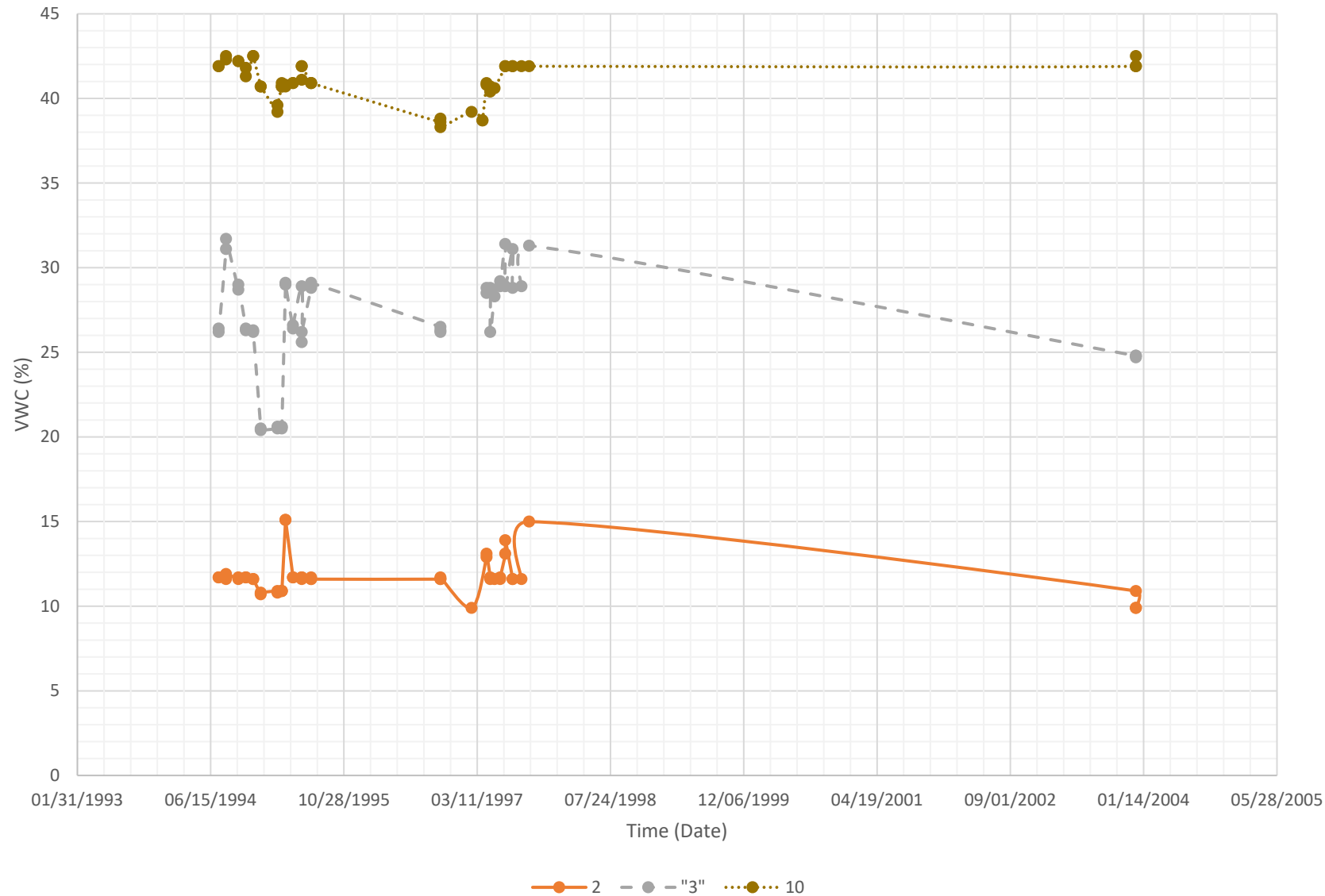


Figure 5L.6 Time (Date) vs Volumetric Moisture Content (VMC) for Section SD 46-0804 Where Probe 2 or 3 is the First in the Subgrade

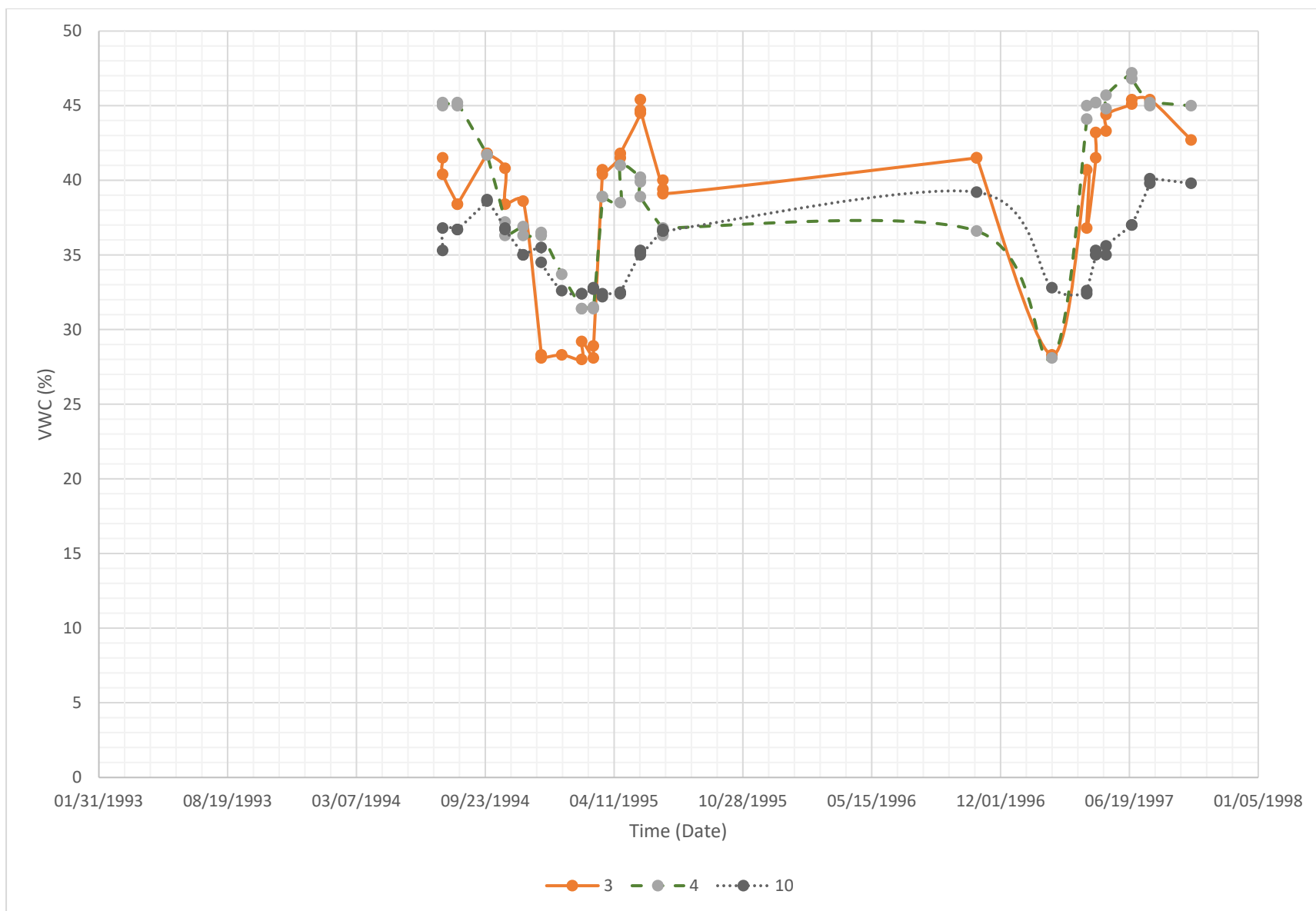


Figure 51.7 Time (Date) vs Volumetric Moisture Content (VMC) for Section SD 46-9187 Where Probe 2 or 3 is the First in the Subgrade

8-15

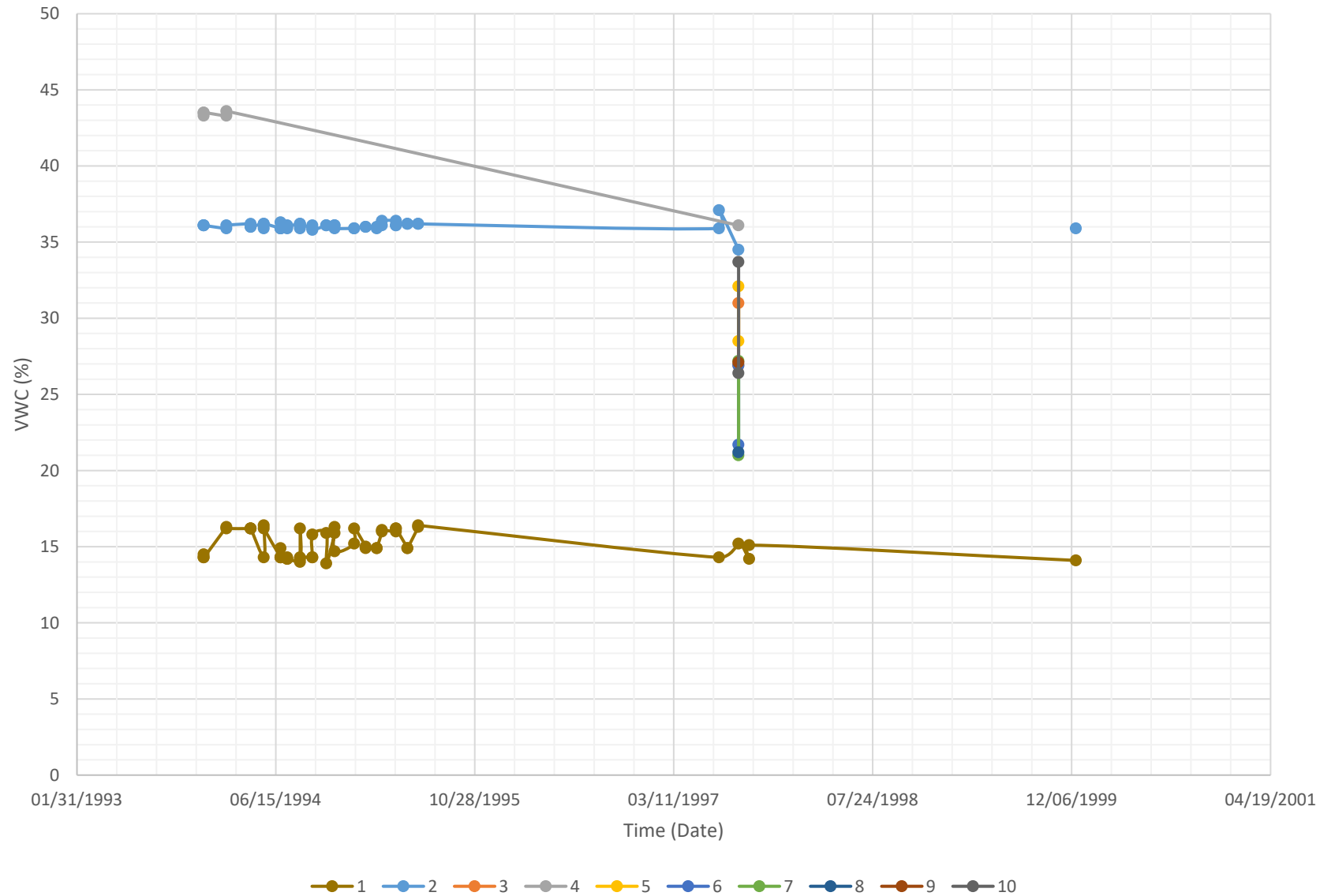


Figure 5I.8 Time (Date) vs Volumetric Moisture Content (VMC) for Section TX 48-1068 Where Probe 3 is the First in the Subgrade

