LTPP Seasonal Monitoring Program

Site Installation Report for GPS Section 906405 (90A) Plunkett, Saskatchewan

Report No. FHWA-

January 1996

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Report No. FHWA-

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16. Abstract

This report contains instrumentation installation details and data collection summaries for GPS test section 906405, which is a core section in the LTPP Seasonal Monitoring Program. This asphalt concrete pavement section on Trans-Canada Highway 16 east of Plunkett, Saskatchewan, was instrumented October 6, 1993. Instrumentation included time domain reflectometry (TDR) probes to estimate moisture content in unbound pavement layers, thermistor probes to measure pavement structure thermal gradients and air temperature, electrical resistivity probe to predict frost/thaw conditions, piezometer to measure water table depth below the pavement surface, and tipping-bucket rain gauge to measure precipitation.

Monitoring data was collected the day after instrument installation and roughly on a monthly basis from October 1993 to June 1995. In addition to temperature and precipitation data that were collected continuously by a datalogger at the site, monitoring data each month usually included Falling Weight Deflectometer data, TDR probe readings, frost/thaw readings, and piezometer readings. On a less regular basis, longitudinal profile data, pavement surface elevation data, and manual distress data were collected as required by FHWA guidelines. A summary of data collected is included in the report.

17. Key Words	18. Distribution Statement
Long Term Pavement Performance, LTPP, Pavement Instrumentation, Seasonal Monitoring Program, SMP, Time Domain Reflectometry, TDR, Resistance, Frost, Thaw, Temperature, Thermistor, Water Table, Piezometer, Falling Weight Deflectometer, FWD	

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LTPP Seasonal Monitoring Program
Site Installation Report for GPS Section 906405 (90A)
Plunkett, Saskatchewan

I. Introduction

This report contains information specific to instrument installation and monitoring data collection for the Long Term Pavement Performance (LTPP) General Pavement Study (GPS) section 906405, which is part of the core Seasonal Monitoring Program (SMP) under the Federal Highway Administration (FHWA) LTPP Division. This pavement section was instrumented on October 6, 1993, and had regular data collection through June 23, 1995. The section will be monitored every other year under the LTPP Study for a ten-year period or until it is removed from the study.

A. Test Site Location

GPS section 906405 is located in central Saskatchewan five miles east of Plunkett on the eastbound lane of Trans-Canada Highway 16, which is also referred to as the Yellowhead Route.

B. General Test Section Information

This two-lane highway has a 71-mm thick asphaltic concrete surface, which consists of the original asphalt surface placed in 1969 and a coarse-aggregate surface seal placed at a later date. The rest of the pavement structure consists of a granular base with an average thickness of 255 mm and a coarse-grain subgrade. Drilling and sampling data identified two base layers, crushed and uncrushed gravel, with the combined thickness ranging from 240-mm to 260-mm thick. Site verification notes also list a thin oil-treated base layer, which was probably the aggregate surface for the roadway before it was upgraded to the existing structure. Additional background information about the section is located in Appendix A-1. This information includes, but is not limited to, the following items:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.

Relevant pre-installation monitoring data for the section located in Appendix A-2 includes the following:

- Pre-installation pavement distress data;
- Pre-installation FWD data (includes tests outside the section limits); and
- FWDCHECK program uniformity analysis results.

C. SMP Test Section Information

The geographic location and existing pavement structure place this section in Cell 7 of the SMP experiment, which is defined by the following parameters:

- Thin asphaltic concrete pavement (less than 127-mm thick);
- Coarse-grain subgrade;
- Freezing environment; and
- Dry environment.

This was the fifth SMP installation in the LTPP North Central Region, and highlights of the installation are summarized in Section IV of this report. The people involved with the installation are listed on "Data Sheet SMP-I01: List of Installed Instrumentation," which is included in Appendix C-1 along with other SMP installation forms.

Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994. The 1994 forms were used to keep all installation reports uniform and to facilitate data entry into the IMS database. Data transfer included conversion from English to metric units with some rounding error. On some forms, data are not available regarding procedure modifications adopted in 1994. On these forms the cells are usually blank, and a comment is included on the form to explain the missing data.

II. Instrumentation Installation

A. Pre-Installation Activities

Saskatchewan Highways and Transportation, sometimes referred to as the agency in this report, currently has a long-term monitoring plan where Benkelman Beam deflection data collected each year on a cross section of pavement structures are used to define seasonal deflection response factors. In this respect, Saskatchewan Highways and Transportation was very willing to participate in the SMP.

Mr. Andrew Horosko was initially contacted regarding potential sections identified for the seasonal monitoring pilot activities started in 1991 under the Strategic Highway Research Program (SHRP). GPS section 906405 was included in the pilot study, and falling weight deflectometer (FWD) data was collected during six visits from the fall of 1991 through the spring of 1992 on roughly a monthly basis as weather permitted. Field notes and data analysis results from this pilot monitoring are included in Appendix D-3.

In 1993, Ms. Stella White was contacted to confirm continued agency support for GPS section 906405 as a core section in experimental cell 7 of the SMP study administered by the FHWA LTPP Division. Saskatchewan Highways and Transportation agreed to support the section and to defer any pavement rehabilitation at least the five years required to get three years of monitoring data that is collected every other year. Section 906405 is also the control section for the SPS-3 sections at this location.

On September 2, 1993, a pre-installation meeting was held in Regina, Saskatchewan. The meeting agenda for this site was expanded at the agencies' request to include a presentation on SHRP and FHWA LTPP activities for a fairly broad audience. This presentation included introductory information on SMP, and a detailed planning session for agency staff involved with instrumentation and monitoring of GPS section 906405 followed the presentation.

At the detailed planning session, arrangements were made for the agency to supply equipment and materials required for the installation. An installation date was set for agency staff to verify availability of equipment and materials, because the Regional Coordination Office (RCO) was looking at a very tight schedule to complete seven SMP installations before winter weather conditions would prevent any additional installations. The agenda and notes from the September 2, 1993 meeting are included in Appendix B-1.

The day before the planning meeting, RCO staff drove to GPS section 906405 to identify any installation concerns with the site and to select which end of the section to monitor. However, heavy rains limited activities to windshield inspection at the site. Field notes from the site visit are included in Appendix B-1.

At the RCO, pre-installation activities included performing instrumentation checks/calibrations, and incorporating improvements to the installation process based on field notes from previous installations. Improvements to the installation process are listed in Section IV of this report, and results from instrumentation checks/calibration are included in Appendix B-2. The checks were performed according to 1993 guidelines, but the results are reported using 1994 forms, as discussed earlier. The forms include the following:

- Data Sheet SMP-C01: TDR Probe Check;
- Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check;
- Data Sheet SMP-C03: Electrical Resistivity Probe Check;
- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

For the TDR probes, checks/calibrations were done with the cable reader setting for the noise filter at 8.0, which is different than listed in the guidelines. Also, checks in water for TDR probes 6, 8, and 9 had calculated dielectrics less than the range specified in the guidelines. However, this was not realized until after the probes had been installed. For these three probes, the traces in water do not have well defined inflection points for the signal leaving the open end of the probe. In fact, the vertical position of the signal increases through the last part of the probe. It is beyond the scope of this installation report to determine what caused the odd traces in water or whether data from these probes are reasonable.

With respect to instrument checks on the resistivity probe, Data Sheet SMP-C03 requires "distance from top of probe" for each electrode. However, procedures in 1993 recorded "spacing between electrodes" on two separate lines about 180 degrees apart on the probe. As a consequence, cumulative errors from adding the 35 "spacings" had to be accounted for to transfer the data to the 1994 form. Adjustments were performed as described below to estimate "distance from top of probe" within ± 5 mm:

1. Obtained average values for probes checked in 1994 and 1995 for the following:
   - Electrode No. 1 assigned 29 mm (± 2 mm) if not measured;
   - Electrode No. 17 in the range 840 mm $\pm$ 3 mm as a check; and
   - Electrode No. 36 assigned at 1,805 mm from the top of the probe.
   - Average electrode spacing is (1805 - 29)/35, which is 50.74 mm.

2. Added the 35 "spacings" measured for the first line, divided the value by 35 to get the average, subtracted 50.74 mm to get adjustment value, and subtracted adjustment value from each "spacing."

3. Repeated Step 2 for the second line.

4. Added two adjusted "spacings" and divided by two to get "adjusted average spacing."

5. Recorded Electrode No. 1 at 29 mm and cumulated "adjusted average spacings" to get "distance from top of probe" for the remaining 35 electrodes.

6. Checked "distance from top of probe" for Electrode No. 17 in the range 840 mm $\pm$ 3 mm and Electrode No. 36 in the range 1,805 mm $\pm$ 2 mm.

For the air temperature probe, no readout device was available while the thermistor probe was checked. Therefore, the only check possible was to compare thermistor and air temperature probe readings obtained overnight with both probes connected to the datalogger. The air temperature probe was within ± 1.0 °C of the average reading on the thermistor probe.

For the resistivity probe, loose electrode wraps were tightened by twisting the lead with a needle-nose pliers, and lead wires sticking out of the potting material for the probe were covered with silicon sealant for protection during installation. Excess potting material was scrapped off the electrodes for better contact with the soil.

Pre-installation activities also required selection of the instrumentation location. From field observations during the September 1, 1993 site visit and FWDCHECK program analysis for the section, Station 3+00 to Station 5+25 was selected for monitoring, and instrumentation would be placed at Station 5+20. This end of the section was monitored in the pilot study done in 1991/1992 based on similar considerations.

B. Installation Activities

The SMP instrumentation installation itinerary for Canada included travel, installation, and data collection time for three sites over a two-week period. Two travel days were allowed to make the 1600 kilometer trip from the RCO to the installation in Saskatchewan, which included stops at GPS sections 833802 and 831801 in Manitoba to confirm installation details at the sites and extra time for crossing the international border between the United States and Canada.

Border crossing was delayed one day because of problems encountered for instrumentation that was not returning to the RCO. Eventually, required forms for equipment registration and exemptions from import taxes and duties were completed. The certificate of registration that will allow export of instrumentation used at GPS section 906405 after termination of monitoring is included in Appendix C-1.

Instrumentation installation was completed at GPS section 906405 on October 6, 1993 in spite of sleet, wind, and cold temperatures. Some final installation activities continued on the following day. The following installation forms are included in Appendix C-1 along with field notes and photographs of the installation:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- Data Sheet SMP-I02: Instrumentation Locations;
- Data Sheet SMP-I03: Log of Piezometer Hole;
- Data Sheet SMP-I04: Log of Instrumentation Hole;
- Data Sheet SMP-I05: Field Gravimetric Moisture Contents;
- Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content; and
- Data Sheet SMP-I07: Representative Dry Density.

Piezometer installation was done according to protocol. A 0.6-m long access tube was set in concrete just below the existing shoulder material to protect the top of the piezometer and provide easy access for measurements. A 3.0-m long grease sleeve was used on this piezometer to isolate the piezometer from frost heave. The grease sleeve extends about 0.2 m up into the access tube and the space between the two is filled with sand. Additional field notes on piezometer installation are included in Appendix C-1.

A 460-mm square for the instrumentation hole and a 100-mm wide trench for the conduit were marked on the pavement surface at Station 5+15 using the pavement edge stripe as a transverse reference. Originally, the block was planned for Station 5+20, but it was shifted to Station 5+15 because of hairline cracks observed in the pavement. FWD testing was only done from Station 5+00 to Station 5+20, including a test over the instrumentation hole. The FWD locations were shifted 100 mm towards the shoulder from the paint marks still visible from pilot testing done in 1991/1992; paint marks from the pilot testing had been referenced to the inside edge, instead of the outside edge, of the pavement edge strip.

The block and conduit trench were sawed using an air-cooled blade. The block was lifted out using anchors tapped into the pavement, and laid upside down on the road for later replacement. The drill rig was moved into position over the hole and material was put into buckets as it was removed from the hole in 0.15-m lifts.

TDR probes were placed according to protocol with TDR probe 1 mid-depth in the granular base.

For installation reports from the LTPP North Central RCO, "Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents," is used to report agency laboratory moisture results. Also, "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison" was created to summarize moisture data obtained from field moisture tests, laboratory moisture tests, and interpretation of TDR probe data. These forms, along with a plot of the moisture results, are included in Appendix C-1, and the following assumptions and conclusions were made regarding the moisture data:

- LTPP Directive Number: SM-13 "TDR Trace Interpretation Method for Calibration and Function Checks" dated August 17, 1995 was used to interpret the apparent length of each TDR trace obtained during installation for estimating moisture results. This method was specified for "calibration and function checks," but no other method had been distributed by FHWA LTPP staff. The interpreted apparent lengths are reported on "Data Sheet SMP-I06: TDR Moisture Content" in Appendix C-1.

- Equations on pages II-2 and II-5 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 were used to convert apparent lengths to gravimetric moisture estimates for the base and subgrade materials, and the results are included on "Data Sheet SMP-I05(B): Gravimetric Moisture Comparison," located in Appendix C-1.

- The moisture estimate from TDR probe 9 is 14.8 percent, and this is the only moisture estimate from the ten TDR probes that is less than field and laboratory moisture results. Subgrade material around this probe had the highest visible organic content, and field moisture test results are probably high at 20.1 percent, because the sample started to burn. However, 18.0 percent moisture from the laboratory test is also significantly higher than the moisture estimate from the TDR probe.

- The field and laboratory moisture results, excluding results from TDR probe 9, were very consistent with an average difference of only 0.4 percentage points, and the TDR probe moisture estimates averaged 1.6 percentage points greater than the average between the field and laboratory results.

- Answers to the following questions could help explain the differences seen in the moisture data, but they are beyond the scope of this report:

  1. Are the equations used appropriate for coarse-grain subgrade and granular base materials?
  2. Does organic material in subgrade soil influence the TDR data?
  3. Do TDR probes 6, 8, and 9 that had calculated dielectrics outside the acceptable range during pre-installation checks provide reasonable data?
  4. How much influence does compaction have on the results?

"Data Sheet SMP-I07: Representative Dry Density," was not used in 1993, but it is included in Appendix C-1 to keep the report complete and uniform with other installation reports.

Several items were changed regarding installation of the datalogger cabinet and weather pole as follows:

- RCO staff were not able to get the 9.1-m offset from the lane edge specified on page II-23 and Figure II-12 of the LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines, April 1994 because the TDR cables provided were too short. The cabinet at this site is offset about 7.6 m and the weather pole is offset about 7.9 m. This places the obstructions inside the normal 9.15-m safety zone for highways. However, FHWA LTPP Division staff approved the two obstructions as break-away objects (page II-32 of manual) for placement inside the safety zone.

- The bottom of the front panel on the datalogger cabinet was notched about 0.1 m so the conduit buried about 0.3 m below the shoulder was easier to get into the cabinet, and it also slightly increased the distance the cabinet could be placed from the roadway.

- The conduit for the air temperature probe and tipping-bucket rain gauge signal wires was cut into the back of the cabinet above ground instead of running the conduit underground as shown in the guidelines. If the cables were run underground, the air temperature probe signal cable would have to be extended using special wire and resistors to compensate for increased lead resistance. Also, a union coupler was used on the weather pole about 0.3 m above ground to make pole installation easier.

For pavement repairs, the base material was left slightly higher than original, and the asphalt block was placed in the hole. A loaded truck was driven across the block several times to seat the block into the base material until it was the same height as the pavement. The block was carefully removed, and a thin layer of W.R. Meadows "REZI-WELD 1000" multi-purpose construction epoxy was placed in the hole to fill voids in the bottom of the block and help prevent settlement of the block. The block was placed in the hole and seated again with the loaded truck. The trench for the conduit was patched with cold-mix asphalt, and epoxy was poured into the saw cuts to bond the pavement thermistor probe and asphalt block in place. The medium-viscosity epoxy had a 45-minute pot life which was sufficient to continue adding material to the saw cuts as the epoxy settled. The saw cuts were filled to within about 15 mm of the pavement surface, and Dow Corning 890-SL was used to fill the remaining saw cuts the following day.

Additional observations about the pavement repair at the instrumentation hole up to the completion of this installation report include the following:

- On August 16, 1994, a low-severity transverse crack was recorded across the saw cut for the temperature probe.

- On December 16, 1994, an additional transverse crack was recorded about 0.8 m right of the block, and a longitudinal crack was recorded out of the saw cut on the top right corner of the block.

- On May 18, 1995, two additional short cracks were recorded. One is a transverse crack 0.7 m left of the block, and the other is short longitudinal crack off the top left corner of the block.

- On June 23, 1995, no cracks were recorded! This same phenomenon has been seen on the rest of the section. Apparently, the thin AC surface "heals" when the pavement temperatures are high enough.

III. SMP Data Collection

A. Initial SMP Data Collection

On October 7, 1993, final wiring of the datalogger in the cabinet was completed, test locations were marked on the pavement according to protocol using the pavement edge stripe as a reference, PK nails were placed at offsets 0.16 m and 3.51 m, and the first set of SMP data was collected.

Three cycles of FWD data were collected, as well as elevation data and piezometer data. The RCO had not received a switch box for manual readings on the resistivity probe, and manual readings were not taken until November 10, 1993. The November resistivity probe readings along with manual data collected October 7, 1993 are included in Appendix D-1 as follows:

- One set of contact resistance data;
- One set of four-point resistivity data;
- One ground water table measurement; and
- One set of elevation data.

Computer data files obtained from automated data collection using the dataloggers included the following:

- Two sets of TDR traces and CRREL voltages; and
- Temperature and precipitation data collected from the datalogger to verify operation overnight.

Temperature data from the thermistor probe should not be entered into the IMS database because of heat given off by epoxy used to repair the pavement and disturbance of material around the probe. In addition, temperature data up to several days after instrument installation will have to be reviewed to determine when the disturbed materials came back to thermal equilibrium. Data affected by the installation will have to be edited from the computer files.

B. Routine SMP Data Collection

Routine data collection was done on the site from October 7, 1993 through June 23, 1995. On June 23, 1995, the datalogger and weather pole were removed, and they will be replaced when monitoring resumes on the section in the fall of 1996. LTPP's standard data tracking log, which summarizes the data collected on the site, is included in Appendix D-2.

The agency frost tube, installed November 28, 1991, at Station 5+45, was repaired between October 7, 1993 and November 10, 1993, and RCO staff read the probe during visits from late fall to late spring for caparison to the resistivity probe data. The agency also collected Benkelman Beam deflection data in conjunction with FWD testing on a regular basis from early spring to early winter to correlate deflection data with frost/thaw depths and moisture data.

Events that influenced the data collection and that will influence data interpretation for the site include the following:

- TDR probes 6, 8, and 9 calibration results in water were outside guideline limits, and any potential influence on the data collected needs to be addressed.

- Organic material in the subgrade, consisting of mostly wood and small roots, will have to be accounted for in moisture estimates, especially for TDR probes 8, 9, and 10. This organic material may also influence resistivity probe data.

- On November 10, 1993, a relay was added to the datalogger at the site, which included a change in the data format for subsequent files.

- Temperature data for the periods from October 7, 1993 to November 10, 1993 and from January 23, 1995 to February 16, 1995 was lost due to battery failures. Local weather station data could provide air temperature and precipitation data, but no subsurface temperature data will be available.

Instrumentation and equipment problems at the site include the following:

- Battery failures for the datalogger noted on November 10, 1993 and February 16, 1995 resulted in two months of lost data. FHWA LTPP Division staff adopted the recommendation to switch from "D" cell alkaline batteries to sealed lead-acid batteries to prevent additional loss of data from defective alkaline batteries. Also, the lead-acid batteries are more economical to use, because they are re-chargeable.

- Cold temperature related problems with the cable reader caused vertical shifts in some traces and general failure of the cable reader if temperatures were extremely cold. Screen prints of TDR data are included in Appendix D-2.

- Vertical movement of the piezometer has been documented on other SMP installations with both a piezometer and an agency benchmark. This installation only has a single elevation reference, and any shift in the reference will be hard to identify. However, elevation data calculated using the piezometer as a reference under similar seasonal conditions indicate the reference is stable as shown on the plot in Appendix D-2.

Other problems experienced at the site include failures with switch boxes used to collect manual resistance and resistivity data and failures of the CRREL multiplexer for automated resistance data collection. Print screens showing the failure modes for the CRREL multiplexer are included in Appendix D-2.

IV. Summary, Conclusions, and Recommendations

A. Instrumentation Installation Highlights

The following items are identified by the authors as unique or particular items of interest regarding this section in the SMP.

- This was the fifth SMP installation in the LTPP North Central Region, and GPS section 906405 was one of the seven sections monitored for the SHRP SMP pilot testing done the fall of 1991 through the spring of 1992.
- The thin pavement surface on this section is over 25 years old, and the amount of pavement distress seems to vary with the season. Much of the distress observed in the spring "heals" when pavement temperatures are high enough in the summer.
- Section 906405 has predicted frost to 2.5 m, which is among the deepest frost for sections in the North Central Region. The resistivity probe has the last electrode 1.93-m deep, and the frost tube extends 3.65-m deep to monitor frost/thaw depths.
- Saskatchewan Highways and Transportation evaluated SHRP products for work zone safety during the two days of lane closure required for installation and data collection.
- Organic material, consisting of mostly wood and small roots, is well preserved in the subgrade, and this material may affect data from the instrumentation.
- FWD testing done January 14, 1994, with air temperatures of -35 °C, is the coldest FWD testing that has been done in the North Central Region.
- Data for this 1993 installation were transferred to forms from the LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines, April 1994.

B. Recommendations for Improving Installations

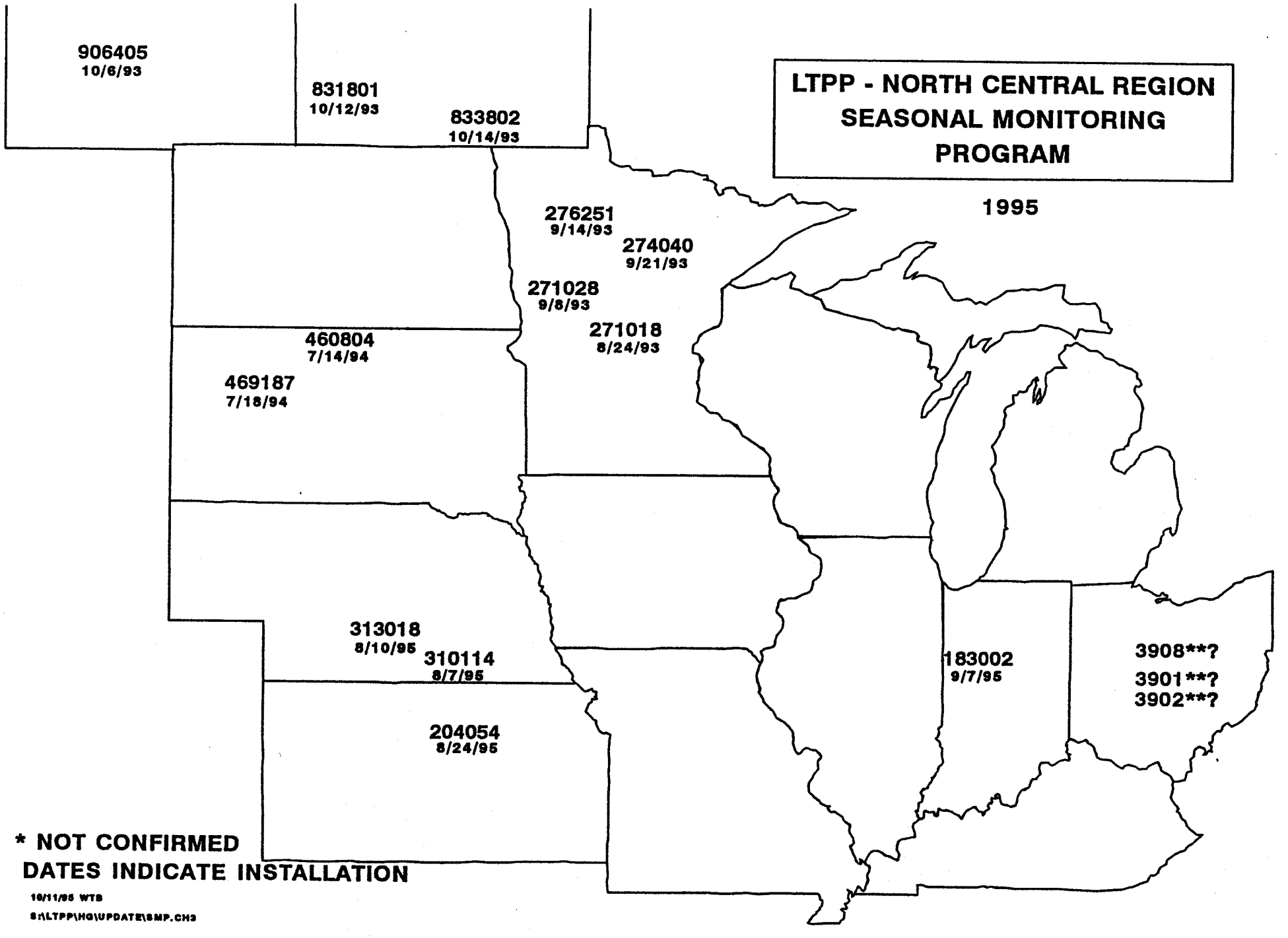
In addition to previous modifications from other installations, the following procedure and equipment changes from protocol were used during this installation:

- Cut the pavement with an air-cooled saw to prevent problems associated with freezing temperatures during the installation and water affecting granular base moisture data.
- Built a box to slide onto the datalogger cabinet to hold the cable reader and notebook computer in a safe, convenient location. This also minimizes snow removal necessary to place monitoring equipment near the datalogger cabinet.
- Purchased a bottomless tent to fit over the datalogger cabinet to keep moisture, sunlight, and air-borne dirt off monitoring equipment and provide a comfortable environment for data collection.

Appendix A-1: Test Section Background Information

Appendix A-1 contains the following test section background information:

- SMP location map;
- Detailed section location map;
- SHRP Inventory Data Sheet - traffic, design factors, and layer information;
- SHRP Section Field Verification Form;
- IMS L05A and L05B tables - layer thickness and material type; and
- LTPP Form S04 - base and subgrade moisture data.


906405
10/6/93
831801
10/12/93
833802
10/14/93
LTPP - NORTH CENTRAL REGION
SEASONAL MONITORING
PROGRAM
1995
276251
9/14/93
274040
9/21/93
271028
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271018
8/24/93
460804
7/14/94
469187
7/18/94
313018
8/10/95
310114
8/7/95
204054
8/24/95
183002
9/7/95
3908**?
3901**?
3902**?
* NOT CONFIRMED
DATES INDICATE INSTALLATION
10/11/95 WTB
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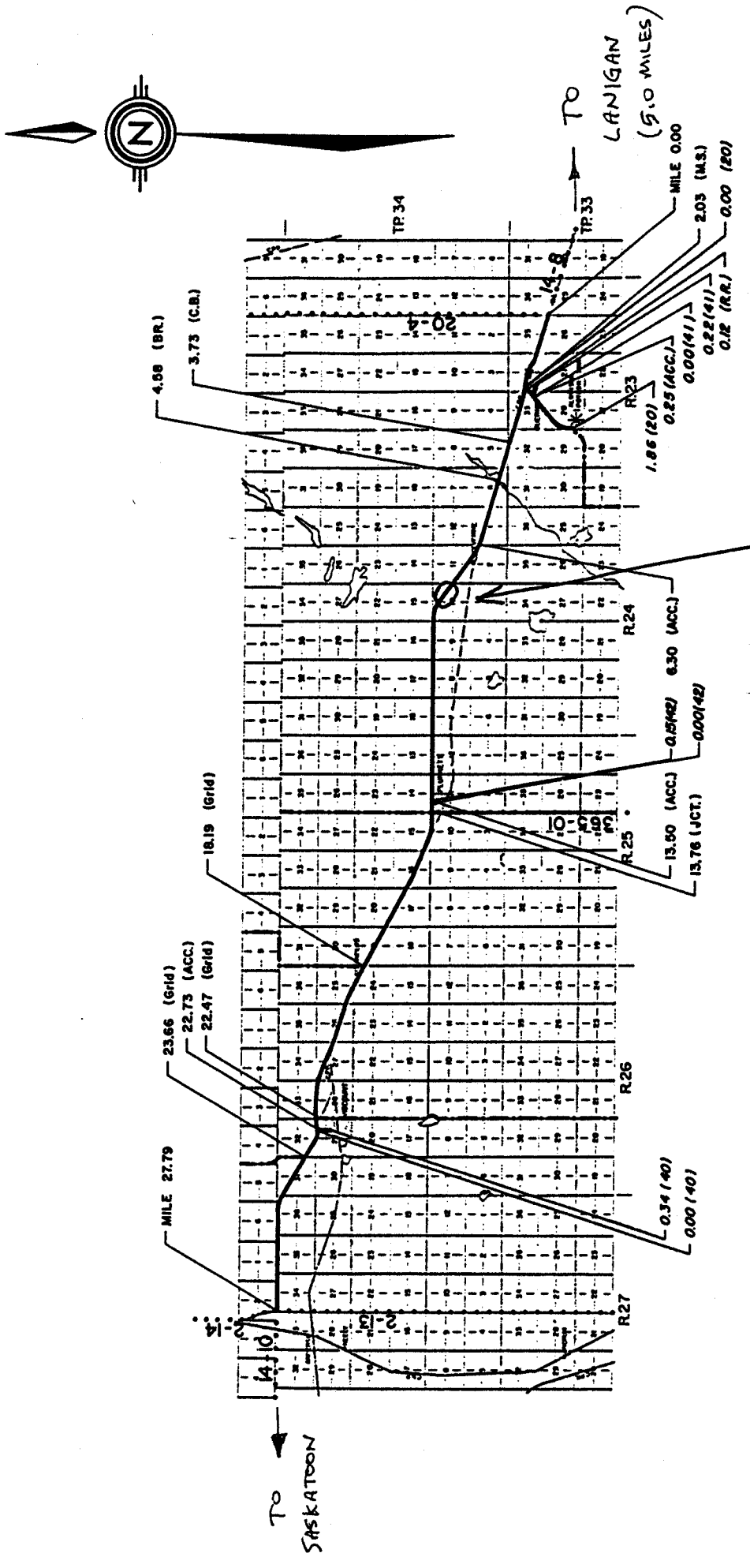


Site No. 906405

SMP 90A

ALL IN E.D. HUMBOLDT

W.2 16-19

C.S. ~~150~~

AMEND. APRIL 1, 1976

STRATEGIC HIGHWAY RESEARCH PROGRAM
GENERAL PAVEMENT STUDIES
Long-Term Pavement Performance Monitoring
Project Information Sheet

REGION: North Central PAVEMENT TYPE: AC on Granular Base
STATE: Saskatchewan

SHRP Assigned ID:	906405	District:	4	Year Open:	1969
State Assigned ID:	1619	Highway:	- 1619	Year Traffic:	1983
Design Cell ID:	1-133	Length:	1.2 miles	AADT:	918
		Lanes:	1	Trucks:	20.3 %
		Shoulder Surface Type:	Surface Treatment		
		Project Status:	Approved		

DESIGN FACTORS - Moisture:	Dry	
Temperature:	Freeze	
Subgrade:	57 - Sand	Coarse
Traffic:	114 KESAL/Yr	High (85)
AC Thickness:	3.0 in.	Low (3.0, 8.0)
Base Thickness:	8.5 in.	Low (10.0)
AC Stiffness:	650 ksi	Low (650)

LAYER CONFIGURATION

LAYER NO.	LAYER DESCRIPTION	LAYER THICKNESS	LAYER MATERIAL TYPE
3	3 - Orig Surface	3.0	1 - HMAC, Dense Graded
2	5 - Base Layer	8.5	23 - Crushed Stone, Gravel, or Slag
1	7 - Subgrade		57 - Sand

PAVEMENT LAYER INFORMATION

					ASPHALT CONCRETE LAYERS					
LAY NUM	-- GRADE --- VISC	PENETR	AC CONT	AC DENS	ACVIS S	ACVIS 140	PEN 275	PEN 77	AC TRBF	AC VOID	AGG SPGR	AC STIFF
3	6		5.8	149	1					3.2		650
3	6		5.8	149	1					3.2		650
3	6		5.8	149	1					3.2		650

OLD AC LAYER BELOW GRANULAR BASE AND ABOVE SAND SUB GRADE "0" END

- PRIME COAT ? (OIL TREATMENT)

Revised July 6, 1988

SECTION FIELD VERIFICATION FORM

Date MAY 9, 1989 State Project Code 1 6 - 1 9
State Code - 9 0
Rater Lukanen SHRP Section I.D. 6 4 0 5

Project and Section Identification

State District No. 0 4 County or Parish _____
Route Signing (Numeric Code) 2
Interstate ..... 1 State 3
Primary ..... 2 Other 4
Route Number 1 6
LTPP Experiment Code 1-133
Number of Through Lanes (One Direction) 1
Direction of Travel 1
Eastbound ..... 1 Northbound 3
Westbound ..... 2 Southbound 4
Available Project Length (Without Discontinuities) ~ 1+ m.le

	Start Point	End Point
Test Section Milepoints		

Additional Section Location Information*: See Sketch on back
~11.9 Km West of Sct 20.
Beg. of section in E.B. lane at about 12 Km mark.

* Include distances from two landmarks (refer to specific procedures outlined in the Initial State Visit Guidelines).
Location of monument: 6" Nails 1' from edge stripe

Geometric Information

Lane Width (Feet) 1 2.
Lane (By Number) Included in Monitoring Section 1
(Lane 1 is Outside Lane, Lane 2 is Next to Lane 1, etc.)

Shoulder Data:	Outside Shoulder	Inside Shoulder
Total Width (Feet)	1 2.	1 2.
Paved Width (Feet)	1 0.	1 0.
Surface Type		3

Turf ..... 1 Concrete 4
Granular ..... 2 Surface Treatment 5
Asphalt Concrete ... 3 Other 6

Additional Data for PCC Shoulders:

Average Joint Spacing (Feet)		
Skewness of Joints (Feet)		
Joints Match Pavement Joints? (Yes - 1; No - 2)		

Revised July 6, 1988

SECTION FIELD VERIFICATION FORM (CONTINUED)

State Code
SHRP Section I.D. 9 0 6 4 0 5

Vertical Alignment (from plans)

Cut, Fill, or At Grade: Fill
Depth of Cut/Fill at Start of Section: ~2-3' Fill
Depth of Cut/Fill at End of Section: ~2-3' Fill

Joint Information for JCP

Average Contraction Joint Spacing (Feet)
Average Intermediate Sawed Joint Spacing (Feet) (JRCP Only)
Skewness of Joints (Feet/Lane)

CORE 1 (Beginning of Project)

Layer No.	Layer Types*	Thickness	Brief Material Description
1	Subgrade (G)		Sandy Top soil ~3½ft down
2	Seal	310	~1" of oil treated on Subgrade
3	Base	80-280	Gravel 3½" Crushed
4	Asphalt	80mm	HMA (includes a Seal coat)
5			
6			
7			

Notes: Top soil is a black sandy material

CORE 2 (End of Project)

Layer No.	Layer Types*	Thickness	Brief Material Description
1	Subgrade (G)		Sandy
2	Clay cap	360	Clay cap
3	P	210	Base - Gravel Crushed
4	A	75	HMA & Surface Seal
5			
6			
7			

Notes:

*Layer Types: A - HMAC/Surface Treatment, P - PCC Layer, B - Base/Subbase, G - Subgrade

Revised June 8, 1988

DISTRESS SURVEY FORM
AC Surfaced Pavements
(GPS Experiments 1,2,6,7)

Date 5/9/89 State Code 9 0

Rater Lukanich SHRP Section ID 6 4 0 5

	Severity Level		
	Low	Medium	High
1. Alligator Cracking (Sq. Ft.)			
2 Block Cracking (Sq. Ft.)			
3. Patch Deterioration (Number and Sq. Ft.)			
4. Pumping (Check highest severity found)			
5. Raveling/Weathering (Sq. Ft.)	~~HHT~~	II	
6. Transverse Cracking (Number of Cracks)	Low (18) ~~HHT~~ ~~HHT~~ ~~HHT~~ III (all small except 1)	(2)	

7. Bleeding (Measure only when extensive enough to cause a reduction in skid resistance, Sq. Ft.) _____

8. Average Rut Depth: < 0.5" X
0.5-1" _____
> 1" _____

Comments Section has a coarse (3/4" agg.) surface and slightly cracked

Revised June 8, 1988

OFFICE PLAN REVIEW FORM
(Potential Monitoring Section)

State Project Code 16-19
State Code 90
SHRP Project ID 6405

Potential Monitoring Section Station Boundaries: Sta 230 to 300.

Reference Landmarks: Not much close - signal records in ~~ft~~ direction must be used

Length of Potential Section: ~ 2 miles light cut to fill

Cut, Fill, or At Grade: about at grade for most of the project.

Depth of Cut or Fill at Start of Section: ± ~ 1ft.

Depth of Cut or Fill at End of Section: ± ~ 1ft.

Differences between previously submitted data and plans: ———

Comments: Plan sheet profile is the old road surface for natural ground

Field Notes*: Section condition is quite consistent. There are no large fills or cuts. A large gravel pit is on the so. side of road at west end of section

*Include distress information obtained while driving over section.

SHRP/LTPP LAYER THICKNESS

L05A - L05B TABLES

26-AUG-93

		L05A				STA 0		STA 5		L05 B REPRESENTATIVE					
		CON	LAYER	DESC	TYPE	THICK	MATL	THICK	MATL	LAYER	DESC	TYPE	THICK	MATL	INVENTORY
90	6405		1	7	SS		214		204	1	7	SS		214	1
			1	2	4	TB	2.5	320	0	320	2	6	TB	1.2	320	
			1	3	5	GB	7	304	11	304	3	5	GB	9	304	2
			1	4	3	AC	2.9	1	2.8	1	4	3	AC	2.8	1	3

oil treated aggregate original road surface?