6-15

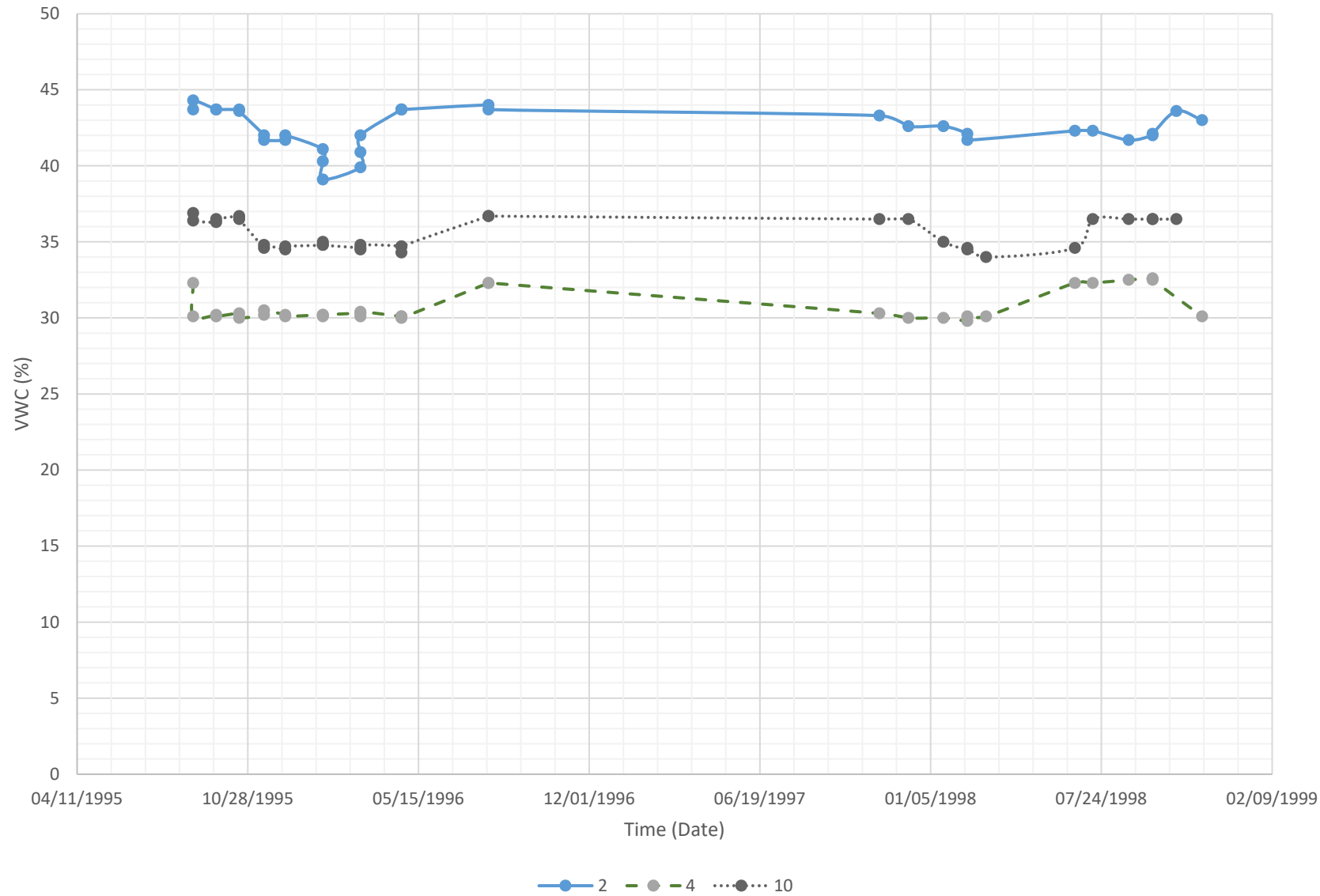


Figure 5L.9 Time (Date) vs Volumetric Moisture Content (VMC) for Section KS 20-4054 Where Probe 2 is the First in the Subgrade

51-10

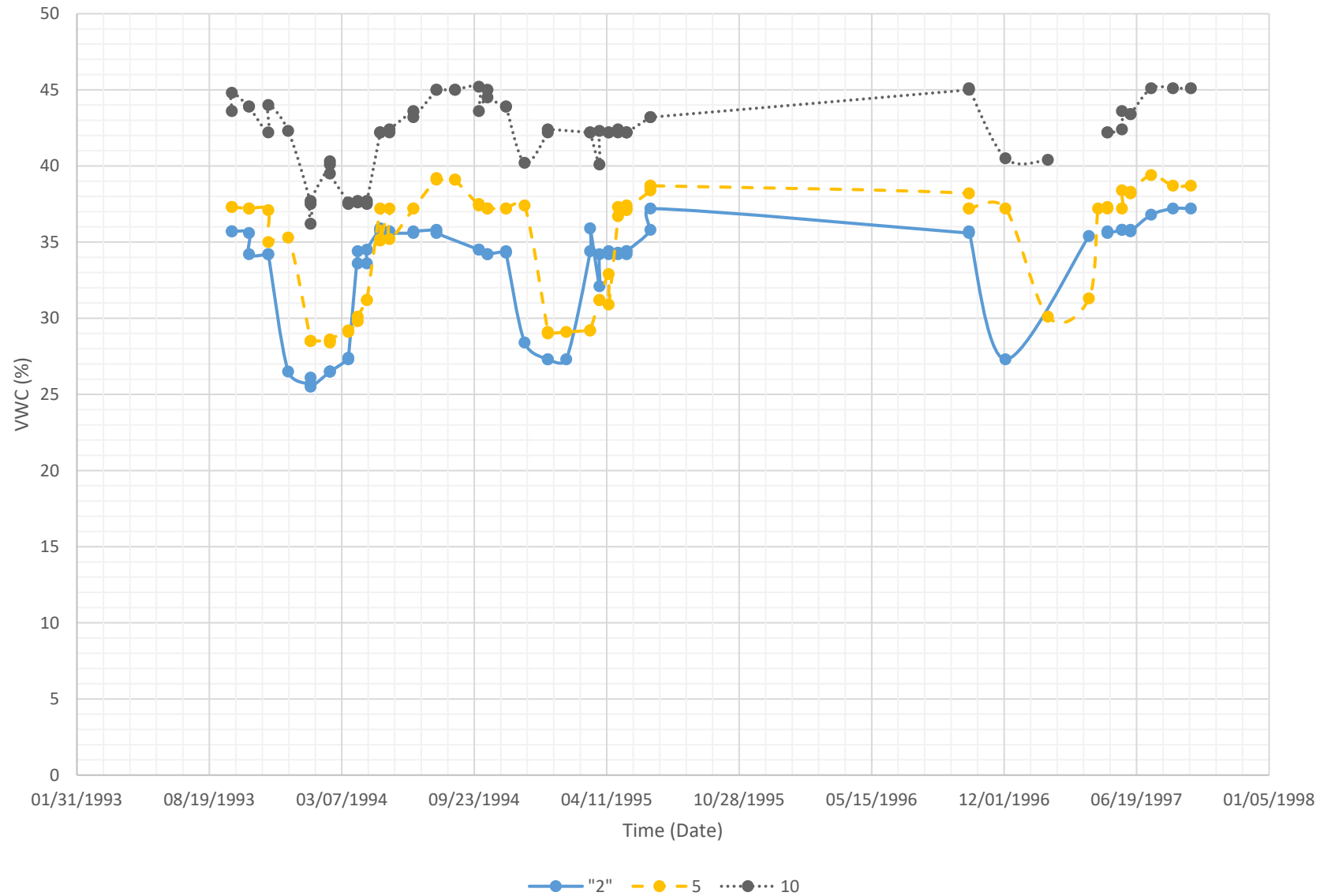


Figure 51.10 Time (Date) vs Volumetric Moisture Content (VMC) for Section MN 27-4040 Where Probe 2 is the First in the Subgrade

5I-11

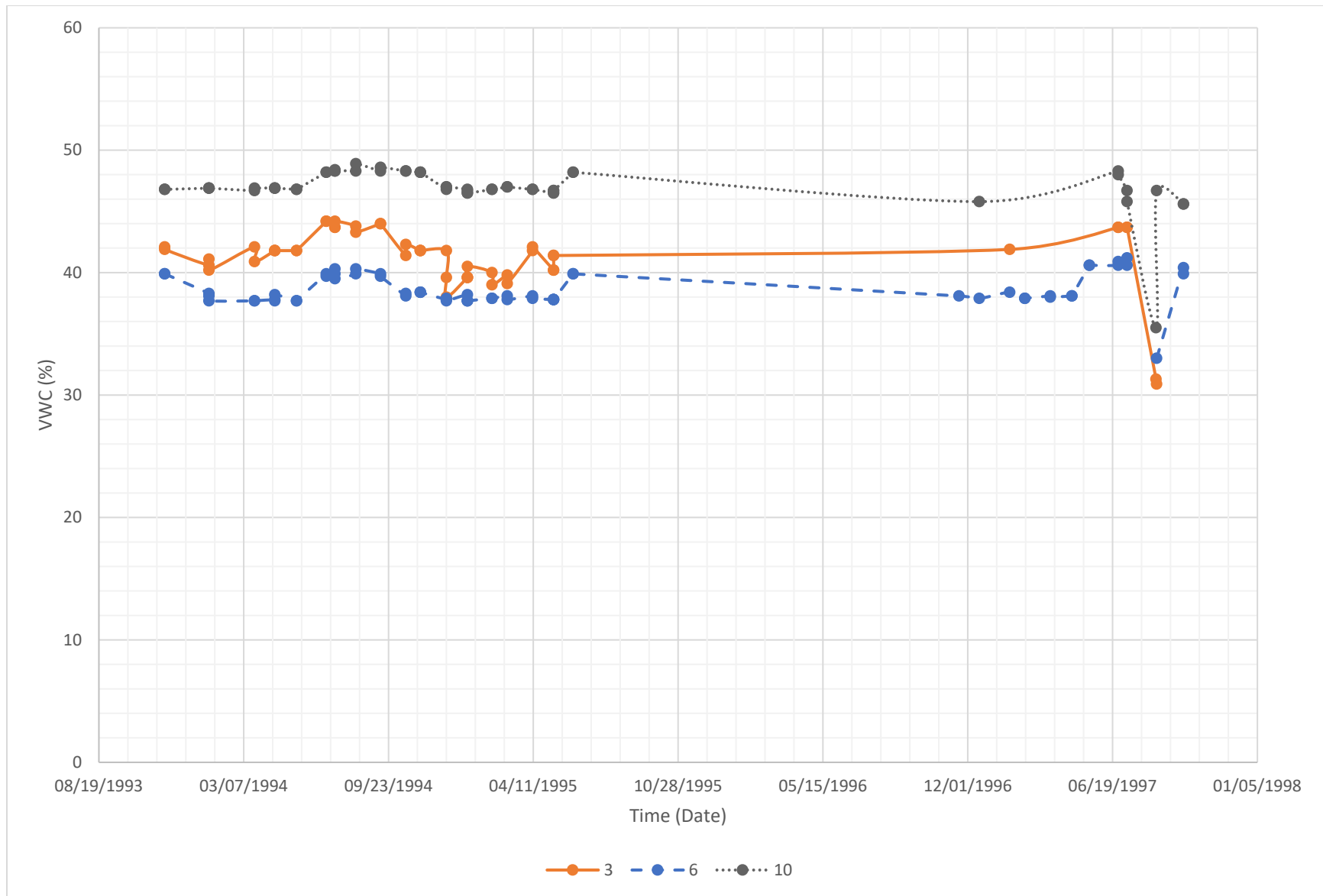


Figure 5I.11 Time (Date) vs Volumetric Moisture Content (VMC) for Section TX 48-4143 Where Probe 3 is the First in the Subgrade

5I-12

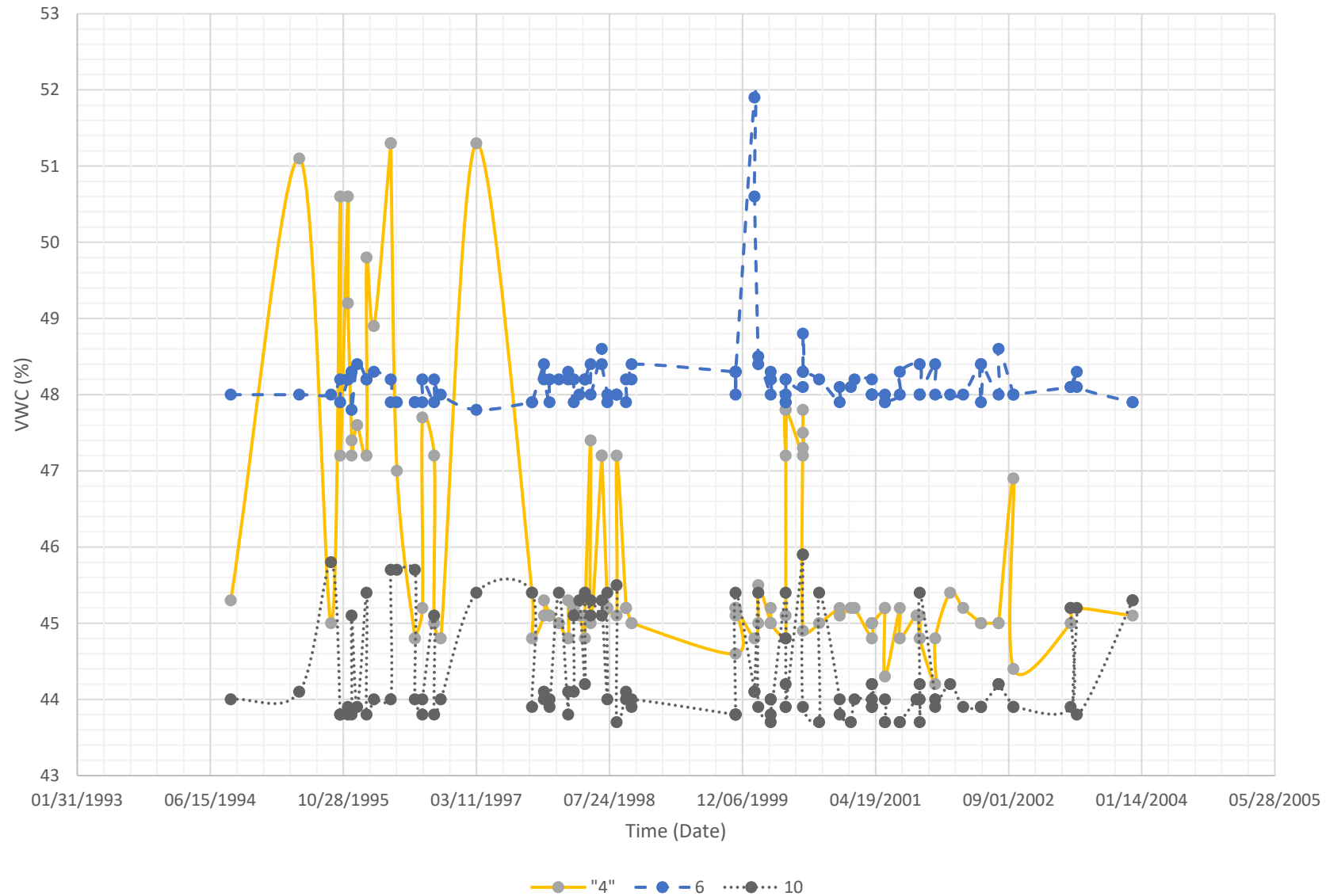


Figure 5I.12 Time (Date) vs Volumetric Moisture Content (VMC) for Section NC 37-0201 Where Probe 4 is the First in the Subgrade