SMP

END

SHRP REGION NC STATE SH

SHRP-LTPP
FIELD MATERIAL SAMPLING
AND FIELD TESTING

STATE CODE 90

SHRP ASSIGNED ID 906405

LTPP EXPERIMENT GPS 1 ROUTE/HIGHWAY Hwy 16 Lane 1 Direction 3
SAMPLE/TEST: (a) Before Section _____ (b) After Section 2 FIELD SET NO. 1

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

OPERATOR D LAVOY NUCLEAR DENSITY GAUGE I.D. 18304 SHEET NUMBER 10 OF 21
TEST DATE 6-13-90 LOCATION: STATION 5758 TEST PIT NUMBER TP 2
DATE OF LAST MAJOR CALIBRATION 3-13-90 OFFSET 3 feet from °/s
Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (SEE S03)		3.5			20 4	
TEST TYPE		BASE COURSE TOP Result, pcf Wet	Dry	SUBBASE TOP Result, pcf Wet	Dry	SUBGRADE TOP Result, pcf Wet	Dry
MATERIAL TYPE: (Unbound-G Other-T)		G		AVERAGE TWO READINGS BSW		G	
IN SITU DENSITY, pcf (AASHTO T238-86)	1	140.2	135.1			131.5	127.4
	2	137.0 136.2 135.4	132.0 130.9 131.5			131.9	127.8
	3	138.8	134.3			130.0	126.2
	4	141.6	136.3			131.5	127.6
AVERAGE		136.6	133.7			131.1	127.3
Method (A,B,or C)		B				B	
Rod Depth, inches		6"				8"	
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	3.8				3.0	
	2	3.4 3.2				3.2	
	3	3.4				3.0	
	4	3.7				3.0	
AVERAGE		3.5				3.1	

GENERAL REMARKS: _____

CERTIFIED _____
Crew Chief, Contractor
Affiliation: _____

VERIFIED AND APPROVED Ronald R Thach
SHRP Representative
Affiliation: BPT

MONTH-DAY-YEAR 6-13-90
Date

3
2 ↑ 4
1

Form S04/Issued 19 February 1990

SHRP REGION NC
STATE SH

SHRP-LTPP
FIELD MATERIAL SAMPLING
AND FIELD TESTING

STATE CODE 90
SHRP ASSIGNED ID 6405

LTPP EXPERIMENT GPS1 ROUTE/HIGHWAY HWY 16 Lane 1 Direction S
SAMPLE/TEST: (a) Before Section ✓ (b) After Section ____ FIELD SET NO. 1

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

OPERATOR D LAVOY NUCLEAR DENSITY GAUGE I.D. 18304 SHEET NUMBER 9 OF 21
TEST DATE 6-13-90 LOCATION: STATION 0-46 TEST PIT NUMBER TP-1
DATE OF LAST MAJOR CALIBRATION 3-13-90 OFFSET 3 feet from °/s
Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (SEE S03)		A			13"	
TEST TYPE		BASE COURSE TOP Result, pcf Wet	Dry	SUBBASE TOP Result, pcf Wet	Dry	SUBGRADE TOP Result, pcf Wet	Dry
MATERIAL TYPE: (Unbound-G Other-T)							
IN SITU DENSITY, pcf (AASHTO T238-86)	1	142.4	137.2			136.2	125.4
	2	141.2	135.9			139.3	128.5
	3	139.5	134.1			136.2	126.1
	4	140.2	135.3			137.6	127.2
AVERAGE		140.8	135.6			137.3	126.8
Method (A,B,or C)		B				B	
Rod Depth, inches		6				8	
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	3.8				8.6	
	2	3.9				8.3	
	3	4.0				8.0	
	4	3.6				8.1	
AVERAGE		3.8				8.3	

GENERAL REMARKS: ____

CERTIFIED

Crew Chief, Contractor
Affiliation: ____

VERIFIED AND APPROVED
Ronald R. Unbach
SHRP Representative
Affiliation: BPT

MONTH-DAY-YEAR 6-13-1990
Date

3
2 ↑ 4
1

Appendix A-2: Pre-Installation Monitoring Data and FWDCHECK Results

Appendix A-2 contains the following pre-installation monitoring data and FWDCHECK analysis results:

- Pre-installation pavement distress data;
- Pre-installation FWD data; and
- FWDCHECK program uniformity analysis results.

Revised May 29, 1992

SHEET 1

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID ____

STATE CODE 90

SHRP SECTION ID 6405

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/16/93

SURVEYORS: ___, BIW PHOTOS, VIDEO, OR BOTH WITH SURVEY (P, V, B) B

PAVEMENT SURFACE TEMP - BEFORE ____°C; AFTER ____°C

DISTRESS TYPE / CRACKING	SEVERITY LEVEL PAVE: STF LOW	MODERATE	HIGH
1. ALLIGATOR (FATIGUE) CRACKING (Square Meters)	0.9	3.9	
2. BLOCK CRACKING (Square Meters)			
3. EDGE CRACKING (Meters)			
4. LONGITUDINAL CRACKING (Meters)			
~~Paving Lane-edge Related~~ NON-Wheel Length Sealed (Meters)	238.8 0.0	11.1 0.0	
~~Other~~ Wheel ~~Length~~ Sealed (Meters)			
5. REFLECTION CRACKING AT JOINTS Number of Transverse Cracks			
Transverse Cracking (Meters) Length Sealed (Meters)			
Longitudinal Cracking (Meters) Length Sealed (Meters)			
6. TRANSVERSE CRACKING Number of Cracks	53	4	
Length (Meters)	121.3	14.5	
Length Sealed (Meters)	0.0	0.0	
PATCHING AND POTHOLES			
7. PATCH/PATCH DETERIORATION (Number)			
(Square Meters)			
8. Potholes (Number)			
(Square Meters)			

Revised May 29, 1992

SHEET 2

DISTRESS SURVEY

LTPP PROGRAM

STATE ASSIGNED ID _ _ _ _

STATE CODE 90

SHRP SECTION ID 6405

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/16/93

SURVEYORS: BSW, _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
SURFACE DEFORMATION			
9. RUTTING - REFER TO SHEET 3 FOR SPS-3 OR Form TRNPROF1 from Dipstick Manual			
10. SHOVING (Number)			_ _ _
(Square Meters)			_ _ _._
SURFACE DEFECTS			
11. BLEEDING (Square Meters)	_ _ _._	_ _ _._	_ _ _._
12. POLISHED AGGREGATE (Square Meters)			_ _ _._
13. RAVELING AND WEATHERING (Square Meters)	_ _ _._	_ _ _._	_ _ _._
MISCELLANEOUS DISTRESSES			
14. LANE-TO-SHOULDER DROPOFF - REFER TO SHEET 3			
15. WATER BLEEDING AND PUMPING (Number)			_ _ _
Length of Affected Pavement (Meters)			_ _ _._

16. OTHER (Describe) LONG CRACK RUNS 6"-12" OUTSIDE OF WHITE SHOULDER/DRIVING LANE FOR MUCH OF THE SECTION (COUNTED IN SURVEY)

Revised May 29, 1992

SHEET 3

STATE ASSIGNED ID _ _ _ _

DISTRESS SURVEY

STATE CODE 90

LTPP PROGRAM

SHRP SECTION ID 6405

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/16/93

SURVEYORS: BJW, _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

9. RUTTING (FOR SPS-3 SITE SURVEYS)

INNER WHEEL PATH Point No.	Point Distance[1] (Meters)	Rut Depth (mm)	OUTER WHEEL PATH Point No.	Point Distance[1] (Meters)	Rut Depth (mm)
1	0.	_ _ _.	1	0.	_ _ _.
2	15.25	_ _ _.	2	15.25	_ _ _.
3	30.5	_ _ _.	3	30.5	_ _ _.
4	45.75	_ _ _. DIPSTICK	4	45.75	_ _ _.
5	61.	_ _ _.	5	61.	_ _ _.
6	76.25	_ _ _.	6	76.25	_ _ _.
7	91.5	_ _ _.	7	91.5	_ _ _.
8	106.75	_ _ _.	8	106.75	_ _ _.
9	122.	_ _ _.	9	122.	_ _ _.
10	137.25	_ _ _.	10	137.25	_ _ _.
11	152.5	_ _ _.	11	152.5	_ _ _.

14. LANE-TO-SHOULDER DROPOFF

Point No.	Point Distance[1] Meters	Lane-to-Shoulder Dropoff (mm)
1	0.	_ _ _.
2	15.25	_ _ _.
3	30.5	_ _ _.
4	45.75	_ _ _.
5	61.	_ _ _.
6	76.25	_ _ _.
7	91.5	_ _ _.
8	106.75	_ _ _.
9	122.	_ _ _.
10	137.25	_ _ _.
11	152.25	_ _ _.

AC SHOULDER
ZERO

Note 1: "Point Distance" is the distance in meters from the start of the test section to the point where the measurement was made. The values shown are SI equivalents of the 50 feet spacing used in previous surveys.

DATE: 6/6/93
TIME: 8:30
OPERATOR: BJW
RECORDER:
BLAU DIPSTICK

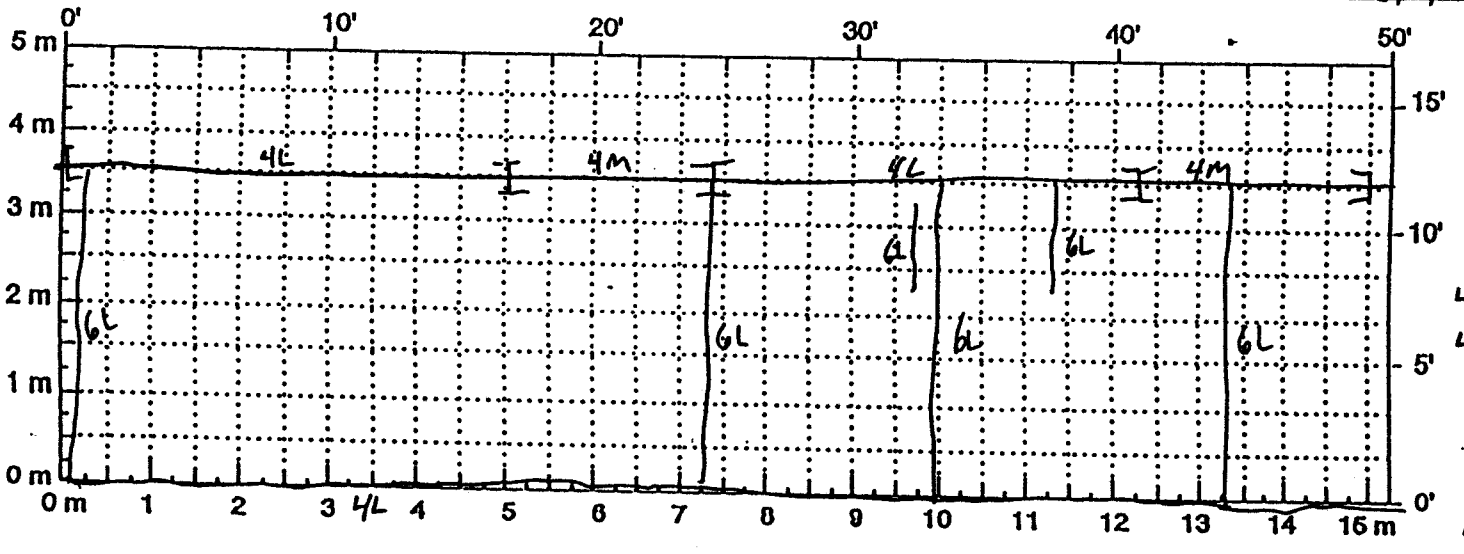
AGENCY: SASKATCHEJAN
SECTION: 906405

STA	DIPSTICK READING (+/-) 1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL	SUM
0	+244	+174	+183	+241	+303	+181	+112	-15	+59	+116	+206			+1804	
	-250	-169	-188	-248	-301	-189	-113	+15	-57	-117	-206			+1825	-021
50	+71	+168	+132	+274	+271	+191	+84	+36	+8	+101	+141				
	-73	-168	-136	-281	-265	-196	-82	-86	-12	-96	-141				
100	+142	+146	+205	+264	+228	+166	+27	-3	+103	+139	+112				
	-133	-150	-207	-262	-232	-167	-31	-1	-91	-138	-112				
150	+145	+152	+179	+245	+216	+185	+861	+33	+85	+87	+117				
	-137	-152	-187	-225	-211	-188	-58	-34	-83	-93	-117				
200	+53	+163	+190	+178	+251	+189	+90	+25	+103	+97	+132				
	-61	-130	-205	-196	-240	-191	-97	-19	-98	-96	-132				
250	+11	+209	+180	+219	+241	+218	+93	+18	+60	+141	+141				
	-15	-213	-176	-231	-240	-210	-102	-20	-46	-158	-141				
300	+143	+142	+175	+190	+273	+206	+78	+27	+78	+95	+161				
	-158	-134	-173	-194	-272	-207	-73	-37	-65	-94	-161				
350	-24	+93	+153	+226	+322	+186	-12	-131	+128	+213	+459				
	+8	-73	-155	-218	-323	-185	+10	+134	-125	-212	-459				
400	-83	+129	+146	+242	+272	+197	+60	-57	+24	+167	+361				
	+86	-125	-146	-241	-277	-197	-57	+62	-32	-159	-361				
~~450~~ 500	+223	+141	+222	+272	+318	+218	+97	+24	+82	+146	+228				
	-224	-129	-223	-275	-327	-208	-90	-23	-81	-148	-228				
~~500~~ 450	+79	+141	+219	+248	+260	+215	+71	-26	+64	+165	+208				
	-80	-149	-206	-248	-260	-212	-74	+26	-66	-159	-208				

State Assigned ID 906405

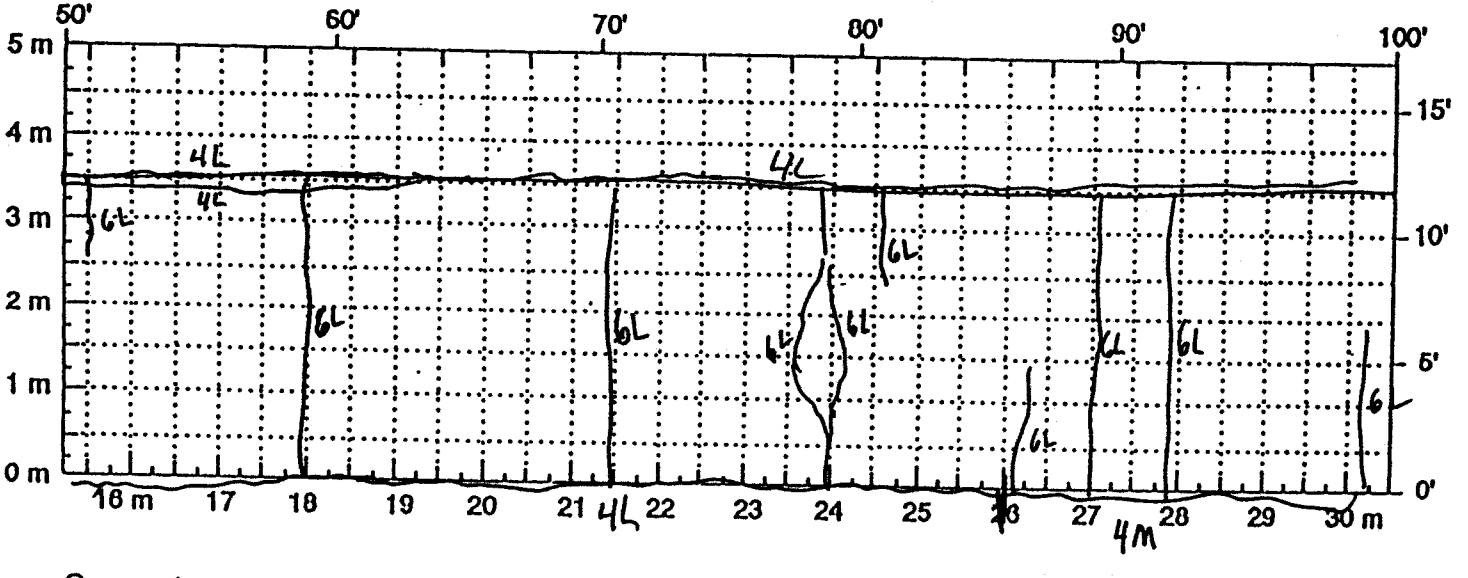
State Code B3U

SHRP Section ID 6/14/93



4L c/L - 24.7/0
4M c/L - 2.7/0
4L - 4.3/0
6L - 15/11.5/0
4L WHITE - 26/0
4M WHITE - 4.5/0

Comments: _____

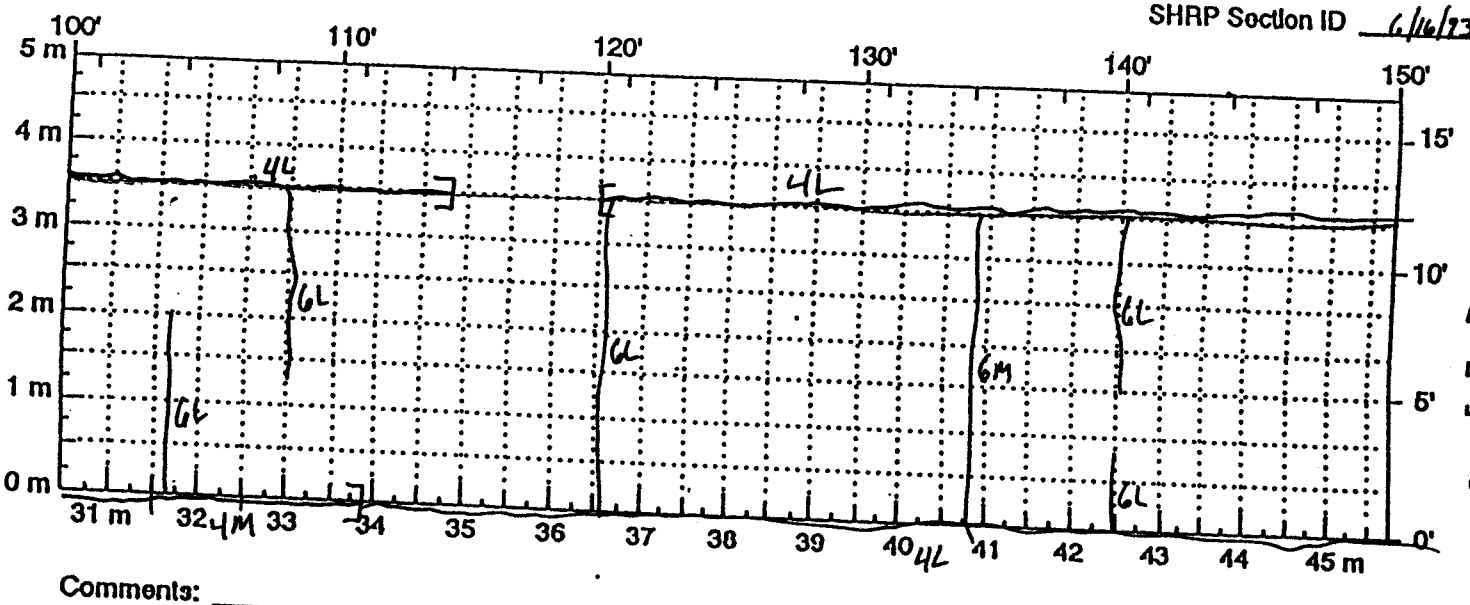


Comments: _____

State Assigned ID 906405

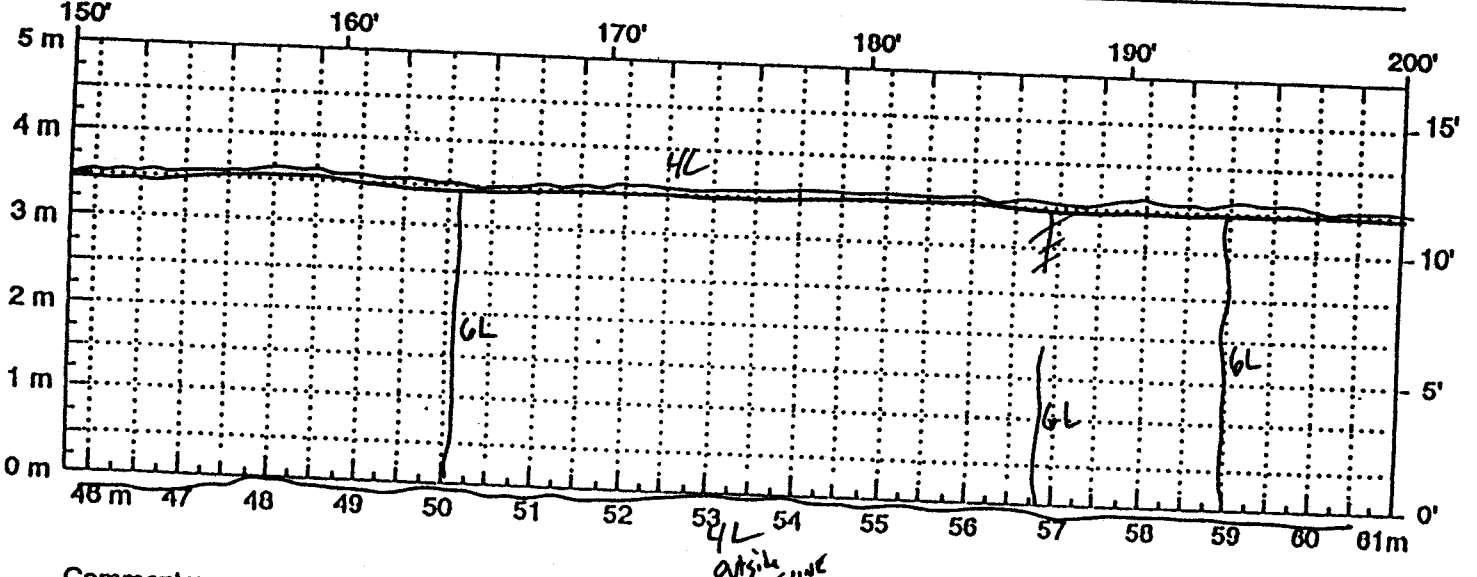
State Code BJW

SHRP Section ID 6/16/93



4L c/L – 28.75/0
4L* – 27/0
4M – 3.3/0
6L – 9/23.70

Comments: _____

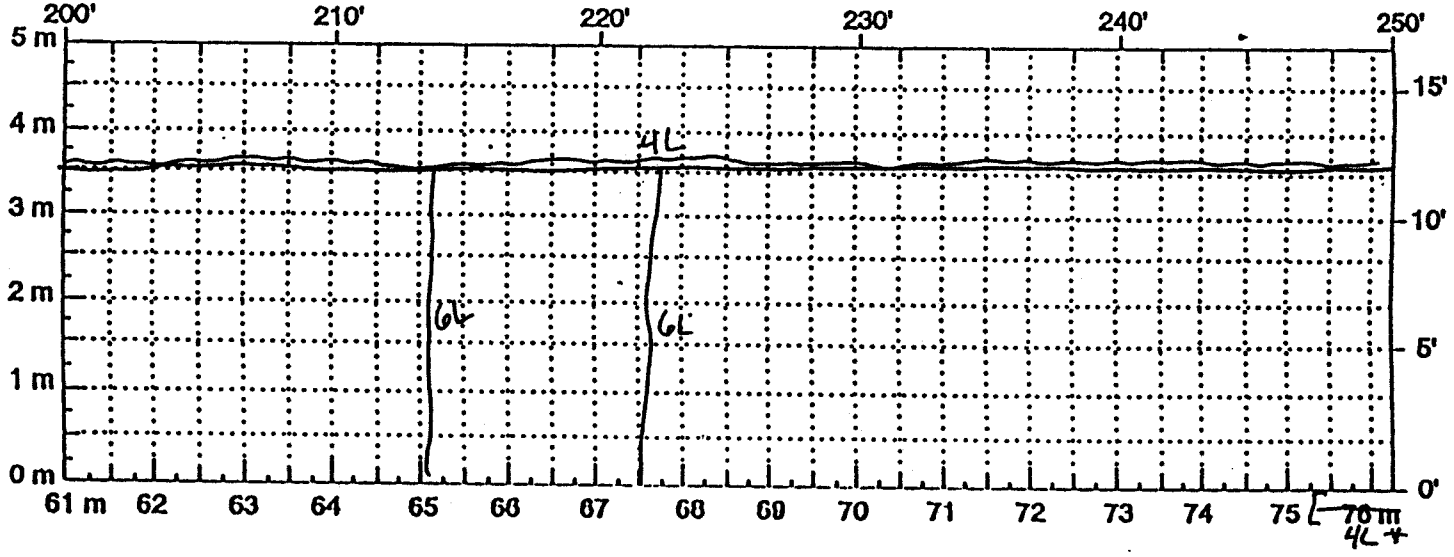


Comments: _____

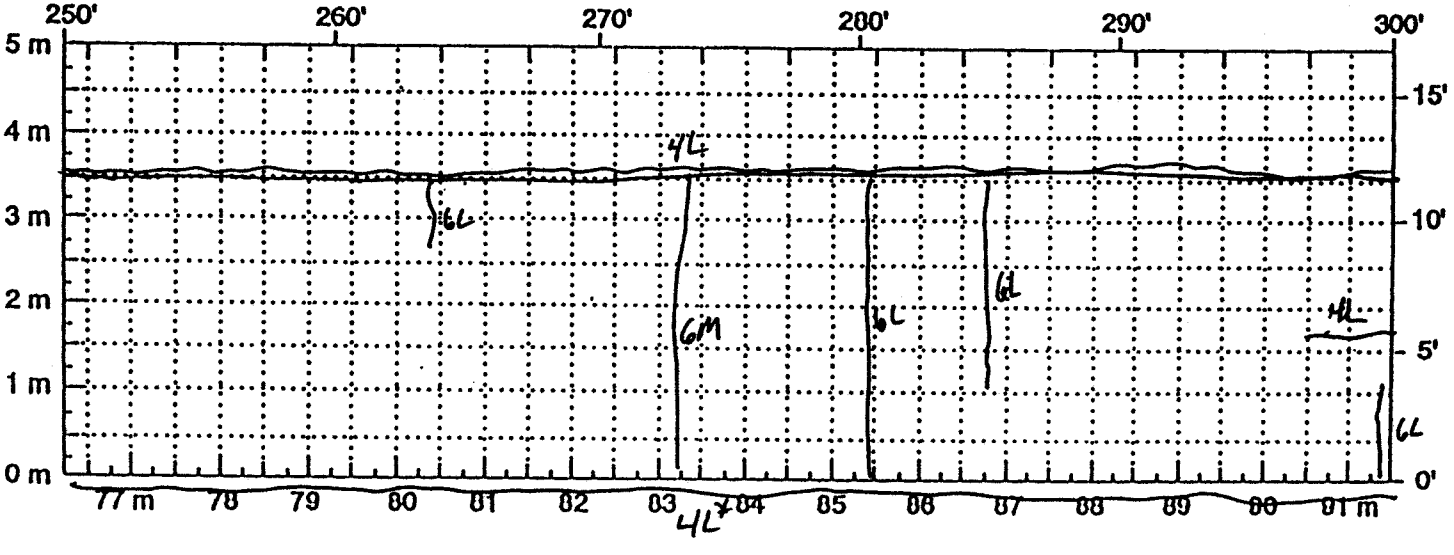
State Assigned ID 906405

State Code BJW

SHRP Section ID 6/4/93



Comments: _____



Comments: *6" OUTSIDE WHITE LINE

6L - 6/19.2/0

6M - 1/3.65/0

4L(C/L) - 30.2/0

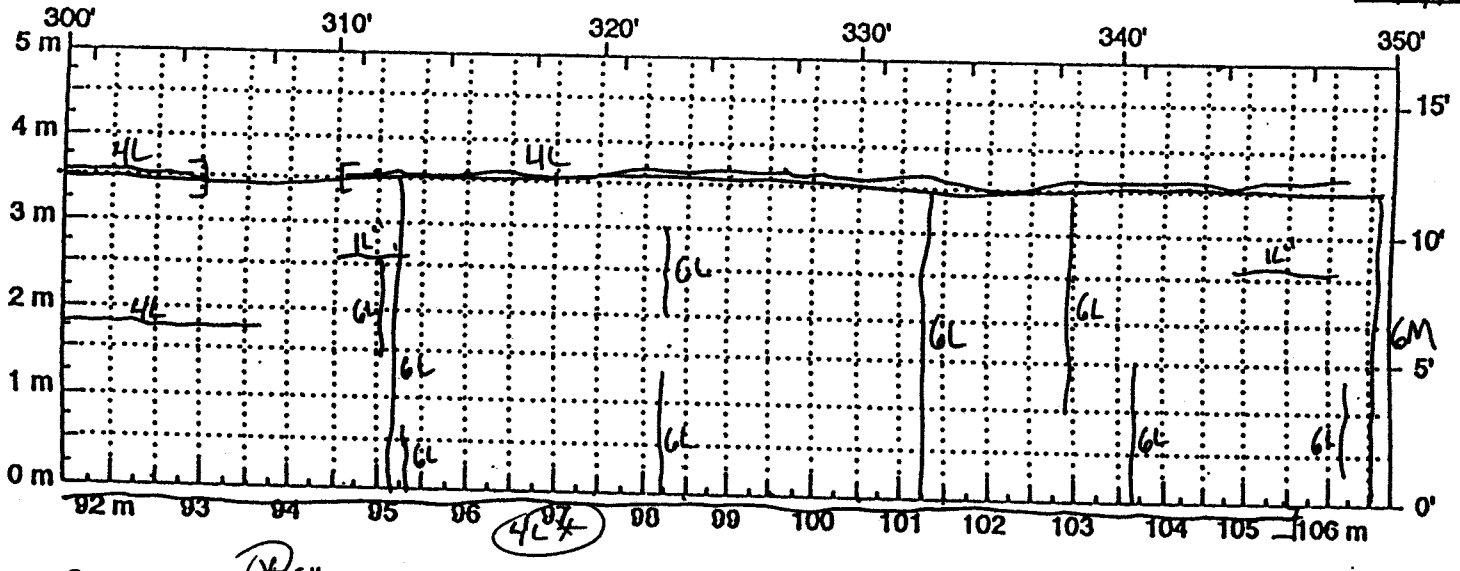
4L - 1/0

4L* - 16.5/0

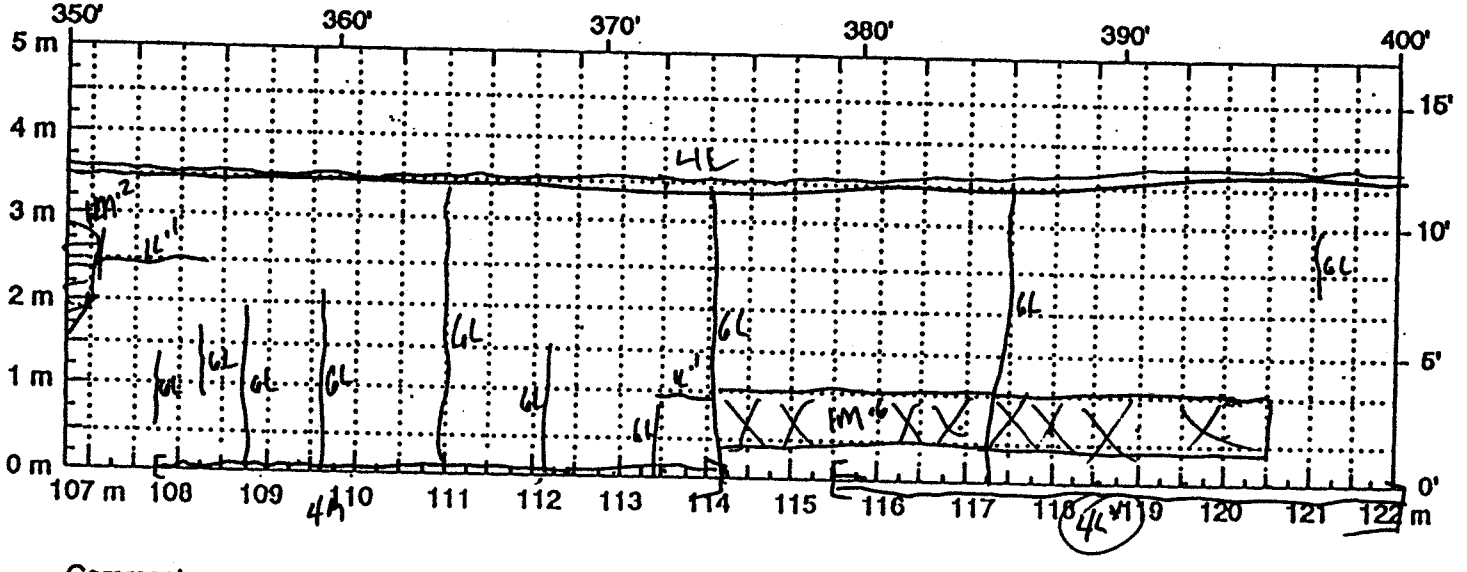
State Assigned ID 906405

State Code BJJ

SHRP Section ID 6/11/93



Comments: ⊕ 6" OUTSIDE WHEEL LINE



Comments: _____

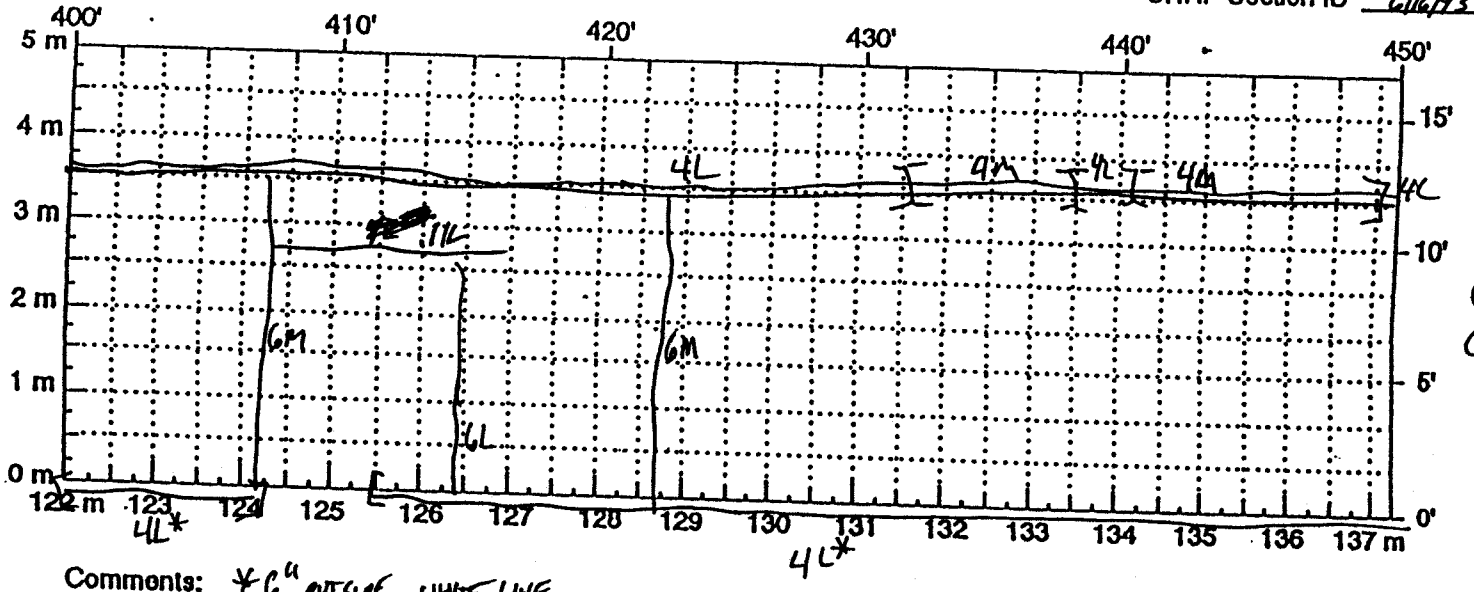
IL - .61
IM - 3.9
6L - 18/33.4/0
4L - 27.6/0