5I-13

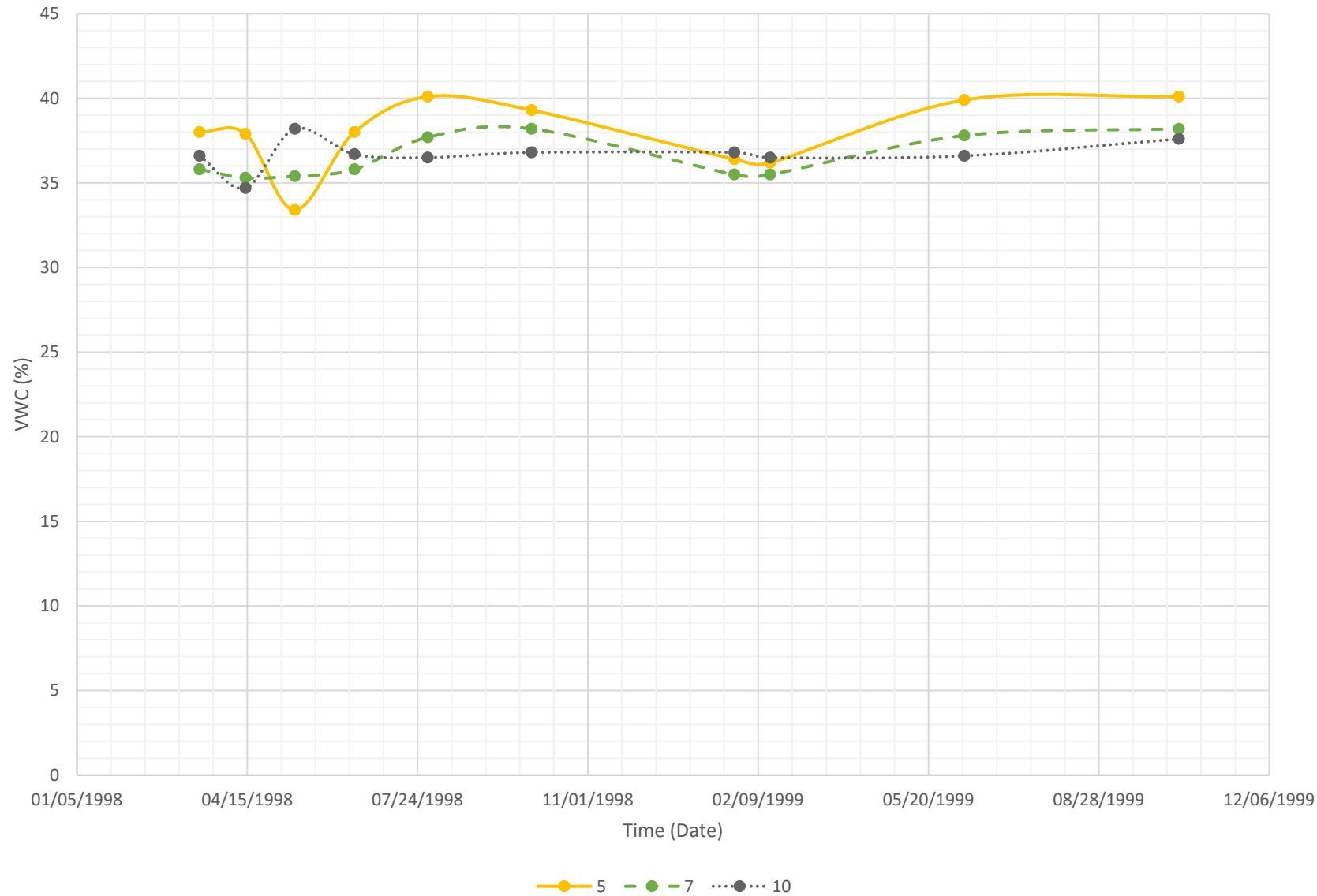


Figure 5I.13 Time (Date) vs Volumetric Moisture Content (VMC) for Section OH 39-0204 Where Probe 5 is the First in the Subgrade

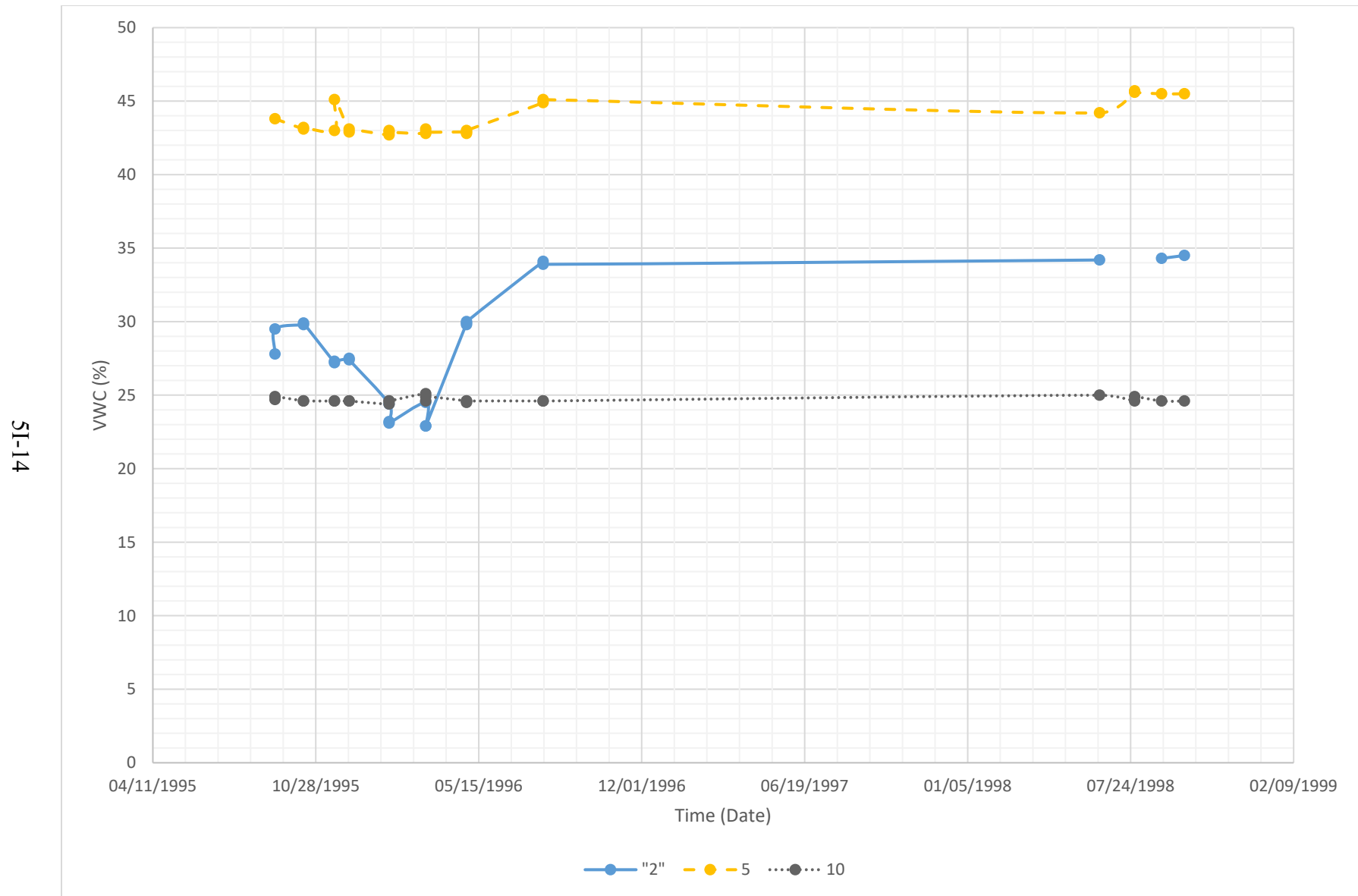


Figure 5I.14 Time (Date) vs Volumetric Moisture Content (VMC) for Section IN 18-3002 Where Probe 2 is the First in the Subgrade

5I-15

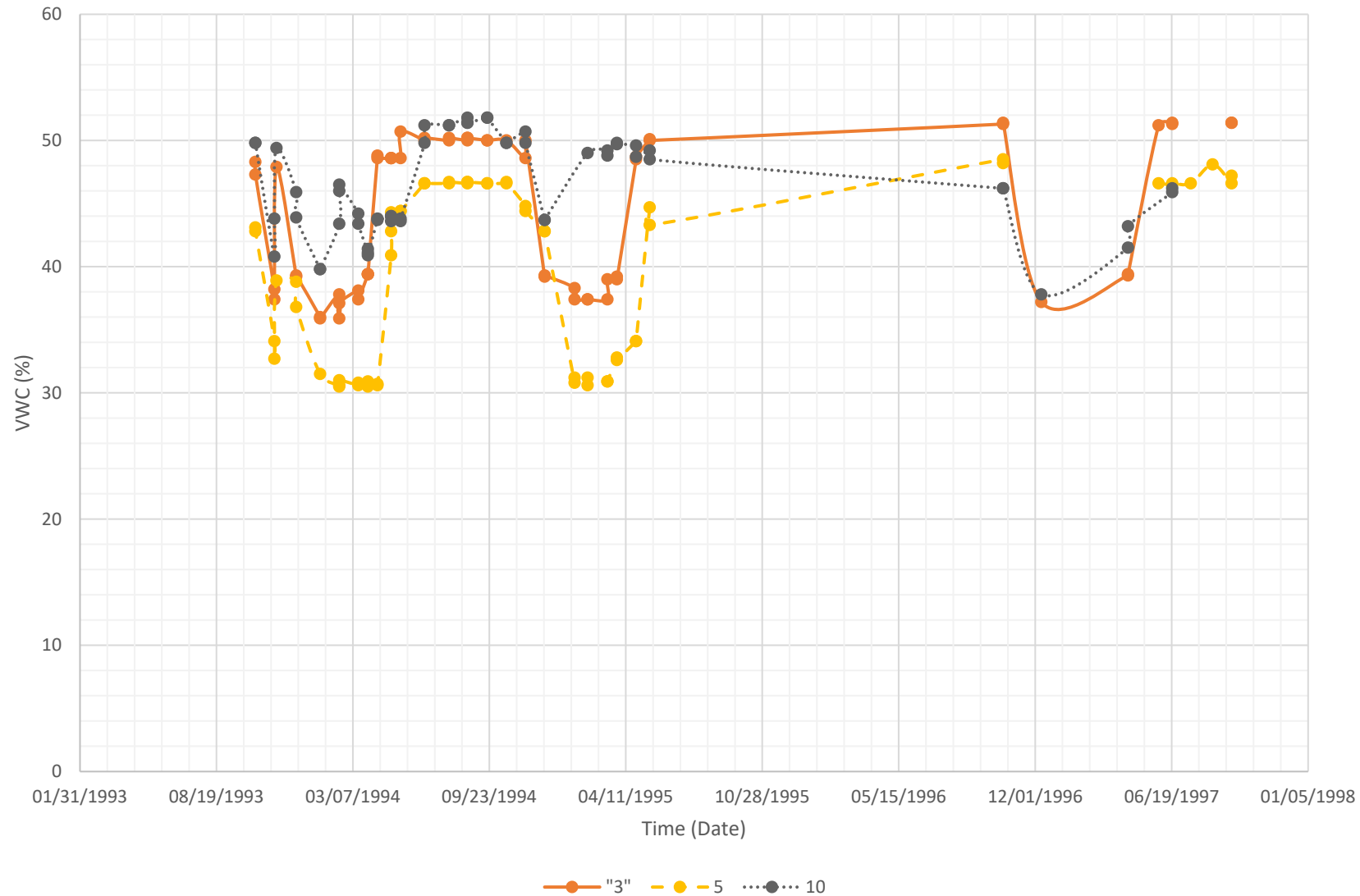


Figure 5I.15 Time (Date) vs Volumetric Moisture Content (VMC) for Section MB 83-3802 Where Probe 3 is the First in the Subgrade

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5J

MEASURED GROUNDWATER TABLE DEPTH

MAY 2023

LIST OF TABLES

Table 5J.1 Available Measured Groundwater Table (GWT) Depths for SMP Sections	1
---	---

Table 5J.1 Available Measured Groundwater Table (GWT) Depths for SMP Sections

AL 01-0102			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
10/29/1997	1100	3.5	11.4
12/15/1997	1100	3.3	10.9
12/15/1997	1400	3.3	10.9
CO 08-1053			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
10/15/1993	1253	2.5	8.3
10/15/1993	1358	2.6	8.4
11/09/1993	0851	2.9	9.6
11/09/1993	1430	2.9	9.5
12/06/1993	1200	3.0	9.7
01/18/1994	1215	3.1	10.0
02/14/1994	1030	3.1	10.3
02/14/1994	1315	3.1	10.3
03/14/1994	1313	2.8	9.3
03/14/1994	1619	2.8	9.3
03/28/1994	1200	2.8	9.1
03/28/1994	1310	2.7	9.0
04/11/1994	1500	2.7	8.8
05/02/1994	1410	2.4	8.0
06/15/1994	1356	2.5	8.0
07/13/1994	1230	2.4	8.0
08/08/1994	1232	2.2	7.3
08/08/1994	1504	2.2	7.3
09/12/1994	1430	2.5	8.3
10/21/1994	1200	2.9	9.6
10/21/1994	1400	2.9	9.6
12/02/1994	1545	1.6	5.3
01/17/1995	1532	2.9	9.6
03/02/1995	1500	2.9	9.6
03/17/1995	1455	2.9	9.6
04/05/1995	1055	2.8	9.1
04/21/1995	1015	2.4	8.0
05/08/1995	0957	2.4	7.7
09/23/1996	1150	2.3	7.6
11/14/1996	0948	2.3	7.6
12/11/1996	1150	2.2	7.3
01/16/1997	0828	2.4	7.9
02/13/1997	0845	2.3	7.6
03/07/1997	0830	2.4	8.0

04/08/1997	1346	2.4	8.0
04/23/1997	0825	1.8	6.0
04/23/1997	0950	1.8	6.0
05/21/1997	0830	1.7	5.7
06/13/1997	0845	1.4	4.5
08/05/1997	0840	1.6	5.2
08/05/1997	1145	1.6	5.2
09/26/1997	0815	1.9	6.3
09/26/1997	1310	1.9	6.3
MT 30-8129			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
05/28/1997	0930	3.1	10.3
06/18/1997	1214	2.4	7.8
06/18/1997	1400	2.4	7.8
08/11/1997	0930	3.0	9.8
08/11/1997	1410	3.0	9.8
NE 31-0114			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
08/08/1996	0855	4.1	13.4
08/08/1996	1430	4.1	13.3
11/18/1998	0920	3.8	12.4
11/02/1999	1340	4.2	13.8
SD 46-9187			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
04/21/1995	0800	4.0	13.1
04/21/1995	1300	4.0	13.2
04/14/1997	0830	3.5	11.5
04/14/1997	1230	3.5	11.5
04/28/1997	1030	3.4	11.0
04/28/1997	1430	3.4	11.0
05/14/1997	0830	3.6	11.7
05/14/1997	1400	3.6	11.7
06/23/1997	0830	4.2	13.6
06/23/1997	1430	4.2	13.6
TX 48-1068			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
11/02/1993	0700	NA	
12/16/1993	0900	4.3	14.2
01/12/1994	0750	4.3	14.2
02/11/1994	0850	4.1	13.4
02/11/1994	1230	4.1	13.4
03/03/1994	1010	4.0	13.3
03/03/1994	1445	4.0	13.3

05/16/1994	0735	4.2	13.7
05/16/1994	1425	4.1	13.6
06/27/1994	0735	4.1	13.3
06/27/1994	1820	4.1	13.4
08/15/1994	0700	4.1	13.5
08/15/1994	1720	4.1	13.5
09/15/1994	0810	4.1	13.5
09/15/1994	1515	4.1	13.5
11/10/1994	0800	4.1	13.5
12/29/1994	0855	4.2	13.6
01/27/1995	1315	4.2	13.6
01/27/1995	0835	4.2	13.6
02/24/1995	0900	4.1	13.4
02/24/1995	1025	4.1	13.4
03/09/1995	0725	4.1	13.4
04/13/1995	0715	4.1	13.4
04/13/1995	1320	4.1	13.4
05/12/1995	0705	4.1	13.4
06/08/1995	0700	4.0	13.2
06/08/1995	1110	4.0	13.2
11/13/1996	1530	3.4	11.0
04/21/1997	1115	0.3	1.0
04/21/1997	1400	0.3	1.0
05/15/1997	1000	3.7	12.0
05/15/1997	1230	3.7	12.0
06/12/1997	1100	1.9	6.2
06/12/1997	1400	1.9	6.2
07/03/1997	0845	2.9	9.5
07/03/1997	1140	3.0	9.7
KS 20-4054			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
03/08/1996	0835	3.9	12.7
03/08/1996	1336	3.8	12.6
04/25/1996	0800	3.6	11.7
04/25/1996	1310	3.6	11.7
08/05/1996	0937	3.6	11.7
08/05/1996	1445	3.5	11.6
11/06/1997	1130	3.5	11.6
12/10/1997	1035	3.5	11.4
01/20/1998	1015	3.4	11.1
02/17/1998	0900	3.3	10.8
06/23/1998	0930	3.6	11.8
08/25/1998	0900	3.5	11.5

09/22/1998	1000	3.6	11.7
10/20/1998	1145	3.6	11.7
11/19/1998	1030	3.6	11.7
MN 27-4040			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
09/22/1993	0803	3.0	9.9
10/18/1993	1200	1.3	4.3
11/16/1993	0913	1.2	4.0
11/16/1993	1442	1.2	3.9
12/16/1993	0830	1.3	4.1
12/16/1993	1045	1.2	4.0
05/18/1994	0730	1.2	4.0
05/18/1994	1200	1.2	3.8
06/23/1994	0730	1.1	3.5
06/23/1994	1100	1.0	3.4
07/28/1994	0700	1.2	3.9
07/28/1994	1000	1.2	3.9
08/25/1994	0852	1.6	5.3
08/25/1994	1408	1.6	5.3
09/30/1994	0800	1.5	4.8
09/30/1994	1300	1.4	4.7
10/13/1994	0800	1.5	4.9
10/13/1994	1505	1.5	4.9
11/10/1994	0900	1.8	5.8
11/10/1994	1240	1.8	5.8
01/12/1995	0820	1.9	6.2
01/12/1995	1330	1.9	6.2
05/11/1995	0800	1.2	3.9
05/11/1995	1245	1.2	3.9
06/16/1995	0915	1.3	4.4
06/16/1995	1355	1.3	4.3
11/07/1996	1000	1.2	3.9
11/07/1996	1500	1.2	3.9
10/09/1996	1055	1.3	4.1
10/09/1996	1350	1.3	4.1
05/06/1997	0900	1.2	4.0
05/06/1997	1400	1.2	4.1
05/28/1997	0800	1.9	6.3
06/10/1997	0930	1.5	5.0
06/10/1997	1500	1.5	5.0
08/13/1997	0900	1.3	4.3
09/09/1997	0905	1.5	5.1
TX 48-4143			

SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
01/18/1994	1550	0.7	2.4
01/18/1994	0735	0.9	3.1
02/15/1994	0845	0.7	2.4
02/15/1994	1015	0.7	2.4
03/22/1994	0905	0.9	2.9
03/22/1994	1300	0.9	3.0
04/19/1994	0740	1.0	3.2
04/19/1994	1002	1.0	3.4
05/19/1994	0845	0.7	2.4
05/19/1994	1530	0.8	2.7
06/29/1994	0920	0.9	2.9
07/11/1994	0700	0.6	2.1
08/09/1994	0955	0.7	2.2
09/12/1994	0815	0.8	2.6
09/12/1994	1040	0.8	2.6
11/07/1994	0820	1.3	4.1
12/12/1994	0850	0.9	3.1
12/12/1994	1440	0.8	2.6
01/10/1995	1045	0.8	2.6
02/13/1995	0755	0.8	2.6
02/13/1995	1040	0.8	2.6
03/06/1995	0855	0.8	2.6
04/10/1995	1015	0.8	2.7
05/09/1995	0745	0.9	2.8
05/09/1995	1435	0.9	2.8
06/05/1995	0720	1.2	3.9
06/05/1995	1100	1.2	3.9
11/19/1996	0945	2.9	9.4
12/17/1996	1200	0.6	2.0
01/28/1997	1055	0.7	2.2
02/18/1997	0945	0.8	2.7
03/25/1997	1015	0.9	3.0
03/25/1997	1445	0.9	2.9
04/24/1997	1035	0.7	2.2
04/24/1997	1410	0.6	2.1
05/18/1997	1045	2.4	7.9
05/18/1997	1415	2.4	8.0
06/27/1997	1145	1.5	4.9
06/27/1997	1505	1.5	4.9
07/09/1997	0930	1.6	5.2
07/09/1997	1100	1.6	5.2
09/25/1997	1015	2.2	7.3

09/25/1997	1400	2.2	7.3
OH 39-0204			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
05/13/1998	0830	2.4	7.7
05/13/1998	1550	2.4	7.7
06/17/1998	1440	2.2	7.3
07/30/1998	0920	2.1	6.9
09/29/1998	1140	2.3	7.7
10/27/1998	1415	2.3	7.5
11/23/1998	0830	2.1	7.0
11/23/1998	1230	2.1	7.0
01/26/1999	1030	2.7	8.7
02/16/1999	1200	2.4	7.9
03/23/1999	1415	2.2	7.2
04/13/1999	1240	2.5	8.2
05/18/1999	1100	2.3	7.6
05/18/1999	1430	2.3	7.6
IN 18-3002			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
03/11/1996	0820	1.8	5.7
03/11/1996	1300	1.8	5.7
04/30/1996	0755	1.2	4.0
04/30/1996	1305	1.3	4.1
08/02/1996	1000	1.7	5.6
08/02/1996	1230	1.7	5.6
07/29/1998	1000	1.7	5.7
09/28/1998	1000	2.6	8.6
MB 83-3802			
SMP_DATE	PIEZO_TIME	WATERTAB_DEPTH (m)	WATERTAB_DEPTH (ft)
11/15/1993	0920	3.3	10.9
11/15/1993	1305	3.3	10.9
12/14/1993	0800	2.1	7.0
12/14/1993	1300	2.1	7.0
02/15/1994	0920	2.7	8.8
02/15/1994	1345	2.7	8.8
03/15/1994	0800	3.1	10.3
03/15/1994	1350	3.1	10.3
03/29/1994	0830	3.0	9.7
03/29/1994	1447	3.0	9.7
04/12/1994	0730	2.8	9.3
04/12/1994	1330	2.8	9.3
06/20/1994	1010	2.2	7.2
06/20/1994	1330	2.1	7.0

07/26/1994	0730	1.4	4.5
07/26/1994	1030	1.4	4.5
08/22/1994	0800	1.1	3.5
08/22/1994	1500	1.1	3.5
09/20/1994	0800	1.2	3.8
09/20/1994	1420	1.2	3.8
10/18/1994	0820	1.2	3.9
10/18/1994	1430	1.2	3.9
11/15/1994	1005	1.5	5.0
11/15/1994	1300	1.5	5.0
12/13/1994	0840	1.8	5.9
12/13/1994	1530	1.8	5.9
01/26/1995	1000	2.1	7.0
02/14/1995	0930	2.9	9.6
02/14/1995	1245	2.9	9.6
03/15/1995	0915	2.8	9.2
03/15/1995	1350	2.8	9.2
06/20/1995	0900	2.2	7.1
06/20/1995	1355	2.1	7.0
08/14/1995	0940	1.8	5.9
09/06/1995	1405	1.5	5.0
10/11/1995	0800	1.5	5.0
11/15/1995	1430	1.3	4.4
11/22/1995	1400	1.8	5.8
12/14/1995	1530	1.9	6.3
02/08/1996	1555	2.4	7.8
03/13/1996	1600	2.7	8.8
04/12/1996	0930	2.8	9.2
04/18/1996	0945	2.7	8.9
07/04/1996	0915	1.8	5.8
08/08/1996	1600	1.5	5.0
09/10/1996	1715	1.3	4.4
10/15/1996	1040	1.5	4.9
10/15/1996	1600	1.5	4.9
12/10/1996	1030	1.6	5.4
04/16/1997	1230	2.7	8.8
05/31/1997	0800	0.2	0.6
06/20/1997	0920	0.8	2.6
07/17/1997	1130	0.2	0.7
08/18/1997	900	0.9	3.0
09/15/1997	1030	2.6	8.6
05/05/1998	1635	2.6	8.6
06/11/1998	1200	0.2	0.7

06/29/1998	1535	0.01	0.03
08/12/1998	1815	2.6	8.6
10/06/1998	1315	2.3	7.7
11/06/1998	1600	2.4	8.0

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5K

TDR PROBES AND GROUNDWATER TABLE DEPTHS AS A FUNCTION OF TIME DATA

MAY 2023

LIST OF FIGURES

Figure 5K.1 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section AL 01-0102.....	1
Figure 5K.2 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section CO 08-1053.....	2
Figure 5K.3 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MT 30-8129	3
Figure 5K.4 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section NE 31-0114.....	4
Figure 5K.5 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section SD 46-9187	5
Figure 5K.6 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section TX 48-1068.....	6
Figure 5K.7 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section KS 20-4054	7
Figure 5K.8 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MN 27-4040.....	8
Figure 5K.9 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section TX 48-4143	9
Figure 5K.10 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section OH 39-0204	10
Figure 5K.11 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section IN 18-3002.....	11
Figure 5K.12 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MB 83-3802.....	12