30.3

State Assigned ID 906405

State Code BJW

SHRP Section ID 6/16/93



Comments: *6" OUTSIDE WHITE LINE

1L = .3

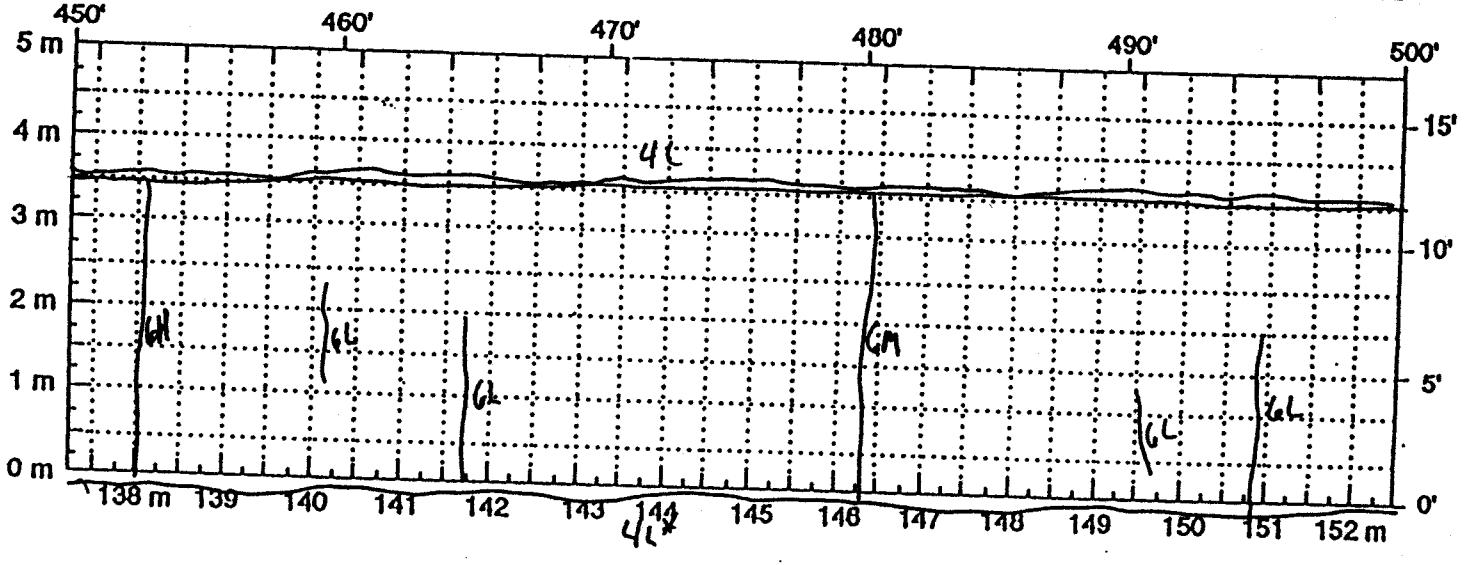
6L = 5/8.4/0

6M = 3/10.8/0

4L WHEEL = ——

4L NOW = 54.3

4M NOW = 5.1



Comments: ——

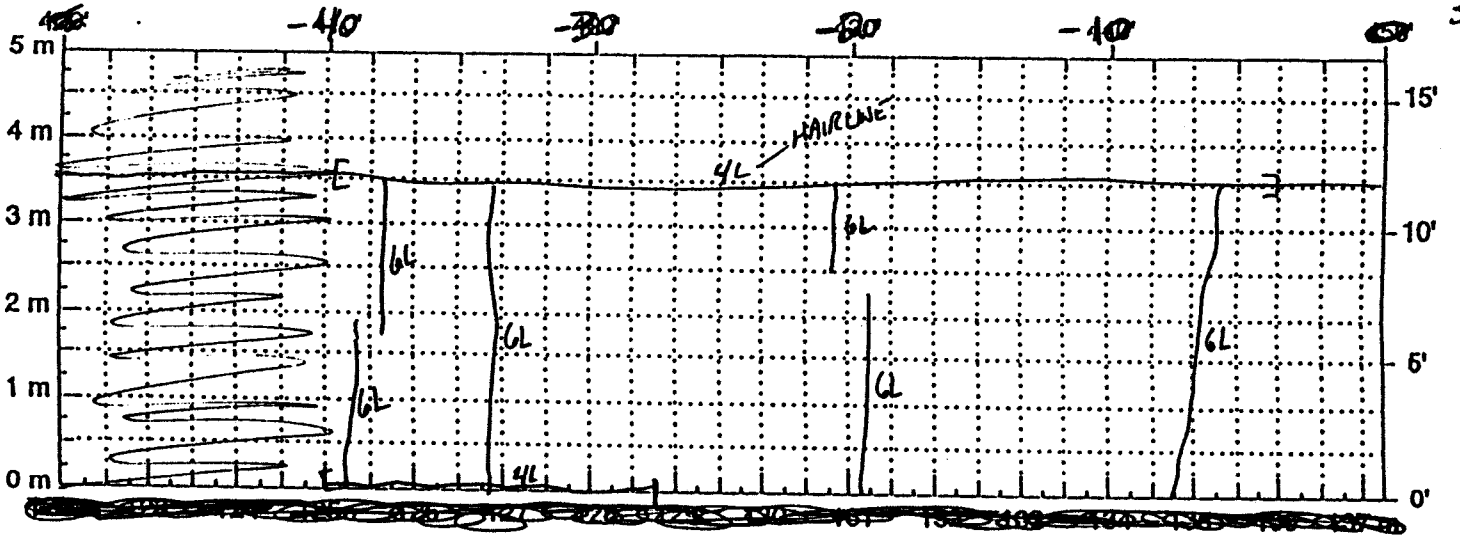
SMP INFO ONLY

State Assigned ID 906405

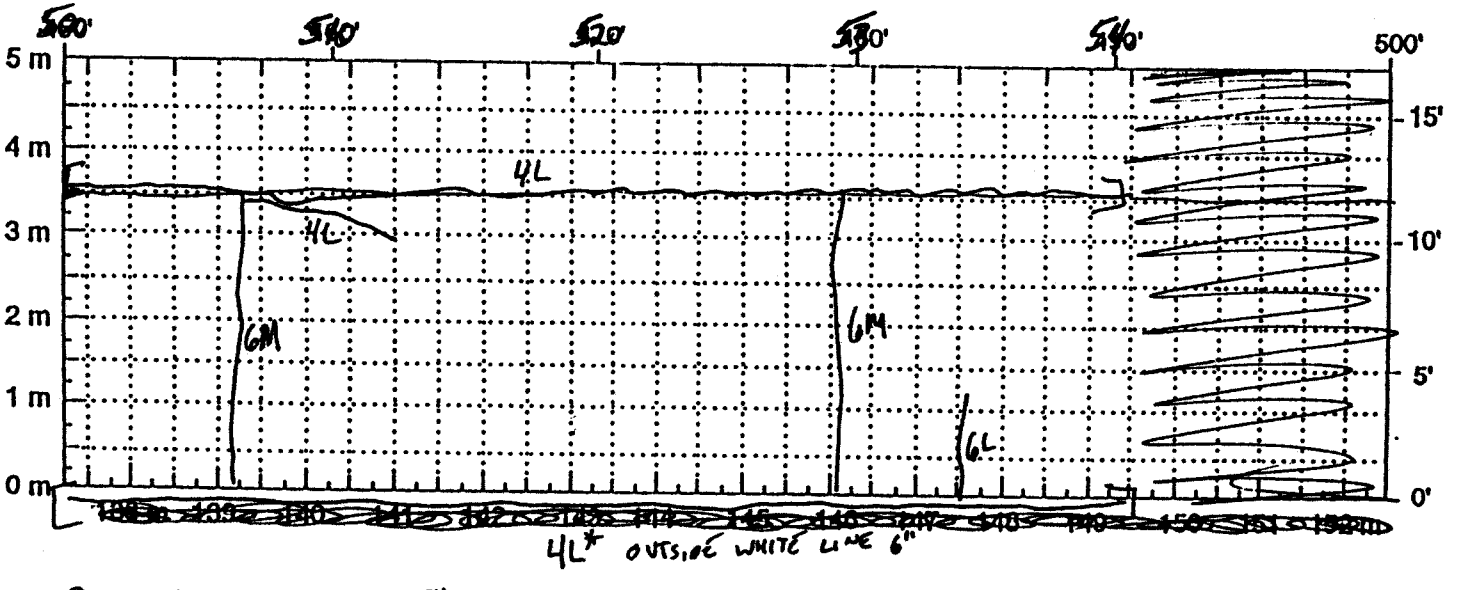
State Code BJU

SHRP Section ID 6/16/93

SM POSS. LOCATION DISTRESS EXTRA



Comments: STA 0 → -40



Comments: STA 500-540

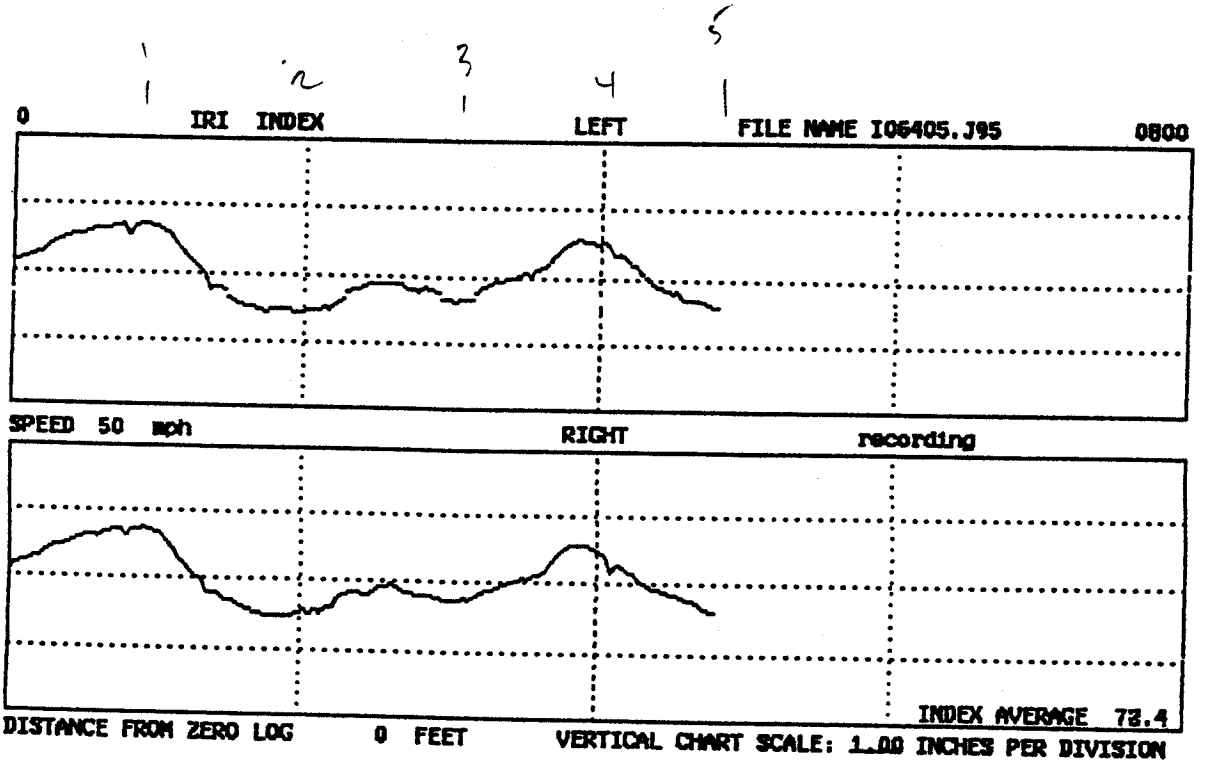
*** LTPP Section ID : 906405 ***

Date Surveyed : 06/23/91
Unit : #1
Camera : #1

Operator : CHAN
Date Digitized : 10/30/91

Rut Depth(mm)

No.	Station	Leftside	Rightside
01	0-02	2	3
02	0+49	4	3
03	0+99	5	5
04	1+50	4	3
05	2+00	4	4
06	2+50	3	6
07	3+00	2	6
08	3+50	9	7
09	4+01	8	7
10	4+51	6	4
11	5+02	3	5
Summary			
Maximum		9	7
Minimum		2	3
Average		4.5	4.8
SD		2.3	1.5


1
2
3
4
5
0
IRI INDEX
LEFT
FILE NAME I06405.J95
0800
SPEED 50 mph
RIGHT
recording
INDEX AVERAGE 72.4
DISTANCE FROM ZERO LOG 0 FEET
VERTICAL CHART SCALE: 1.00 INCHES PER DIVISION

Edit comment @ stn. 275

07:36 930616

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

FWD S/N : 8002-063
Operator ID : VAN SAMBEEK, ROBERT J.

Extra tests for SM

Stationing...: Feet

Diameter of Plate: 11.8
Deflector distances : 8 12 18 24 36 60

SHRP TESTING - FLEXIBLE - BASIN TEST (F0,F1,F3)
Sequence: CCC1111222233334444

Stn: -40 Lane:F1 Temp: J/C: Air: 53 PvT: 55 07:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	21.32	15.94	10.71	7.51	5.33	3.47	2.13
	C	109.4	11992	21.03	15.77	10.67	7.51	5.38	3.51	2.13
	C	109.9	12040	20.99	15.81	10.67	7.51	5.38	3.55	2.17
*	1	56.4	6176	11.14	8.32	5.23	3.55	2.53	1.65	1.04
*	1	56.1	6152	11.02	8.27	5.27	3.59	2.58	1.69	1.04
*	1	56.4	6184	11.10	8.36	5.27	3.71	2.62	1.73	1.13
*	1	56.4	6192	11.06	8.32	5.23	3.55	2.53	1.69	1.04
*	2	84.6	9280	16.05	12.06	8.01	5.53	3.91	2.56	1.60
*	2	84.9	9304	16.17	12.19	8.10	5.66	4.00	2.64	1.65
*	2	84.9	9320	16.17	12.19	8.05	5.57	3.96	2.60	1.60
*	2	85.1	9336	16.13	12.19	8.05	5.57	3.96	2.56	1.56
*	3	109.7	12032	20.65	15.60	10.63	7.47	5.33	3.51	2.17
*	3	109.9	12048	20.65	15.64	10.67	7.47	5.33	3.47	2.13
*	3	110.0	12056	20.70	15.64	10.63	7.47	5.33	3.47	2.13
*	3	109.6	12016	20.70	15.68	10.63	7.47	5.33	3.51	2.13
*	4	146.8	16104	26.14	19.69	13.62	9.62	6.89	4.46	2.73
*	4	146.5	16056	26.27	19.73	13.75	9.71	7.02	4.59	2.82
*	4	144.8	15880	26.39	19.95V	13.75	9.75	6.98	4.55	2.78
*	4	146.2	16032	26.44	19.78	13.71	9.75	6.98	4.55	2.82

Stn: -35 Lane:F1 Temp: J/C: Air: 53 PvT: 56 07:41

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	24.55	15.04	11.27	7.39	5.38	3.55	2.26
	C	110.6	12120	23.96	14.74	11.05	7.30	5.29	3.47	2.17
	C	110.4	12112	23.92	14.74	11.10	7.26	5.29	3.51	2.21
*	1	56.5	6208	13.15	7.54	5.61	3.46	2.53	1.69	1.13
*	1	56.4	6184	13.07	7.50	5.57	3.46	2.49	1.65	1.08
*	1	56.2	6160	13.03	7.45	5.61	3.46	2.53	1.69	1.13
*	1	56.2	6160	12.95	7.41	5.57	3.46	2.53	1.69	1.13
*	2	85.1	9328	18.43	11.16	8.35	5.36	3.87	2.56	1.60
*	2	85.2	9352	18.56	11.20	8.40	5.36	3.87	2.56	1.60
*	2	85.5	9376	18.52	11.20	8.48	5.36	3.91	2.56	1.65
*	2	85.1	9320	18.43	11.20	8.40	5.36	3.91	2.56	1.60
*	3	110.7	12136	23.42	14.56	11.01	7.26	5.29	3.51	2.21
*	3	110.7	12144	23.46	14.61	11.05	7.22	5.24	3.47	2.17
*	3	110.6	12128	23.46	14.61	11.05	7.22	5.24	3.42	2.17
*	3	110.6	12128	23.54	14.74	11.14	7.35	5.33	3.55	2.26
*	4	144.5	15840	29.49	18.61	14.14	9.37	6.80	4.51	2.82
*	4	144.9	15888	29.70	18.83	14.27	9.50	6.89	4.59	2.91
*	4	144.9	15888	29.70	18.79	14.27	9.50	6.85	4.55	2.82
*	4	144.5	15848	29.70	18.92	14.27	9.62	6.93	4.59	2.91

'L-TRANS.CR. UNDER LP

Stn: -25 Lane:F1 Temp: J/C: Air: 53 PvT: 56 07:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11936	21.11	15.51	11.78	7.89	5.47	3.51	2.17
	C	109.6	12016	20.70	15.21	11.53	7.73	5.38	3.47	2.17
	C	109.0	11960	20.61	15.12	11.53	7.73	5.38	3.47	2.17
*	1	55.5	6088	10.85	7.71	5.78	3.71	2.53	1.65	1.08
*	1	55.7	6096	10.89	7.76	5.87	3.80	2.58	1.73	1.13
*	1	55.5	6088	10.89	7.71	5.87	3.76	2.58	1.69	1.13
*	1	55.9	6128	10.85	7.76	5.87	3.76	2.58	1.69	1.13
*	2	84.5	9264	15.79	11.59	8.83	5.78	3.96	2.60	1.65
*	2	84.8	9296	15.88	11.68	8.91	5.87	4.04	2.64	1.65
*	2	84.6	9280	15.79	11.68	8.91	5.87	4.04	2.64	1.69
*	2	84.8	9296	15.84	11.63	8.91	5.87	4.04	2.64	1.65

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	3	109.4	12000	20.44	15.12	11.53	7.73	5.42	3.51	2.17
*	3	109.7	12024	20.53	15.17	11.57	7.77	5.47	3.51	2.21
*	3	109.4	12000	20.44	15.08	11.48	7.73	5.38	3.47	2.17
*	3	109.4	12000	20.49	15.17	11.53	7.77	5.42	3.42	2.13
*	4	145.1	15904	25.97	19.26	14.74	10.00	7.02	4.51	2.82
*	4	145.5	15952	26.18	19.35	14.78	10.05	7.11	4.51	2.86
*	4	145.2	15920	26.23	19.39	14.78	10.05	7.11	4.51	2.86
*	4	144.9	15888	26.14	19.35	14.74	10.00	7.07	4.46	2.82

Stn: -15 Lane:F1 Temp: J/C: Air: 53 PvT: 59 07:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	21.95	16.07	11.87	7.94	5.51	3.51	2.17
	C	109.4	12000	21.53	15.73	11.65	7.85	5.47	3.51	2.17
	C	109.4	12000	21.37	15.73	11.57	7.77	5.42	3.47	2.13
*	1	55.8	6120	11.23	8.14	5.78	3.71	2.53	1.60	1.00V
*	1	55.8	6120	11.27	8.19	5.87	3.84	2.62	1.65	1.13
*	1	56.4	6184	11.27	8.19	5.91	3.88	2.62	1.69	1.08
*	1	56.2	6168	11.19	8.19	5.91	3.84	2.67	1.73	1.17
*	2	84.3	9240	16.46	12.02	8.78	5.83	4.04	2.51	1.60
*	2	84.6	9280	16.46	12.06	8.78	5.83	4.00	2.51	1.56
*	2	84.1	9224	16.46	12.06	8.83	5.87	4.09	2.60	1.69
*	2	84.5	9264	16.46	12.06	8.83	5.87	4.04	2.56	1.60
*	3	109.4	12000	20.99	15.47	11.44	7.68	5.38	3.38	2.13
*	3	109.4	12000	20.99	15.51	11.48	7.73	5.38	3.42	2.13
*	3	109.4	12000	21.11	15.60	11.53	7.77	5.42	3.47	2.17
*	3	109.4	12000	21.07	15.55	11.53	7.77	5.42	3.51	2.17
*	4	145.4	15936	26.77	19.65	14.78	10.05	7.02	4.55	2.82
*	4	145.2	15928	26.90	19.65	14.87	10.09	7.07	4.55	2.82
*	4	145.1	15904	26.98	19.69	14.87	10.09	7.07	4.59	2.82
*	4	144.3	15824	26.98	19.52	15.04	10.26V	7.20	4.68	2.86

Stn: -10 Lane:F1 Temp: J/C: Air: 54 PvT: 58 07:49

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	21.99	16.07	12.04	7.85	5.38	3.34	2.17
	C	109.1	11976	21.45	15.60	11.78	7.73	5.29	3.34	2.21
	C	109.6	12008	21.41	15.51	11.70	7.68	5.29	3.29	2.13
*	1	55.9	6128	11.14	8.01	5.87	3.67	2.53	1.52	1.04V
*	1	55.9	6128	11.23	8.06	5.96	3.76	2.58	1.56	1.13
*	1	55.8	6120	11.14	8.01	5.96	3.76	2.58	1.56	1.13
*	1	55.8	6120	11.14	8.01	5.91	3.71	2.58	1.56	1.13
*	2	84.1	9224	16.34	11.81	8.83	5.70	3.91	2.38	1.60
*	2	84.3	9248	16.42	11.89	8.95	5.78	4.00	2.47	1.65
*	2	84.1	9224	16.38	11.85	8.91	5.74	3.91	2.38	1.65
*	2	84.5	9256	16.38	11.89	9.00	5.83	3.96	2.51	1.69
*	3	109.7	12032	21.03	15.25	11.61	7.64	5.24	3.29	2.08
*	3	109.6	12016	21.11	15.34	11.70	7.68	5.33	3.34	2.17
*	3	109.3	11976	21.11	15.30	11.65	7.64	5.29	3.25	2.13
*	3	109.3	11984	21.07	15.34	11.70	7.68	5.33	3.25	2.13
*	4	144.5	15840	26.64	19.56	14.91	9.96	6.85	4.38	2.78
*	4	144.5	15840	26.73	19.61	14.95	9.92	6.80	4.33	2.78
*	4	144.1	15792	26.81	19.69	15.00	9.96	6.89	4.42	2.82
*	4	144.3	15824	26.85	19.73	15.04	10.00	6.89	4.42	2.82

Stn: 0 Lane:F1 Temp: J/C: Air: 54 PvT: 56 07:52

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12288	23.59	14.61	10.33	6.67	4.62	3.08	2.13
	C	112.5	12328	22.66	14.31	10.11	6.54	4.53	3.03	2.13
	C	112.6	12344	22.58	14.31	10.15	6.59	4.58	3.08	2.08
*	1	56.2	6160	11.81	7.07	4.93	3.12	2.22	1.47	1.00
*	1	56.2	6160	11.65	7.02	4.93	3.08	2.18	1.52	1.00
*	1	56.4	6176	11.69	6.98	4.97	3.12	2.22	1.52	1.04
*	1	56.7	6216	11.69	7.02	4.97	3.17	2.22	1.52	1.04
*	2	85.4	9360	17.18	10.77	7.50	4.81	3.29	2.25	1.47
*	2	85.9	9416	17.26	10.82	7.58	4.85	3.33	2.25	1.52
*	2	85.7	9392	17.30	10.94	7.63	4.94	3.38	2.34	1.56
*	2	85.5	9376	17.26	10.90	7.63	4.94	3.38	2.34	1.56
*	3	112.6	12344	22.12	14.22	10.11	6.59	4.58	3.08	2.13
*	3	112.6	12352	22.20	14.22	10.11	6.54	4.53	3.03	2.08
*	3	112.5	12336	22.20	14.26	10.15	6.63	4.58	3.12	2.17
*	3	112.3	12304	22.08	14.26	10.11	6.54	4.58	3.08	2.08
*	4	144.3	15832	26.28	18.40	13.15	8.61	6.00	3.99	2.65

- Rexwald - Quick et maybe in order for this section
WIM - Piezo does give S Bob V.
- use for Seasonal profile
for deflection

FHWA-LTPP SEASONAL PROGRAM IN SASKATCHEWAN

Introduction

Objectives of the Seasonal Monitoring Program

- Collect and analyze data to better understand the short and long term impacts of environmental factors including temperature, moisture, and frost/thaw depth on a pavement structure for improving pavement design.

— More Intense Monitoring of GPS sections.

- Factors defined in the core experiment monitored by FHWA-LTPP include
    - wet or dry climate
    - freeze or no freeze climate
    - pavement surface type (AC or PCC)
    - pavement surface thickness
    - original construction

- Factors not defined in the core experiment include
    - pavement edge drains
    - recycled materials
    - CRCP
    - shallow water table
    - shallow bedrock
    - etc

- Agencies are encouraged to monitor supplemental sections to study factors not included in the core experiment
    - reduced monitoring requirements
    - use existing GPS or SPS sections

Overview of Sensor Installation and Monitoring Activities

- Two days for initial instrumentation installation and monitoring

- About $10,000 of equipment installed at each site + Labor + time

- Monitor sections every other year (70 days over a 10 year period)

- Relate environmental variations to changes in pavement performance
    - pavement, base and subgrade strength calculated from deflection data
        - collected monthly most of year and bi-weekly in the spring
    - ride quality determined from profile data
        - collected five times per year
    - pavement distress documented using detailed distress surveys
        - collected two times per year in addition to PASCO photo logging
    - frost heave/swelling soil monitored using elevation data
        - collected five times in the first year and two times per year after that

Test Sections

Section Location

- 64 sections in the Core Experiment for the United States and Canada monitored under FHWA-LTPP contract

- 16 sections in the North Central Region
  - one core section in Saskatchewan
    - 906405, EB PTH 16, east of Plunkett (East of Saskatoon) — AC - Thin — Dry - Freeze — Coarse Soil
- no supplemental experiment sections identified in the North Central Region at this time

- see map of core sections in the North Central Region (next page)

Allowable Maintenance

- routine maintenance
  - any scheduled? — probe 1" deep.

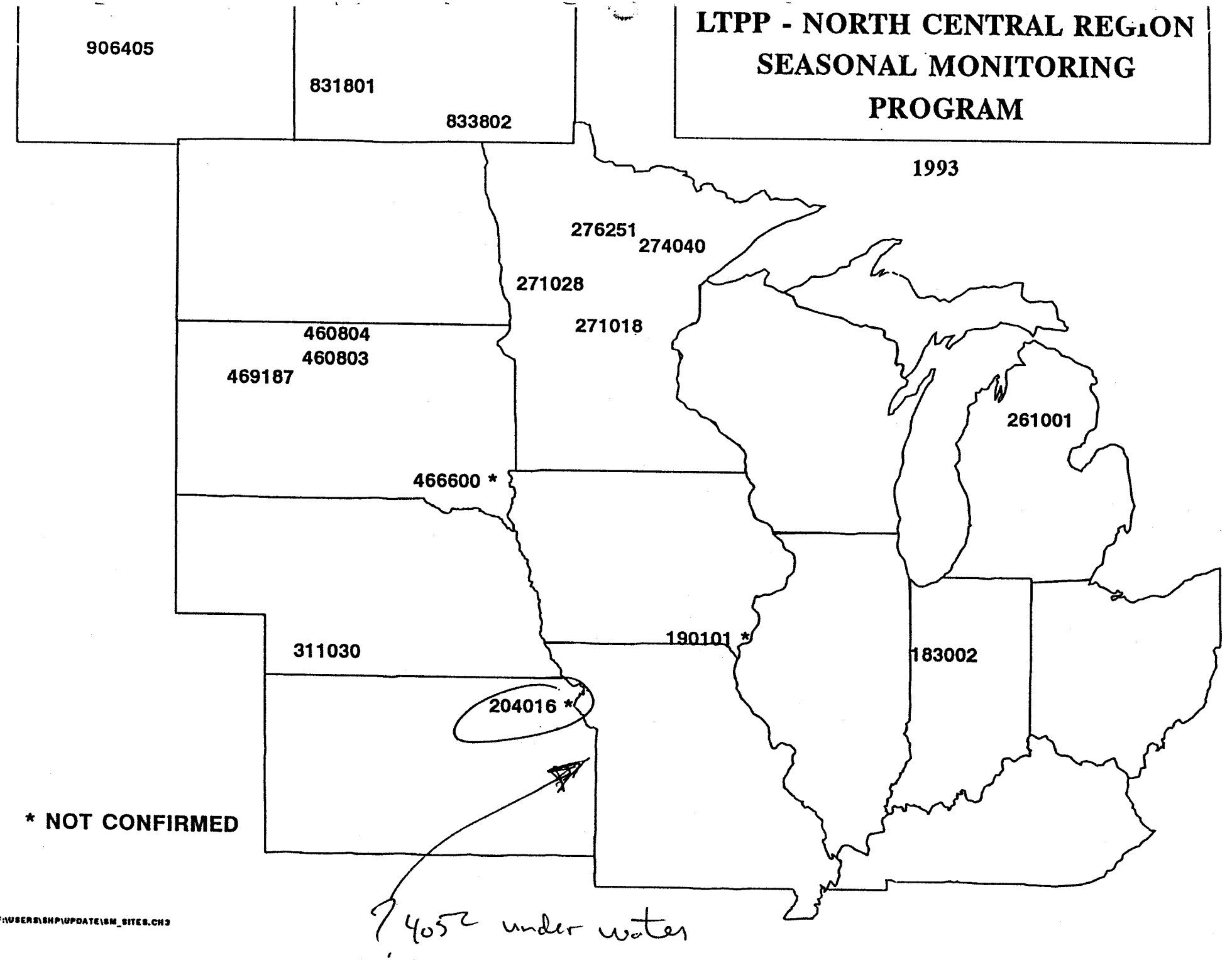
- no structural rehabilitation preferred for ten years

- safety is primary concern

- careful around buried cables for the equipment

LTPP - NORTH CENTRAL REGION SEASONAL MONITORING PROGRAM

1993



* NOT CONFIRMED

F:\USERS\SHP\UPDATE\SM_SITES.CH3

405 under water

→Pilot Projects to evaluate various instruments

Sensor Description and Installation Procedure

TDR (Time Domain Reflectometry) Probes

Moisture

- FHWA design and manufacture
  - three prong — 8" x 4"
  - $60.00 each

- measure dielectric of material between probes and relate to moisture content
  - air = 1.0
  - dry soil = 3 to 4
  - water = 80

Sat. Sand ≃ 60

- calibration
  - laboratory in air, water, and shorted
  - field moisture test on material placed on probes
  - retain soil samples for additional laboratory calibration

- 10 probes per installation
  - one mid-depth in the base
  - seven at six inch intervals in the top of the subgrade
  - two at 12 inch intervals approximately seven feet below the surface

Thermistor Probe

- Measurement Research Corporation (MRC)
  - $1000.00

- thermistors change resistance with change in temperature

- built in multiplexer for automated readings

- two part
  - stainless steel section (13 inches long)
    - monitor temperature gradient through the pavement surface
      - one inch deep
      - mid depth in the surface
      - one inch above bottom of pavement

  - plexiglass section
    - monitor temperatures at 15 points along probe
      - three inch intervals near surface
      - six inch intervals to 80 inch depth

- laboratory calibration at three temperatures
  - ice bath
  - room temperature
  - warm water bath

Resistivity Instrumentation

- CRREL design
  - PVC probe with 36 electrodes at two inch intervals
  - $800.00

- large increase in resistance when moisture in the soil freezes
  - determine both frost and thaw depth

- require signal generator and multimeters
  - compute AC resistance between electrodes

- both manual measurement and automated

Air Temperature

- Campbell Scientific
  - $150.00

- air probe and radiation shield

- mount on instrument pole nine feet above the ground

Rain Gauge/Tipping Bucket

- Texas Electronics
  - $255.00

- 0.1 mm (0.004 inches) liquid precipitation per tip

- mount on instrument pole nine feet above the ground

Equipment Cabinet and Instrument Pole

- telephone pedestal
  - break away classification
  - contain power supply, data logger, sensor connections for mobile reader
  - conduit runs into cabinet from instrumentation hole
  - pea rock inside base to prevent condensation
  - located about 26 feet off edge of driving lane (limited by cable length)

- instrument pole
  - two inch diameter galvanized pipe
  - break away classification
  - extend below frost line
  - holds rain gauge and air temperature probe
  - located about 27 feet off edge of driving lane behind equipment cabinet

Interface/Communications Equipment

- mobile unit
  - used on site to read TDR probes and resistivity probe
  - multiplexers for automated readings

- cable reader
  - Tektronics model 1502
    - $8000.00
  - generates signal and monitors reflected energy from TDR probes
  - relate time for pulse to travel through probe to dielectric constant
    - relate dielectric constant to moisture content

- computer and software
  - "onsite" used to monitor temperatures and rainfall continuously
  - "mobile" used to monitor resistivity probe and TDR probes during site visits

↳ frost/flow moisture

Observation Piezometer

- monitor depth to ground water table

- designed to act as frost free bench mark
  - Dave Esch design
  - anchor at 14 foot depth
  - sliding section extends eight feet below the surface — prevent frost from lifting
    - filled with water proof grease

Measuring Points for Joint Movement on PCC Pavements

- install three sets of snap rings on each joint monitored — load transfer
  - located at one, six and eleven feet from edge of slab
  - bonded 0.3 inches deep in the pavement

- measure distance between rings
  - nearest 0.001 inch with digital caliper
  - use "hot" measurement as zero opening on the joint

Planning Session for Agency Staff Involved with Instrumentation and Monitoring of GPS Section 906405

Installation and Monitoring Schedule

Instrumentation Installation and Initial Monitoring

- two days required with third day as contingency
  - first day complete instrument installation
  - second day collect data

- tentative schedule
  - Oct. 6 & 7 - 906405, EB PTH 16, East of Plunkett — NO MOSQUITE
  - Oct. 8 as contingency days for weather or equipment problems

Long Term Monitoring

- one day every month with the exception of two times per month in the spring

- every other year for 10 years

- obtain about 70 days of FWD monitoring data

Special Concerns

Safety

- Agency Requirements
  - clothing and safety shoes
  - bring up any safety concerns on-site

now 15' into ditch from shoulder

10' 2' 15

- about when cabinet is placed

Other

- Delineators to mark cabinet and pole for snowmobiles?
  - in 30' zone off driving lane

Crossing markings. reflective will be provided

- Maintenance -
  - Crack seal - when?

Saskatchewan Highways and Transportation Responsibilities

Project Contacts for Maintenance Activities and Traffic Control
- will set up traffic control directly with district if desired

Public Relations
- coordinate with FHWA representative on-site regarding any news coverage

Utility Clearance
- 700 foot section (extend 100 foot outside both ends of 500 foot test section)
- sections marked on right edge of driving lane with white paint
- clear driving lane and 40 feet into the ditch on the south side

Traffic Control for Full Lane Closure
- two days for initial installation and monitoring in October
- lane closure for 700 foot section
  - signs, cones, etc
- set up as early as possible
  - 7:30 AM?
- may want to mark locations for placing signs

Establish Bench Mark for Elevation Reference
- not affected by frost
- actual elevation not required

Equipment
- pavement saw and operator
  - only required for first day during instrument installation
  - saw 16 inch square block out of the pavement surface
    - located in the outer wheel path
    - will put block back in-place
  - equipment capable of cutting four inches deep
    - 906405 has approximately 3.0 inch asphalt surface
  - saw four inch wide trench for conduit
    - extend from outer wheel path to edge of paved shoulder
  - saw 13 inch slot for temperature probe
    - extend out from block in the outer wheel path
- drill rig and operator
  - only required for first day during instrument installation
  - able to reach location for instrument pole 27 feet off edge of driving lane
  - bore one six-inch diameter hole for piezometer
    - 14 foot depth
    - located on shoulder
      - location may depend on cap used for piezometer

- bore one 12 inch diameter hole for instrumentation
  - solid stem auger preferred
    - continuous flighting not required
  - eight foot depth
  - located in outer wheel path
  - NCRCO has 12 inch diameter auger with 1-5/8 inch male hex drive

- bore one 12 inch diameter hole for equipment cabinet (or will dig by hand)
  - two feet deep
  - located about 26 feet outside the driving lane in the ditch

- bore one six-inch diameter hole for the instrumentation pole
  - 10 feet deep
  - located adjacent to the equipment cabinet in the ditch

- small portable generator (only if readily available) → will have my saw
  - may not be needed

Materials

- cover assembly for piezometer
  - must function for ten years
  - able to open in the winter
  - minimum four inch inside diameter
  - 18 inches to 24 inches long

Slope Meter Cap
- concrete in
- have large or rider

- sackcrete for piezometer cover and instrumentation pole
  - estimate six bags

- bentonite pellets for sealing piezometer
  - five gallon bucket

- filter sand for piezometer
  - 400 pounds (four bags)
  - particle size not critical

- pea gravel or trap rock for equipment cabinet
  - 500 pounds
  - 3/8 inch size preferred

— from pit 1 km away

- asphalt patch for conduit trench
  - estimate 500 pounds — may use hot mix if plant still open

- water for mixing sackcrete and equipment clean-up
  - estimate 30 gallons

Pavement Repairs

- patch conduit trench with asphalt material

- assist with block replacement

Miscellaneous Activities

- mow grass in area identified for utility clearance or bring weed whip to the site

NCRCO (Braun Intertec) and FHWA Staff Responsibilities

Instrumentation

- provide all instrumentation

- install all instrumentation
  - may ask anyone on-site for assistance

- monitoring activities
  - will collect all required monitoring data

- NCRCO phone 612-776-7522
  - main contacts for Seasonal Monitoring
    - Bob Van Sambeek
    - Ron Urbach

Closing Comments

OLD FROST TUBE ? @ 5'45" - will get operational

DR. FREDLUND - Thermal Conductivity ?

- will look @ 833802

- 890405 to coarse - soil

SASKATCHEWAN HIGHWAYS AND TRANSPORTATION
TECHNICAL STANDARDS AND POLICIES BRANCH
1610 PARK STREET
REGINA, SASK. S4P 3V7

FAX TRANSMITTAL SHEET

DATE: September 8, 1993

FROM: George Wasyliw
Field Testing Supervisor

PHONE : (306)787-3422 **FAX :** (306)787-4582

DELIVER TO :

NAME: Bob Van Sambeek

ADDRESS: NCROCO (Braun Intertec)

PHONE : (416)839-9960 **FAX :** (416)839-4325

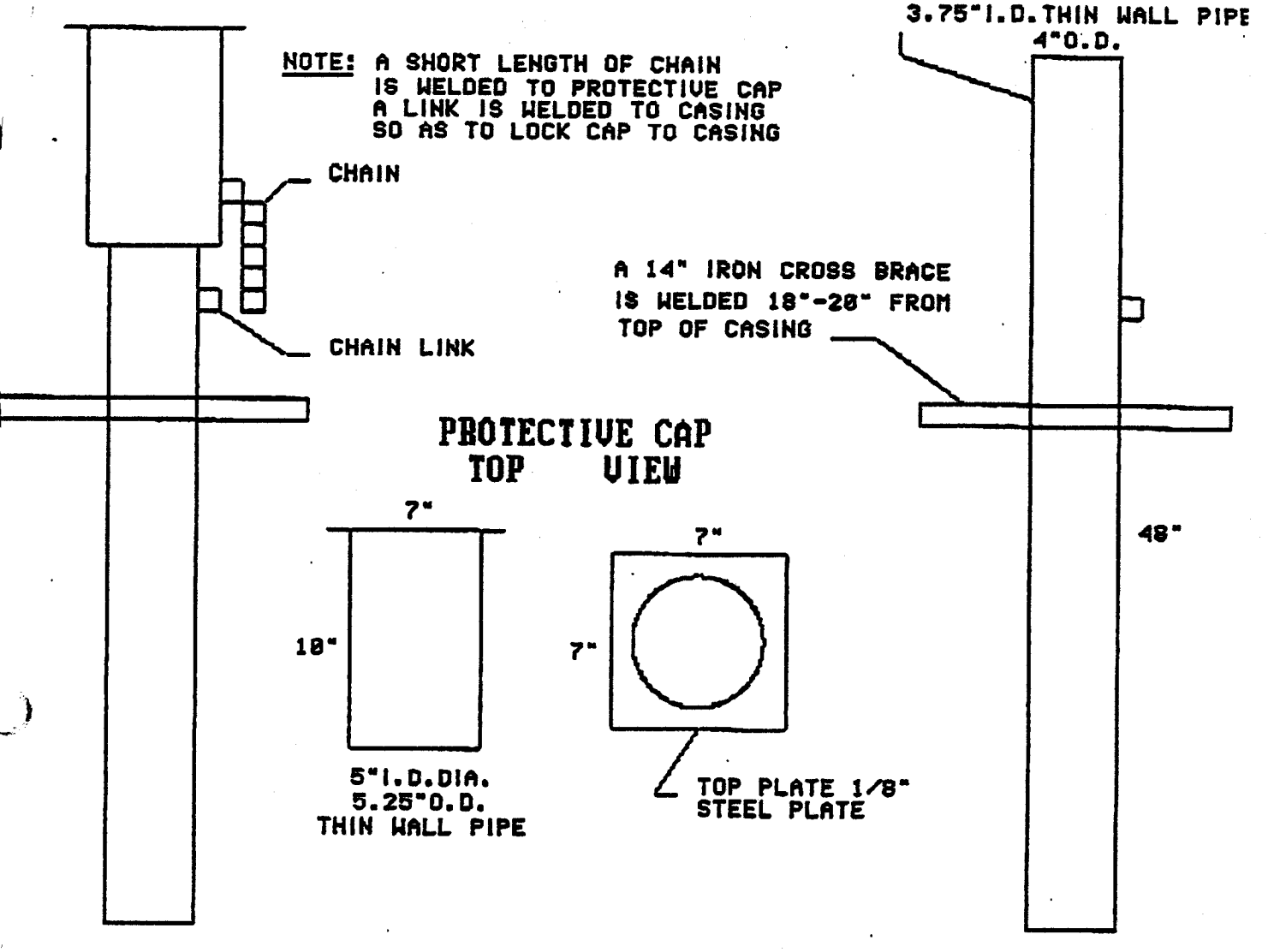
NUMBER OF PAGES SENT (including cover page) : 2

MESSAGE : Re: SHRP Instrumentation GPS Section 906405

Attached is a plan our shop uses to make protective casing for slope indicators. For shoulder installations, we reduce the length from four feet to two feet and the cap down to about six inches. The chain link is also removed.