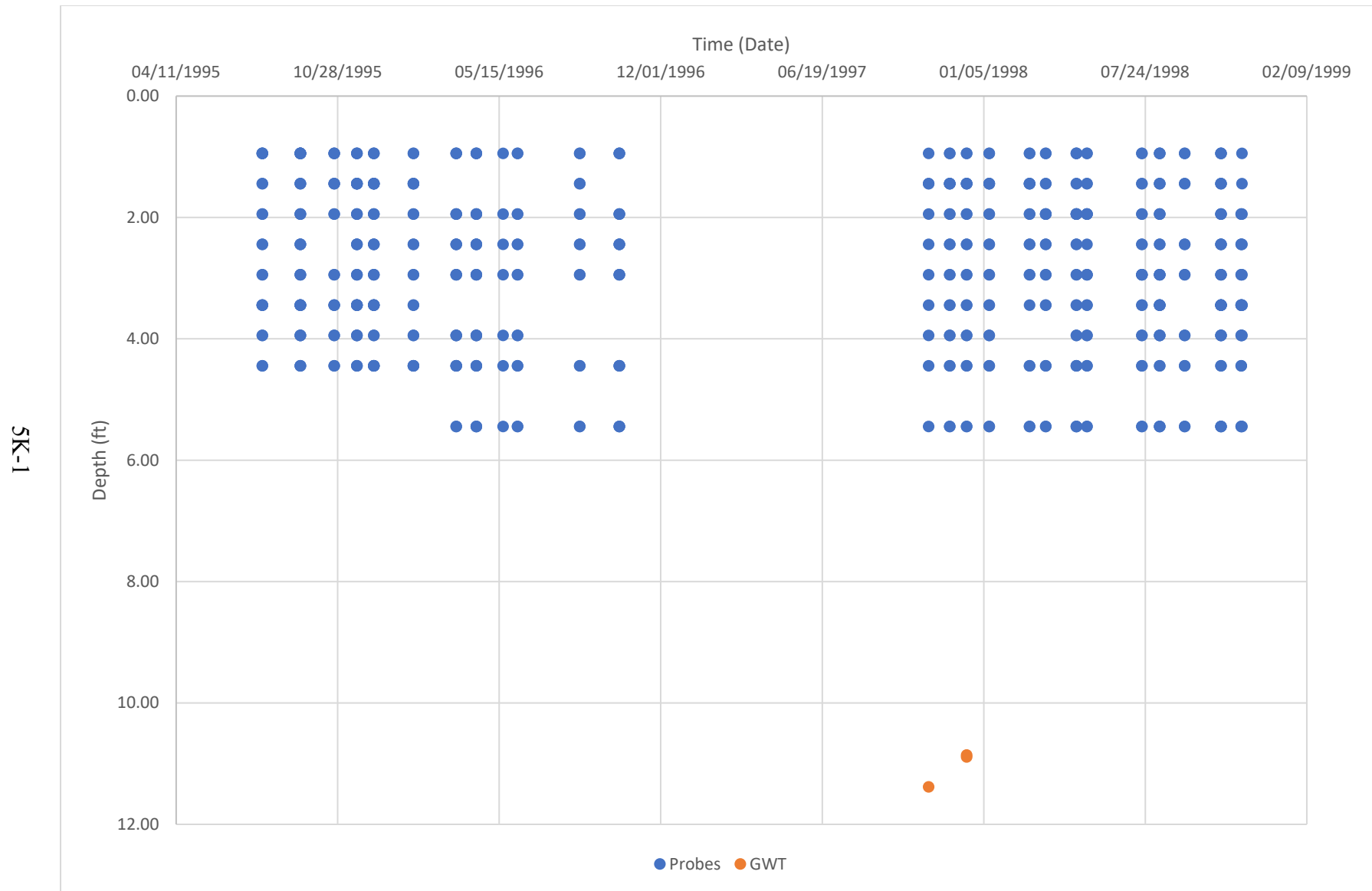


Figure 5K.1 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section AL 01-0102

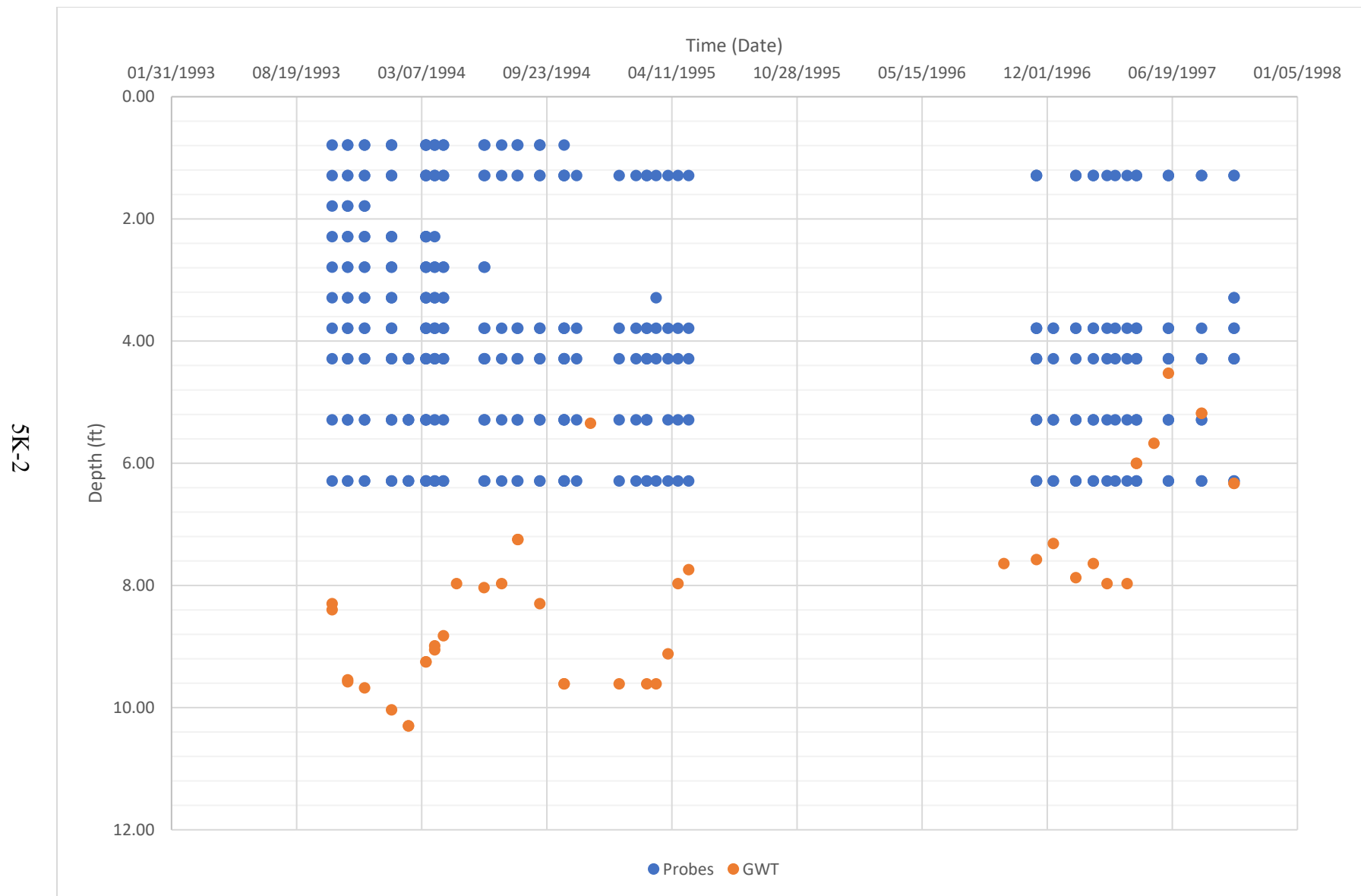


Figure 5K.2 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section CO 08-1053

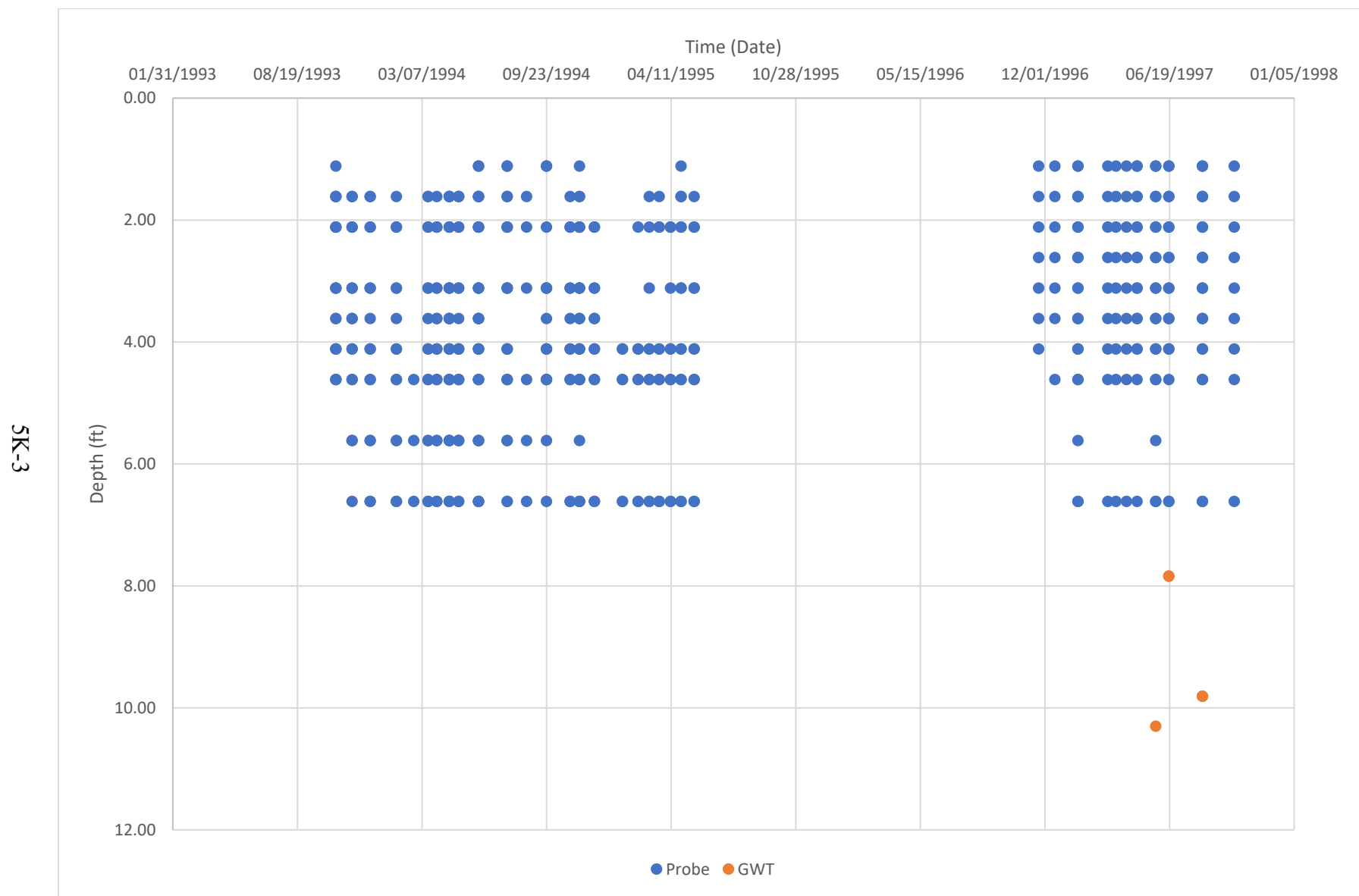


Figure 5K.3 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MT 30-8129

5K-4



Figure 5K.4 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section NE 31-0114

5K-5

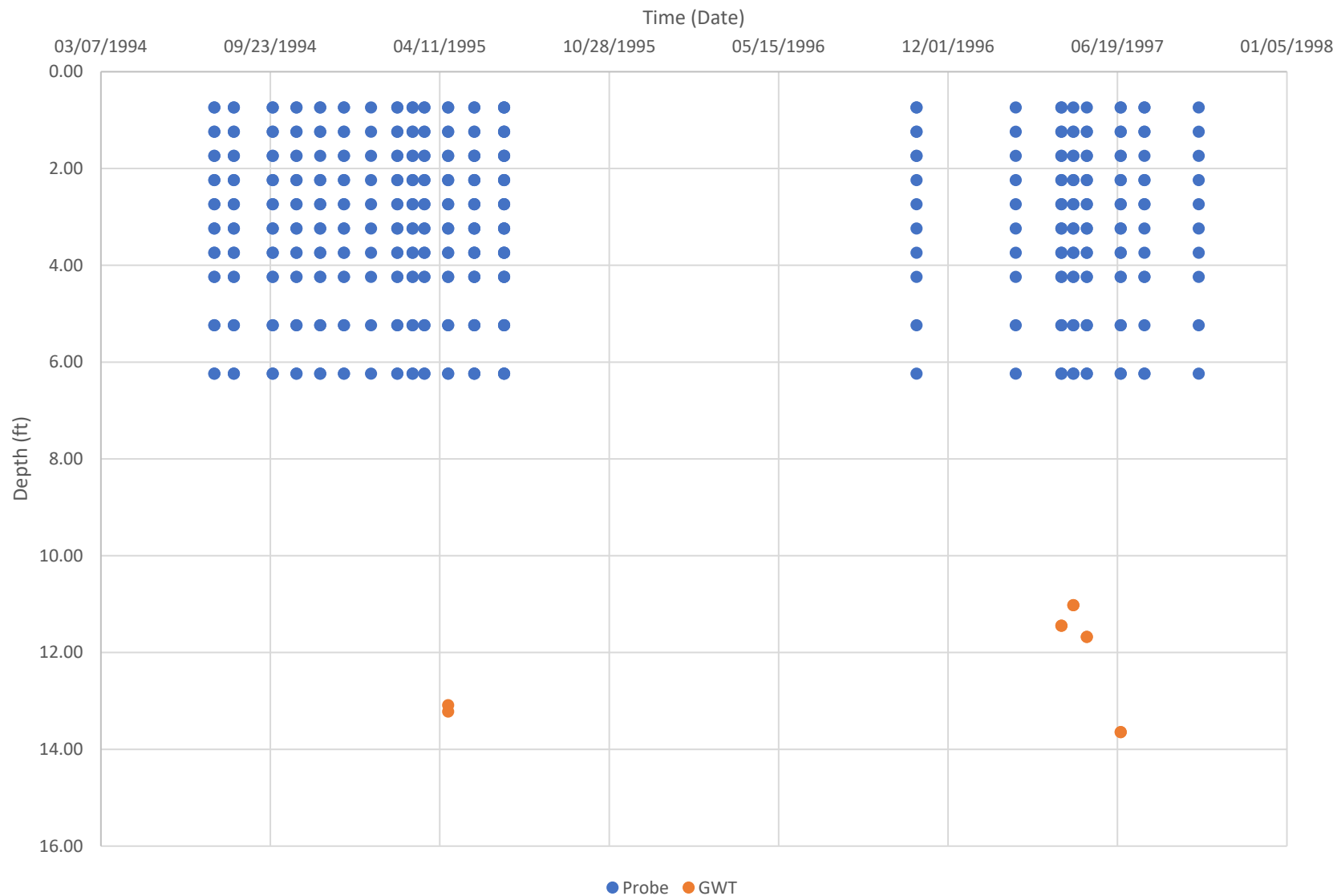


Figure 5K.5 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section SD 46-9187

5K-7

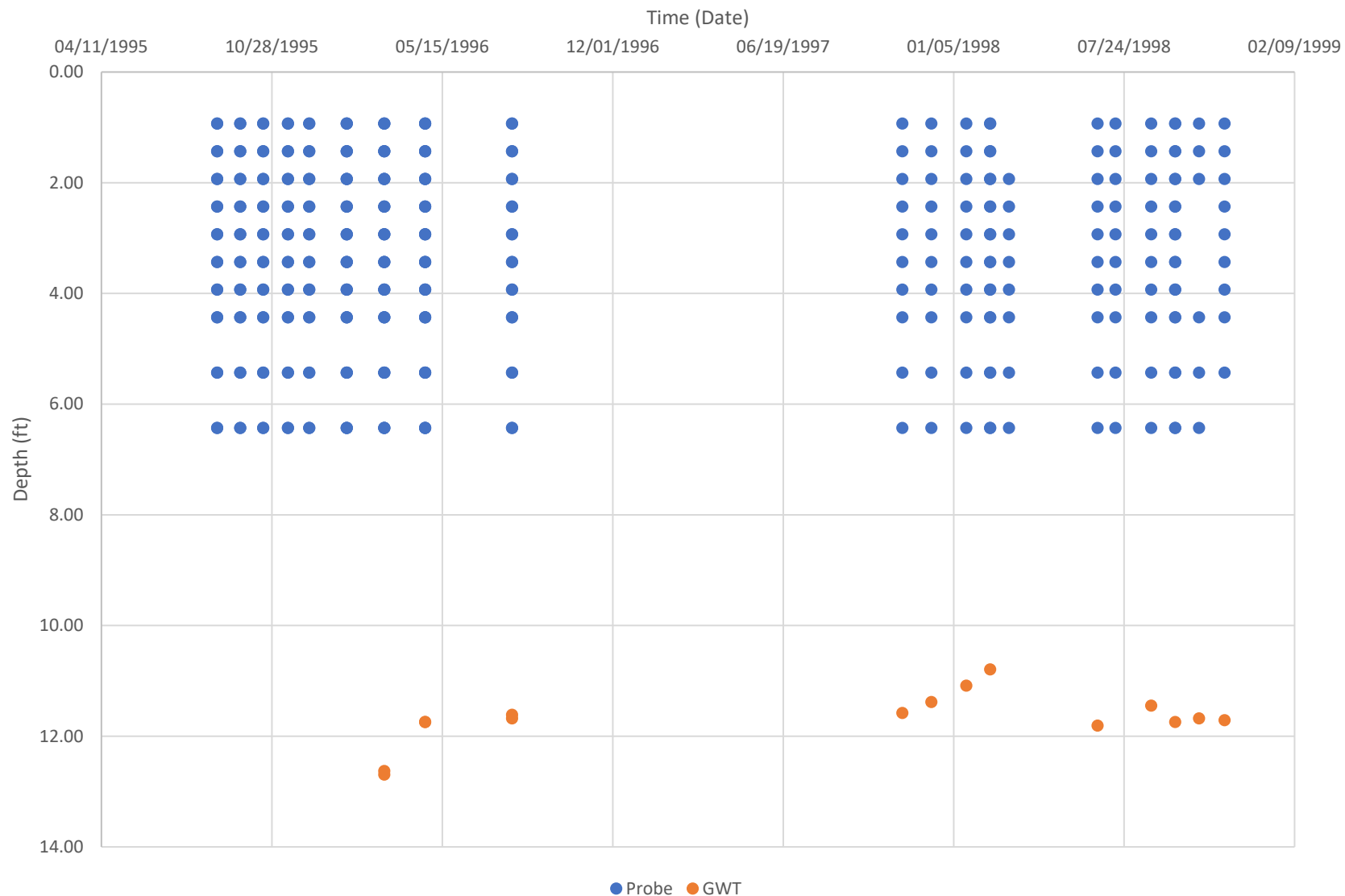


Figure 5K.7 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section KS 20-4054

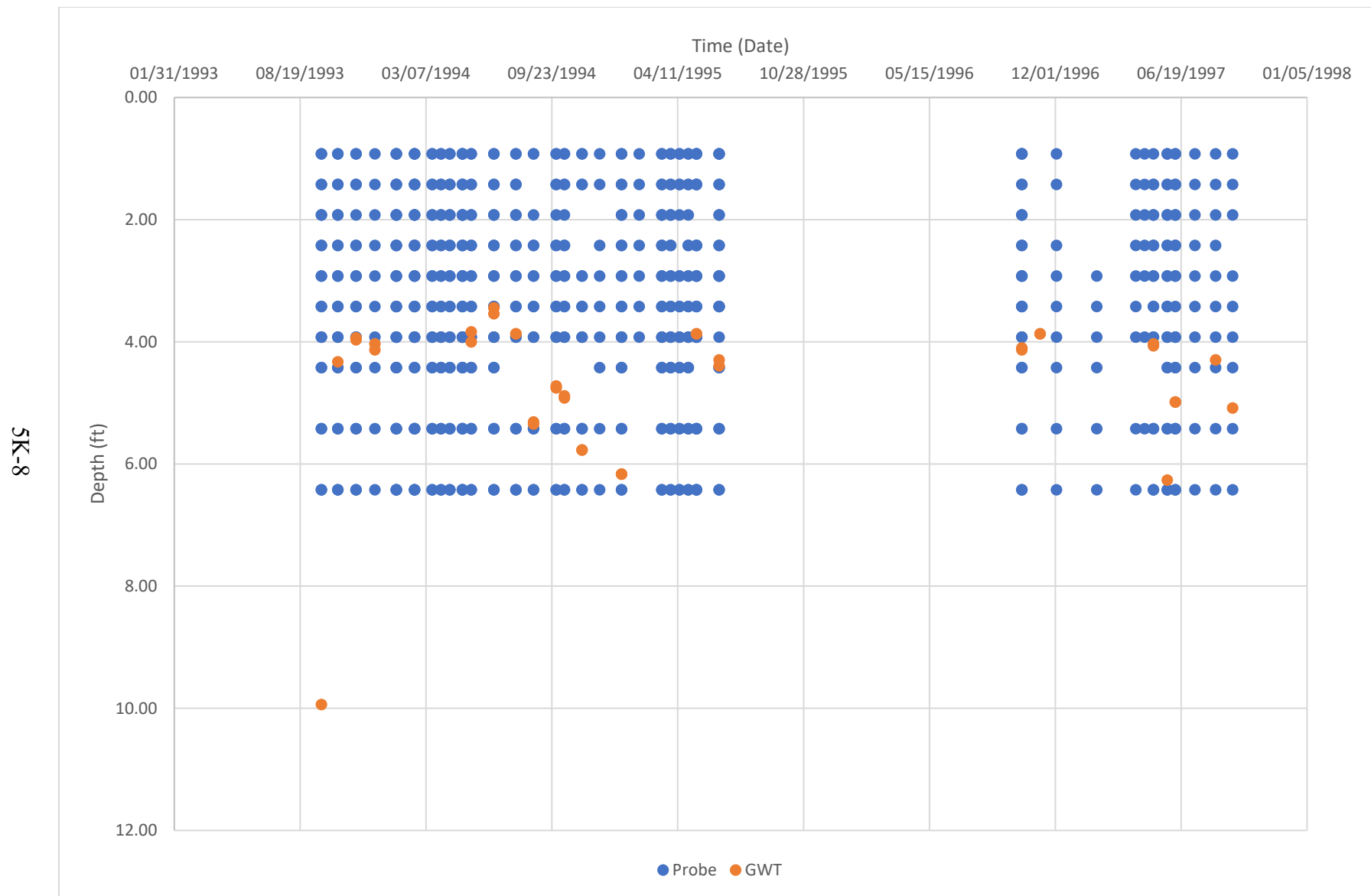


Figure 5K.8 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MN 27-4040

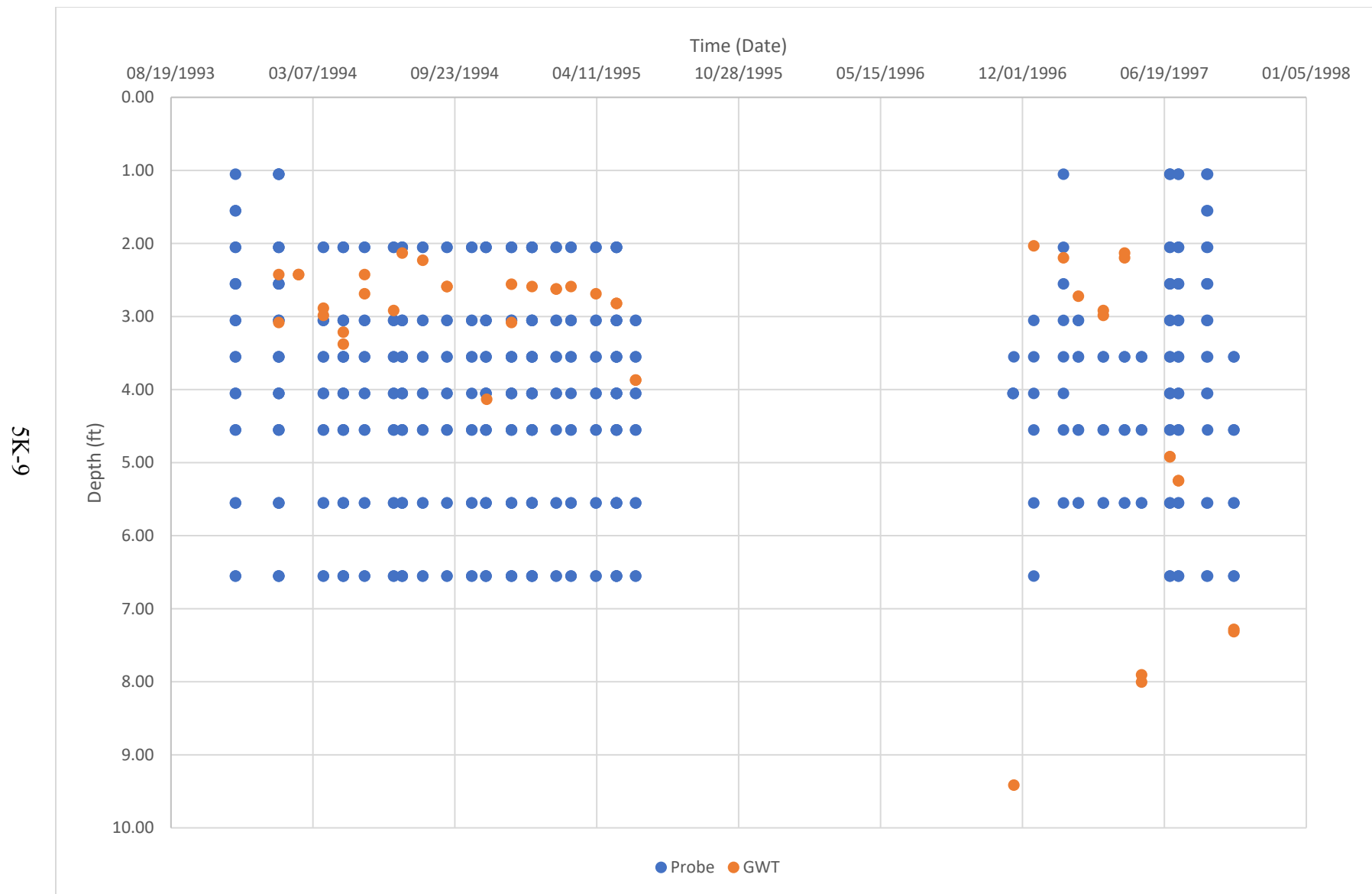


Figure 5K.9 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section TX 48-4143



Figure 5K.10 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section OH 39-0204



Figure 5K.11 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section IN 18-3002