If you do not receive all pages, please call immediately.

SASKATCHEWAN HIGHWAYS AND TRANSPORTATION
PROTECTIVE CASING FOR SLOPE INDICATORS



PROTECTIVE CAP
TOP VIEW

Saskatchewan

Saskatchewan
Highways and
Transportation

Planning & Coordination
1855 Victoria Avenue
Regina, Saskatchewan
CANADA
S4P 3V5

File:16-16-02-05-02

January 7, 1994

Mr. R. VanSambeek
Braun Intertec Corporation
1983 Sloan Place, Suite 10
St. Paul, Minnesota
USA
55117

Dear Bob;

I am writing in regards to the FWD testing you are performing on our SHRP seasonal monitoring site near Plunkett (Site #906405).

We would like to continue to do beam testing in conjunction with the FWD testing you are doing on this site. We are interested in doing this each time you come up, except for the winter months of November through February when we will not see any significant difference in beaming values. In addition to contacting our staff for traffic control, could you please contact Kenner Lees at (306)787-4922 or Harvey Koch at (306)787-4921 each time you plan to complete testing at this site. They will arrange for the benkleman beam testing we wish to carry out.

Please call me at (306)787-4808 if you have any questions.

Take care and yours sincerely,

Stella White

SW/sw

attach

cc. W. Antonio, Senior Municipal Planning Engineer
K. Lees, Manager of Testing Services
H. Koch, Highway Testing Supervisor

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	4	144.2	15808	28.40	18.44	13.24	8.70	6.09	4.03	2.69
*	4	144.2	15808	28.45	18.44	13.20	8.65	6.04	4.03	2.73
*	4	144.1	15792	28.49	18.40	13.20	8.65	6.04	4.03	2.73

'L-TRANS.CR. UNDER D1

Stn: 25 Lane:F1 Temp: J/C: Air: 54 PvT: 59 07:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.2	12184	24.51	15.94	12.04	8.44	6.00	3.77	2.30
	C	111.7	12256	23.71	15.51	11.78	8.27	5.91	3.77	2.26
	C	111.3	12208	23.59	15.51	11.83	8.27	5.96	3.81	2.34
*	1	56.7	6216	12.44	7.80	5.78	3.88	2.76	1.78	1.13
*	1	56.1	6144	12.32	7.76	5.74	3.88	2.71	1.82	1.08
*	1	56.5	6192	12.28	7.71	5.74	3.84	2.71	1.78	1.08
*	1	56.1	6144	12.23	7.76	5.78	3.93	2.84	1.91	1.21
*	2	85.1	9328	17.89	11.59	8.76	6.08	4.27	2.82	1.73
*	2	85.2	9352	17.97	11.63	8.83	6.08	4.31	2.77	1.69
*	2	85.5	9368	17.97	11.63	8.83	6.08	4.31	2.82	1.69
*	2	85.7	9384	17.97	11.59	8.83	6.08	4.31	2.77	1.69
*	3	111.9	12264	23.08	15.30	11.70	8.19	5.91	3.81	2.30
*	3	111.7	12256	23.21	15.34	11.74	8.27	5.96	3.81	2.34
*	3	111.9	12256	23.13	15.30	11.70	8.19	5.87	3.81	2.30
*	3	111.9	12264	23.17	15.34	11.78	8.23	5.91	3.81	2.34
*	4	143.5	15728	29.54	19.73	15.21	10.76	7.69V	4.94	2.95
*	4	143.2	15696	29.66	19.78	15.25	10.85	7.82	4.94	2.99
*	4	143.0	15688	29.70	19.78	15.30	10.93	7.91	4.98	3.04
*	4	143.2	15696	29.79	19.78	15.30	11.02	8.00	4.94	3.04

'L-TRANS.CR. UNDER LP

Stn: 50 Lane:F1 Temp: J/C: Air: 54 PvT: 59 07:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11904	22.04	16.42	12.64	8.74	6.22	3.94	2.34
	C	108.8	11936	21.58	16.07	12.38	8.61	6.13	3.99	2.34
	C	109.0	11960	21.58	16.03	12.42	8.65	6.18	4.03	2.39
*	1	55.2	6056	11.19	8.19	6.13	4.18	2.89	1.91	1.17
*	1	55.2	6056	11.14	8.19	6.13	4.14	2.89	1.91	1.17
*	1	55.4	6064	11.14	8.19	6.17	4.14	2.93	1.91	1.17
*	1	55.7	6104	11.10	8.19	6.13	4.14	2.89	1.86	1.13
*	2	83.9	9192	16.34	12.24	9.25	6.33	4.49	2.90	1.69
*	2	83.9	9192	16.42	12.24	9.34	6.42	4.58	2.95	1.73
*	2	83.9	9192	16.42	12.24	9.38	6.42	4.53	2.95	1.73
*	2	83.9	9200	16.42	12.24	9.34	6.42	4.58	2.95	1.73
*	3	109.3	11984	21.20	15.90	12.25	8.57	6.18	3.94	2.34
*	3	109.4	12000	21.24	15.90	12.34	8.61	6.22	3.94	2.34
*	3	109.4	12000	21.24	15.94	12.34	8.57	6.18	3.94	2.30
*	3	109.3	11984	21.28	15.99	12.34	8.61	6.18	3.99	2.34
*	4	143.6	15744	27.06	20.34	15.85	11.19	8.09	5.16	3.04
*	4	143.5	15736	27.27	20.42	15.94	11.23	8.18	5.24	3.12
*	4	143.6	15752	27.23	20.42	15.94	11.19	8.13	5.20	3.08
*	4	143.3	15720	27.32	20.51	16.02	11.31	8.27	5.29	3.17

Stn: 75 Lane:F1 Temp: J/C: Air: 55 PvT: 60 08:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	25.68	19.43	15.34	10.72	7.38	4.07	2.21
	C	109.1	11960	25.05	18.92	14.91	10.43	7.20	4.03	2.21
	C	109.4	12000	24.89	18.87	14.91	10.47	7.25	4.07	2.26
*	1	55.2	6048	12.86	9.57	7.41	4.98	3.33	1.91	1.26V
*	1	55.5	6080	12.82	9.61	7.41	5.02	3.38	1.91	1.17
*	1	55.5	6096	12.74	9.52	7.33	4.94	3.33	1.86	1.08
*	1	55.7	6096	12.82	9.61	7.37	4.94	3.33	1.86	1.08
*	2	84.1	9208	18.89	14.31	11.18	7.77	5.24	2.99	1.69
*	2	84.2	9232	19.02	14.39	11.27	7.77	5.33	2.99	1.69
*	2	84.1	9216	19.02	14.35	11.27	7.81	5.33	2.99	1.69
*	2	84.3	9248	19.02	14.35	11.31	7.81	5.33	2.99	1.69
*	3	109.7	12032	24.38	18.57	14.70	10.30	7.11	3.99	2.21
*	3	109.6	12008	24.47	18.66	14.82	10.38	7.16	4.07	2.39V
*	3	109.3	11976	24.47	18.61	14.82	10.38	7.25	4.12	2.26
*	3	109.4	12000	24.47	18.66	14.74	10.34	7.16	4.03	2.30
*	4	142.9	15664	31.00	23.70	18.89	13.38	9.38	5.24	2.82
*	4	142.8	15648	31.13	23.70	18.89	13.38	9.38	5.33	2.95

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	4	142.6	15640	31.13	23.70	18.89	13.38	9.38	5.33	2.86
*	4	142.8	15648	31.09	23.66	18.85	13.38	9.38	5.29	2.86

'L-TRANS.CR. BETWEEN D5 AND D6, AND D6 AND D7

Stn: 100 Lane:F1 Temp: J/C: Air: 55 PvT: 60 08:05

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11936	24.09	18.01	13.71	9.16	6.40	3.90	2.30
	C	109.4	12000	23.92	17.84	13.56	9.03	6.31	3.86	2.26
	C	109.3	11992	23.84	17.80	13.54	8.99	6.36	3.90	2.30
*	1	55.5	6096	12.44	9.13	6.81	4.31	3.02	1.86	1.13
*	1	55.4	6072	12.28	9.05	6.77	4.35	2.98	1.82	1.13
*	1	55.5	6096	12.32	9.05	6.73	4.35	2.98	1.82	1.08
*	1	55.2	6048	12.19	9.01	6.73	4.31	2.98	1.86	1.17
*	2	83.8	9184	18.14	13.49	10.20	6.67	4.58	2.82	1.65
*	2	84.2	9224	18.31	13.53	10.28	6.67	4.62	2.86	1.65
*	2	84.1	9208	18.22	13.57	10.28	6.75	4.71	2.86	1.69
*	2	84.1	9208	18.27	13.53	10.28	6.75	4.71	2.90	1.73
*	3	109.7	12024	23.46	17.58	13.41	8.95	6.31	3.90	2.26
*	3	110.0	12056	23.59	17.62	13.45	9.12	6.36	3.86	2.21
*	3	109.9	12048	23.54	17.62	13.50	8.99	6.31	3.90	2.26
*	3	109.9	12048	23.50	17.67	13.54	9.03	6.36	3.90	2.26
*	4	143.0	15680	29.83	22.28	17.14	11.69	8.22	5.07	2.95
*	4	142.8	15656	29.95	22.28	17.18	11.78	8.31	5.11	2.99
*	4	142.9	15664	29.95	22.32	17.18	11.69	8.27	5.07	2.91
*	4	142.5	15624	30.00	22.32	17.22	11.78	8.31	5.11	2.95

Stn: 125 Lane:F1 Temp: J/C: Air: 55 PvT: 61 08:07

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11896	22.96	16.93	12.94	8.78	6.18	3.73	2.08
	C	109.0	11944	22.33	16.46	12.55	8.57	6.04	3.68	2.08
	C	109.1	11968	22.20	16.37	12.47	8.48	6.04	3.68	2.13
*	1	55.1	6040	11.52	8.32	6.21	4.01	2.84	1.73	1.04
*	1	55.2	6048	11.48	8.32	6.17	4.01	2.80	1.69	1.04
*	1	55.2	6056	11.48	8.32	6.21	4.05	2.84	1.73	1.08
*	1	55.4	6072	11.56	8.40	6.30	4.09	2.93	1.82	1.17V
*	2	83.6	9168	16.93	12.45	9.43	6.29	4.49	2.69	1.52
*	2	83.8	9176	16.97	12.45	9.43	6.29	4.49	2.69	1.65
*	2	83.8	9176	16.93	12.50	9.47	6.29	4.49	2.69	1.65
*	2	83.9	9208	16.97	12.50	9.47	6.29	4.49	2.69	1.60
*	3	109.1	11960	21.74	16.16	12.38	8.40	6.04	3.68	2.17
*	3	109.4	12000	21.67	16.20	12.42	8.48	6.09	3.73	2.17
*	3	109.1	11968	21.83	16.16	12.38	8.40	6.04	3.68	2.17
*	3	109.0	11952	21.83	16.20	12.42	8.48	6.09	3.73	2.17
*	4	143.0	15680	27.78	20.68	15.98	11.02	7.91	4.85	2.82
*	4	142.9	15664	27.82	20.64	15.94	10.98	7.87	4.81	2.82
*	4	143.0	15680	27.86	20.73	16.02	11.06	7.91	4.85	2.78
*	4	142.5	15624	27.78	20.64	15.98	11.02	7.87	4.85	2.78

Stn: 150 Lane:F1 Temp: J/C: Air: 55 PvT: 60 08:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11920	19.19	14.65	11.48	8.06	5.96	3.64	2.04
	C	109.6	12016	18.77	14.35	11.27	7.98	5.91	3.73	2.13
	C	109.4	12000	18.56	14.13	11.14	7.89	5.82	3.64	2.08
*	1	55.2	6048	10.05	7.54	5.91	4.01	2.80	1.86	1.00
*	1	55.7	6104	10.10	7.58	5.83	4.01	2.84	1.73	1.08
*	1	55.8	6120	9.72V	7.58	5.91	4.05	2.80	1.91	1.00
*	1	55.8	6120	10.10	7.54	5.78	3.97	2.84	1.69V	1.08
*	2	84.3	9248	14.41	11.03	8.57	5.95	4.36	2.64	1.60
*	2	84.1	9224	14.50	10.99	8.57	5.99	4.36	2.64	1.56
*	2	84.5	9264	14.45	11.03	8.65	5.99	4.36	2.64	1.52
*	2	84.3	9248	14.54	11.07	8.70	6.12	4.44	2.77	1.60
*	3	109.9	12040	18.18	13.96	11.01	7.85	5.78	3.64	2.08
*	3	109.6	12016	18.18	14.05	11.10	7.89	5.91	3.68	2.17
*	3	109.9	12048	18.18	14.00	11.10	7.94	5.87	3.73	2.13
*	3	110.0	12056	18.10	14.00	11.05	7.89	5.87	3.64	2.13
*	4	143.5	15728	22.54	17.41	13.92	10.00	7.47	4.77	2.73
*	4	143.6	15752	22.62	17.45	13.97	10.09	7.51	4.81	2.78
*	4	143.3	15712	22.54	17.41	13.88	10.05	7.51	4.81	2.82
*	4	143.3	15712	22.50	17.32	13.88	10.00	7.47	4.77	2.73

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

Stn: 175 Lane:F1 Temp: J/C: Air: 55 PvT: 61 08:13

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11936	18.35	13.87	10.75	7.56	5.42	3.38	1.91
	C	109.1	11976	17.85	13.53	10.45	7.35	5.38	3.38	1.95
	C	109.3	11984	17.60	13.49	10.41	7.35	5.38	3.38	2.00
*	1	55.7	6104	9.59	7.28	5.44	3.63	2.62	1.65	1.00
*	1	55.7	6104	9.51	7.24	5.40	3.59	2.58	1.65	0.95
*	1	55.5	6080	9.43	7.20	5.40	3.59	2.62	1.60	0.91
*	1	55.8	6120	9.47	7.24	5.40	3.59	2.58	1.60	0.91
*	2	84.1	9216	13.66	10.43	7.97	5.49	3.96	2.43	1.39
*	2	84.3	9248	13.78	10.56	8.10	5.66	4.09	2.56	1.47
*	2	84.6	9288	13.78	10.56	8.10	5.57	4.04	2.51	1.47
*	2	84.5	9264	13.74	10.56	8.10	5.57	4.00	2.51	1.47
*	3	109.7	12032	17.30	13.31	10.37	7.35	5.38	3.38	2.00
*	3	109.6	12016	17.30	13.31	10.37	7.39	5.42	3.38	2.04
*	3	109.6	12016	17.22	13.31	10.33	7.30	5.33	3.38	2.00
*	3	109.6	12008	17.22	13.31	10.33	7.30	5.38	3.38	2.00
*	4	143.5	15728	21.41	16.50	12.98	9.33	6.89	4.33	2.52
*	4	143.5	15736	21.45	16.46	13.02	9.41	6.89	4.38	2.52
*	4	143.5	15728	21.45	16.55	12.98	9.37	6.85	4.33	2.52
*	4	143.3	15712	21.41	16.50	13.02	9.37	6.89	4.38	2.52

Stn: 200 Lane:F1 Temp: J/C: Air: 57 PvT: 61 08:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11960	18.06	13.87	10.93	7.85	5.69	3.60	2.08
	C	109.3	11984	17.47	13.40	10.54	7.60	5.56	3.55	2.08
	C	109.1	11968	17.34	13.31	10.50	7.56	5.56	3.60	2.08
*	1	55.2	6056	9.30	7.02	5.40	3.76	2.67	1.69	1.00
*	1	55.4	6064	9.34	7.07	5.44	3.76	2.71	1.69	1.00
*	1	55.5	6080	9.30	7.02	5.40	3.76	2.67	1.69	1.00
*	1	55.5	6096	9.30	7.02	5.40	3.76	2.67	1.69	1.00
*	2	83.5	9144	13.45	10.26	8.01	5.70	4.13	2.64	1.52
*	2	84.3	9248	13.57	10.34	8.10	5.78	4.18	2.64	1.52
*	2	84.1	9224	13.53	10.34	8.10	5.78	4.18	2.64	1.52
*	2	84.5	9264	13.53	10.34	8.10	5.78	4.18	2.64	1.56
*	3	109.1	11968	17.01	13.06	10.33	7.47	5.47	3.51	2.04
*	3	110.0	12056	17.09	13.19	10.45	7.56	5.56	3.51	2.08
*	3	109.7	12024	17.09	13.14	10.41	7.56	5.56	3.55	2.08
*	3	109.7	12032	17.09	13.19	10.45	7.60	5.60	3.60	2.13
*	4	142.9	15672	21.16	16.42	13.11	9.58	7.07	4.59	2.65
*	4	142.9	15672	21.20	16.42	13.11	9.62	7.07	4.59	2.69
*	4	142.5	15616	21.24	16.42	13.15	9.62	7.16	4.68	2.73
*	4	142.6	15640	21.24	16.46	13.15	9.62	7.20	4.68	2.73

Stn: 225 Lane:F1 Temp: J/C: Air: 57 PvT: 62 08:18

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	17.30	13.31	10.54	7.56	5.56	3.47	2.04
	C	109.9	12040	16.80	12.93	10.28	7.43	5.47	3.47	2.08
	C	109.9	12040	16.67	12.88	10.20	7.30	5.42	3.47	2.04
*	1	55.5	6080	8.84	6.72	5.23	3.63	2.62	1.65	1.04
*	1	55.5	6088	8.80	6.59	5.18	3.59	2.58	1.60	0.95
*	1	55.7	6096	8.80	6.76	5.27	3.67	2.67	1.69	1.04
*	1	55.7	6096	8.76	6.64	5.18	3.59	2.62	1.65	0.95
*	2	83.6	9168	12.78	9.78	7.71	5.40	4.00	2.56	1.47
*	2	84.3	9248	12.86	9.91	7.84	5.53	4.04	2.56	1.52
*	2	84.6	9280	12.95	9.91	7.80	5.57	4.09	2.56	1.52
*	2	84.5	9256	12.86	9.91	7.80	5.57	4.09	2.56	1.52
*	3	109.4	12000	16.26	12.62	10.03	7.22	5.33	3.38	2.04
*	3	109.3	11984	16.30	12.58	10.07	7.22	5.38	3.38	2.00
*	3	109.7	12032	16.38	12.71	10.15	7.35	5.47	3.47	2.08
*	3	109.9	12040	16.34	12.71	10.15	7.26	5.47	3.47	2.08
*	4	142.6	15632	20.53	16.03	12.81	9.41	6.98	4.42	2.60
*	4	142.8	15656	20.57	16.03	12.81	9.46	7.07	4.46	2.60
*	4	142.5	15624	20.53	15.99	12.81	9.37	6.98	4.46	2.65
*	4	142.9	15672	20.61	16.07	12.85	9.41	7.07	4.55	2.69

Stn: 250 Lane:F1 Temp: J/C: Air: 57 PvT: 62 08:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11896	17.13	13.53	10.75	7.85	5.73	3.55	2.04
	C	109.4	11992	16.63	13.10	10.41	7.64	5.56	3.47	2.00

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	16.42	12.97	10.37	7.56	5.51	3.47	2.00
*	1	55.2	6056	8.84	6.85	5.40	3.76	2.71	1.65	0.95
*	1	54.5	5976	8.80	6.89	5.40	3.80	2.76	1.69	1.04
*	1	55.4	6080	8.80	6.76	5.36	3.76	2.71	1.65	0.95
*	1	54.8	6008	8.76	6.76	5.36	3.76	2.71	1.65	1.00
*	2	83.2	9120	12.69	10.00	7.88	5.66	4.09	2.51	1.39
*	2	84.2	9240	12.82	10.04	8.01	5.74	4.18	2.56	1.43
*	2	83.8	9184	12.78	10.04	7.97	5.70	4.18	2.56	1.43
*	2	83.8	9184	12.82	10.08	7.97	5.74	4.22	2.60	1.47
*	3	109.1	11968	16.13	12.80	10.20	7.47	5.47	3.42	2.00
*	3	109.1	11968	16.17	12.80	10.28	7.56	5.51	3.47	2.04
*	3	109.3	11984	16.21	12.84	10.28	7.56	5.56	3.47	2.04
*	3	109.7	12032	16.21	12.88	10.28	7.60	5.56	3.51	2.04
*	4	143.3	15712	20.19	15.99	12.85	9.54	7.07	4.46	2.56
*	4	142.9	15664	20.19	16.03	12.85	9.58	7.11	4.51	2.65
*	4	142.3	15608	20.15	16.03	12.85	9.62	7.07	4.55	2.65
*	4	142.6	15632	20.19	15.99	12.85	9.62	7.11	4.55	2.65

Stn: 275 Lane:F1 Temp: J/C: Air: 58 PvT: 63 08:24

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11896	18.35	14.22	11.40	8.19	5.91	3.29	2.00
	C	108.7	11912	17.72	13.75	10.97	7.98	5.82	3.29	1.95
	C	109.1	11960	17.60	13.62	10.97	7.89	5.73	3.25	1.95
*	1	55.2	6048	9.43	7.15	5.66	3.97	2.80	1.56	1.00
*	1	55.1	6032	9.30	7.11	5.61	3.88	2.76	1.52	0.95
*	1	55.4	6072	9.34	7.15	5.66	3.93	2.80	1.56	1.00
*	1	55.4	6064	9.34	7.15	5.66	3.97	2.80	1.60	1.00
*	2	82.9	9088	13.49	10.34	8.27	5.87	4.22	2.38	1.39
*	2	83.9	9192	13.57	10.47	8.40	5.95	4.27	2.43	1.43
*	2	83.8	9176	13.62	10.51	8.44	5.99	4.31	2.47	1.47
*	2	83.8	9176	13.62	10.51	8.44	5.99	4.31	2.47	1.47
*	3	109.0	11944	17.18	13.36	10.80	7.81	5.69	3.25	1.95
*	3	109.3	11984	17.26	13.44	10.84	7.85	5.73	3.25	1.95
*	3	109.4	12000	17.22	13.44	10.84	7.85	5.73	3.29	1.95
*	3	109.1	11968	17.18	13.44	10.84	7.85	5.69	3.25	1.95
*	4	142.6	15640	21.70	16.93	13.71	10.00	7.38	4.29	2.56
*	4	142.3	15608	21.70	16.93	13.62	10.13	7.42	4.25	2.52
*	4	142.0	15576	21.70	16.89	13.62	10.00	7.38	4.29	2.56
*	4	142.5	15624	21.70	16.89	13.62	10.05	7.42	4.29	2.56

'L-TRANS.CR. UNDER D6

Stn: 300 Lane:F1 Temp: J/C: Air: 58 PvT: 62 08:27

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.3	11872	20.74	15.21	11.83	8.06	5.73	3.55	2.04
	C	109.0	11960	20.15	14.82	11.57	7.98	5.73	3.64	2.08
	C	109.0	11960	20.03	14.78	11.57	7.98	5.73	3.68	2.08
*	1	54.8	6008	10.56	7.71	5.87	3.93	2.76	1.73	1.04
*	1	55.2	6056	10.52	7.71	5.91	3.93	2.76	1.73	1.04
*	1	55.5	6088	10.47	7.63	5.83	3.88	2.76	1.69	1.00
*	1	55.4	6072	10.43	7.63	5.83	3.88	2.71	1.69	0.95
*	2	83.0	9112	15.33	11.25	8.74	5.95	4.22	2.69	1.56
*	2	83.8	9184	15.46	11.33	8.83	5.99	4.22	2.69	1.56
*	2	83.9	9200	15.50	11.33	8.87	6.04	4.27	2.73	1.56
*	2	84.1	9216	15.46	11.33	8.83	5.95	4.22	2.69	1.52
*	3	108.8	11928	19.56	14.56	11.40	7.94	5.69	3.60	2.08
*	3	109.6	12016	19.69	14.69	11.57	8.02	5.73	3.68	2.13
*	3	109.4	12000	19.65	14.65	11.48	7.98	5.69	3.64	2.04
*	3	109.4	11992	19.65	14.65	11.48	7.98	5.69	3.64	2.04
*	4	142.2	15592	24.89	18.66	14.74	10.38	7.47	4.72	2.73
*	4	142.3	15608	24.97	18.66	14.78	10.38	7.51	4.77	2.78
*	4	142.3	15608	24.93	18.66	14.74	10.34	7.51	4.72	2.78
*	4	142.5	15624	24.97	18.66	14.70	10.34	7.47	4.72	2.73

'L-LONG.CR. UNDER SENSORS

Stn: 325 Lane:F1 Temp: J/C: Air: 58 PvT: 63 08:30

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11944	19.19	14.61	11.31	7.94	5.78	3.64	2.08
	C	109.6	12016	18.60	14.26	11.01	7.68	5.73	3.60	2.13
	C	109.7	12032	18.39	14.09	10.88	7.64	5.64	3.55	2.08

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	1	55.5	6088	9.64	7.33	5.44	3.63	2.67	1.69	1.04
*	1	55.8	6120	9.64	7.28	5.40	3.63	2.62	1.65	0.95
*	1	55.1	6040	9.51	7.20	5.40	3.63	2.67	1.69	1.04
*	1	55.7	6096	9.51	7.20	5.40	3.59	2.62	1.65	0.95
*	2	83.0	9104	13.99	10.60	8.10	5.61	4.13	2.60	1.52
*	2	84.1	9208	14.12	10.73	8.27	5.74	4.22	2.64	1.56
*	2	84.2	9240	14.12	10.73	8.27	5.74	4.22	2.64	1.52
*	2	84.2	9224	14.08	10.69	8.27	5.78	4.22	2.64	1.52
*	3	109.4	11992	18.01	13.83	10.80	7.64	5.60	3.60	2.08
*	3	109.9	12040	18.10	13.92	10.84	7.64	5.64	3.55	2.04
*	3	109.7	12032	18.10	13.96	10.84	7.64	5.69	3.60	2.08
*	3	110.0	12056	18.06	13.96	10.84	7.64	5.69	3.55	2.08
*	4	141.6	15528	23.00	17.88	14.05	10.05	7.47	4.72	2.78
*	4	141.9	15552	23.04	17.80	14.01	10.05	7.47	4.68	2.73
*	4	141.9	15560	23.13	17.88	14.05	10.09	7.51	4.77	2.78
*	4	141.6	15528	23.08	17.84	14.10	10.09	7.51	4.77	2.78

Stn: 350 Lane:F1 Temp: J/C: Air: 59 PvT: 63 08:32

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11840	29.16	19.99	14.95	9.71	6.67	3.86	2.21
	C	108.6	11904	27.94	19.22	14.44	9.46	6.58	3.90	2.30
	C	108.4	11888	27.65	19.00	14.35	9.41	6.53	3.90	2.30
*	1	54.5	5968	14.96	9.91	7.28	4.56	3.11	1.82	1.17
*	1	54.2	5952	14.83	9.82	7.20	4.52	3.16	1.78	1.17
*	1	54.2	5936	14.75	9.87	7.24	4.56	3.16	1.82	1.17
*	1	54.2	5936	14.66	9.78	7.15	4.47	3.07	1.73	1.08
*	2	81.7	8968	20.95	14.39	10.71	6.92	4.80	2.77	1.69
*	2	82.9	9088	21.20	14.61	10.93	7.05	4.89	2.86	1.73
*	2	82.9	9088	21.24	14.61	10.93	7.05	4.93	2.90	1.73
*	2	82.8	9072	21.16	14.52	10.84	6.97	4.80	2.82	1.60
*	3	108.6	11904	26.90	18.61	14.05	9.24	6.44	3.86	2.21
*	3	109.1	11960	27.11	18.74	14.22	9.37	6.53	3.90	2.26
*	3	109.1	11960	27.06	18.74	14.18	9.37	6.53	3.86	2.21
*	3	108.8	11936	27.02	18.70	14.18	9.37	6.53	3.86	2.21
*	4	141.2	15480	34.06	23.70	18.12	12.07	8.49	5.07	2.91
*	4	141.0	15472	34.10	23.83	18.21	12.24	8.49	5.20	2.91
*	4	140.9	15448	34.10	23.78	18.17	12.24	8.49	5.24	2.95
*	4	140.6	15416	34.06	23.78	18.17	12.24	8.45	5.24	2.91

'M-TRANS.CR. BEHIND LP

Stn: 375 Lane:F1 Temp: J/C: Air: 58 PvT: 64 08:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.4	12112	25.43	18.27	13.80	9.46	6.62	3.99	2.17
	C	111.4	12216	24.42	17.58	13.32	9.20	6.58	4.03	2.26
	C	111.0	12176	24.09	17.36	13.20	9.12	6.44	3.94	2.17
*	1	56.2	6160	12.86	8.88	6.51	4.35	3.07	1.91	1.13
*	1	56.2	6160	12.74	8.79	6.47	4.31	3.02	1.91	1.04
*	1	55.8	6112	12.57	8.70	6.43	4.22	3.02	1.86	1.04
*	1	56.2	6160	12.69	8.79	6.51	4.35	3.02	1.91	1.13
*	2	83.9	9192	18.31	12.97	9.77	6.63	4.71	2.90	1.60
*	2	85.1	9328	18.43	13.14	9.90	6.75	4.76	2.95	1.60
*	2	84.8	9304	18.39	13.10	9.90	6.75	4.80	2.95	1.60
*	2	85.1	9328	18.48	13.19	9.94	6.80	4.80	2.95	1.65
*	3	110.4	12112	23.50	17.02	13.02	9.08	6.49	3.99	2.21
*	3	111.0	12168	23.54	17.06	13.07	9.08	6.49	3.99	2.17
*	3	110.9	12160	23.46	17.02	13.07	9.08	6.49	3.94	2.17
*	3	110.7	12144	23.42	17.02	13.07	9.12	6.58	3.99	2.17
*	4	140.4	15400	29.79	21.93	17.01	11.99	8.71	5.33	2.91
*	4	141.0	15456	29.75	21.85	16.97	11.95	8.62	5.29	2.86
*	4	141.0	15464	29.70	21.89	16.97	11.99	8.67	5.29	2.86
*	4	140.9	15440	29.70	21.89	17.01	12.07	8.62	5.37	2.95

'L-TRANS.CR. UNDER LP

Stn: 400 Lane:F1 Temp: J/C: Air: 58 PvT: 64 08:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11912	22.37	15.99	12.08	7.98	5.60	3.42	1.95
	C	109.4	11992	21.24	15.21	11.57	7.73	5.42	3.42	1.95
	C	109.4	12000	20.99	15.08	11.44	7.68	5.47	3.38	1.95
*	1	55.2	6048	11.40	7.97	5.83	3.71	2.58	1.65	1.00

File: C:\FWD\DATA\906405E1.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	1	55.4	6080	11.35	7.89	5.78	3.67	2.53	1.60	0.91
*	1	55.2	6048	11.27	7.84	5.78	3.63	2.53	1.60	0.95
*	1	55.4	6080	11.23	7.89	5.78	3.67	2.53	1.60	0.91
*	2	83.3	9136	16.17	11.46	8.61	5.66	4.04	2.51	1.43
*	2	84.1	9216	16.26	11.59	8.70	5.74	4.04	2.51	1.43
*	2	84.3	9240	16.30	11.59	8.70	5.74	4.09	2.56	1.43
*	2	84.1	9216	16.26	11.63	8.74	5.83	4.13	2.60	1.47
*	3	109.1	11968	20.40	14.82	11.31	7.64	5.47	3.47	2.04
*	3	109.9	12040	20.49	14.91	11.44	7.68	5.47	3.47	2.00
*	3	109.7	12024	20.44	14.91	11.48	7.73	5.51	3.51	2.08
*	3	109.6	12008	20.44	14.82	11.35	7.68	5.51	3.47	2.00
*	4	141.0	15464	25.64	18.79	14.48	9.92	7.11	4.46	2.52
*	4	141.3	15496	25.68	18.79	14.57	9.96	7.16	4.55	2.60
*	4	141.2	15472	25.60	18.79	14.52	9.96	7.20	4.55	2.56
*	4	140.9	15448	25.51	18.74	14.57	9.96	7.20	4.55	2.60

Stn: 425 Lane:F1 Temp: J/C: Air: 59 PvT: 65 08:41

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11896	21.70	15.86	11.87	8.10	5.87	3.68	2.08
	C	109.3	11984	20.74	15.21	11.44	7.85	5.78	3.68	2.08
	C	109.4	11992	20.53	15.12	11.44	7.89	5.82	3.73	2.13
*	1	55.2	6048	11.06	7.89	5.78	3.71	2.76	1.78	1.04
*	1	55.5	6080	11.02	7.89	5.78	3.71	2.71	1.69	1.00
*	1	55.8	6112	11.02	7.93	5.78	3.71	2.80	1.78	1.04
*	1	55.7	6096	11.02	7.89	5.78	3.71	2.76	1.73	1.04
*	2	84.5	9256	15.88	11.59	8.65	5.87	4.27	2.73	1.56
*	2	84.2	9232	15.79	11.55	8.61	5.83	4.27	2.69	1.56
*	2	84.2	9240	15.84	11.63	8.70	5.87	4.31	2.73	1.60
*	2	84.1	9216	15.79	11.59	8.61	5.83	4.27	2.69	1.52
*	3	109.7	12032	20.03	14.82	11.27	7.81	5.82	3.73	2.13
*	3	109.7	12032	19.98	14.87	11.31	7.81	5.82	3.68	2.04
*	3	109.6	12016	19.90	14.82	11.27	7.77	5.78	3.68	2.08
*	3	109.7	12024	19.90	14.82	11.27	7.77	5.82	3.73	2.08
*	4	140.3	15384	25.18V	18.87	14.57V	10.22	7.60	4.85	2.78
*	4	142.0	15576	25.05	18.74	14.40	10.22	7.56	4.81	2.73
*	4	141.9	15560	25.01	18.74	14.44	10.17	7.60	4.85	2.73
*	4	141.6	15528	25.01	18.66	14.40	10.26	7.56	4.81	2.73

Stn: 450 Lane:F1 Temp: J/C: Air: 60 PvT: 64 08:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11888	20.82	15.21	11.48	7.35	4.58	3.08	1.87
	C	109.4	12008	19.82	14.48	11.05	7.22	4.49	3.12	1.87
	C	109.1	11960	19.56	14.39	11.01	7.26	4.49	3.16	1.91
*	1	54.6	5984	10.66	7.67	5.74	3.55	2.13	1.47	0.95
*	1	54.9	6024	10.64	7.71	5.74	3.55	2.13	1.47	0.91
*	1	54.5	5984	10.56	7.67	5.74	3.55	2.13	1.47	0.91
*	1	55.1	6048	10.64	7.76	5.78	3.59	2.22	1.56	1.00
*	2	83.9	9200	15.17	11.07	8.40	5.40	3.24	2.30	1.34
*	2	84.2	9224	15.25	11.16	8.48	5.49	3.33	2.34	1.34
*	2	84.2	9224	15.25	11.20	8.48	5.49	3.38	2.34	1.39
*	2	83.9	9208	15.17	11.16	8.44	5.45	3.33	2.34	1.39
*	3	109.7	12032	19.10	14.13	10.88	7.22	4.49	3.16	1.91
*	3	109.6	12016	19.02	14.18	10.84	7.18	4.44	3.08	1.82
*	3	109.7	12024	19.02	14.22	10.84	7.18	4.44	3.03	1.82
*	3	109.7	12024	19.02	14.22	10.88	7.22	4.53	3.08	1.87
*	4	142.2	15592	23.84	17.84	13.75	9.20	5.82	3.99V	2.39
*	4	142.3	15600	23.88	17.71	13.80	9.29	5.87	4.12	2.43
*	4	142.0	15568	23.84	17.67	13.71	9.24	5.87	4.12	2.43
*	4	142.3	15600	23.75	17.62	13.80	9.29	5.82	4.20	2.39