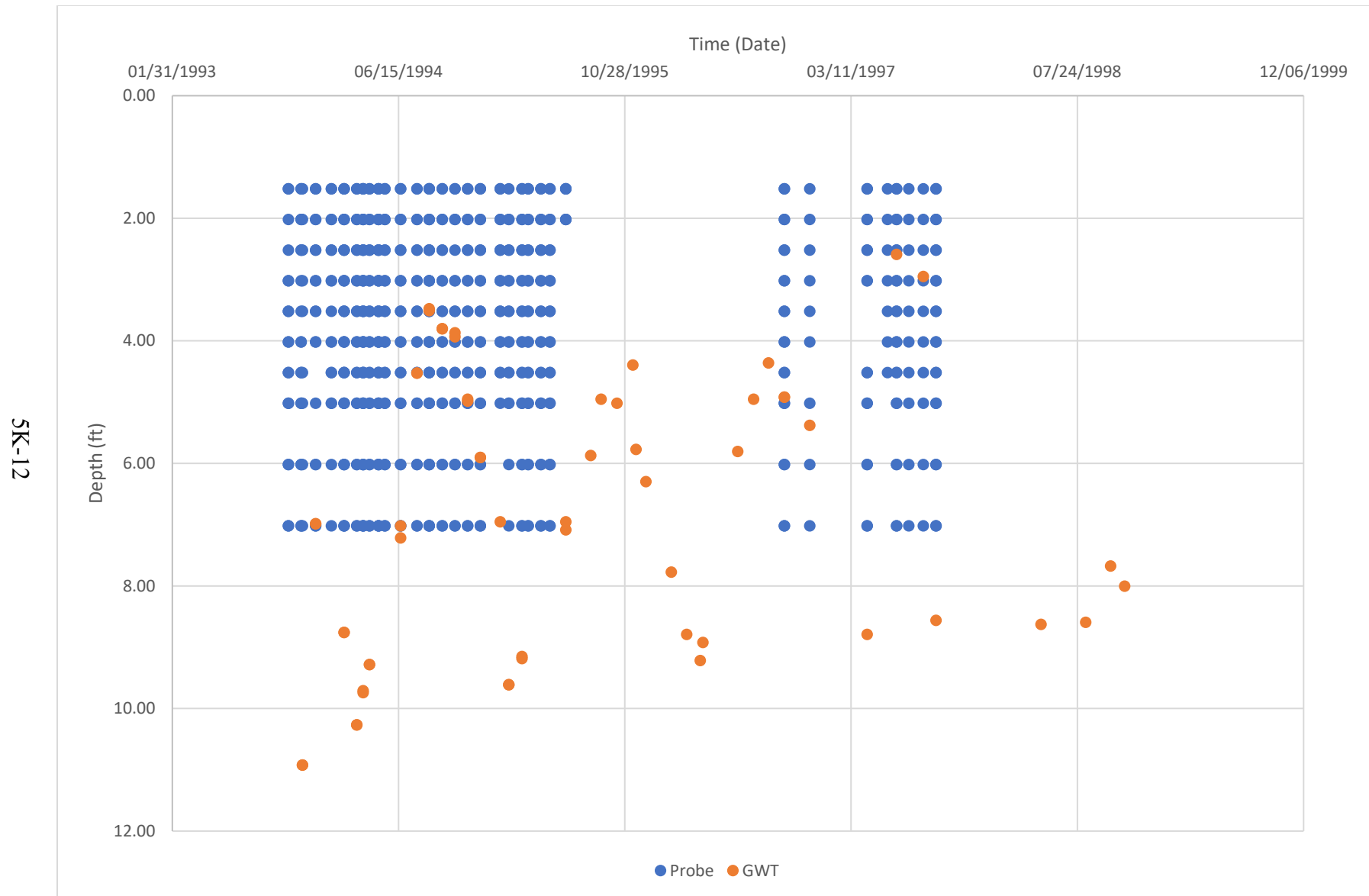


Figure 5K.12 Time (Date) vs Depth (ft) for TDR Probes and GWT for Section MB 83-3802

Project No. 01-59

**PROPOSED ENHANCEMENTS TO PAVEMENT ME DESIGN: IMPROVED CONSIDERATION OF THE
INFLUENCE OF SUBGRADE SOILS SUSCEPTIBLE TO SHRINK/SWELL AND/OR FROST HEAVE ON
PAVEMENT PERFORMANCE**

APPENDIX 5L

AIR TEMPERATURE DATA USED IN THE ANALYSIS

MAY 2023

LIST OF TABLES

Table 5L.1 Air Temperature Data Used in the Analysis for Calibration SMP Sections.....	1
--	---

Table 5L.1 Air Temperature Data Used in the Analysis for Calibration SMP Sections

CO 08-1053		
DATE	TMAX	TMIN
12/1/1993	39	25
12/2/1993	43	23
12/3/1993	34	19
12/4/1993	45	17
12/5/1993	37	20
12/6/1993	43	25
3/8/1994	47	30
3/9/1994	45	24
3/10/1994	50	24
3/11/1994	54	33
3/12/1994	52	33
3/13/1994	55	30
3/14/1994	61	29
4/26/1994	44	30
4/27/1994	42	30
4/28/1994	49	30
4/29/1994	45	32
4/30/1994	54	32
5/1/1994	47	36
5/2/1994	61	35
8/2/1994	84	54
8/3/1994	88	55
8/4/1994	89	57
8/5/1994	88	63
8/6/1994	90	68
8/7/1994	86	66
8/8/1994	82	68
10/15/1994	42	32
10/16/1994	42	29
10/17/1994	40	29
10/18/1994	50	31
10/19/1994	51	32
10/20/1994	52	29
10/21/1994	58	33
1/11/1995	41	31
1/12/1995	37	23
1/13/1995	40	25
1/14/1995	47	32
1/15/1995	43	26

1/16/1995	30	19
1/17/1995	29	12
2/7/1995	47	25
2/8/1995	46	27
2/9/1995	36	20
2/10/1995	40	29
2/11/1995	36	29
2/12/1995	37	28
2/13/1995	41	31
4/15/1995	42	31
4/16/1995	56	24
4/17/1995	40	29
4/18/1995	46	28
4/19/1995	48	30
4/20/1995	44	29
4/21/1995	47	25
5/2/1995	52	52
5/3/1995	50	32
5/4/1995	61	33
5/5/1995	56	34
5/6/1995	48	32
5/7/1995	49	33
5/8/1995	52	36
11/8/1996	47	20
11/9/1996	53	25
11/10/1996	57	29
11/11/1996	59	29
11/12/1996	60	30
11/13/1996	59	34
11/14/1996	55	42
3/1/1997	35	16
3/2/1997	47	15
3/3/1997	41	21
3/4/1997	28	13
3/5/1997	36	6
3/6/1997	51	16
3/7/1997	50	20
5/15/1997	77	45
5/16/1997	76	52
5/17/1997	77	46
5/18/1997	73	52
5/19/1997	71	49
5/20/1997	66	50

5/21/1997	63	44
7/30/1997	64	53
7/31/1997	75	54
8/1/1997	84	54
8/2/1997	85	57
8/3/1997	83	63
8/4/1997	74	56
8/5/1997	74	56
9/20/1997	75	49
9/21/1997	55	43
9/22/1997	57	42
9/23/1997	61	40
9/24/1997	65	39
9/25/1997	70	42
9/26/1997	63	52
MT 30-8129		
DATE	TMAX	TMIN
12/8/1993	45	15
12/9/1993	55	28
12/10/1993	58	28
12/11/1993	41	20
12/12/1993	50	15
12/13/1993	42	13
12/14/1993	35	18
3/11/1994	58	24
3/12/1994	60	26
3/13/1994	52	12
3/14/1994	63	30
3/15/1994	67	39
3/16/1994	58	22
3/17/1994	62	28
4/14/1994	60	35
4/15/1994	45	19
4/16/1994	72	28
4/17/1994	83	40
4/18/1994	85	39
4/19/1994	70	38
4/20/1994	68	39
8/16/1994	94	55
8/17/1994	88	56
8/18/1994	90	48
8/19/1994	81	49
8/20/1994	83	50

8/21/1994	85	50
8/22/1994	92	55
10/25/1994	51	25
10/26/1994	71	32
10/27/1994	62	32
10/28/1994	65	32
10/29/1994	65	22
10/30/1994	52	18
10/31/1994	52	19
1/17/1995	55	20
1/18/1995	40	15
1/19/1995	40	15
1/20/1995	43	15
1/21/1995	45	20
1/22/1995	39	8
1/23/1995	45	10
2/11/1995	15	-2
2/12/1995	10	-11
2/13/1995	9	-12
2/14/1995	5	-10
2/15/1995	22	-5
2/16/1995	40	18
2/17/1995	53	26
4/21/1995	53	32
4/22/1995	50	30
4/23/1995	52	30
4/24/1995	52	22
4/25/1995	60	30
4/26/1995	45	25
4/27/1995	44	25
5/12/1995	68	43
5/13/1995	42	31
5/14/1995	50	26
5/15/1995	60	36
5/16/1995	70	42
5/17/1995	60	45
5/18/1995	65	40
1/17/1997	25	-18
1/18/1997	28	-8
1/19/1997	39	0
1/20/1997	46	35
1/21/1997	52	29
1/22/1997	50	28

1/23/1997	50	10
3/6/1997	40	13
3/7/1997	52	20
3/8/1997	52	26
3/9/1997	40	16
3/10/1997	47	21
3/11/1997	45	28
3/12/1997	35	28
5/22/1997	72	42
5/23/1997	70	45
5/24/1997	72	44
5/25/1997	55	40
5/26/1997	54	39
5/27/1997	54	35
5/28/1997	58	39
9/25/1997	78	38
9/26/1997	86	38
9/27/1997	86	42
9/28/1997	84	40
9/29/1997	66	41
9/30/1997	72	40
10/1/1997	87	52
SD 46-0804		
DATE	TMAX	TMIN
10/19/1994	60	40
10/20/1994	69	39
10/21/1994	66	35
10/22/1994	56	33
10/23/1994	49	27
10/24/1994	48	22
10/25/1994	53	20
12/14/1994	25	8
12/15/1994	28	-4
12/16/1994	41	13
12/17/1994	32	12
12/18/1994	38	15
12/19/1994	38	11
12/20/1994	43	23
3/17/1995	52	31
3/18/1995	61	34
3/19/1995	57	33
3/20/1995	56	32
3/21/1995	52	31

3/22/1995	45	33
3/23/1995	61	31
4/14/1995	44	35
4/15/1995	53	30
4/16/1995	51	27
4/17/1995	48	30
4/18/1995	46	27
4/19/1995	47	23
4/20/1995	42	34
6/21/1995	72	59
6/22/1995	78	58
6/23/1995	76	55
6/24/1995	68	50
6/25/1995	71	48
6/26/1995	76	48
6/27/1995	80	51
10/18/1996	58	24
10/19/1996	71	33
10/20/1996	45	32
10/21/1996	39	26
10/22/1996	52	20
10/23/1996	53	34
10/24/1996	52	29
4/23/1997	56	41
4/24/1997	54	35
4/25/1997	60	36
4/26/1997	58	38
4/27/1997	60	38
4/28/1997	50	39
4/29/1997	57	34
5/9/1997	72	29
5/10/1997	83	41
5/11/1997	60	38
5/12/1997	56	38
5/13/1997	67	38
5/14/1997	62	32
5/15/1997	68	29
7/16/1997	95	60
7/17/1997	92	62
7/18/1997	90	66
7/19/1997	85	64
7/20/1997	75	63
7/21/1997	78	57

7/22/1997	77	70
9/16/1997	76	53
9/17/1997	78	45
9/18/1997	80	47
9/19/1997	52	47
9/20/1997	62	36
9/21/1997	67	36
9/22/1997	65	48
12/10/2003	12	-6
12/11/2003	9	-13
12/12/2003	22	-4
12/13/2003	26	18
12/14/2003	30	13
12/15/2003	28	20
12/16/2003	21	1
SD 46-9187		
DATE	TMAX	TMIN
7/13/1994	94	80
7/14/1994	98	79
7/15/1994	102	81
7/16/1994	99	81
7/17/1994	105	79
7/18/1994	114	88
7/19/1994	96	82
9/20/1994	82	52
9/21/1994	57	36
9/22/1994	67	34
9/23/1994	74	36
9/24/1994	82	39
9/25/1994	70	43
9/26/1994	76	42
10/18/1994	55	46
10/19/1994	60	40
10/20/1994	69	39
10/21/1994	66	35
10/22/1994	56	33
10/23/1994	49	27
10/24/1994	48	22
12/13/1994	21	5
12/14/1994	25	8
12/15/1994	28	-4
12/16/1994	41	13
12/17/1994	32	12

12/18/1994	38	15
12/19/1994	38	11
3/4/1995	7	-5
3/5/1995	1	-10
3/6/1995	1	-18
3/7/1995	6	-22
3/8/1995	9	-21
3/9/1995	31	7
3/10/1995	51	22
4/1/1995	55	23
4/2/1995	56	33
4/3/1995	44	22
4/4/1995	31	18
4/5/1995	64	22
4/6/1995	52	26
4/7/1995	56	31
5/16/1995	58	43
5/17/1995	57	37
5/18/1995	69	38
5/19/1995	60	40
5/20/1995	68	34
5/21/1995	75	49
5/22/1995	58	41
6/20/1995	85	68
6/21/1995	72	59
6/22/1995	78	58
6/23/1995	76	55
6/24/1995	68	50
6/25/1995	71	48
6/26/1995	76	48
10/19/1996	71	33
10/20/1996	45	32
10/21/1996	39	26
10/22/1996	52	20
10/23/1996	53	34
10/24/1996	52	29
10/25/1996	61	29
2/13/1997	38	20
2/14/1997	32	16
2/15/1997	36	11
2/16/1997	41	7
2/17/1997	43	30
2/18/1997	40	22

2/19/1997	39	23
4/8/1997	21	2
4/9/1997	22	12
4/10/1997	22	10
4/11/1997	31	7
4/12/1997	36	17
4/13/1997	41	15
4/14/1997	53	24
5/8/1997	60	32
5/9/1997	72	29
5/10/1997	83	41
5/11/1997	60	38
5/12/1997	56	38
5/13/1997	67	38
5/14/1997	62	32
9/17/1997	82	42
9/18/1997	77	53
9/19/1997	55	33
9/20/1997	65	26
9/21/1997	63	39
9/22/1997	53	39
9/23/1997	72	37
MN 27-4040		
DATE	TMAX	TMIN
9/16/1993	49	43
9/17/1993	59	40
9/18/1993	57	41
9/19/1993	65	37
9/20/1993	63	47
9/21/1993	63	47
9/22/1993	63	47
11/10/1993	28	8
11/11/1993	30	10
11/12/1993	32	10
11/13/1993	35	19
11/14/1993	35	19
11/15/1993	35	19
11/16/1993	37	20
2/11/1994	9	-30
2/12/1994	15	-21
2/13/1994	22	-3
2/14/1994	23	0
2/15/1994	44	0

2/16/1994	27	0
2/17/1994	44	8
3/25/1994	35	8
3/26/1994	41	12
3/27/1994	36	30
3/28/1994	37	23
3/29/1994	36	20
3/30/1994	34	17
3/31/1994	44	26
4/28/1994	42	27
4/29/1994	39	29
4/30/1994	43	29
5/1/1994	54	32
5/2/1994	57	34
5/3/1994	60	42
5/4/1994	57	41
8/19/1994	74	57
8/20/1994	70	55
8/21/1994	73	50
8/22/1994	77	49
8/23/1994	78	61
8/24/1994	75	61
8/25/1994	84	56
11/4/1994	36	25
11/5/1994	40	25
11/6/1994	40	29
11/7/1994	46	30
11/8/1994	51	35
11/9/1994	46	25
11/10/1994	48	26
1/6/1995	21	0
1/7/1995	7	-14
1/8/1995	12	-10
1/9/1995	12	-10
1/10/1995	10	-9
1/11/1995	21	9
1/12/1995	28	21
3/11/1995	46	24
3/12/1995	56	31
3/13/1995	53	45
3/14/1995	55	34
3/15/1995	55	25
3/16/1995	56	26

3/17/1995	53	35
3/25/1995	53	24
3/26/1995	39	33
3/27/1995	37	30
3/28/1995	44	23
3/29/1995	48	25
3/30/1995	39	22
3/31/1995	39	23
4/22/1995	56	31
4/23/1995	57	33
4/24/1995	50	27
4/25/1995	51	29
4/26/1995	53	30
4/27/1995	46	33
4/28/1995	45	32
5/5/1995	62	36
5/6/1995	61	31
5/7/1995	68	47
5/8/1995	69	47
5/9/1995	59	41
5/10/1995	59	40
5/11/1995	60	40
6/10/1995	71	49
6/11/1995	70	45
6/12/1995	73	47
6/13/1995	80	55
6/14/1995	80	55
6/15/1995	85	63
6/16/1995	86	63
10/3/1996	46	27
10/4/1996	50	36
10/5/1996	68	38
10/6/1996	74	40
10/7/1996	50	32
10/8/1996	55	32
10/9/1996	59	39
11/1/1996	26	19
11/2/1996	24	18
11/3/1996	33	24
11/4/1996	57	28
11/5/1996	38	30
11/6/1996	41	36
11/7/1996	42	30

4/2/1997	57	36
4/3/1997	49	30
4/4/1997	55	38
4/5/1997	55	38
4/6/1997	46	29
4/7/1997	30	4
4/8/1997	15	6
4/16/1997	33	23
4/17/1997	42	21
4/18/1997	54	31
4/19/1997	67	34
4/20/1997	62	30
4/21/1997	61	29
4/22/1997	61	28
4/30/1997	59	30
5/1/1997	48	29
5/2/1997	56	35
5/3/1997	57	31
5/4/1997	55	34
5/5/1997	71	44
5/6/1997	56	35
5/22/1997	65	47
5/23/1997	65	45
5/24/1997	65	48
5/25/1997	66	44
5/26/1997	63	36
5/27/1997	65	37
5/28/1997	70	44
6/4/1997	79	50
6/5/1997	77	50
6/6/1997	75	51
6/7/1997	75	48
6/8/1997	71	49
6/9/1997	79	52
6/10/1997	81	53
8/7/1997	79	60
8/8/1997	81	64
8/9/1997	82	66
8/10/1997	74	50
8/11/1997	74	43
8/12/1997	70	51
8/13/1997	71	46
9/3/1997	66	39

9/4/1997	70	42
9/5/1997	71	52
9/6/1997	83	57
9/7/1997	83	57
9/8/1997	67	57
9/9/1997	78	53
NC 37-0201		
DATE	TMAX	TMIN
5/9/1995	77	54
5/10/1995	79	61
5/11/1995	84	65
5/12/1995	78	56
5/13/1995	76	56
5/14/1995	79	56
5/15/1995	87	60
7/6/1995	89	71
7/7/1995	86	66
7/8/1995	85	62
7/9/1995	83	58
7/10/1995	89	63
7/11/1995	90	69
7/12/1995	90	69
10/10/1995	78	44
10/11/1995	77	58
10/12/1995	80	54
10/13/1995	73	61
10/14/1995	75	67
10/15/1995	70	48
10/16/1995	71	37
1/17/1996	43	34
1/18/1996	66	35
1/19/1996	66	51
1/20/1996	40	16
1/21/1996	37	22
1/22/1996	48	18
1/23/1996	55	24
4/17/1996	70	34
4/18/1996	81	37
4/19/1996	79	42
4/20/1996	75	58
4/21/1996	79	55
4/22/1996	85	54
4/23/1996	84	63

8/14/1996	83	64
8/15/1996	85	59
8/16/1996	88	52
8/17/1996	89	64
8/18/1996	88	48
8/19/1996	89	49
8/20/1996	88	65
9/27/1996	83	68
9/28/1996	82	63
9/29/1996	75	56
9/30/1996	66	54
10/1/1996	60	54
10/2/1996	71	58
10/3/1996	80	61
9/30/1997	83	51
10/1/1997	77	51
10/2/1997	71	44
10/3/1997	76	39
10/4/1997	82	47
10/5/1997	87	49
10/6/1997	87	48
2/13/1998	51	28
2/14/1998	55	28
2/15/1998	52	26
2/16/1998	46	33
2/17/1998	69	43
2/18/1998	62	46
2/19/1998	64	32
4/17/1998	74	60
4/18/1998	74	53
4/19/1998	73	51
4/20/1998	68	44
4/21/1998	69	43
4/22/1998	68	49
4/23/1998	65	47
7/10/1998	91	69
7/11/1998	89	67
7/12/1998	87	67
7/13/1998	88	71
7/14/1998	89	62
7/15/1998	90	62
7/16/1998	89	63
10/9/1998	80	51

10/10/1998	75	45
10/11/1998	78	45
10/12/1998	78	46
10/13/1998	78	49
10/14/1998	74	48
10/15/1998	73	44
3/8/2002	74	32
3/9/2002	73	48
3/10/2002	62	40
3/11/2002	59	26
3/12/2002	55	36
3/13/2002	54	46
3/14/2002	72	39
5/14/2002	68	43
5/15/2002	74	41
5/16/2002	80	49
5/17/2002	84	60
5/18/2002	81	58
5/19/2002	66	40
5/20/2002	65	40
9/13/2002	89	54
9/14/2002	78	62
9/15/2002	77	68
9/16/2002	85	70
9/17/2002	83	68
9/18/2002	82	70
9/19/2002	82	70
4/16/2003	80	50
4/17/2003	78	53
4/18/2003	77	44
4/19/2003	54	44
4/20/2003	67	50
4/21/2003	67	53
4/22/2003	70	55
12/5/2003	37	32
12/6/2003	47	30
12/7/2003	49	23
12/8/2003	53	22
12/9/2003	59	25
12/10/2003	60	36
12/11/2003	55	38
OH 39-0204		
DATE	TMAX	TMIN

5/7/1998	76	49
5/8/1998	69	59
5/9/1998	70	55
5/10/1998		
5/11/1998	72	53
5/12/1998	64	56
5/13/1998	74	55
7/24/1998	83	59
7/25/1998		
7/26/1998		
7/27/1998		
7/28/1998	82	57
7/29/1998	85	67
7/30/1998	84	64
9/23/1998	87	44
9/24/1998	68	41
9/25/1998	74	41
9/26/1998	81	59
9/27/1998		
9/28/1998	91	56
9/29/1998		
2/10/1999	57	27
2/11/1999	55	28
2/12/1999	72	29
2/13/1999	35	16
2/14/1999		
2/15/1999	35	16
2/16/1999	51	29
3/17/1999	50	28
3/18/1999	66	37
3/19/1999	40	28
3/20/1999	49	28
3/21/1999		
3/22/1999	45	23
3/23/1999	40	24
MB 83-3802		
DATE	TMAX	TMIN
10/9/1993	52	20
10/10/1993	60	29
10/11/1993	44	22
10/12/1993	39	22
10/13/1993	51	29
10/14/1993	45	22

10/15/1993	51	32
11/3/1993	34	28
11/4/1993	29	21
11/5/1993	24	15
11/6/1993	29	7
11/7/1993	25	16
11/8/1993	26	10
11/9/1993	25	6
11/10/1993	31	6
11/11/1993	35	27
11/12/1993	37	24
11/13/1993	34	15
11/14/1993	36	20
11/15/1993	41	19
12/8/1993		
12/9/1993	12	0
12/10/1993	3	-11
12/11/1993	20	-3
12/12/1993	28	20
12/13/1993	26	16
12/14/1993	23	9
2/9/1994	-12	-28
2/10/1994	-3	-15
2/11/1994	4	-16
2/12/1994	6	-12
2/13/1994	15	-1
2/14/1994	27	5
2/15/1994	17	-3
3/9/1994	24	3
3/10/1994	17	-5
3/11/1994	33	16
3/12/1994	42	18
3/13/1994	40	18
3/14/1994	46	24
3/15/1994	28	14
3/23/1994	28	15
3/24/1994	38	14
3/25/1994	42	24
3/26/1994	37	28
3/27/1994	34	16
3/28/1994	32	11
3/29/1994	36	12
4/6/1994	37	15

4/7/1994	52	25
4/8/1994	47	33
4/9/1994	46	33
4/10/1994	52	25
4/11/1994	62	37
4/12/1994	66	36
4/26/1994	40	25
4/27/1994	39	16
4/28/1994	47	15
4/29/1994	51	26
4/30/1994	55	24
5/1/1994	58	23
5/2/1994	64	34
6/14/1994	77	60
6/15/1994	68	53
6/16/1994	73	52
6/17/1994	74	55
6/18/1994	71	49
6/19/1994	76	59
6/20/1994	79	62
8/16/1994	78	57
8/17/1994	71	51
8/18/1994	75	49
8/19/1994	74	50
8/20/1994	77	44
8/21/1994	82	52
8/22/1994	82	59
9/14/1994	72	52
9/15/1994	69	55
9/16/1994	70	49
9/17/1994	80	49
9/18/1994	80	48
9/19/1994	82	52
9/20/1994	75	51
10/12/1994	56	44
10/13/1994	55	40
10/14/1994	63	46
10/15/1994	64	52
10/16/1994	56	53
10/17/1994	65	53
10/18/1994	58	49
2/8/1995	30	-6
2/9/1995	25	-4

2/10/1995	0	-22
2/11/1995	0	-25
2/12/1995	-3	-16
2/13/1995	-2	-16
2/14/1995	4	-14
3/23/1995	40	30
3/24/1995	50	36
3/25/1995	48	37
3/26/1995	39	34
3/27/1995	47	31
3/28/1995	34	26
3/29/1995	33	21
4/20/1995	57	33
4/21/1995	48	27
4/22/1995	61	25
4/23/1995	51	30
4/24/1995	50	22
4/25/1995	45	22
4/26/1995	40	22
5/10/1995	71	39
5/11/1995	56	39
5/12/1995	42	34
5/13/1995	49	32
5/14/1995	64	26
5/15/1995	53	20
5/16/1995	60	31
6/14/1995	87	65
6/15/1995	93	68
6/16/1995	93	73
6/17/1995	100	75
6/18/1995	97	72
6/19/1995	91	62
6/20/1995	94	65
10/9/1996	49	31
10/10/1996	60	34
10/11/1996	65	40
10/12/1996	73	32
10/13/1996	54	32
10/14/1996	55	41
10/15/1996	65	46
12/4/1996	17	11
12/5/1996	24	13
12/6/1996	24	22

12/7/1996	26	22
12/8/1996	22	3
12/9/1996	22	10
12/10/1996	17	5
4/10/1997	29	1
4/11/1997	36	3
4/12/1997	34	9
4/13/1997	38	13
4/14/1997	37	28
4/15/1997	31	17
4/16/1997	31	10
5/25/1997	63	35
5/26/1997	68	31
5/27/1997	73	37
5/28/1997	75	40
5/29/1997	77	46
5/30/1997	83	46
5/31/1997	86	51
6/14/1997	84	41
6/15/1997	68	49
6/16/1997	71	43
6/17/1997	66	46
6/18/1997	72	37
6/19/1997	72	56
6/20/1997	78	51
9/9/1997	67	40
9/10/1997	76	42
9/11/1997	82	46
9/12/1997	71	60
9/13/1997	82	54
9/14/1997	63	43
9/15/1997	65	35
4/16/1998	52	25
4/17/1998	49	25
4/18/1998	51	19
4/19/1998	55	27
4/20/1998	60	21
4/21/1998	66	23
4/22/1998	75	33