'M-TRANS.CR. BETWEEN D4 AND D5

Stn: 475 Lane:F1 Temp: J/C: Air: 60 PvT: 65 08:46

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11920	19.23	14.05	10.28	6.75	4.53	2.69	1.69
	C	109.1	11960	18.31	13.36	9.85	6.50	4.49	2.77	1.82
	C	109.1	11968	18.01	13.19	9.73	6.46	4.44	2.73	1.78
*	1	54.8	6016	10.10	7.11	5.06	3.17	2.09	1.26	0.87
*	1	54.9	6032	10.10	7.20	5.14	3.29	2.18	1.30	0.95
*	1	55.4	6072	10.10	7.15	5.14	3.25	2.18	1.30	0.95
*	1	55.4	6064	10.01	7.15	5.14	3.25	2.18	1.30	0.95

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Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
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*	2	83.8	9176	14.12	10.34	7.50	4.94	3.33	2.08	1.34
*	2	83.6	9176	14.16	10.26	7.54	4.94	3.33	2.08	1.39
*	2	83.6	9176	14.08	10.21	7.45	4.85	3.29	1.99	1.30
*	2	83.6	9168	14.08	10.21	7.45	4.90	3.29	1.99	1.30
*	3	109.1	11968	17.51	12.88	9.55	6.37	4.40	2.73	1.78
*	3	109.3	11984	17.51	12.97	9.64	6.46	4.49	2.77	1.82
*	3	109.1	11960	17.47	12.97	9.60	6.42	4.49	2.77	1.82
*	3	109.0	11952	17.43	12.88	9.60	6.46	4.49	2.77	1.82
*	4	142.2	15584	21.62	15.99	12.04	8.19	5.78	3.60	2.30
*	4	142.0	15568	21.58	16.03	12.04	8.27	5.78	3.60	2.39
*	4	141.9	15560	21.62	16.07	12.04	8.32	5.87	3.60	2.39
*	4	141.7	15544	21.58	16.03	12.00	8.32	5.82	3.60	2.39

'M-TRANS.CR. UNDER D7

Stn: 500 Lane:F1 Temp: J/C: Air: 60 PvT: 65 08:51

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.7	12136	19.61	14.09	10.67	7.26	5.07	3.08	1.91
	C	111.2	12192	18.73	13.44	10.11	6.97	4.89	3.03	1.87
	C	111.0	12168	18.48	13.27	10.07	6.92	4.89	3.03	1.91
*	1	56.1	6152	10.10	7.15	5.23	3.46	2.36	1.47	0.91
*	1	56.1	6152	10.05	7.11	5.23	3.42	2.31	1.47	0.95
*	1	56.1	6152	10.05	7.07	5.23	3.42	2.31	1.43	0.91
*	1	56.2	6160	10.05	7.11	5.23	3.46	2.36	1.47	0.91
*	2	84.8	9304	14.24	10.21	7.67	5.19	3.56	2.25	1.39
*	2	84.9	9304	14.24	10.26	7.71	5.23	3.60	2.30	1.43
*	2	84.5	9264	14.12	10.21	7.63	5.19	3.56	2.25	1.39
*	2	84.9	9304	14.16	10.21	7.67	5.15	3.56	2.25	1.39
*	3	111.3	12200	18.01	13.10	9.98	6.92	4.89	3.12	1.91
*	3	110.9	12160	17.85	13.01	9.85	6.84	4.84	3.03	1.87
*	3	110.9	12160	17.89	12.97	9.90	6.88	4.84	3.03	1.87
*	3	111.0	12168	17.81	12.97	9.85	6.88	4.80	3.03	1.91
*	4	142.0	15568	22.37	16.50	12.68	8.91	6.36	4.03	2.52
*	4	142.0	15568	22.29	16.50	12.68	8.95	6.40	4.07	2.52
*	4	142.0	15568	22.29	16.46	12.64	8.95	6.40	4.07	2.52
*	4	142.0	15568	22.20	16.46	12.64	8.91	6.36	4.07	2.47

Stn: 515 Lane:F1 Temp: J/C: Air: 60 PvT: 63 08:53

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	19.73	14.48	11.01	7.43	5.11	3.08	1.87
	C	109.6	12008	18.89	13.83	10.54	7.09	4.98	2.99	1.82
	C	109.3	11984	18.73	13.79	10.50	7.09	4.98	3.03	1.91
*	1	55.4	6064	10.14	7.33	5.44	3.46	2.36	1.43	0.95
*	1	54.9	6016	10.01	7.28	5.40	3.46	2.36	1.39	0.91
*	1	55.1	6040	10.01	7.28	5.44	3.46	2.36	1.43	1.00
*	1	55.2	6048	9.93	7.28	5.40	3.46	2.36	1.39	0.95
*	2	83.5	9152	14.37	10.56	7.97	5.23	3.60	2.17	1.34
*	2	83.8	9184	14.45	10.64	8.10	5.32	3.69	2.21	1.43
*	2	83.3	9136	14.37	10.60	8.05	5.28	3.64	2.21	1.34
*	2	83.5	9144	14.37	10.56	8.01	5.28	3.64	2.21	1.34
*	3	109.6	12008	18.22	13.49	10.33	6.97	4.89	2.99	1.82
*	3	109.7	12032	18.22	13.49	10.33	7.01	4.93	2.99	1.82
*	3	109.6	12016	18.18	13.49	10.33	7.01	4.93	3.03	1.82
*	3	109.9	12040	18.22	13.44	10.37	7.05	4.98	3.03	1.87
*	4	140.7	15432	23.17	17.11V	13.24V	9.24	6.53	4.07	2.47
*	4	141.3	15488	23.17	16.80	13.02	9.46	6.62	4.20	2.43
*	4	141.3	15496	23.13	16.68	12.94	9.50	6.62	4.20	2.43
*	4	141.3	15496	23.21	16.72	12.90	9.50	6.67	4.25	2.47

Stn: 525 Lane:F1 Temp: J/C: Air: 60 PvT: 63 08:56

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11896	19.82	14.39	11.18	7.26	5.07	2.86	1.82
	C	109.3	11976	18.73	13.57	10.54	6.92	4.84	2.86	1.82
	C	109.3	11976	18.43	13.44	10.45	6.88	4.89	2.90	1.87
*	1	54.9	6024	9.89	7.07	5.36	3.33	2.31	1.39	0.91
*	1	54.9	6032	9.85	7.07	5.40	3.42	2.36	1.43	0.95
*	1	54.9	6024	9.76	6.98	5.31	3.33	2.27	1.34	0.91
*	1	55.2	6056	9.80	6.98	5.31	3.33	2.27	1.39	0.87
*	2	83.9	9192	14.20	10.30	7.93	5.11	3.56	2.08	1.34
*	2	83.9	9192	14.20	10.38	7.97	5.15	3.56	2.12	1.34
*	2	83.9	9192	14.20	10.43	8.01	5.23	3.60	2.17	1.39

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Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	2	83.8	9184	14.16	10.38	7.97	5.15	3.56	2.12	1.34
*	3	109.6	12016	17.97	13.14	10.24	6.80	4.84	2.90	1.82
*	3	109.4	12000	17.93	13.14	10.28	6.80	4.80	2.90	1.87
*	3	109.6	12016	17.93	13.10	10.24	6.80	4.80	2.90	1.82
*	3	109.3	11984	17.89	13.10	10.24	6.75	4.80	2.86	1.82
*	4	141.4	15504	22.62	16.63	13.07	8.82	6.27	3.73	2.39
*	4	141.4	15512	22.58	16.63	13.07	8.86	6.40	3.81	2.39
*	4	141.6	15528	22.54	16.59	12.98	8.91	6.44	3.81	2.39
*	4	141.4	15512	22.50	16.55	12.94	8.86	6.40	3.77	2.34

'M-TRANS.CR. BETWEEN D5 AND D6.

Stn: 530 Lane:F1 Temp: J/C: Air: 61 PvT: 62 08:59

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.7	11808	20.07	14.74	11.05	7.39	5.02	3.03	1.82
	C	108.6	11904	18.81	13.83	10.37	6.92	4.76	2.95	1.78
	C	108.7	11920	18.60	13.62	10.24	6.88	4.76	2.99	1.78
*	1	55.1	6040	10.14	7.37	5.44	3.46	2.31	1.47	0.95
*	1	54.8	6008	10.05	7.28	5.36	3.38	2.27	1.43	0.91
*	1	54.8	6008	10.01	7.24	5.36	3.38	2.27	1.39	0.87
*	1	54.8	6000	9.97	7.24	5.36	3.38	2.27	1.39	0.91
*	2	83.3	9128	14.29	10.51	7.84	5.19	3.51	2.17	1.30
*	2	82.9	9096	14.33	10.56	7.88	5.15	3.51	2.17	1.34
*	2	83.0	9104	14.29	10.51	7.84	5.15	3.51	2.17	1.30
*	2	83.6	9176	14.29	10.56	7.88	5.19	3.51	2.21	1.34
*	3	108.7	11920	18.10	13.27	10.07	6.80	4.71	2.95	1.82
*	3	108.8	11928	18.06	13.31	10.07	6.80	4.71	2.99	1.82
*	3	108.6	11904	17.97	13.31	10.11	6.80	4.71	2.99	1.82
*	3	108.8	11928	17.93	13.27	10.11	6.80	4.67	2.95	1.78
*	4	140.7	15432	22.41	16.59	12.68	8.82	6.22	3.86	2.34
*	4	141.6	15528	22.50	16.63	12.64	8.82	6.18	3.86	2.30
*	4	141.2	15480	22.41	16.50	12.64	8.86	6.22	3.86	2.30
*	4	140.7	15432	22.33	16.50	12.60	8.86	6.22	3.86	2.34

Stn: 535 Lane:F1 Temp: J/C: Air: 60 PvT: 63 09:02

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11848	19.90	14.48	10.93	7.43	5.11	3.08	1.82
	C	108.3	11872	18.77	13.57	10.28	6.97	4.84	2.99	1.78
	C	108.6	11896	18.48	13.49	10.24	6.92	4.84	2.99	1.82
*	1	54.3	5960	10.10	7.15	5.27	3.42	2.31	1.47	1.00
*	1	54.6	5992	9.93	7.11	5.23	3.33	2.27	1.39	0.91
*	1	54.5	5976	9.89	7.07	5.23	3.33	2.27	1.34	0.91
*	1	54.3	5960	9.93	7.02	5.18	3.33	2.27	1.39	0.87
*	2	82.9	9096	14.29	10.38	7.75	5.15	3.56	2.21	1.43
*	2	82.9	9096	14.33	10.34	7.71	5.15	3.56	2.17	1.39
*	2	83.3	9136	14.29	10.34	7.75	5.15	3.56	2.21	1.34
*	2	83.0	9104	14.29	10.34	7.80	5.19	3.60	2.21	1.39
*	3	108.7	11920	18.10	13.27	10.11	6.88	4.89	3.03	1.91
*	3	108.7	11920	17.97	13.19	10.07	6.88	4.80	2.99	1.82
*	3	108.4	11888	17.97	13.19	10.07	6.88	4.84	2.99	1.82
*	3	108.7	11928	17.97	13.23	10.15	6.97	4.89	3.03	1.87
*	4	141.3	15496	22.54	16.68	12.85	8.95	6.27	3.90	2.34
*	4	141.0	15456	22.54	16.68	12.85	8.95	6.36	3.99	2.43
*	4	140.4	15400	22.37	16.55	12.77	8.86	6.31	3.94	2.34
*	4	140.1	15368	22.29	16.50	12.77	8.86	6.27	3.90	2.34

Mileage:-.008 -> .101

— NO CORRECTIONS

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

FWD S/N : 8002-063
Operator ID : VAN SAMBEEK, ROBERT J.

Stationing...: Feet

EXTRA TESTS FOR SM

Diameter of Plate: 11.8
Deflector distances : 8 12 18 24 36 60

SHRP TESTING - FLEXIBLE - BASIN TEST (F0,F1,F3)
Sequence: CCC1111222233334444

Stn: -40 Lane:F3 Temp: J/C: Air: 61 PvT: 66 09:07

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.4	11776	22.04	15.64	11.83	7.94	5.42	3.42	2.13
	C	108.1	11856	21.62	15.38	11.65	7.94	5.47	3.51	2.26
	C	108.4	11888	21.58	15.34	11.65	7.85	5.42	3.47	2.13
*	1	54.8	6000	11.56	8.10	5.96	3.84	2.58	1.65	1.04
*	1	54.6	5984	11.52	8.10	5.96	3.84	2.58	1.65	1.08
*	1	54.9	6024	11.60	8.19	6.04	3.93	2.62	1.73	1.17V
*	1	55.1	6032	11.52	8.10	6.00	3.84	2.58	1.65	1.04
*	2	83.3	9136	16.72	11.85	8.91	5.91	4.00	2.56	1.60
*	2	83.2	9120	16.76	11.94	8.95	5.95	4.04	2.60	1.60
*	2	82.9	9096	16.67	11.89	8.95	5.95	4.04	2.56	1.60
*	2	83.2	9120	16.67	11.94	8.95	5.95	4.00	2.56	1.60
*	3	108.0	11840	21.16	15.17	11.53	7.81	5.38	3.47	2.13
*	3	108.3	11864	21.20	15.30	11.57	7.89	5.42	3.51	2.13
*	3	107.7	11800	21.11	15.25	11.57	7.94	5.42	3.47	2.13
*	3	108.0	11840	21.16	15.21	11.61	7.89	5.47	3.47	2.13
*	4	140.6	15416	26.27	18.92	14.65	10.22	7.11	4.59	2.82
*	4	140.1	15368	26.35	18.83	14.61	10.30	7.16	4.59	2.82
*	4	140.3	15384	26.39	18.83	14.65	10.30	7.11	4.59	2.86
*	4	140.3	15392	26.44	18.92	14.74	10.34	7.20	4.64	2.91

Stn: -35 Lane:F3 Temp: J/C: Air: 62 PvT: 64 09:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11856	21.91	15.86	12.00	7.73	4.98	3.38	2.08
	C	108.0	11832	21.37	15.51	11.74	7.68	5.02	3.42	2.13
	C	108.1	11864	21.24	15.43	11.74	7.68	5.02	3.38	2.08
*	1	54.9	6016	11.56	8.19	6.13	3.71	2.31	1.69	1.04
*	1	55.1	6032	11.65	8.23	6.13	3.71	2.31	1.69	1.04
*	1	54.6	5992	11.56	8.19	6.08	3.71	2.31	1.69	1.04
*	1	54.9	6016	11.56	8.19	6.08	3.71	2.31	1.69	1.04
*	2	83.2	9112	16.59	12.02	9.04	5.70	3.60	2.51	1.52
*	2	82.9	9096	16.63	12.02	9.08	5.74	3.60	2.51	1.56
*	2	83.2	9112	16.63	12.02	9.08	5.74	3.60	2.51	1.52
*	2	83.5	9152	16.67	12.06	9.13	5.74	3.64	2.51	1.56
*	3	108.6	11904	20.95	15.38	11.70	7.64	4.98	3.38	2.13
*	3	108.4	11888	20.95	15.38	11.74	7.64	4.93	3.38	2.08
*	3	108.6	11896	20.95	15.38	11.78	7.68	4.98	3.38	2.08
*	3	108.1	11856	20.99	15.43	11.78	7.68	5.02	3.42	2.13
*	4	141.2	15480	25.89	19.17	14.78	9.88	6.58	4.46	2.78
*	4	140.9	15440	26.18	19.35	15.00	10.22V	6.89V	4.72V	3.08V
*	4	140.6	15424	25.93	19.13	14.78	9.96	6.62	4.46	2.78
*	4	140.6	15408	25.89	19.09	14.78	9.96	6.67	4.46	2.73V

'M-TRANS.CR. BETWEEN D4 AND D5.

Stn: -25 Lane:F3 Temp: J/C: Air: 62 PvT: 64 09:13

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11928	20.78	15.30	11.78	7.77	5.47	3.47	2.13
	C	109.1	11968	20.32	15.04	11.57	7.64	5.38	3.42	2.13
	C	109.4	12000	20.36	15.08	11.61	7.68	5.42	3.51	2.17
*	1	55.1	6032	10.81	7.84	5.91	3.71	2.58	1.65	1.04
*	1	55.1	6032	10.77	7.84	5.87	3.67	2.53	1.60	1.04
*	1	54.9	6016	10.77	7.84	5.91	3.76	2.58	1.69	1.13
*	1	54.6	6000	10.60	7.76	5.87	3.71	2.53	1.65	1.08
*	2	83.2	9120	15.58	11.50	8.83	5.70	3.96	2.47	1.56
*	2	82.9	9096	15.63	11.50	8.83	5.70	3.96	2.47	1.56
*	2	82.8	9080	15.58	11.46	8.78	5.70	3.91	2.47	1.52
*	2	83.0	9104	15.63	11.55	8.87	5.74	3.96	2.51	1.52

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	3	109.1	11968	19.90	14.87	11.48	7.60	5.38	3.47	2.17
*	3	109.6	12008	19.94	14.91	11.53	7.60	5.38	3.42	2.13
*	3	109.4	11992	19.98	14.95	11.57	7.68	5.42	3.47	2.17
*	3	109.3	11992	19.98	14.95	11.57	7.68	5.42	3.47	2.17
*	4	140.0	15352	24.97	18.61	14.52	9.79	7.02	4.46	2.73
*	4	140.4	15392	25.09	18.70	14.57	9.88	7.07	4.51	2.73
*	4	140.4	15392	25.18	18.66	14.65	9.92	7.07	4.55	2.73
*	4	140.3	15384	25.22	18.70	14.70	9.96	7.16	4.64	2.82

'L-TRANS.CR. BETWEEN D6 AND D7.

Stn: -15 Lane:F3 Temp: J/C: Air: 62 PvT: 65 09:16

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11960	22.25	15.68	11.70	7.64	5.33	3.42	2.13
	C	109.3	11976	21.70	15.34	11.53	7.51	5.24	3.42	2.17
	C	109.1	11968	21.53	15.25	11.44	7.51	5.29	3.42	2.17
*	1	54.5	5968	11.31	7.80	5.66	3.50	2.40	1.56	1.00
*	1	54.6	5984	11.27	7.84	5.70	3.55	2.49	1.60	1.04
*	1	54.6	5992	11.31	7.89	5.74	3.59	2.49	1.65	1.08
*	1	55.2	6056	11.27	7.89	5.70	3.55	2.49	1.65	1.04
*	2	82.5	9048	16.34	11.63	8.57	5.45	3.82	2.51	1.56
*	2	83.2	9120	16.46	11.72	8.70	5.57	3.91	2.51	1.60
*	2	82.8	9072	16.42	11.68	8.70	5.57	3.91	2.51	1.60
*	2	83.0	9104	16.46	11.72	8.70	5.53	3.91	2.56	1.65
*	3	109.4	12000	21.11	15.12	11.40	7.47	5.29	3.42	2.17
*	3	110.0	12056	21.28	15.21	11.44	7.51	5.33	3.42	2.13
*	3	110.0	12056	21.20	15.21	11.44	7.47	5.29	3.42	2.13
*	3	109.6	12016	21.20	15.21	11.48	7.47	5.33	3.42	2.13
*	4	140.4	15400	26.64	19.13	14.61	9.79	7.02	4.51	2.82
*	4	140.4	15400	26.73	19.17	14.57	9.71	6.98	4.46	2.78
*	4	140.0	15352	26.77	19.22	14.65	9.84	7.02	4.51	2.82
*	4	140.1	15360	26.73	19.17	14.61	9.75	6.98	4.46	2.78

Stn: -5 Lane:F3 Temp: J/C: Air: 62 PvT: 64 09:18

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.8	11816	23.84	16.07	11.87	7.73	5.47	3.47	2.08
	C	108.3	11872	23.00	15.73	11.70	7.68	5.42	3.47	2.17
	C	108.4	11896	22.79	15.64	11.61	7.64	5.42	3.42	2.08
*	1	54.5	5968	12.44	8.23	5.96	3.71	2.62	1.69	1.13
*	1	54.8	6000	12.36	8.23	5.96	3.71	2.58	1.69	1.08
*	1	54.5	5976	12.36	8.23	5.96	3.71	2.62	1.73	1.13
*	1	54.6	5984	12.32	8.19	5.91	3.71	2.58	1.69	1.08
*	2	82.2	9008	17.55	11.94	8.83	5.66	4.00	2.56	1.60
*	2	82.8	9080	17.64	12.06	8.91	5.70	4.04	2.56	1.60
*	2	82.8	9072	17.72	12.06	8.95	5.78	4.04	2.60	1.65
*	2	82.9	9088	17.64	12.02	8.91	5.74	4.00	2.51	1.56
*	3	108.7	11912	22.16	15.43	11.57	7.64	5.38	3.42	2.08
*	3	108.6	11904	22.25	15.47	11.57	7.64	5.42	3.47	2.13
*	3	108.4	11888	22.33	15.51	11.65	7.73	5.51	3.51	2.17
*	3	108.7	11912	22.33	15.51	11.65	7.77	5.51	3.51	2.17
*	4	140.3	15392	27.57	19.39	14.74	9.92	7.11	4.55	2.73
*	4	140.6	15416	27.78	19.52	14.82	10.00	7.16	4.59	2.78
*	4	140.3	15384	27.73	19.48	14.78	9.96	7.16	4.59	2.78
*	4	140.3	15384	27.73	19.48	14.82	10.00	7.16	4.59	2.73

'L-TRANS.CR. BETWEEN D6 AND D7.

Stn: 0 Lane:F3 Temp: J/C: Air: 63 PvT: 64 09:21

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.9	12160	24.89	14.26	10.11	6.37	4.53	3.12	2.08
	C	111.3	12208	23.96	14.05	9.94	6.37	4.49	3.08	2.04
	C	111.2	12184	23.75	14.09	10.03	6.46	4.53	3.12	2.04
*	1	55.2	6048	13.03	7.24	4.97	3.12	2.18	1.47	1.04
*	1	55.5	6088	12.99	7.28	4.97	3.17	2.18	1.52	1.04
*	1	55.7	6096	12.99	7.28	5.01	3.12	2.18	1.52	1.04
*	1	56.1	6144	13.11	7.37	5.10	3.21	2.22	1.56	1.13
*	2	84.5	9256	18.35	10.86	7.63	4.85	3.42	2.38	1.60
*	2	84.2	9240	18.43	10.86	7.67	4.85	3.42	2.38	1.60
*	2	84.2	9240	18.39	10.86	7.67	4.85	3.38	2.34	1.56
*	2	84.5	9256	18.39	10.94	7.71	4.90	3.42	2.34	1.52
*	3	111.2	12184	23.17	14.05	10.03	6.50	4.53	3.08	2.00

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*	3	111.6	12232	23.29	14.18	10.15	6.59	4.58	3.12	2.08
*	3	111.6	12232	23.29	14.26	10.20	6.63	4.67	3.16	2.04
*	3	111.3	12208	23.25	14.22	10.15	6.59	4.58	3.12	2.04
*	4	142.3	15600	28.99	18.05	13.07	8.61	6.13	4.12	2.69
*	4	142.2	15584	28.99	18.18	13.20	8.70	6.13	4.12	2.65
*	4	142.3	15600	28.99	18.31	13.32	8.78	6.18	4.20	2.73
*	4	142.0	15576	28.91	18.40	13.28	8.82	6.13	4.12	2.60

'L-TRANS.CR. UNDER LP

Stn: 25 Lane:F3 Temp: J/C: Air: 63 PvT: 71 09:24

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11912	23.80	16.93	12.47	8.48	6.04	3.68	2.26
	C	109.3	11976	23.13	16.63	12.17	8.61	6.22	3.77	2.30
	C	109.1	11960	23.04	16.59	12.17	8.65	6.31	3.81	2.34
*	1	54.9	6024	12.57	8.66	6.08	4.26	3.07	1.69	1.13
*	1	54.8	6000	12.48	8.62	6.08	4.22	3.02	1.65	1.13
*	1	54.9	6016	12.48	8.66	6.08	4.35	3.11	1.73	1.21
*	1	54.9	6024	12.48	8.57	6.04	4.26	3.07	1.69	1.21
*	2	83.2	9128	17.76	12.67	9.21	6.54	4.67	2.69	1.69
*	2	83.3	9136	17.76	12.71	9.25	6.63	4.76	2.77	1.73
*	2	83.0	9104	17.81	12.67	9.17	6.63	4.71	2.69	1.69
*	2	82.9	9088	17.76	12.67	9.21	6.63	4.76	2.69	1.69
*	3	109.0	11944	22.79	16.24	12.08	8.82	6.36	3.77	2.39
*	3	109.1	11960	22.87	16.33	12.17	8.86	6.40	3.73	2.43
*	3	109.1	11968	22.83	16.29	12.12	8.82	6.36	3.64	2.34
*	3	109.3	11984	22.87	16.33	12.21	8.86	6.36	3.73	2.39
*	4	139.7	15320	28.36	20.29	15.47	11.31	8.13	4.85	2.99
*	4	139.7	15320	28.53	20.42	15.51	11.40	8.27	4.81	3.04
*	4	139.4	15280	28.53	20.38	15.42	11.31	8.18	4.81	2.99
*	4	139.3	15272	28.61	20.47	15.42	11.36	8.31	4.85	3.08

'L-TRANS.CR. BEHIND LP

Stn: 50 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11832	22.37	16.16	12.42	8.23	5.82	3.77	2.30
	C	108.1	11848	21.66	15.77	12.12	8.06	5.73	3.73	2.26
	C	108.3	11864	21.62	15.77	12.12	8.10	5.78	3.77	2.26
*	1	54.3	5960	11.77	8.27	6.17	3.80	2.62	1.73	1.08
*	1	54.8	6008	11.73	8.32	6.17	3.80	2.62	1.73	1.13
*	1	54.6	5984	11.73	8.32	6.21	3.84	2.67	1.78	1.21
*	1	54.3	5960	11.65	8.27	6.13	3.80	2.62	1.73	1.13
*	2	82.3	9032	16.72	12.11	9.25	5.99	4.22	2.73	1.65
*	2	82.6	9056	16.80	12.19	9.30	6.08	4.27	2.77	1.73
*	2	82.8	9080	16.84	12.19	9.30	6.04	4.22	2.77	1.69
*	2	83.0	9104	16.84	12.19	9.30	6.08	4.27	2.73	1.69
*	3	108.0	11840	21.16	15.55	12.00	7.98	5.69	3.73	2.30
*	3	108.4	11880	21.20	15.55	12.04	8.02	5.73	3.73	2.21
*	3	108.6	11896	21.24	15.60	12.08	8.06	5.78	3.77	2.26
*	3	108.1	11856	21.20	15.51	12.00	8.02	5.73	3.73	2.17
*	4	140.6	15408	26.18	19.35	15.12	10.30	7.51	4.90	2.95
*	4	140.3	15376	26.14	19.43	15.12	10.26	7.47	4.90	2.95
*	4	140.0	15344	26.23	19.43	15.17	10.30	7.51	4.94	3.04
*	4	140.4	15392	26.18	19.48	15.21	10.34	7.51	4.90	2.91

Stn: 75 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:29

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.2	11752	31.00	24.43	15.08	9.12	5.87	3.68	2.13
	C	107.2	11752	29.87	23.66	14.70	8.91	5.78	3.68	2.17
	C	107.5	11792	29.66	23.61	14.74	8.95	5.78	3.68	2.17
*	1	54.1	5928	16.55	13.19	7.28	4.14	2.67	1.69	1.04
*	1	53.8	5904	16.42	13.10	7.28	4.18	2.67	1.73	1.08
*	1	53.9	5912	16.42	13.14	7.33	4.22	2.71	1.73	1.08
*	1	53.8	5904	16.38	13.10	7.33	4.22	2.71	1.78	1.13
*	2	81.9	8984	23.21	18.53	11.18	6.63	4.27	2.73	1.60
*	2	82.0	9000	23.34	18.66	11.27	6.63	4.27	2.73	1.60
*	2	82.3	9032	23.29	18.66	11.27	6.67	4.27	2.69	1.60
*	2	82.2	9000	23.34	18.66	11.23	6.63	4.27	2.69	1.56
*	3	107.4	11776	28.95	23.14	14.61	8.91	5.78	3.64	2.13
*	3	107.5	11792	29.12	23.35	14.70	8.99	5.78	3.68	2.13

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*	3	107.4	11776	29.12	23.31	14.70	8.95	5.82	3.68	2.17
*	3	107.4	11776	29.12	23.31	14.78	8.99	5.87	3.77	2.26
*	4	139.9	15336	35.44	28.31	18.55	11.61	7.65	4.85	2.82
*	4	139.9	15336	35.65	28.40	18.59	11.57	7.65	4.90	2.86
*	4	139.3	15264	35.40	28.27	18.55	11.57	7.65	4.90	2.82
*	4	139.6	15304	35.48	28.44	18.68	11.61	7.69	4.90	2.86

'L-TRANS.CR. BETWEEN D4 AND D5, AND D5 AND D6

Stn: 100 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:32

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	106.7	11696	32.30	21.59	15.42	9.24	5.91	3.68	2.17
	C	107.2	11760	31.21	20.98	15.17	9.20	5.96	3.73	2.21
	C	107.2	11760	30.96	20.94	15.21	9.29	6.00	3.77	2.26
*	1	53.8	5904	16.97	11.16	7.75	4.43	2.76	1.78	1.13
*	1	53.9	5912	16.88	11.16	7.80	4.47	2.80	1.82	1.17
*	1	54.1	5928	16.84	11.12	7.80	4.43	2.76	1.78	1.13
*	1	53.9	5904	16.76	11.07	7.75	4.43	2.76	1.82	1.13
*	2	81.6	8936	24.17	16.20	11.61	6.92	4.36	2.77	1.69
*	2	81.7	8968	24.22	16.29	11.70	6.97	4.40	2.73	1.65
*	2	81.6	8952	24.22	16.33	11.65	6.97	4.40	2.77	1.73
*	2	81.6	8952	24.22	16.29	11.70	6.97	4.40	2.77	1.65
*	3	107.2	11752	30.25	20.68	15.08	9.24	6.00	3.77	2.26
*	3	107.5	11792	30.33	20.77	15.12	9.24	6.00	3.77	2.21
*	3	107.5	11784	30.37	20.90	15.21	9.33	6.09	3.81	2.26
*	3	107.4	11776	30.37	20.90	15.25	9.37	6.09	3.81	2.26
*	4	139.6	15296	37.08	25.72	18.85	11.82	7.78	4.85	2.82
*	4	139.4	15280	37.16	25.81	18.98	11.86	7.87	4.90	2.91
*	4	139.1	15256	37.16	25.77	18.89	11.82	7.78	4.85	2.91
*	4	139.3	15272	37.08	25.72	18.94	11.82	7.78	4.85	2.82

Stn: 125 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.7	11808	23.75	16.63	12.17	7.89	5.33	3.29	1.87
	C	108.1	11856	23.13	16.33	12.08	7.89	5.42	3.38	2.00
	C	108.1	11848	22.96	16.29	12.04	7.94	5.42	3.38	2.04
*	1	54.3	5960	12.69	8.66	6.13	3.80	2.53	1.60	1.00
*	1	54.8	6008	12.78	8.66	6.17	3.80	2.49	1.56	0.95
*	1	54.2	5944	12.65	8.62	6.17	3.84	2.53	1.60	1.04
*	1	54.3	5960	12.65	8.57	6.17	3.80	2.49	1.56	0.95
*	2	82.6	9056	18.01	12.54	9.21	5.91	3.96	2.47	1.47
*	2	82.9	9088	18.14	12.58	9.25	5.95	4.00	2.47	1.47
*	2	82.5	9040	18.06	12.58	9.21	5.91	3.96	2.47	1.47
*	2	82.6	9064	18.14	12.67	9.30	5.95	4.04	2.51	1.56
*	3	108.3	11864	22.50	16.03	12.00	7.89	5.42	3.36	2.08
*	3	108.1	11848	22.46	15.99	11.95	7.85	5.38	3.34	1.95
*	3	108.3	11864	22.58	16.12	12.08	7.94	5.47	3.42	2.04
*	3	108.3	11872	22.50	16.07	12.00	7.89	5.42	3.38	2.04
*	4	140.0	15352	27.73	19.82	15.04	10.09	6.98	4.42	2.60
*	4	140.0	15344	27.73	19.82	15.04	10.13	7.02	4.42	2.60
*	4	140.3	15364	27.78	19.82	15.04	10.13	6.98	4.38	2.60
*	4	139.7	15312	27.69	19.73	15.04	10.13	7.07	4.46	2.69

Stn: 150 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:37

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11848	19.98	14.95	11.53	7.94	5.56	3.51	2.04
	C	108.4	11880	19.36	14.52	11.18	7.73	5.47	3.38	2.00
	C	108.4	11896	19.19	14.43	11.18	7.73	5.47	3.42	2.00
*	1	54.2	5952	11.14	8.06	6.04	3.97	2.76	1.65	1.08
*	1	54.5	5976	11.14	8.01	6.00	3.93	2.67	1.60	1.00
*	1	54.8	6008	11.10	8.06	6.08	4.01	2.71	1.69	1.08
*	1	54.6	5992	11.06	8.06	6.04	3.97	2.71	1.65	1.04
*	2	83.3	9144	15.33	11.46	8.78	5.95	4.13	2.60	1.52
*	2	83.5	9160	15.38	11.46	8.78	5.95	4.13	2.56	1.47
*	2	83.2	9112	15.17	11.46	8.78	5.95	4.13	2.56	1.52
*	2	83.3	9128	15.21	11.50	8.83	6.04	4.18	2.60	1.56
*	3	108.0	11840	18.85	14.18	11.01	7.68	5.42	3.47	2.00
*	3	108.4	11888	18.85	14.31	11.14	7.77	5.47	3.51	2.04
*	3	108.7	11912	18.94	14.35	11.14	7.81	5.51	3.60	2.08
*	3	108.4	11880	18.89	14.31	11.10	7.77	5.47	3.55	2.04
*	4	140.9	15456	22.62	17.28	13.58	9.67	6.93	4.51	2.56

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*	4	140.9	15456	22.66	17.36	13.71	9.75	7.02	4.64	2.65
*	4	140.1	15368	22.54	17.28	13.62	9.71	7.02	4.59	2.65
*	4	140.9	15456	22.54	17.32	13.67	9.67	6.98	4.51	2.60

Stn: 175 Lane:F3 Temp: J/C: Air: 63 PvT: 72 09:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.7	11808	18.77	14.09	10.97	7.56	5.33	3.25	2.04
	C	108.4	11896	18.22	13.75	10.67	7.35	5.16	3.16	1.91
	C	108.3	11872	18.10	13.70	10.63	7.35	5.11	3.12	1.91
*	1	54.2	5944	10.10	7.50	5.61	3.67	2.44	1.47	0.91
*	1	54.3	5960	10.05	7.54	5.70	3.76	2.53	1.56	1.00
*	1	54.5	5976	10.05	7.50	5.66	3.67	2.49	1.47	0.95
*	1	54.3	5968	10.01	7.45	5.61	3.67	2.49	1.52	0.95
*	2	82.6	9056	14.24	10.77	8.27	5.57	3.82	2.34	1.43
*	2	83.3	9144	14.33	10.86	8.35	5.66	3.87	2.34	1.43
*	2	83.2	9112	14.37	10.82	8.35	5.66	3.87	2.38	1.43
*	2	83.0	9112	14.33	10.77	8.31	5.66	3.87	2.34	1.39
*	3	108.4	11896	17.68	13.49	10.54	7.30	5.07	3.12	1.91
*	3	108.6	11904	17.72	13.53	10.58	7.39	5.16	3.16	1.95
*	3	108.7	11912	17.72	13.53	10.63	7.39	5.16	3.16	1.95
*	3	108.7	11912	17.76	13.53	10.58	7.39	5.16	3.16	1.91
*	4	140.6	15408	21.58	16.59	13.07	9.24	6.58	4.12	2.47
*	4	140.7	15432	21.62	16.63	13.15	9.33	6.62	4.16	2.52
*	4	140.3	15376	21.62	16.63	13.15	9.29	6.67	4.20	2.52
*	4	140.4	15400	21.66	16.68	13.20	9.37	6.76	4.20	2.56

Stn: 200 Lane:F3 Temp: J/C: Air: 63 PvT: 73 09:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11848	20.40	15.47	11.91	8.23	5.82	3.51	2.13
	C	108.0	11840	19.77	14.99	11.61	8.06	5.69	3.47	2.04
	C	108.4	11888	19.65	14.95	11.57	8.06	5.69	3.51	2.08
*	1	53.9	5904	10.89	8.10	6.13	4.05	2.76	1.65	1.00
*	1	54.6	5992	10.98	8.19	6.13	4.09	2.76	1.65	1.04
*	1	54.2	5944	10.89	8.19	6.08	4.01	2.71	1.60	1.00
*	1	54.5	5968	10.89	8.14	6.13	4.05	2.76	1.60	1.00
*	2	82.9	9088	15.58	11.76	9.04	6.21	4.31	2.60	1.52
*	2	83.2	9112	15.67	11.81	9.04	6.21	4.36	2.64	1.56
*	2	82.8	9080	15.58	11.76	9.04	6.21	4.31	2.56	1.52
*	2	82.6	9064	15.58	11.76	9.04	6.21	4.31	2.60	1.56
*	3	108.3	11872	19.19	14.74	11.44	8.02	5.64	3.47	2.08
*	3	108.1	11856	19.19	14.78	11.48	8.02	5.69	3.47	2.04
*	3	108.4	11880	19.23	14.82	11.53	8.06	5.73	3.51	2.08
*	3	108.4	11888	19.19	14.78	11.53	8.02	5.69	3.47	2.04
*	4	141.3	15488	23.50	18.10	14.22	10.13	7.29	4.55	2.69
*	4	141.3	15496	23.46	17.97	14.22	10.17	7.33	4.59	2.69
*	4	140.7	15432	23.42	18.01	14.27	10.17	7.33	4.64	2.73
*	4	140.7	15432	23.42	17.97	14.18	10.13	7.33	4.59	2.69

Stn: 225 Lane:F3 Temp: J/C: Air: 63 PvT: 73 09:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11888	18.77	14.31	11.14	7.85	5.56	3.38	2.04
	C	108.6	11904	18.14	13.87	10.75	7.60	5.38	3.34	2.00
	C	108.7	11920	18.01	13.83	10.75	7.64	5.42	3.38	2.00
*	1	54.8	6008	9.97	7.45	5.61	3.80	2.62	1.56	0.95
*	1	54.8	6008	10.01	7.50	5.66	3.84	2.62	1.60	1.00
*	1	54.5	5968	9.93	7.45	5.66	3.84	2.67	1.60	1.00
*	1	54.6	5984	9.85	7.45	5.61	3.80	2.58	1.56	0.95
*	2	83.2	9128	14.24	10.86	8.40	5.83	4.18	2.51	1.47
*	2	83.3	9136	14.24	10.82	8.35	5.78	4.09	2.43	1.43
*	2	83.3	9144	14.33	10.82	8.44	5.87	4.18	2.51	1.52
*	2	83.2	9120	14.20	10.73	8.31	5.78	4.09	2.43	1.43
*	3	108.6	11896	17.60	13.57	10.71	7.60	5.47	3.34	1.95
*	3	109.0	11952	17.76	13.70	10.71	7.60	5.42	3.38	2.08
*	3	109.0	11944	17.68	13.66	10.71	7.60	5.42	3.42	2.04
*	3	108.7	11920	17.72	13.70	10.67	7.60	5.42	3.38	2.04
*	4	140.6	15408	21.66	16.80	13.24	9.58	6.89V	4.33	2.52
*	4	140.9	15448	21.74	16.80	13.54	9.71	7.16	4.42	2.60
*	4	140.9	15456	21.70	16.72	13.45	9.71	7.16	4.38	2.56
*	4	140.7	15432	21.66	16.72	13.50	9.71	7.16	4.38	2.56

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

Stn: 250 Lane:F3 Temp: J/C: Air: 64 PvT: 74 09:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11840	18.18	13.87	10.88	7.64	5.33	3.25	1.95
	C	108.3	11880	17.72	13.53	10.67	7.56	5.29	3.29	2.00
	C	108.6	11904	17.47	13.40	10.58	7.47	5.20	3.25	1.91
*	1	54.2	5936	9.43	7.20	5.57	3.80	2.58	1.52	0.95
*	1	54.5	5976	9.47	7.20	5.57	3.76	2.58	1.52	0.95
*	1	54.8	6008	9.43	7.20	5.53	3.76	2.53	1.52	0.91
*	1	54.8	6008	9.51	7.24	5.57	3.80	2.58	1.56	1.00
*	2	83.0	9104	13.66	10.47	8.23	5.70	3.96	2.43	1.47
*	2	82.6	9064	13.74	10.47	8.23	5.70	3.96	2.43	1.47
*	2	82.8	9080	13.74	10.47	8.23	5.74	4.00	2.43	1.47
*	2	82.8	9080	13.74	10.47	8.23	5.74	4.00	2.43	1.47
*	3	108.1	11856	17.09	13.23	10.45	7.43	5.24	3.29	1.95
*	3	108.6	11904	17.22	13.31	10.58	7.47	5.29	3.29	1.95
*	3	108.7	11912	17.13	13.27	10.54	7.47	5.24	3.25	1.95
*	3	108.6	11904	17.18	13.27	10.54	7.51	5.29	3.25	1.95
*	4	140.1	15360	21.07	16.29	13.02	9.33	6.67	4.20	2.52
*	4	140.6	15408	21.11	16.33	13.07	9.37	6.71	4.20	2.47
*	4	141.0	15456	21.20	16.37	13.07	9.46	6.76	4.29	2.56
*	4	140.9	15440	21.07	16.33	13.07	9.46	6.71	4.20	2.47

Stn: 275 Lane:F3 Temp: J/C: Air: 63 PvT: 74 09:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11848	19.15	14.52	11.48	7.94	5.47	3.08	1.82
	C	108.1	11848	18.48	14.00	11.14	7.68	5.38	3.08	1.87
	C	108.1	11848	18.43	14.09	11.14	7.77	5.47	3.12	1.91
*	1	54.2	5944	10.18	7.58	5.87	3.80	2.62	1.43	0.91
*	1	54.3	5968	10.14	7.58	5.87	3.80	2.58	1.47	0.91
*	1	54.3	5968	10.18	7.63	5.96	3.93	2.67	1.52	1.00
*	1	54.3	5968	10.18	7.58	5.91	3.88	2.67	1.52	0.95
*	2	82.8	9072	14.50	10.99	8.65	5.95	4.13	2.34	1.43
*	2	83.2	9120	14.58	11.03	8.70	5.91	4.04	2.30	1.43
*	2	83.3	9136	14.58	11.03	8.70	5.95	4.09	2.30	1.43
*	2	82.9	9088	14.50	11.03	8.70	5.91	4.09	2.30	1.43
*	3	108.3	11872	17.93	13.79	11.01	7.64	5.38	3.12	1.87
*	3	108.6	11896	18.01	13.83	11.05	7.68	5.42	3.12	1.91
*	3	108.6	11904	17.97	13.83	11.05	7.73	5.38	3.08	1.87
*	3	108.4	11888	17.93	13.75	11.01	7.64	5.38	3.08	1.87
*	4	140.9	15448	21.95	16.93	13.58	9.67	6.93	4.07	2.47
*	4	141.3	15488	21.99	16.89	13.58	9.67	6.93	4.12	2.52
*	4	141.4	15504	21.95	16.85	13.58	9.62	6.93	4.12	2.47
*	4	140.6	15416	21.83	16.80	13.54	9.67	6.85	4.03	2.34V

'L-TRANS.CR. BETWEEN D5 AND D6

Stn: 300 Lane:F3 Temp: J/C: Air: 63 PvT: 73 09:53

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.8	11832	22.08	15.43	11.70	7.89	5.51	3.25	1.91
	C	108.4	11888	21.45	15.12	11.48	7.85	5.51	3.34	2.00
	C	108.4	11888	21.16	14.99	11.40	7.77	5.42	3.34	1.95
*	1	54.2	5952	11.81	7.97	5.87	3.80	2.58	1.60	1.00
*	1	54.2	5952	11.69	7.93	5.78	3.76	2.53	1.52	0.95
*	1	54.1	5920	11.65	7.93	5.78	3.76	2.58	1.56	1.00
*	1	54.1	5920	11.60	7.89	5.74	3.71	2.53	1.52	0.95
*	2	82.9	9096	16.51	11.63	8.78	5.91	4.13	2.56	1.52
*	2	83.0	9104	16.55	11.72	8.78	5.87	4.04	2.43	1.47
*	2	83.0	9104	16.63	11.68	8.83	5.91	4.13	2.51	1.47
*	2	83.0	9104	16.55	11.68	8.83	5.91	4.09	2.47	1.43
*	3	108.4	11888	20.70	14.87	11.40	7.81	5.51	3.38	2.04
*	3	108.4	11888	20.70	14.91	11.40	7.81	5.51	3.34	2.00
*	3	108.7	11920	20.78	14.99	11.48	7.89	5.56	3.34	2.00
*	3	108.6	11896	20.82	15.04	11.57	7.94	5.60	3.47	2.04
*	4	141.0	15464	25.47	18.70	14.57	10.13	7.20	4.42	2.52
*	4	141.2	15472	25.56	18.79	14.61	10.17	7.25	4.42	2.56
*	4	141.2	15480	25.47	18.79	14.57	10.13	7.20	4.38	2.52
*	4	140.9	15448	25.51	18.83	14.61	10.17	7.29	4.42	2.60

Stn: 325 Lane:F3 Temp: J/C: Air: 63 PvT: 74 09:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11896	21.83	16.63	12.81	8.95	6.22	3.73	2.08

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.7	11920	21.20	16.20	12.51	8.82	6.18	3.68	2.13
	C	108.8	11928	21.11	16.12	12.47	8.78	6.13	3.73	2.13
*	1	54.8	6016	11.40	8.45	6.34	4.22	2.84	1.69	1.04
*	1	54.6	5984	11.31	8.45	6.30	4.26	2.84	1.69	1.04
*	1	54.8	6000	11.31	8.49	6.34	4.31	2.89	1.78	1.08
*	1	54.9	6024	11.31	8.40	6.34	4.22	2.84	1.73	1.04
*	2	83.3	9136	16.21	12.37	9.47	6.54	4.53	2.69	1.60
*	2	83.8	9176	16.30	12.41	9.51	6.59	4.53	2.69	1.60
*	2	83.6	9168	16.30	12.37	9.47	6.54	4.49	2.64	1.52
*	2	83.6	9168	16.26	12.32	9.47	6.50	4.49	2.64	1.52
*	3	108.4	11888	20.49	15.77	12.25	8.61	6.04	3.60	2.04
*	3	109.0	11944	20.65	15.90	12.38	8.70	6.09	3.64	2.08
*	3	108.6	11896	20.61	15.90	12.38	8.74	6.13	3.68	2.13
*	3	108.6	11904	20.61	15.90	12.34	8.74	6.13	3.68	2.13
*	4	140.9	15456	25.85	20.08	15.81	11.31	8.05	4.85	2.78
*	4	140.9	15440	25.89	20.12	15.81	11.31	8.05	4.81	2.78
*	4	140.0	15352	25.72	19.99	15.72	11.27	8.00	4.81	2.78
*	4	140.3	15392	25.85	20.04	15.77	11.27	8.00	4.90	2.78

Stn: 350 Lane:F3 Temp: J/C: Air: 63 PvT: 74 09:58

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11840	26.44	19.35	14.48	9.33	6.27	3.60	2.17
	C	108.4	11868	25.35	18.61	13.97	9.08	6.04	3.60	2.13
	C	108.0	11840	25.01	18.44	13.88	8.99	6.04	3.51	2.13
*	1	54.2	5936	13.87	9.78	7.03	4.31	2.76	1.56	1.00
*	1	54.2	5944	13.91	9.82	7.03	4.35	2.76	1.56	1.00
*	1	54.2	5936	13.74	9.74	7.03	4.35	2.76	1.56	1.00
*	1	54.2	5936	13.83	9.82	7.07	4.35	2.80	1.60	1.04
*	2	82.3	9032	19.52	14.26	10.54	6.75	4.40	2.51	1.56
*	2	82.6	9064	19.69	14.39	10.63	6.84	4.44	2.56	1.60
*	2	82.9	9088	19.65	14.35	10.63	6.80	4.40	2.51	1.52
*	2	82.9	9096	19.69	14.39	10.67	6.84	4.44	2.60	1.56
*	3	108.3	11864	24.42	18.18	13.67	9.03	6.00	3.42	2.08
*	3	108.7	11912	24.55	18.31	13.80	9.16	6.04	3.47	2.08
*	3	108.4	11888	24.51	18.31	13.80	9.16	6.09	3.47	2.08
*	3	108.6	11896	24.51	18.23	13.80	9.16	6.04	3.42	2.08
*	4	139.9	15336	30.42	22.88	17.48	11.90	8.05	4.51	2.73
*	4	139.7	15328	30.37	22.92	17.48	11.99	8.09	4.51	2.78
*	4	139.7	15320	30.33	22.88	17.48	11.90	8.05	4.55	2.73
*	4	140.1	15368	30.37	22.97	17.57	12.03	8.13	4.59	2.82

'M-TRANS.CR. BEHIND LP

Stn: 375 Lane:F3 Temp: J/C: Air: 64 PvT: 73 10:01

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.7	11800	27.65	19.35	14.10	8.36	5.60	3.60	2.13
	C	108.0	11840	26.35	18.57	13.58	8.10	5.42	3.55	2.08
	C	108.0	11840	26.14	18.48	13.54	8.02	5.42	3.47	2.04
*	1	54.2	5952	14.79	9.82	6.86	3.71	2.44	1.65	1.00
*	1	53.8	5896	14.70	9.82	6.86	3.76	2.53	1.73	1.08
*	1	54.5	5968	14.75	9.87	6.90	3.76	2.49	1.65	1.04
*	1	54.3	5968	14.66	9.82	6.90	3.80	2.53	1.65	1.04
*	2	82.5	9040	20.57	14.26	10.28	5.91	3.96	2.60	1.60
*	2	82.8	9064	20.61	14.31	10.28	5.91	3.91	2.56	1.47V
*	2	82.8	9080	20.70	14.39	10.37	5.95	4.00	2.64	1.60
*	2	82.8	9064	20.65	14.39	10.37	5.95	4.00	2.60	1.56
*	3	108.1	11848	25.51	18.18	13.37	7.94	5.42	3.51	2.08
*	3	108.6	11896	25.68	18.27	13.45	8.10	5.42	3.60	2.08
*	3	108.4	11880	25.60	18.23	13.41	8.10	5.42	3.60	2.08
*	3	108.6	11904	25.64	18.31	13.45	8.10	5.47	3.60	2.08
*	4	140.6	15416	31.59	22.71	16.92	10.51	7.16	4.64	2.69
*	4	140.9	15440	31.71	22.88	17.05	10.51	7.20	4.72	2.78
*	4	140.6	15416	31.63	22.75	16.97	10.51	7.16	4.64	2.73
*	4	140.3	15384	31.63	22.79	17.01	10.51	7.16	4.68	2.73

'L-TRANS.CR. BETWEEN D4 AND D5

Stn: 400 Lane:F3 Temp: J/C: Air: 63 PvT: 73 10:04

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.5	11792	23.67	16.80	12.30	7.98	5.38	3.03	1.82
	C	108.4	11880	22.62	16.20	11.91	7.85	5.33	3.21	1.87

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11880	22.29	16.03	11.83	7.81	5.29	3.16	1.82
*	1	54.6	5984	12.78	8.79	6.17	3.80	2.44	1.47	0.87
*	1	54.5	5976	12.69	8.83	6.21	3.84	2.53	1.52	0.95
*	1	54.5	5968	12.61	8.79	6.17	3.80	2.49	1.52	0.95
*	1	54.6	5984	12.65	8.83	6.21	3.88	2.53	1.60	0.95
*	2	82.8	9072	17.72	12.58	9.08	5.87	3.91	2.30	1.34
*	2	83.3	9136	17.89	12.67	9.21	5.91	3.96	2.34	1.34
*	2	83.2	9120	17.85	12.67	9.17	5.91	3.91	2.30	1.34
*	2	83.5	9152	17.85	12.67	9.25	5.99	4.00	2.38	1.39
*	3	108.3	11864	21.83	15.90	11.74	7.81	5.33	3.16	1.82
*	3	108.4	11886	21.87	15.94	11.87	7.85	5.33	3.21	1.82
*	3	108.1	11848	21.83	15.99	11.91	7.94	5.38	3.25	1.91
*	3	108.4	11888	21.83	15.99	11.87	7.89	5.38	3.21	1.82
*	4	140.7	15432	26.81	19.78	14.95	10.09	6.98	4.16	2.39
*	4	140.9	15440	26.81	19.86	15.00	10.17	7.07	4.25	2.43
*	4	140.3	15384	26.73	19.86	15.04	10.17	7.07	4.25	2.39
*	4	140.4	15392	26.77	19.91	15.08	10.22	7.11	4.33	2.47

Stn: 425 Lane:F3 Temp: J/C: Air: 64 PvT: 76 10:06

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11888	22.92	16.29	11.95	7.81	5.51	3.42	2.00
	C	109.0	11944	21.95	15.73	11.57	7.64	5.38	3.38	2.00
	C	108.6	11896	21.74	15.60	11.57	7.60	5.38	3.38	2.04
*	1	54.8	6008	12.40	8.62	6.08	3.71	2.53	1.56	1.00
*	1	54.8	6008	12.48	8.66	6.13	3.76	2.58	1.65	1.04
*	1	54.8	6016	12.44	8.62	6.17	3.80	2.58	1.65	1.04
*	1	54.9	6024	12.40	8.62	6.08	3.76	2.53	1.60	1.00
*	2	83.0	9104	17.22	12.19	8.91	5.70	4.00	2.47	1.52
*	2	83.3	9136	17.18	12.24	8.91	5.70	3.96	2.47	1.43
*	2	83.8	9176	17.22	12.24	8.95	5.74	4.00	2.47	1.47
*	2	83.8	9176	17.22	12.28	8.95	5.74	4.00	2.51	1.47
*	3	108.3	11864	21.07	15.25	11.31	7.51	5.33	3.34	2.00
*	3	108.6	11896	21.16	15.30	11.40	7.56	5.33	3.34	1.91
*	3	108.6	11904	21.20	15.34	11.48	7.64	5.38	3.42	2.00
*	3	109.0	11944	21.16	15.38	11.48	7.64	5.42	3.42	2.04
*	4	141.0	15456	25.85	18.87	14.27	9.67	6.93	4.42	2.56
*	4	140.9	15440	25.81	18.87	14.31	9.71	6.98	4.42	2.56
*	4	140.9	15440	25.81	19.00	14.40	9.79	7.07	4.51	2.65
*	4	140.9	15440	25.72	18.96	14.31	9.75	6.98	4.46	2.56

Stn: 450 Lane:F3 Temp: J/C: Air: 65 PvT: 77 10:09

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11840	21.53	15.34	11.65	7.39	4.40	2.73	1.65
	C	108.3	11872	20.65	14.78	11.27	7.26	4.40	2.82	1.78
	C	108.4	11896	20.36	14.61	11.23	7.22	4.40	2.77	1.73
*	1	54.5	5976	11.86	8.23	6.04	3.59	2.04	1.26	0.91
*	1	54.8	6000	11.69	8.14	6.04	3.59	2.04	1.26	0.87
*	1	55.4	6064	11.81	8.19	6.08	3.63	2.09	1.26	0.91
*	1	55.1	6032	11.73	8.14	6.04	3.59	2.09	1.26	0.91
*	2	82.8	9072	16.05	11.42	8.65	5.40	3.20	2.08	1.21
*	2	83.5	9160	16.13	11.55	8.78	5.49	3.24	2.12	1.30
*	2	83.8	9184	16.17	11.59	8.83	5.53	3.29	2.12	1.34
*	2	83.5	9160	16.13	11.55	8.78	5.53	3.24	2.12	1.34
*	3	108.3	11872	19.77	14.26	10.97	7.13	4.36	2.77	1.69
*	3	109.0	11944	19.86	14.39	11.05	7.18	4.40	2.82	1.69
*	3	109.0	11944	19.82	14.35	11.05	7.18	4.36	2.82	1.69
*	3	108.6	11896	19.86	14.35	11.05	7.22	4.40	2.86	1.69
*	4	141.2	15472	24.05	17.58	13.71	9.16	5.69	3.64	2.30
*	4	141.4	15512	24.13	17.67	13.71	9.20	5.69	3.73	2.21
*	4	141.4	15512	24.09	17.67	13.71	9.24	5.69	3.73	2.21
*	4	141.4	15512	24.05	17.62	13.58	9.20	5.60	3.73	2.08V

'H-TRANS.CR. BETWEEN D4 AND D5

Stn: 475 Lane:F3 Temp: J/C: Air: 65 PvT: 79 10:12

	Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11896	20.11	14.18	10.28	6.54	4.49	2.73	1.82
	C	109.1	11968	19.27	13.66	9.94	6.37	4.40	2.73	1.78
	C	109.0	11960	18.98	13.49	9.81	6.33	4.36	2.69	1.82
*	1	54.6	5992	11.10	7.67	5.36	3.25	2.09	1.30	0.91
*	1	54.6	5984	11.02	7.58	5.27	3.12	2.04	1.26	0.87

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	1	54.5	5976	10.98	7.54	5.27	3.12	2.04	1.26	0.87
*	1	54.5	5968	11.02	7.58	5.31	3.17	2.09	1.30	0.91
*	2	82.9	9088	15.12	10.56	7.58	4.69	3.16	1.95	1.21
*	2	83.5	9152	15.21	10.64	7.67	4.77	3.20	1.99	1.30
*	2	83.6	9168	15.21	10.69	7.67	4.81	3.24	2.04	1.30
*	2	83.3	9128	15.21	10.69	7.67	4.85	3.24	2.04	1.34
*	3	108.4	11888	18.39	13.19	9.68	6.25	4.36	2.73	1.82
*	3	109.3	11984	18.48	13.23	9.73	6.29	4.36	2.73	1.78
*	3	109.0	11960	18.52	13.27	9.77	6.33	4.40	2.77	1.82
*	3	108.8	11936	18.48	13.31	9.73	6.46	4.40	2.73	1.87
*	4	140.4	15400	22.29	16.20	12.08	8.06	5.69	3.60	2.39
*	4	140.6	15408	22.29	16.24	12.08	8.10	5.64	3.60	2.34
*	4	140.9	15440	22.33	16.29	12.17	8.19	5.73	3.64	2.39
*	4	140.7	15424	22.29	16.20	12.17	8.06	5.78	3.68	2.39

'M-TRANS.CR. NEAR D7

Stn: 500 Lane:F3 Temp: J/C: Air: 66 PvT: 79 10:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12072	22.54	13.83	10.07	6.29	4.36	2.90	1.87
	C	110.7	12136	21.53	13.36	9.68	6.12	4.31	2.82	1.82
	C	110.6	12128	21.41	13.27	9.68	6.12	4.36	2.90	1.87
*	1	55.4	6064	12.69	7.54	5.27	3.00	2.00	1.39	0.91
*	1	55.5	6088	12.74	7.63	5.31	3.08	2.09	1.43	0.95
*	1	55.5	6088	12.57	7.58	5.27	3.04	2.00	1.39	0.91
*	1	55.9	6136	12.61	7.58	5.27	3.08	2.04	1.39	0.91
*	2	83.2	9128	17.13	10.47	7.50	4.60	3.16	2.12	1.39
*	2	84.2	9232	17.22	10.51	7.54	4.60	3.16	2.08	1.34
*	2	83.9	9208	17.13	10.47	7.54	4.60	3.16	2.08	1.34
*	2	84.2	9224	17.18	10.47	7.54	4.60	3.16	2.08	1.39
*	3	110.6	12128	20.65	13.06	9.55	6.08	4.31	2.90	1.87
*	3	110.7	12144	20.74	13.06	9.55	6.08	4.31	2.86	1.82
*	3	110.9	12152	20.65	13.06	9.60	6.12	4.36	2.90	1.91
*	3	110.7	12136	20.78	13.06	9.60	6.16	4.36	2.90	1.87
*	4	141.3	15488	25.05	15.99	12.00	7.85	5.69	3.81	2.47
*	4	140.7	15424	25.01	15.94	11.91	7.89	5.69	3.81	2.43
*	4	140.6	15416	24.93	15.86	11.83	7.89	5.73	3.77	2.39
*	4	140.6	15416	25.01	15.94	11.95	7.94	5.73	3.86	2.47

Stn: 510 Lane:F3 Temp: J/C: Air: 66 PvT: 74 10:18

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.4	11784	20.91	14.82	10.93	7.18	4.98	3.08	2.00
	C	108.3	11864	20.11	14.35	10.63	7.09	4.93	3.16	2.04
	C	108.1	11856	19.86	14.22	10.58	7.05	4.89	3.16	2.00
*	1	54.5	5976	11.44	7.89	5.66	3.50	2.31	1.52	1.00
*	1	54.3	5968	11.35	7.84	5.57	3.42	2.27	1.43	0.95
*	1	54.3	5952	11.27	7.80	5.57	3.46	2.27	1.43	0.95
*	1	54.2	5944	11.27	7.84	5.61	3.50	2.36	1.60V	1.04
*	2	82.5	9048	15.75	11.12	8.18	5.32	3.64	2.30	1.52
*	2	82.8	9064	15.75	11.16	8.23	5.32	3.64	2.34	1.47
*	2	82.9	9080	15.71	11.12	8.18	5.28	3.56	2.25	1.43
*	2	83.3	9128	15.75	11.16	8.18	5.32	3.64	2.34	1.47
*	3	108.3	11872	19.36	13.92	10.45	6.97	4.89	3.12	2.04
*	3	108.6	11896	19.44	13.96	10.45	6.97	4.89	3.12	2.00
*	3	108.6	11904	19.40	14.00	10.45	7.09	4.89	3.16	2.00
*	3	108.3	11872	19.44	14.00	10.50	7.05	4.93	3.21	2.04
*	4	140.3	15384	23.63	17.11	12.98	8.82V	6.31	4.07V	2.65
*	4	140.7	15424	23.67	17.28	13.15	9.29	6.49	4.33	2.65
*	4	140.9	15448	23.75	17.32	13.15	9.29	6.49	4.33	2.69
*	4	140.6	15408	23.71	17.32	13.07	9.37V	6.53	4.42V	2.65

Stn: 520 Lane:F3 Temp: J/C: Air: 66 PvT: 72 10:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11856	21.74	15.43	11.35	7.18	4.89	2.95	1.82
	C	108.7	11920	20.95	14.95	11.05	7.05	4.84	3.08	1.87
	C	108.6	11904	20.74	14.82	10.97	7.01	4.84	3.03	1.91
*	1	54.8	6008	12.07	8.27	5.87	3.46	2.31	1.43	1.00
*	1	54.5	5976	11.90	8.19	5.83	3.42	2.27	1.43	0.87
*	1	54.5	5968	11.94	8.23	5.87	3.55	2.36	1.52	1.00
*	1	54.5	5976	11.86	8.19	5.87	3.50	2.31	1.43	0.95
*	2	82.3	9024	16.34	11.50	8.44	5.23	3.51	2.17	1.34

File: C:\FWD\DATA\906405E3.FWD
Road: HWY-16 EB LANE, 14 MILES WEST OF LANIGAN, SK
Subsection: 906405

*	2	83.2	9120	16.46	11.59	8.53	5.36	3.60	2.25	1.34
*	2	83.0	9104	16.46	11.63	8.53	5.36	3.60	2.25	1.43
*	2	83.3	9136	16.42	11.59	8.53	5.32	3.56	2.21	1.34
*	3	108.7	11912	20.15	14.43	10.88	7.01	4.84	3.03	1.87
*	3	108.7	11912	20.28	14.56	10.88	7.01	4.84	3.03	1.87
*	3	109.0	11944	20.28	14.52	10.88	7.05	4.84	3.03	1.82
*	3	109.0	11952	20.15	14.48	10.93	7.09	4.89	3.03	1.82
*	4	141.3	15488	24.59	17.80	13.62	8.99V	6.31V	3.99	2.34
*	4	141.0	15456	24.63	17.71	13.80	9.29	6.49	4.12	2.39
*	4	140.7	15432	24.59	17.67	13.75	9.29	6.49	4.12	2.43
*	4	140.4	15400	24.47	17.58	13.75	9.24	6.40	4.03	2.39

Stn: 525 Lane:F3 Temp: J/C: Air: 65 PvT: 73 10:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.0	11840	21.11	14.99	11.10	7.09	4.62	2.82	1.62
	C	108.3	11872	20.11	14.35	10.63	6.88	4.53	2.82	1.82
	C	108.4	11896	19.94	14.26	10.58	6.88	4.53	2.86	1.82
*	1	54.3	5968	11.40	7.84	5.61	3.38	2.18	1.39	0.87
*	1	54.3	5960	11.35	7.84	5.61	3.38	2.18	1.34	0.87
*	1	54.8	6008	11.35	7.84	5.57	3.33	2.18	1.39	0.87
*	1	54.9	6024	11.31	7.84	5.61	3.33	2.18	1.43	0.87
*	2	82.5	9048	15.71	11.12	8.14	5.15	3.33	2.08	1.34
*	2	82.9	9088	15.79	11.20	8.27	5.19	3.38	2.12	1.34
*	2	83.0	9112	15.75	11.12	8.18	5.15	3.33	2.04	1.30
*	2	83.5	9152	15.84	11.20	8.23	5.19	3.38	2.12	1.34
*	3	108.3	11872	19.36	13.92	10.41	6.71	4.49	2.82	1.78
*	3	109.0	11952	19.52	14.05	10.54	6.84	4.58	2.95	1.87
*	3	108.7	11912	19.48	14.05	10.54	6.88	4.58	2.90	1.87
*	3	108.7	11912	19.48	14.05	10.58	6.92	4.62	2.95	1.87
*	4	140.0	15352	23.71	17.15	13.02	8.65	5.96	3.81	2.39
*	4	140.7	15424	23.71	17.28	13.15	8.74	6.00	3.86	2.47
*	4	141.2	15472	23.71	17.24	13.11	8.78	5.96	3.77	2.39
*	4	140.7	15432	23.67	17.19	13.15	8.78	5.96	3.77	2.34

'L-TRANS.CR. UNDER D5

Stn: 535 Lane:F3 Temp: J/C: Air: 65 PvT: 74 10:26

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.7	11800	21.70	14.95	10.84	6.21	4.44	2.77	1.69
	C	108.4	11888	20.74	14.39	10.54	6.08	4.40	2.82	1.73
	C	108.7	11920	20.61	14.35	10.58	6.12	4.49	2.86	1.87
*	1	53.9	5912	11.73	7.93	5.57	2.95	2.13	1.39	0.95
*	1	54.1	5928	11.69	7.93	5.57	2.95	2.13	1.39	1.00
*	1	54.2	5936	11.65	7.84	5.53	2.87	2.04	1.30	0.87
*	1	53.9	5912	11.56	7.89	5.57	2.95	2.13	1.39	0.95
*	2	81.7	8968	16.42	11.07	7.97	4.43	3.20	2.04	1.26
*	2	82.8	9064	16.51	11.20	8.10	4.52	3.24	2.08	1.34
*	2	82.8	9072	16.55	11.25	8.14	4.56	3.24	2.08	1.30
*	2	82.5	9040	16.46	11.25	8.10	4.52	3.24	2.08	1.34
*	3	108.1	11856	19.90	14.05	10.37	6.08	4.44	2.86	1.87
*	3	108.3	11864	19.90	14.05	10.33	5.99	4.36	2.82	1.78
*	3	108.4	11888	19.94	14.13	10.45	6.08	4.44	2.86	1.78
*	3	108.4	11888	19.77	14.09	10.41	6.08	4.40	2.82	1.73
*	4	140.0	15352	24.30	17.26	12.98	7.85	5.73	3.73	2.26
*	4	140.1	15368	24.47	17.41	13.07	7.94	5.82	3.77	2.39
*	4	139.6	15304	24.30	17.36	13.07	7.89	5.82	3.77	2.34
*	4	140.4	15392	24.38	17.41	13.11	7.94	5.82	3.77	2.34

Mileage:-.008 -> .101

F1 TESTS

Summary of Data for section 906405E
Analyzed by: ROBERT VAN SAMBEEK on 09-01-1993

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	1.7838	1.2725	0.9463	0.6200	0.4321	0.2698	0.1688
	2	1.7051	1.2379	0.9362	0.6305	0.4427	0.2761	0.1658
	3	1.6629	1.2209	0.9352	0.6428	0.4575	0.2866	0.1719
	4	1.6152	1.1892	0.9188	0.6426	0.4600	0.2895	0.1721

Standard Deviations

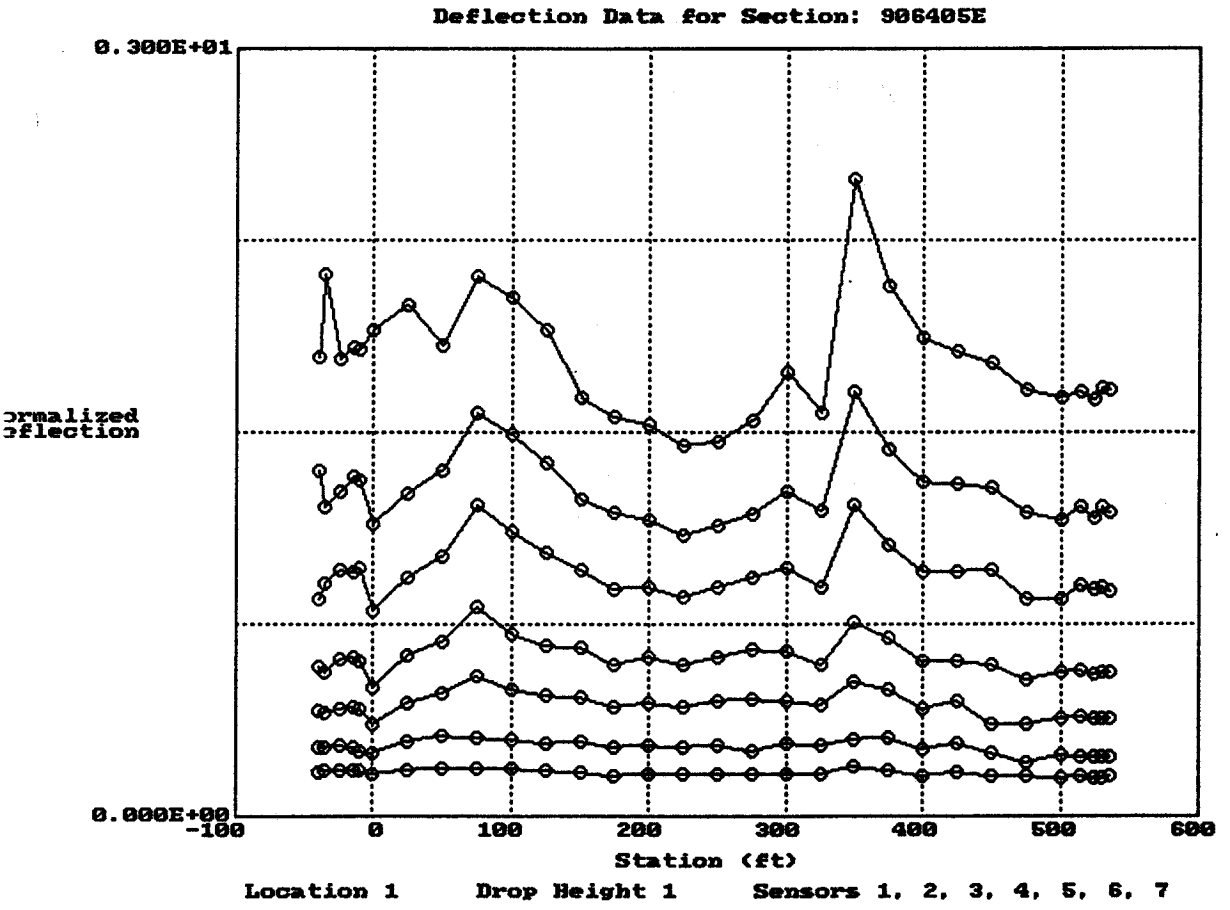
Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2270	0.1312	0.0984	0.0666	0.0482	0.0265	0.0130
	2	0.2194	0.1343	0.1032	0.0704	0.0525	0.0275	0.0131
	3	0.2231	0.1393	0.1069	0.0734	0.0544	0.0290	0.0126
	4	0.2284	0.1424	0.1101	0.0747	0.0549	0.0293	0.0128

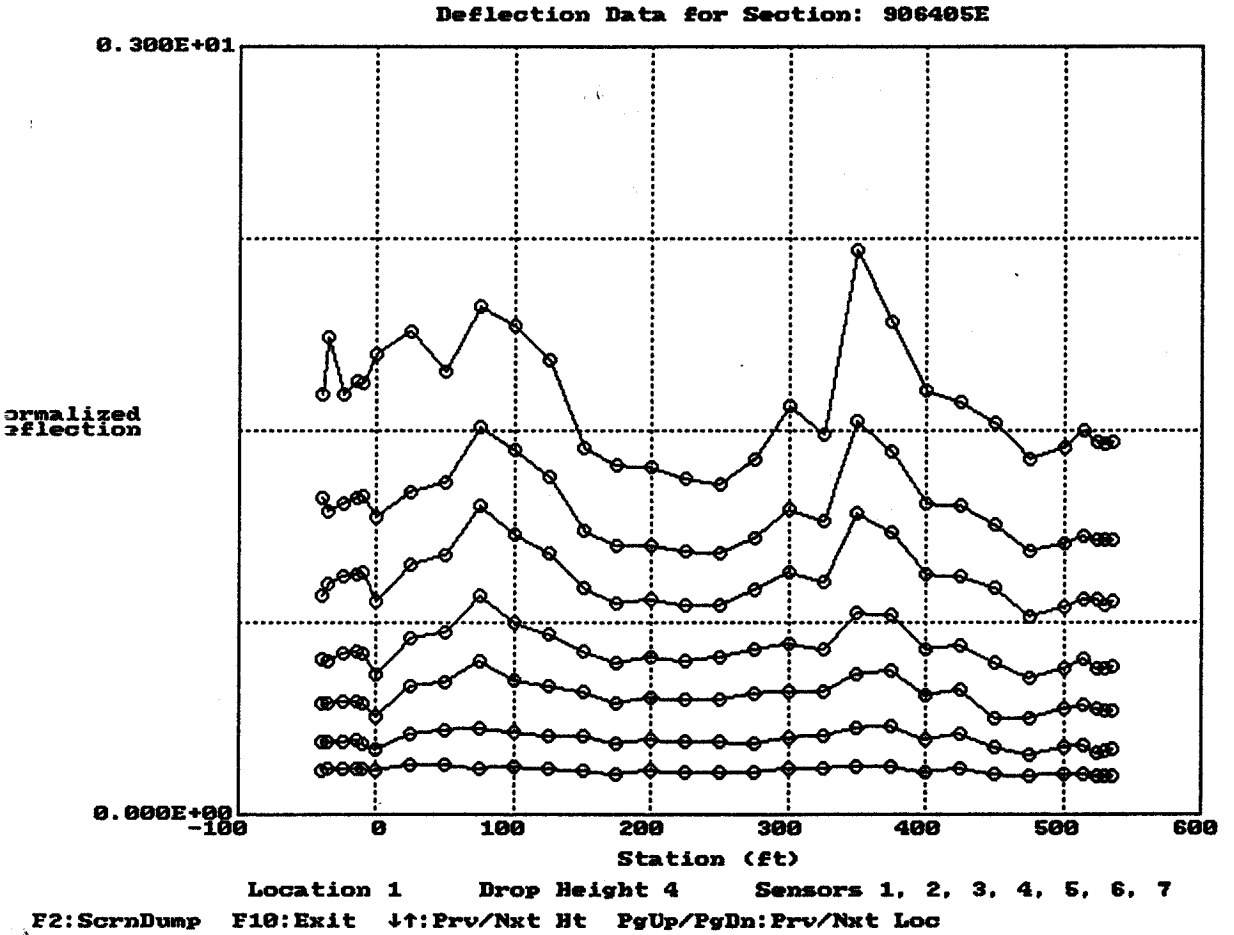
Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	12.72%	10.31%	10.40%	10.74%	11.15%	9.83%	7.73%
	2	12.87%	10.85%	11.03%	11.16%	11.85%	9.97%	7.89%
	3	13.42%	11.41%	11.43%	11.42%	11.88%	10.11%	7.32%
	4	14.14%	11.97%	11.98%	11.62%	11.93%	10.12%	7.43%

FIELD COMMENTS FROM FWD OPERATOR

35 L-TRANS.CR.UNDER LP
0 L-TRANS.CR.UNDER D1
5 L-TRANS.CR.UNDER LP
L-TRANS.CR.BETWEEN D5 AND D6, AND D6 AND D7
.75 L-TRANS.CR.UNDER D6
00 L-LONG.CR.UNDER SENSORS
50 M-TRANS.CR.BEHIND LP
75 L-TRANS.CR.UNDER LP
50 M-TRANS.CR.BETWEEN D4 AND D5
75 M-TRANS.CR.UNDER D7
25 M-TRANS.CR.BETWEEN D5 AND D6


Deflection Data for Section: 906405E
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 1 Drop Height 1 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc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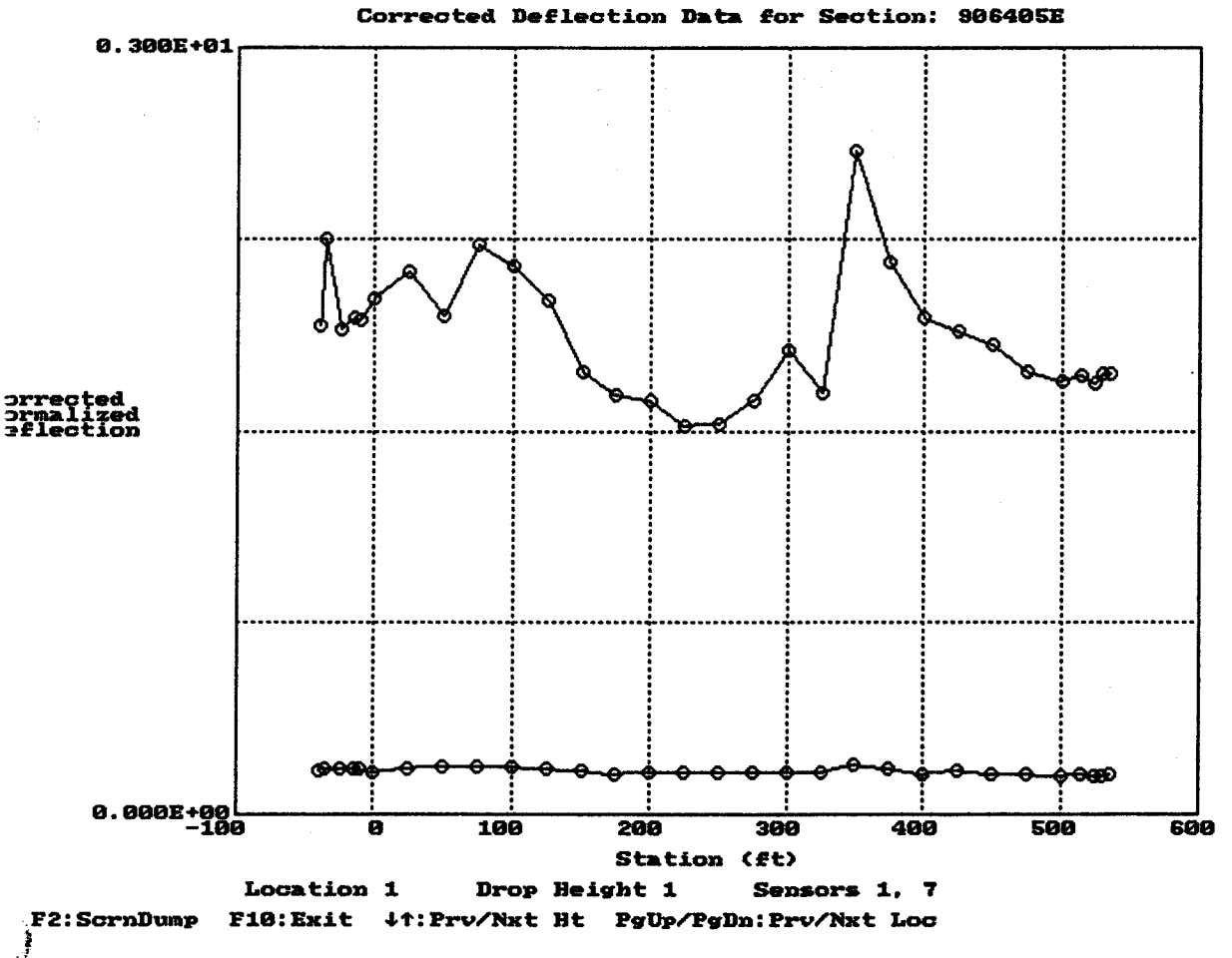
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 1 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc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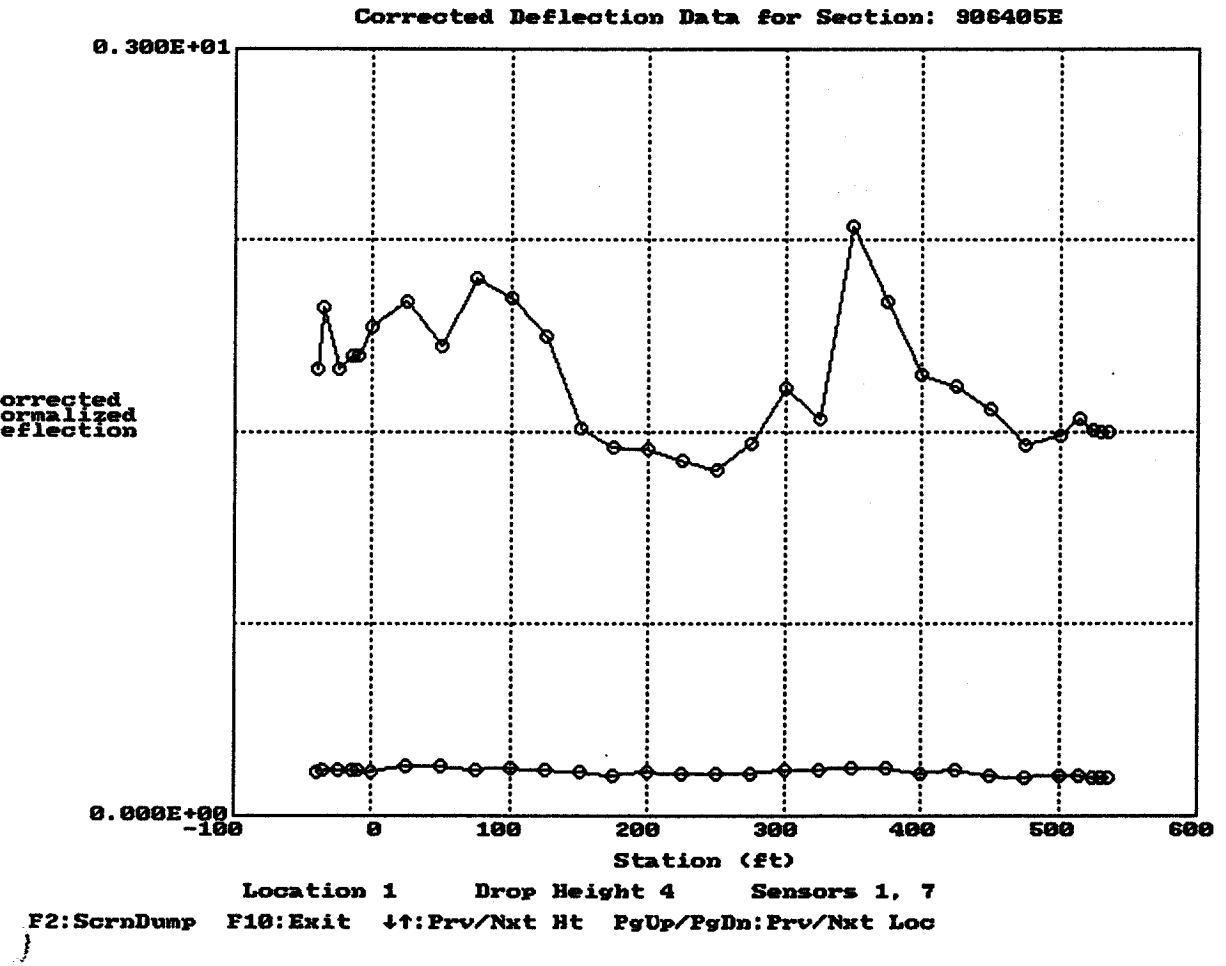
0.300E+01
orrected
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 1 Drop Height 1 Sensors 1, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Corrected Deflection Data for Section: 906405E
0.300E+01
orrected
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 1 Drop Height 4 Sensors 1, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

F3

Summary of Data for section 906405E
Analyzed by: ROBERT VAN SAMBEEK on 09-01-1993

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	2.0110	1.4040	1.0067	0.6249	0.4177	0.2622	0.1687
	2	1.8698	1.3341	0.9836	0.6337	0.4299	0.2680	0.1643
	3	1.7792	1.2919	0.9695	0.6427	0.4438	0.2787	0.1697
	4	1.6919	1.2375	0.9431	0.6400	0.4487	0.2835	0.1708

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.2877	0.2098	0.1033	0.0637	0.0435	0.0232	0.0130
	2	0.2694	0.1992	0.1103	0.0687	0.0463	0.0241	0.0131
	3	0.2599	0.1934	0.1144	0.0712	0.0472	0.0254	0.0132
	4	0.2508	0.1841	0.1126	0.0697	0.0467	0.0244	0.0135

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	14.31%	14.94%	10.26%	10.19%	10.41%	8.85%	7.73%
	2	14.41%	14.93%	11.22%	10.84%	10.78%	8.98%	7.99%
	3	14.61%	14.97%	11.80%	11.08%	10.63%	9.10%	7.75%
	4	14.82%	14.88%	11.94%	10.90%	10.40%	8.62%	7.88%

Flexible Pavement Deflection Statistics - 906405E

Mean Values (mils/kip)

Test Loc.	Drop Ht	CORRECTED Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	2.0248	1.4040	1.0067	0.6249	0.4177	0.2622	0.1687
	2	1.8831	1.3341	0.9836	0.6337	0.4299	0.2680	0.1643
	3	1.7922	1.2919	0.9695	0.6427	0.4438	0.2787	0.1697
	4	1.7046	1.2375	0.9431	0.6400	0.4487	0.2835	0.1708

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.2963	0.2098	0.1033	0.0637	0.0435	0.0232	0.0130
	2	0.2810	0.1992	0.1103	0.0687	0.0463	0.0241	0.0131
	3	0.2735	0.1934	0.1144	0.0712	0.0472	0.0254	0.0132
	4	0.2650	0.1841	0.1126	0.0697	0.0467	0.0244	0.0135

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	14.63%	14.94%	10.26%	10.19%	10.41%	8.85%	7.73%
	2	14.92%	14.93%	11.22%	10.84%	10.78%	8.98%	7.99%
	3	15.26%	14.97%	11.80%	11.08%	10.63%	9.10%	7.75%
	4	15.55%	14.88%	11.94%	10.90%	10.40%	8.62%	7.88%

Outlier Statistics - 906405E

Station	Height	Sensor	Number of Std. Dev.
25	1	5	2.12
25	3	7	2.27
75	1	1	2.77
75	1	2	3.90
75	1	3	2.22
75	2	1	2.72
75	2	2	3.69
75	2	3	2.40
75	3	1	2.68
75	3	2	3.54
75	3	3	2.43
75	4	1	2.52
75	4	2	3.34
75	4	3	2.41
100	1	1	3.00
100	1	2	2.28
100	1	3	2.99
100	2	1	3.13
100	2	2	2.43
100	2	3	2.90
100	2	4	2.09
100	3	1	3.07
100	3	2	2.46
100	3	3	2.78
100	3	4	2.06
100	4	1	2.94
100	4	2	2.44
100	4	3	2.62
350	4	4	2.00
450	1	6	-2.28
450	3	7	-2.12
450	4	7	-2.15
475	1	6	-2.07
475	2	6	-2.01
535	1	4	-2.04

Pavement Construction Information - 906405E

Material Code	Material Name	Layer Thickness
700	Asphaltic Concrete	2.8
304	Crushed Gravel	9.0
321	Asphalt Treated Mixture	1.2

Depth to rigid foundation: 100.0 ft.

FLEXIBLE Pavement Thickness Data - 906405E
(comparison of each calculation to the expected value)

Minimum expected SN value: 1.97
Maximum expected SN value: 3.30

Height	Station	Effective SN

No predicted SN values fall outside the expected range...

FLEXIBLE Pavement Thickness Statistics - 906405E

Drop height 1

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	23085	2.60
	-35	24011	2.60
	-25	23331	2.75
	-15	23957	2.65
	-5	22530	2.55
	0	23822	2.45
	25	21437	2.55
	50	21894	2.65
	75	22722	2.15
	100	21614	2.15
	125	25117	2.45
	150	23668	2.70
	175	25919	2.75
	200	23887	2.70
	225	25200	2.85
	250	25700	2.95
	275	24954	2.80
	300	25235	2.60
	325	23213	2.70
	350	23636	2.40
	375	23749	2.30
	400	26406	2.45
	425	24465	2.55
	450	27626	2.55
	475	27755	2.65
	500	27375	2.45
	510	25085	2.65
	520	25937	2.55
	525	28417	2.60
	535	26015	2.60
Subsection 1 Overall Mean:		24592	2.58
Standard Deviation:		1830	0.18
Coeff Of Variation:		7.44%	6.96%

FLEXIBLE Pavement Thickness Statistics - 906405E

Drop height 2

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	23674	2.70
	-35	24564	2.65
	-25	24517	2.75
	-15	23559	2.70
	-5	23498	2.60
	0	24443	2.55
	25	21257	2.65
	50	22337	2.70
	75	23248	2.20
	100	22188	2.20
	125	25049	2.55
	150	24320	2.85
	175	26040	2.90
	200	23042	2.85
	225	24148	2.95
	250	25168	3.05
	275	24562	2.95
	300	24448	2.75
	325	21835	2.85
	350	22621	2.50
	375	24154	2.40
	400	24724	2.60
	425	25288	2.65
	450	29063	2.65
	475	29250	2.75
	500	27832	2.60
	510	25547	2.80
	520	27583	2.70
	525	28245	2.75
	535	28467	2.65
Subsection 1 Overall Mean:		24822	2.68
Standard Deviation:		2144	0.19
Coeff Of Variation:		8.64%	7.20%

FLEXIBLE Pavement Thickness Statistics - 906405E

Drop height 3

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	23105	2.75
	-35	23465	2.75
	-25	23081	2.85
	-15	23368	2.75
	-5	23154	2.65
	0	24831	2.60
	25	20695	2.75
	50	22113	2.80
	75	22340	2.30
	100	21469	2.25
	125	24122	2.65
	150	23959	2.95
	175	25557	3.00
	200	23016	2.95
	225	24212	3.05
	250	24915	3.15
	275	24220	3.05
	300	23659	2.85
	325	20723	2.95
	350	21386	2.65
	375	23729	2.50
	400	23617	2.75
	425	24465	2.80
	450	29072	2.75
	475	27090	2.95
	500	26883	2.80
	510	24418	2.95
	520	26745	2.80
	525	26671	2.85
	535	27414	2.80
Subsection 1 Overall Mean:		24117	2.79
Standard Deviation:		2030	0.20
Coeff Of Variation:		8.42%	7.20%

FLEXIBLE Pavement Thickness Statistics - 906405E

Drop height 4

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	22456	2.85
	-35	22600	2.85
	-25	23229	2.90
	-15	22845	2.80
	-5	23229	2.75
	0	24258	2.65
	25	20499	2.80
	50	21637	2.90
	75	22030	2.40
	100	21577	2.35
	125	24135	2.70
	150	24358	3.10
	175	25357	3.15
	200	23288	3.05
	225	23884	3.20
	250	25331	3.20
	275	24644	3.20
	300	23074	2.95
	325	20447	3.05
	350	20643	2.75
	375	23443	2.60
	400	23134	2.85
	425	24365	2.90
	450	29059	2.90
	475	26821	3.10
	500	26186	2.90
	510	24062	3.05
	520	26529	2.90
	525	26608	3.00
	535	27210	2.90
Subsection 1 Overall Mean:		23898	2.89
Standard Deviation:		2090	0.21
Coeff Of Variation:		8.75%	7.35%

FIELD COMMENTS FROM FWD OPERATOR
35 M-TRANS.CR.BETWEEN D4 AND D5
25 L-TRANS.CR.BETWEEN D6 AND D7
L-TRANS.CR.BETWEEN D6 AND D7
L-TRANS.CR.UNDER LP
25 L-TRANS.CR.BEHIND LP
75 L-TRANS.CR.BETWEEN D4 AND D5, AND D5 AND D6
275 L-TRANS.CR.BETWEEN D5 AND D6
150 M-TRANS.CR.BEHIND LP
175 L-TRANS.CR.BETWEEN D4 AND D5
450 H-TRANS.CR.BETWEEN D4 AND D5
175 M-TRANS.CR.NEAR D7
125 L-TRANS.CR.UNDER D5

NO SUBSECTIONS IDENTIFIED FOR SEASONAL MONITORING EVALUATION OF SECTION

Summary of Results

Section uniformity:
NO Subsections were identified within the section.

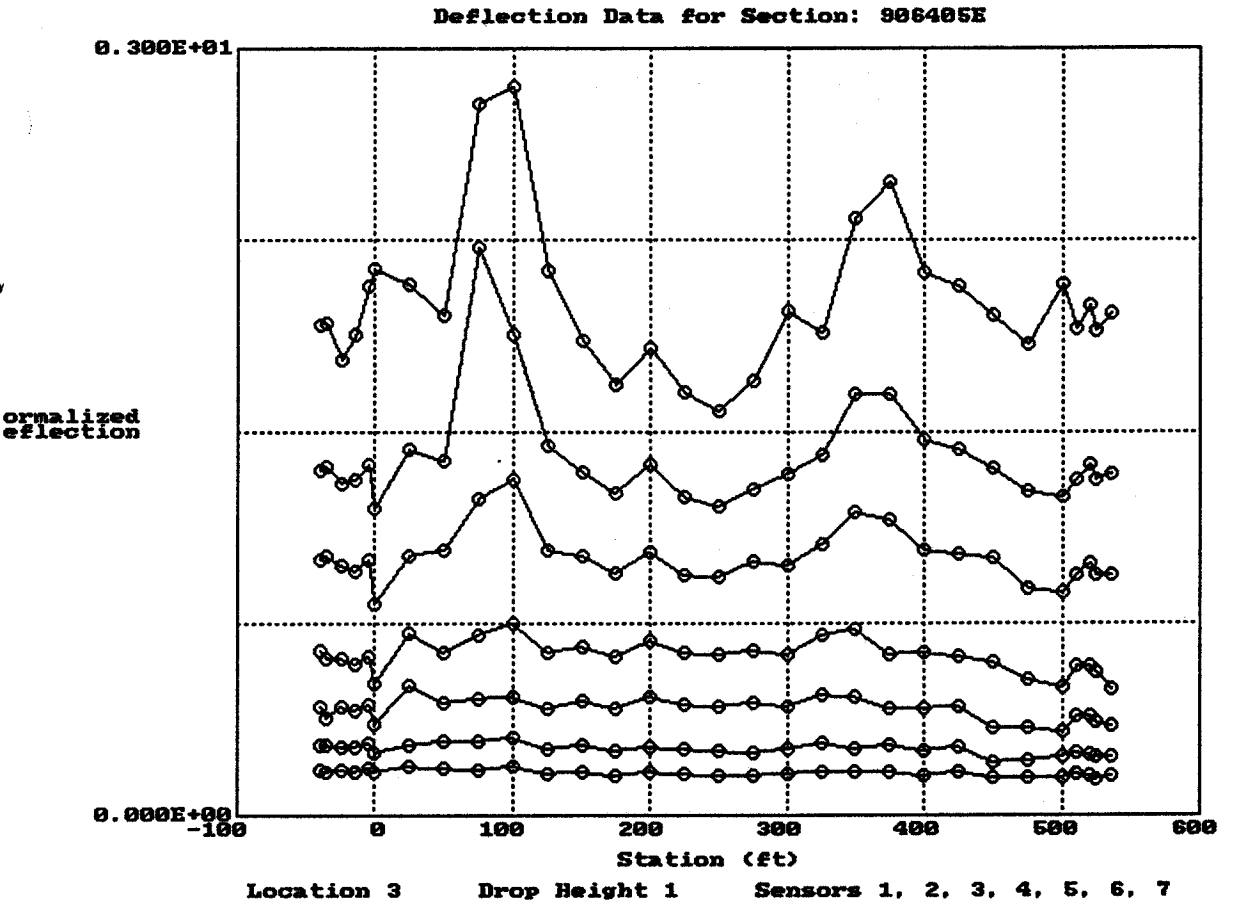
Outliers - Test pits: 28 combinations at each test pit
NO Test pit data was present.

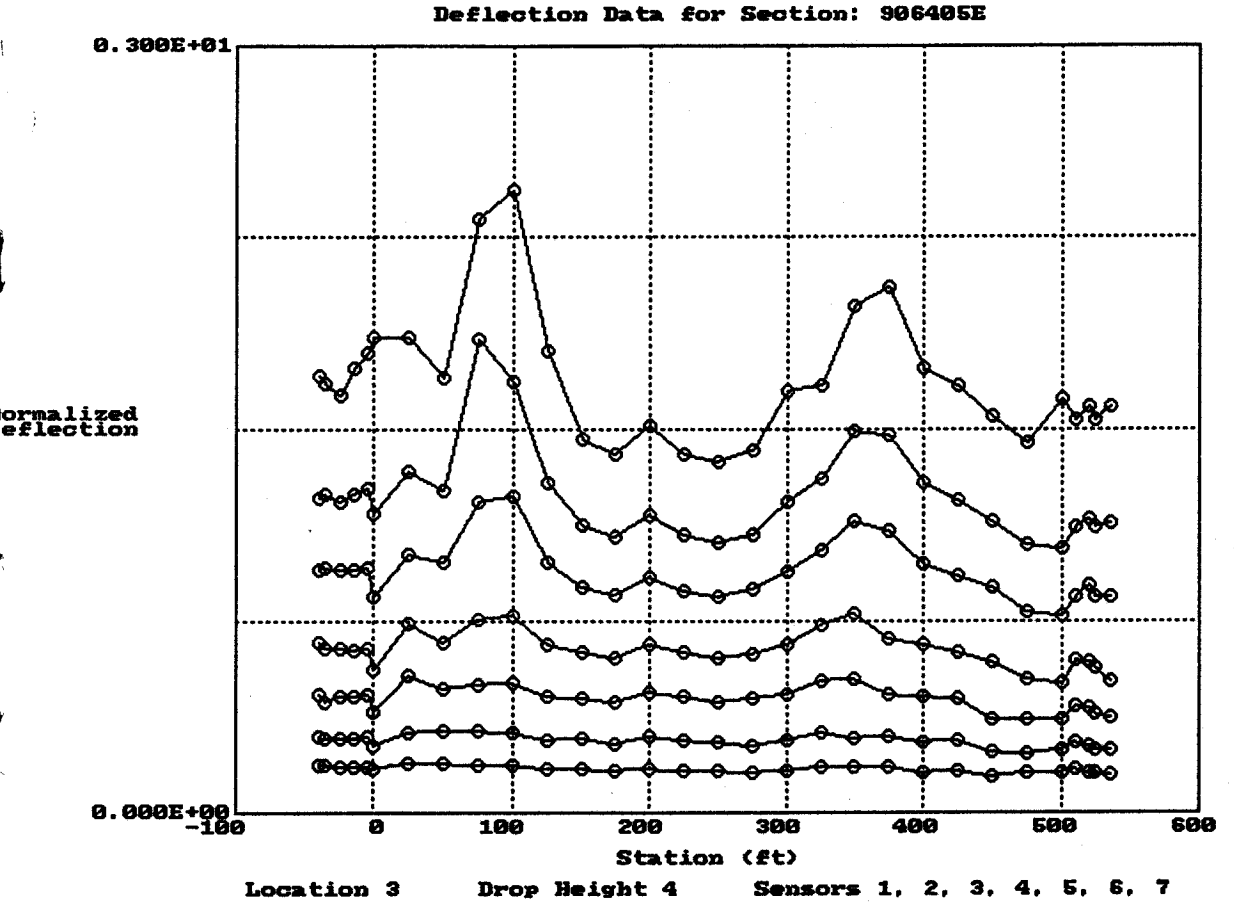
Outliers - Section data: 840 total combinations within the section
35 height/sensor/station combinations are data outliers in subsection 1.

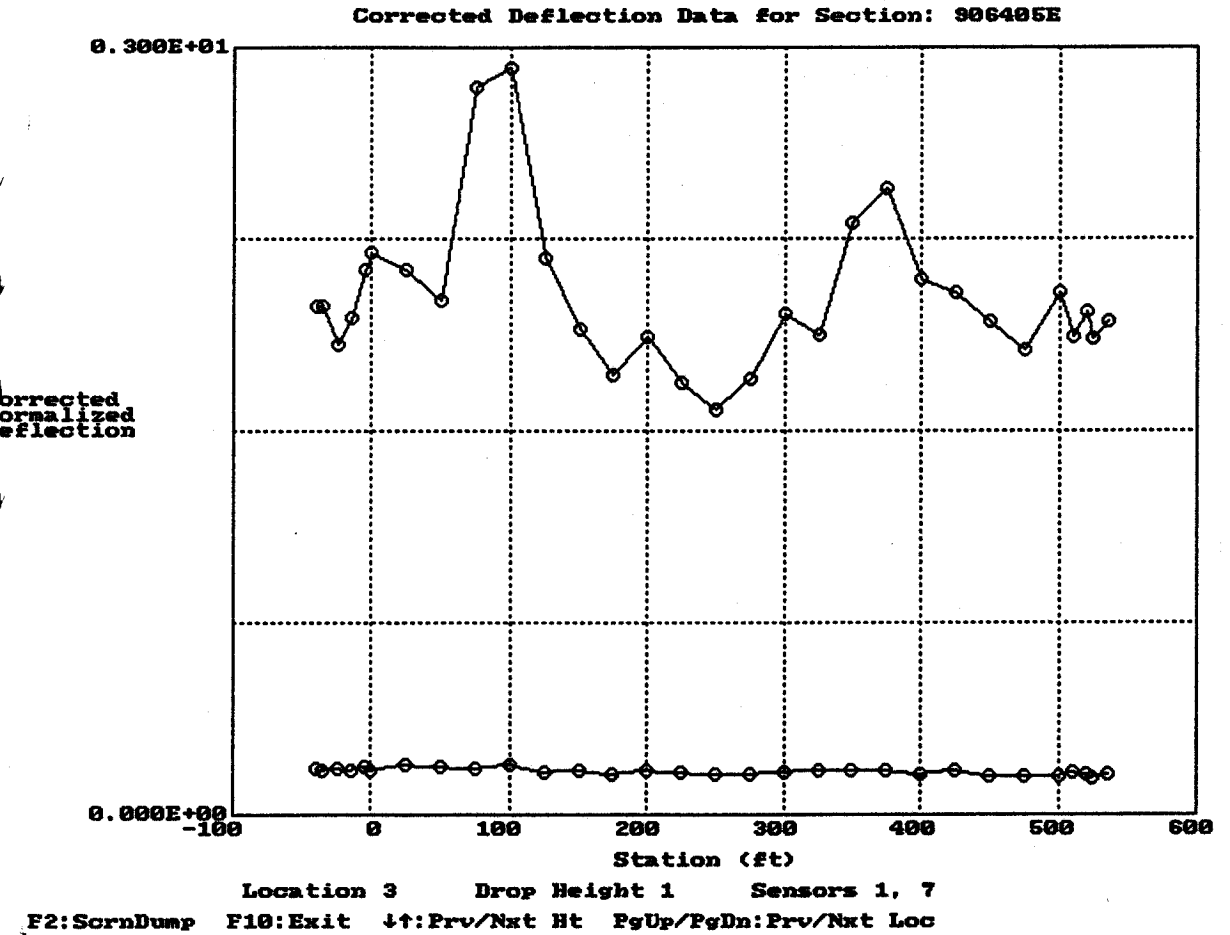
Structural capacity - Test pits: 4 combinations at each test pit
All results for TP 1 are within the range of expected values.
All results for TP 2 are within the range of expected values.

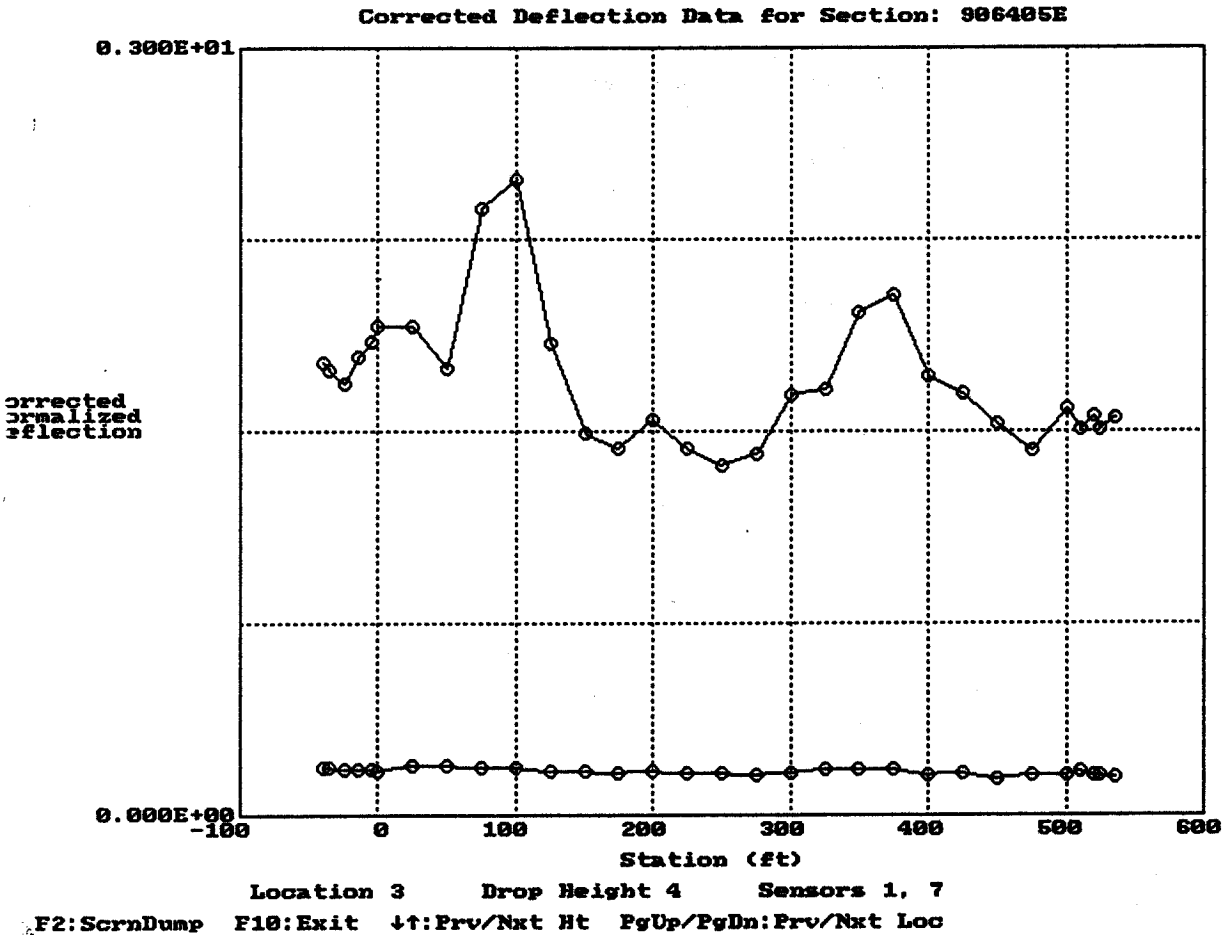
Structural capacity - Section data: 120 total combinations within the section
All results are within the range of expected values.

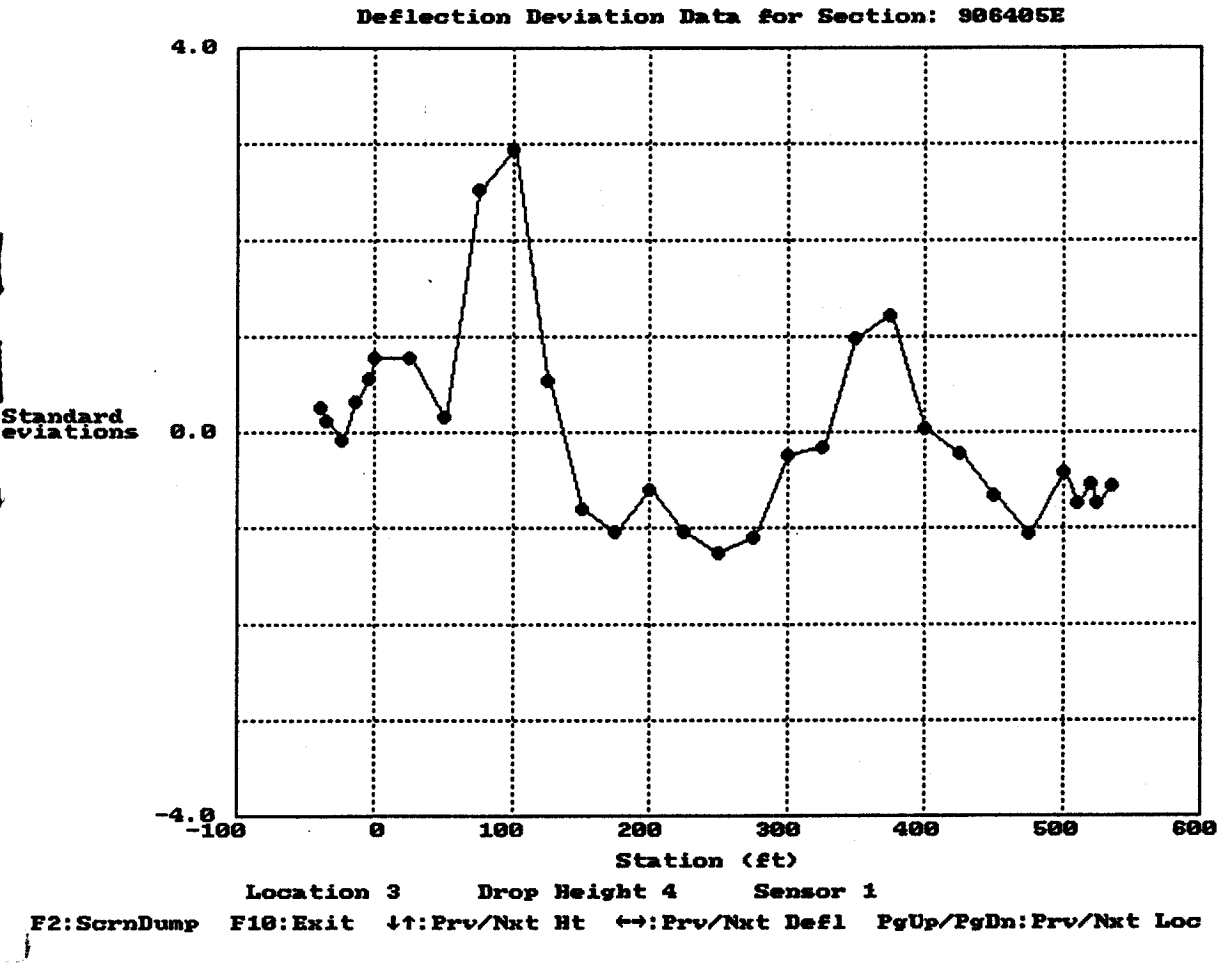
Subgrade response:
120 height/station combinations exhibit linear response.

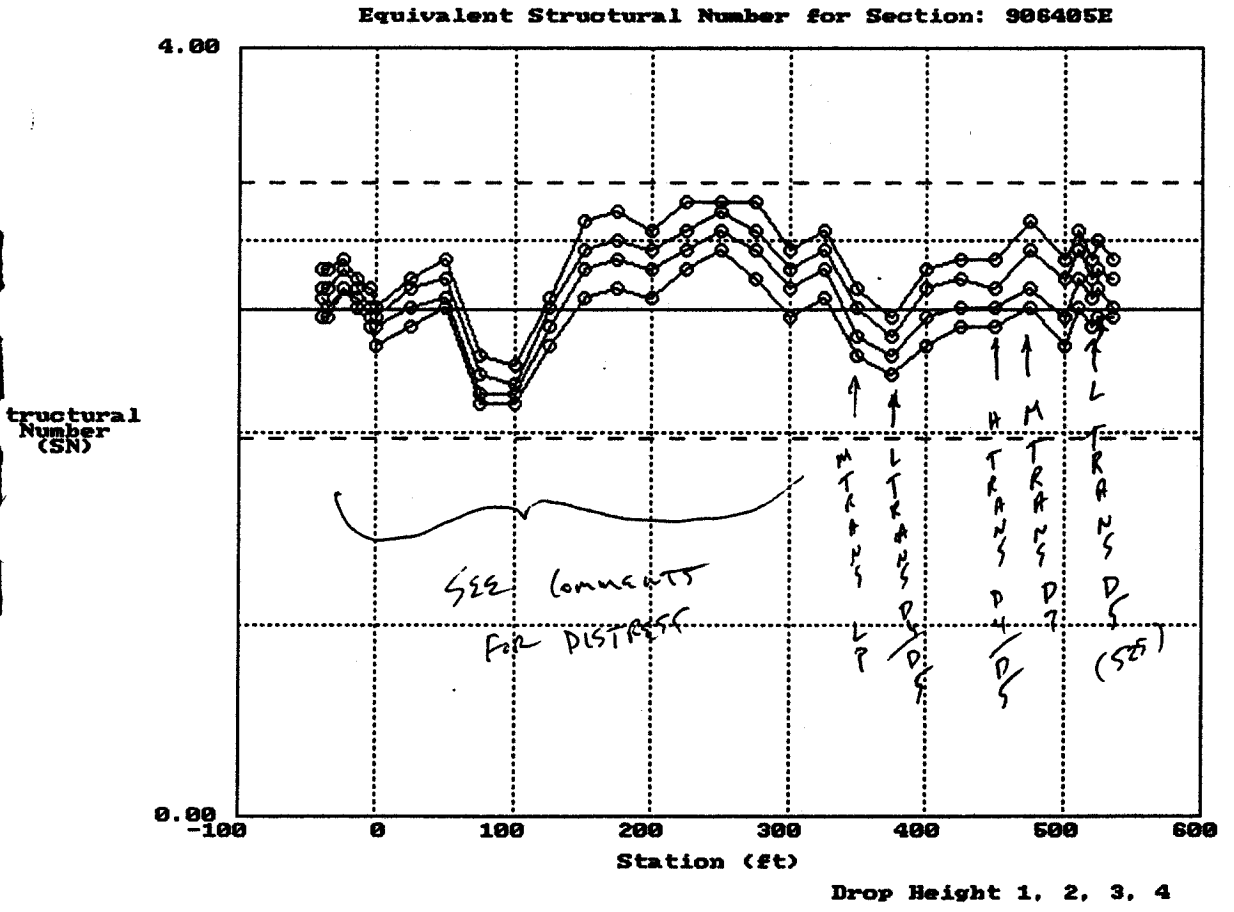

Deflection Data for Section: 906405E
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3 Drop Height 1 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Deflection Data for Section: 906405E
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Corrected Deflection Data for Section: 906405E
0.300E+01
0.000E+00
orrected
ormalized
eflection
-100
0
100
200
300
400
500
600
Station (ft)
Location 3
Drop Height 1
Sensors 1, 7
F2:ScrnDump
F10:Exit
↓↑:Prv/Nxt Ht
PgUp/PgDn:Prv/Nxt Loc

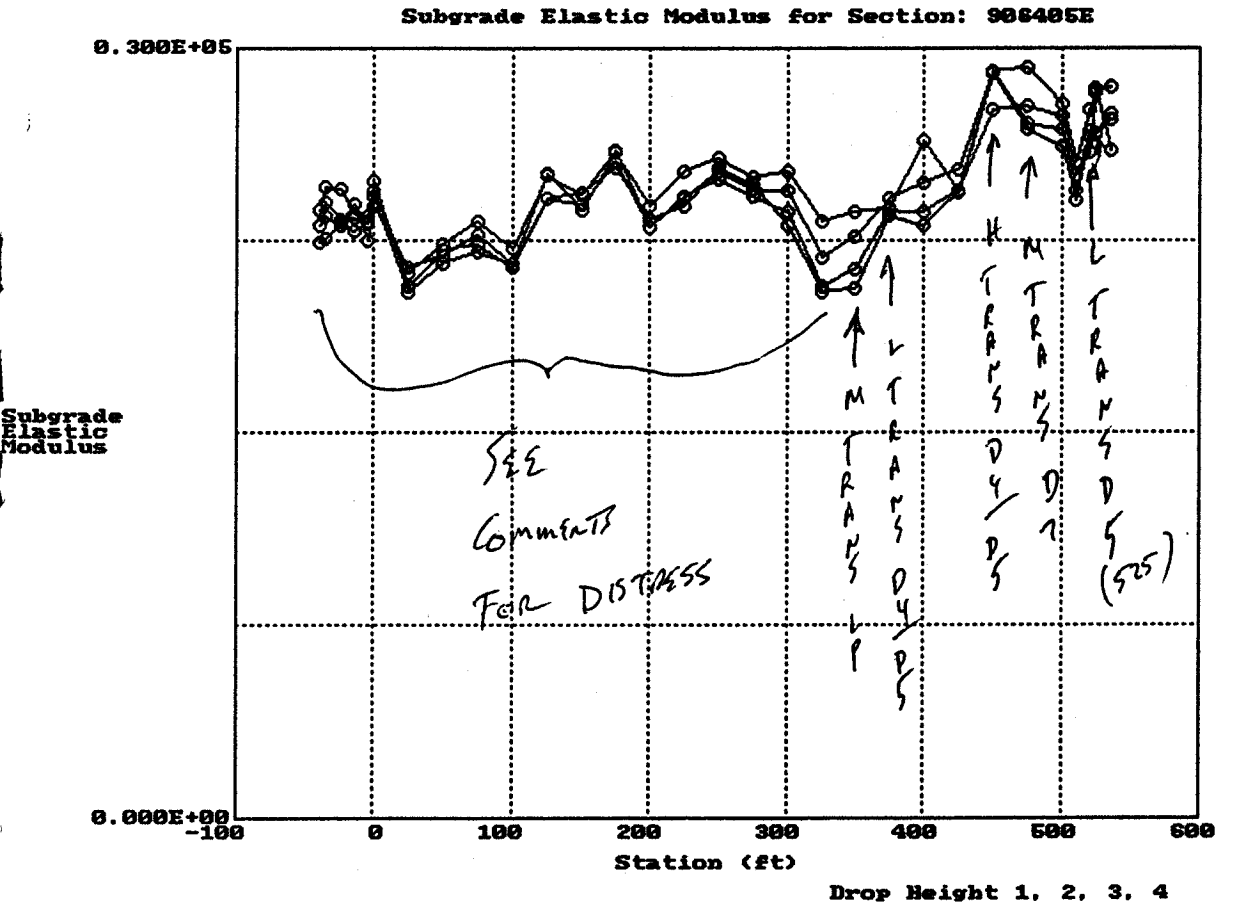

Corrected Deflection Data for Section: 906405E
0.300E+01
orrected
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3 Drop Height 4 Sensors 1, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Deflection Deviation Data for Section: 906405E
4.0
Standard
eviations
0.0
-4.0
-100
0
100
200
300
400
500
600
Station (ft)
Location 3
Drop Height 4
Sensor 1
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht ↔:Prv/Nxt Defl PgUp/PgDn:Prv/Nxt Loc



See comment for distress

Monitored in pilot study



- See FWD CHECK From 1991 IN APPENDIX D-3
- Sta. 3 to Sta. 5 was more uniform

Appendix B-1: Pre-Installation Site Recruitment and Coordination Information

Appendix B-1 contains the following pre-installation site recruitment and coordination information:

- SMP site recruitment notes;
- Site visit field notes; and
- Pre-installation meeting agenda and notes.

906405

30-Nov-90

SASKATCHEWAN
HIGHWAYS AND
TRANSPORTATION

1855 Victoria Avenue
REGINA, Sask. Canada
S4P 3V5

FACSIMILE

(306) 787-3963

SEND TO FAX NO: (612) 644-1045

TO: ERLAND LUKANEN
BRAUN PAVEMENT TECHNOLOGIES

FROM: ANDREW HOROSKO, DIRECTOR
TECHNICAL RESEARCH BRANCH
PHONE: (306) 787-4781

NUMBER OF PAGES INCLUDING COVER SHEET: 2

SUBJECT / MESSAGE: Seasonal Deflection Testing

Strong interest has been expressed for participating in the seasonal deflection testing project that was briefly outlined in your November 9 memo. A project submission is being developed, in support of participation, for presentation to the Department's Interdivisional Committee to Prioritize Research.

We would appreciate receiving further details, as they become available, on the selection process and resource implications for participating agencies. At present we are assuming that participating agencies will only be responsible for traffic control. An early indication of the likelihood of the Saskatchewan test section being chosen would greatly assist us. We really don't want to go to the well if our site has a low probability of being selected.

A copy of the worksheet with the information for the Saskatchewan site is attached. We needed to resort to a ballpark estimate as field frost depth information near the site was not available.

Please call me at (306) 787 -4781 if we can be of further assistance.

Andy Horosko

90-11-30

WORKSHEET FOR GATHERING FROST DEPTH INFORMATION FOR SEASONAL TESTING

GPS-1 and 2 SECTIONS IN NORTH CENTRAL REGION

AGENCY	SECTION NUMBER	FULL-DEPTH	AC (in.)	SOIL	DEPTH TO WATER	DEPTH TO REFUSAL	FROST DEPTH	
IL.	171002	Y	13.3	F	13	N		
IL.	171003	N	11.0	F	N	N		
IN.	181028	Y	15.0	F	N	N		
IN.	181037	Y	14.0	F	N	N		
IN.	182008	Y	19.0	F	N	N		
IN.	182009	N	15.0	F	N	N		
IA.	191044	Y	16.0	F	N	N		
KS.	201005	Y	13.5	F	N	16		
KS.	201009	Y	10.0	C	N	N		
KS.	201010	Y	8.0	C	N	N		
KY.	211010	N	6.3	C	N	15		
KY.	211014	Y	12.5	C	N	N		
KY.	211034	Y	15.0	F	N	10		
MI.	261001	N	2.3	C	6	N		
MI.	261004	N	4.5	C	N	2.5		
MI.	261010	N	2.3	F	6.5	N		
MI.	261012	N	6.0	F	N	N		
MI.	261013	N	7.5	C	N	N		
MN.	271016	N	3.0	C	N	N		WET SOIL
MN.	271018	N	4.5	C	20	N		
MN.	271019	N	4.8	C	N	N		
MN.	271023	N	10.7	C	N	N		
MN.	271028	Y	9.5	C	N	N		
MN.	271029	Y	8.0	C	N	N		
MN.	271085	Y	12.0	F	N	N		
MN.	271087	Y	14.3	C	N	N		
MN.	276251	N	7.0	C	N	N		WET @ 5'
MO.	291002	N	7.0	F	N	N		
MO.	291005	N	9.0	F	N	N		
MO.	291008	N	10.0	F	N	N		
MO.	291010	N	14.0	F	N	7.5		
NE.	311030	Y	7.0	F	N	N		
ND.	382001	N	2.5	F	N	N		6" LEAN PCC BASE
SD.	469187	N	4.5	F	N	N		
MB.	831801	N	4.4	F	N	N		
MB.	836454	Y	11.0	F	N	N		BIT. STAB. BASE
SK.	906405	N	3.0	C	N	N	≥ 8 FT	

906405

NATIONAL RESEARCH COUNCIL

STRATEGIC HIGHWAY RESEARCH PROGRAM

North Central Region, 1404 Concordia Ave., St. Paul, MN 55104, Tel: (612) 644-2996 Fax: (612) 644-1045

RICHARD C. INGBERG
Regional Engineer

June 26, 1991

Mr. Andrew Horosko
Director Technical Research Branch
Sask. Highways & Transp.
1855 Victoria Ave.
Regina, Saskatchewan S4P 3V5
Canada

Dear Mr. Horosko;

Re: Seasonal monitoring of SHRP GPS Sections

The SHRP LTPP program will be monitoring 64 GPS sections located throughout the United States and Canada to determine daily, seasonal, and yearly effects of temperature, moisture and frost on pavement structures. Detailed monitoring is needed to fully understand critical pavement characteristics, and link these characteristics at specific points in time to design factors.

The monitoring activities include: running pavement deflection tests; measuring transverse and longitudinal pavement profiles; and recording temperature, moisture, and frost conditions in the pavement structure and subgrade. Each section will be monitored once a month throughout the year and several additional times during spring thaw on a two year cycle.

The agency will be responsible for helping install the instrumentation, and for providing traffic control for the monitoring activities. Typically, the monitoring activities will start at 5 to 6 a.m. or daylight, whichever is earlier, and continue up to 12 hours. The instrumentation to be installed includes temperature probes, frost probes, and moisture sensors at each site. SHRP will furnish all instrumentation but will need assistance with traffic control, coring, drilling, sawing and any other activity needed for installing the instrumentation. The latest plan calls for deflection testing to begin by late summer, and the installation of instrumentation completed by this fall.

A site selection process was used based on such factors as: surface thickness, joint spacing, frost depth, ground water table, location, section uniformity, pavement condition, sites per region and sites per agency. The following Saskatchewan monitoring is based on the above factors:

906405 on TC-16 eastbound, west of Lanigan

We hope that Saskatchewan can participate in this part of the SHRP LTPP program. We are asking for a preliminary response on whether your agency is willing to include the site in the seasonal monitoring plan. If the site can not be included, an alternative site will have to be found in the North Central Region. Please respond as soon as possible, but no later than July 12, 1991. Should you have any questions or wish to respond by telephone or fax instead of writing, please do not hesitate to call. If I am not available, please talk to Gene Skok, Erland Lukanen or Bob Van Sambeek.

Sincerely,

Richard C. Ingberg
Regional Engineer

rci/bw

cc: Greg Gilks, LTPP Contact
E.L. Skok
R.J. Van Sambeek

906405

BRAUN INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

DATE: October 31, 1991

TO: Cheryl Richter, SHRP

FROM: Erland Lukanen

RE: SEASONAL MONITORING SECTIONS

In previous discussions you have told us that we can begin scheduling the deflection testing part of the seasonal monitoring. We may be able to do that very soon now. I would like to confirm that this is in fact do-able and provide the status of the sections that have been identified.

Our first year route will be along the western tier of the region involving Manitoba, Saskatchewan, North Dakota, South Dakota, Nebraska, and Kansas. The second year route would involve the rest of the agencies that are participating. The status of all of the section in our first year route are as follows:

831801 Manitoba	OK
906405 Saskatchewan	OK
383005 North Dakota	Waiting for information on instrumentation requirements before agreeing to participate
469187 South Dakota	OK
311030 Nebraska	OK
201005 Kansas	OK
201009 Kansas	OK
201010 Kansas	OK

We only have one section identified by PCS Law in the western tier that is still in question and that is the rigid pavement section in North Dakota. Gonzalo has indicated another section is available in a different region.

The eastern route, however, is not fairing nearly as well. The current status is as follows:

271016 Minnesota	OK
276251 Minnesota	OK
261004 Michigan	HOLD: No budget
261001 Michigan	HOLD: No budget
261010 Michigan	HOLD: No budget
394031 Ohio	OUT: Cannot close lane due to heavy traffic
184042 Indiana	UNKNOWN
171003 Illinois	Waiting for instrumentation requirements before giving approval

To: Cheryl Richter, SHRP
FROM: Erland Lukanen

October 31, 1991

So as you can see we have a reasonably filled western route but a very small eastern route at this time. Since we are proposing to conduct a western route in year one or odd number years and an eastern route in even number years, that gives us more time to work out problems and establish replacement sections if necessary before year two starts. However, if replacement sections end up in the midst of a year one route, we may eventually have to evaluate changing our route for purposes of efficiency. If we can get information on the agency requirements for instrumentation installation we amy be able to include the North Dakota section in the year one testing route. Wisconsin has expressed an interest in participating in the seasonal monitoring, particularly with the 556351-55 section. One of these may be a replacement for 383005 but I have not reviewed the drilling and sampling data yet.

cc. Gonzalo Rada, PCS Law

90645

Saskatchewan

Saskatchewan
Highways and
Transportation

Technical Research Branch
1855 Victoria Avenue
Regina, Canada
S4P 3V5

January 3, 1992

Mr. Mike Marti
Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, MN. 55117-2004
U.S.A.

File: 16-16-02-05-02

Dear Mike:

Re: Seasonal Monitoring Test Site

I don't know who is responsible for the Seasonal Monitoring Test Site, so I am sending this to you with the request to re-direct it as may be necessary. The attached diagram indicates the location and installation information for the frost tube which we installed this fall.

If you have any questions, please contact me at (306) 787-4860.

Yours sincerely,

Greg Gilks
Transportation Research Branch

Attachment
GG\den: G:\DTA\GROUP\TRB\GREG\SHRP.1

FROST TUBE INSTALLED FALL 1991
NOV-28

5 SHRP 906405

NOV. 28/91

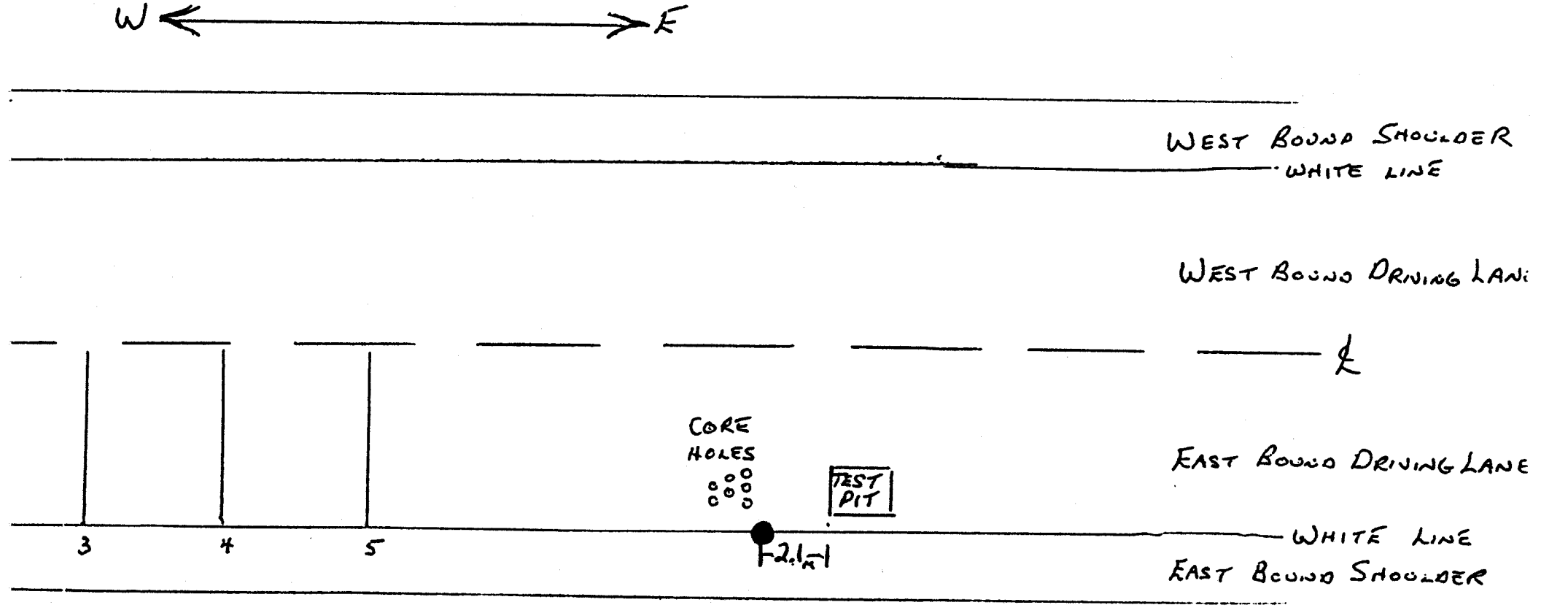
L. SINCLAIR
M. MILLER

- 3.65m FROST TUBE INSTALLED

  0m TO 1.2m FROST (AIR DRILLED)

  2.1m TO 3.65m WET (WATER TABLE)

  * AFTER TUBE INSTALLED SILICA SAND WAS POURED ALONG SIDE OF TUBE TO FILL VOIDS
  * TOP OF TUBE 5cm BELOW PAVEMENT SURFACE
  * CLOTH PLACED OVER TOP OF TUBE AND THEN SILICA SAND PLACED OVERTOP TO PAVEMENT SURFACE FOR EASY ACCESS



fax 306-787-4836

BRAUN[SM]
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

August 17, 1993

Stella White
Saskatchewan Highways and Transportation - Operations Division
Ninth Floor, 1855 Victoria Avenue
Regina, Saskatchewan S4P 3V5

Dear Ms. White:

Re: Tentative Agenda for September 2, 1993 Meeting.

Braun Intertec, under contract with the Federal Highway Administration (FHWA), is responsible for the Seasonal Monitoring Program initiated by the Strategic Highway Research Program (SHRP). Under SHRP, section 906405 on TC-16 east of Saskatoon was selected for monitoring. Under FHWA the section will remain in the study, and it will be instrumented this fall along with six other sections located in Minnesota and Manitoba.

A meeting with appropriate agency people involved with instrument installation is required. In our previous discussions, it was decided to conduct a meeting for both reviewing activities in the Long Term Pavement Performance (LTPP) Study and introducing activities with the Seasonal Monitoring Program. Attached is the tentative meeting announcement and agenda. Please make any changes or additions you would like.

The meeting objectives at this point include;

* Discuss current role of SHRP/CSHRP and implementation of SHRP products
* Review activities of LTPP under FHWA
* Plan instrumentation of GPS section 906405 as part of the Seasonal Monitoring Program

Please make arrangements for people identified in the meeting announcement to attend the meeting. It is very important that people in charge of traffic control, drill rig, pavement saw, and maintenance attend at least the Seasonal Monitoring part of the meeting. If you have any questions or need additional information, please call me at 612-776-7522.

Sincerely,

Robert Van Sambeek

Robert Van Sambeek
Project Engineer
c:\smp\wp\skmtg1.sm

MEETING ANNOUNCEMENT

Topics:

* Discuss current role of SHRP and implementation of SHRP products
* Review activities of LTPP under FHWA
* Plan instrumentation of GPS section 906405 for Seasonal Monitoring

When: September 2, 1993 from 8:00 AM to 12:00 Noon

Where: Saskatchewan Highways and Transportation
1855 Victoria Avenue
Regina, Saskatchewan

Who: Agency Level

SHRP Representative
LTPP Contact

District Level

Materials Engineer and/or Soils Engineer

Maintenance Superintendent or Maintenance Sub Area Supervisor

Other Interested Parties

Highways and Transportation staff involved with instrumentation, deflection testing, or spring recovery studies

University professors and students

Agenda: See next page

REVIEW OF SHRP AND FHWA-LTPP ACTIVITIES
MEETING AGENDA

Introduction — Stella White

SHRP Products and Implementation — Stella White/Gene Skok

FHWA-LTPP

Review of LTPP Program and Activities — Gene Skok

- GPS
- SPS
- RIMS
- Monitoring Activities

(break)

Introduction to Seasonal Monitoring Program — Bob Van Sambeek

- Program Objectives
- Section Selection
- Sensor Selection and Installation
- Monitoring Activities

Closing Comments

Planning Session for Agency Staff Involved with Instrumentation and Monitoring of GPS Section 906405 — Bob Van Sambeek

General Section Information

Installation and Monitoring Schedule

Address Special Concerns

Coordinate Responsibilities

- Agency Level
- District Level
- NCRCO and FHWA Staff

BRAUN SM
INTERTEC

WEDS → Fly in and visit SPS-3 w/ Interned
Thurs. → AM – mtg.
PM – visit SM site
Friday – Fly back

8/18/93

NOTES FOR SK MTG.

00

* STELLA COVER SHRP PRODUCTS (30 MIN.)
– MAYBE GENE HELP FILL IN SOME.
– IMPLEMENTATION ?

~~LOAF~~

* GENE – FHWA – LTPP – (60 MIN)
– ACTIVITIES
– RESULTS – ? SPS-3 ? RIMS ?

BREAK) (15 MIN.)

* BOB V. – SMP (60 MIN.)
– INTRO TO STUDY
– Results from Pilot – 900405

BREAK (15 MIN.)

* BOB V. – Planning Session w/ Agency
(30 to 60 min)

LUNCH

MMTS – Mostly interested in AC vs. PCC.
– Provide slide + overhead projector
– EXPECT 15 to 20 people total

tel, Car + Airline Sch

BRAUN[SM]
INTERTEC

Braun Intertec Pavement, Inc.
1983 Sloan Place
St. Paul, Minnesota 55117-2004
612-776-7522 Fax: 776-7201

Engineers and Scientists Serving the Built and Natural Environments

Memorandum

Date: August 19, 1993

To: Stella White

From: Robert J. Van Sambeek RV

Re: Copy of Seasonal Monitoring Program Information

Stella, the enclosed information is Ver. 1.1 (Draft), and the next version is expected to be out later this month. If I receive an updated version prior to the September 2nd meeting, I will bring an extra copy to the meeting. Also, I did not include the last part of the manual with the software source code or technical descriptions and specifications for some of the equipment.

If you have any questions regarding the enclosed information or other activities with seasonal monitoring, please call.

@ Regina Inn Beverly Hills II Room
- expect ~ 35 to 40 people
- 40 copies
- have slide projector and overhead
- Stella 1 hour on SHRP Products
- Stella not able to visit sites
- expect 12 to 15 @ installation meeting for details on

BRAUN INTERTEC

Description: SITE VISIT 906405

Project No: OBRx92700 B5

Date: 9/1/93 By: RV

Sta. 3+00 to 5+00 monitored in pilot study 1991

- old frost tube @ ~ 5+50
- back drill rig up not a problem
- Inst. to. hole 5+20 should be good
- no delineators in ditch - look @ getting some in for protecting cabinet
- No BM w/in 100 meters (Power pole further down road that crosses @ angle)
- one turn point

- No H2O in ditch -
- No culverts

RAINING - not able to check ditch very well

Expect crack sealing @ some point in time

510 525 534
MONITORED IN PILOT

REVIEW OF SHRP AND FHWA-LTPP ACTIVITIES
MEETING AGENDA

September 2, 1993 from 8:00 AM to 12:00 Noon
Regina's Victoria Inn - Beverly Hills II Room
1717 Victoria Avenue, ~~Saskatoon~~ Regina, Saskatchewan

Introduction	Stella White
SHRP Products and Implementation	Stella White/Gene Skok
Review of FHWA-LTPP Program and Activities	Gene Skok

- GPS
- SPS
- RIMS
- Monitoring Activities

(break)

FHWA-LTPP Seasonal Monitoring Program	Bob Van Sambeek

- Introduction
- Test Sections
- Sensor Description and Installation Procedures

Closing Comments	Stella White

Planning Session for Agency Staff Involved with Instrumentation and Monitoring of GPS Section 906405	Bob Van Sambeek

- Installation and Monitoring Schedule
- Special Concerns
- Saskatchewan Highways and Transportation Responsibilities
- NCRCO and FHWA Staff Responsibilities
- Closing Comments

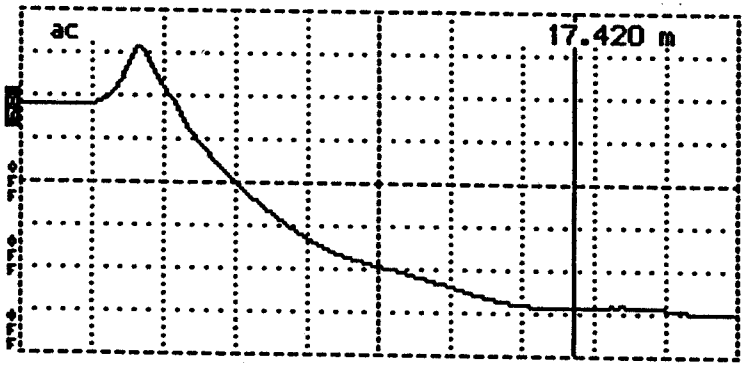
Appendix B-2: Pre-Installation Equipment Checks/Calibration Information

Appendix B-2 contains the following data sheets for the pre-installation equipment checks/calibration:

- Data Sheet SMP-C01: TDR Probe Check;
- Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check;
- Data Sheet SMP-C03: Electrical Resistivity Probe Check;
- Data Sheet SMP-C04: Function Generator, Multi-meter, and Switch Box Checks; and
- Data Sheet SMP-C05: Tipping-Bucket Rain Gauge Calibration.

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

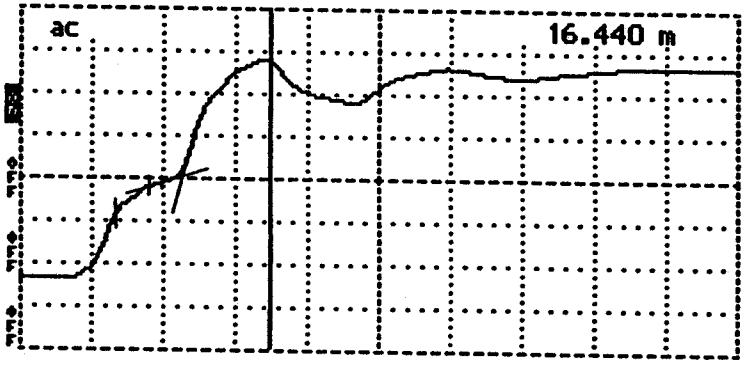
Cursor ..... 17.420 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90A01
Notes SHORTEN
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.440 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

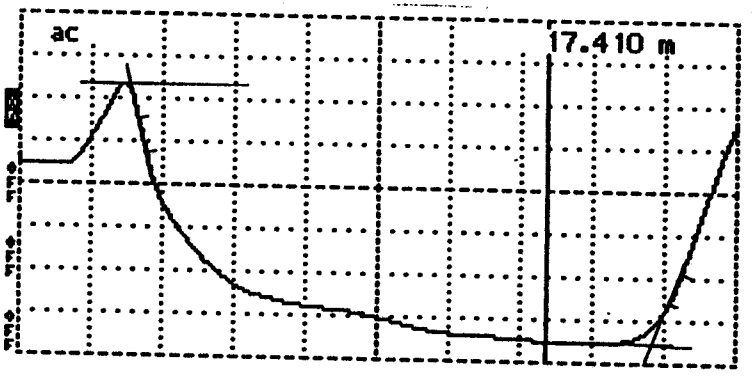


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90A01
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	1.22	1.20

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-99
Cable 90640S - 90A01
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.92	82.01

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A01 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

Comments: (1) Not measured in 1993, used 0.203 m for "L"

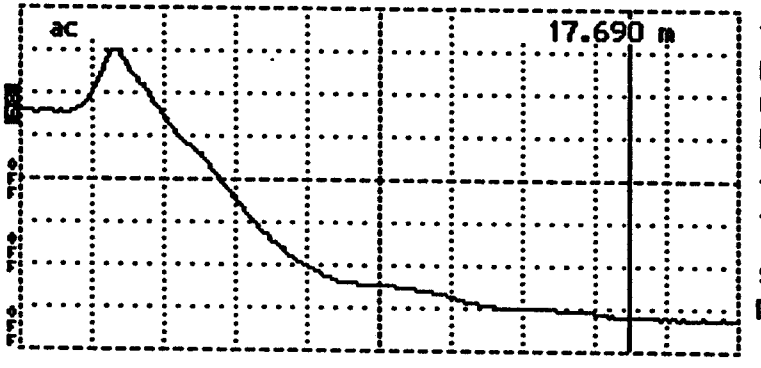
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16NOV95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

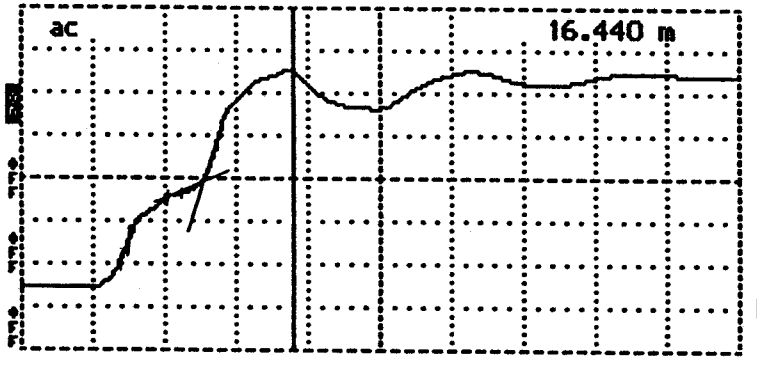
Cursor ..... 17.690 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405-90R02
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"Shorted at Start"	N/A	N/A

Cursor ..... 16.440 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

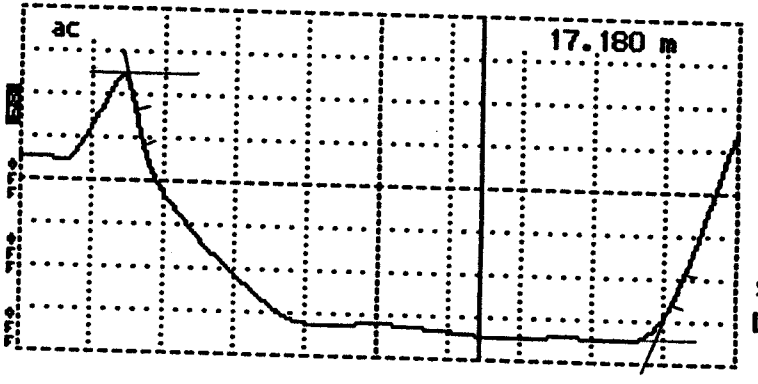


Tektronix 1502B TDR
Date 10-7-93
Cable 906405-90R02
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.27	1.80

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.180 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90405-90A02
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.93	82.92

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A02 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

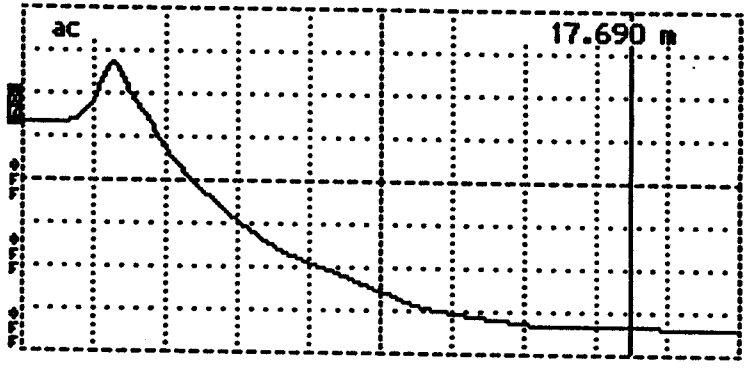
Comments: (1) Not measured in 1993, used 0.203 m for "L"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

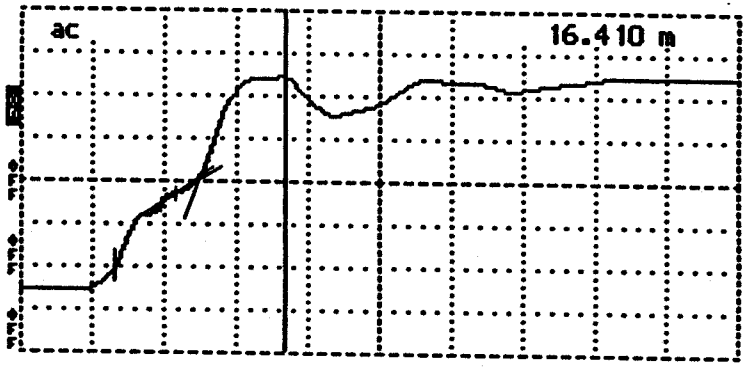
Cursor ..... 17.690 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90405 - 90A03
Notes SHORT
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

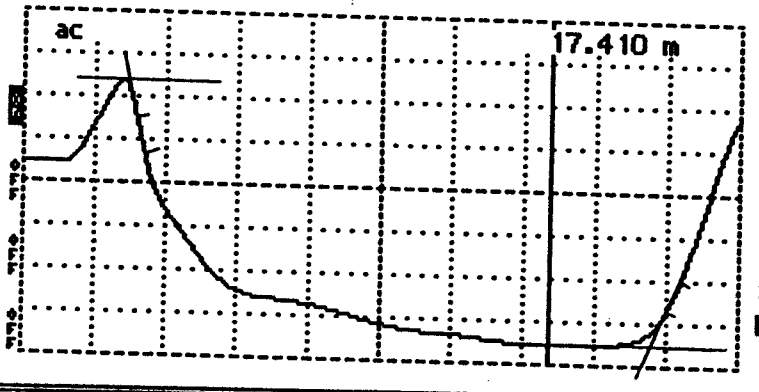


Tektronix 1502B TDR
Date 10-7-93
Cable 90405 90A03
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.28	1.94

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90A03
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace[1]	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.83	82.92

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A03 TDR Probe Length, L: .(1)___ m Length of Coax Cable: (1).__ m

Comments: (1) Not measured in 1993, used 0.203 m for "L"

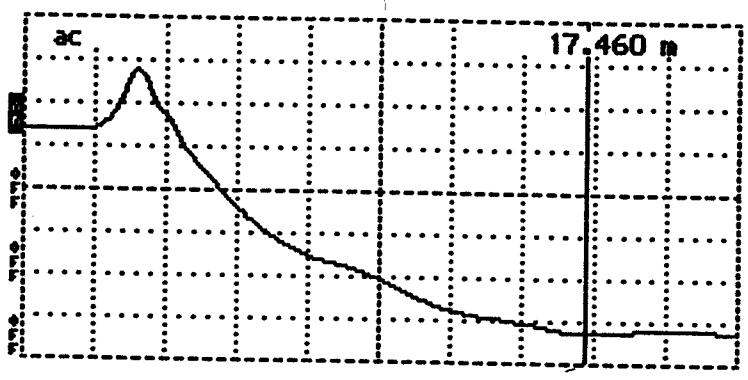
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

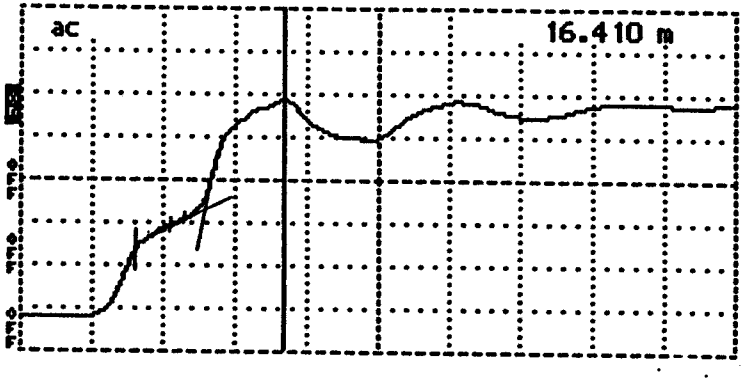
Cursor ..... 17.460 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90A04
Notes Short-End
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

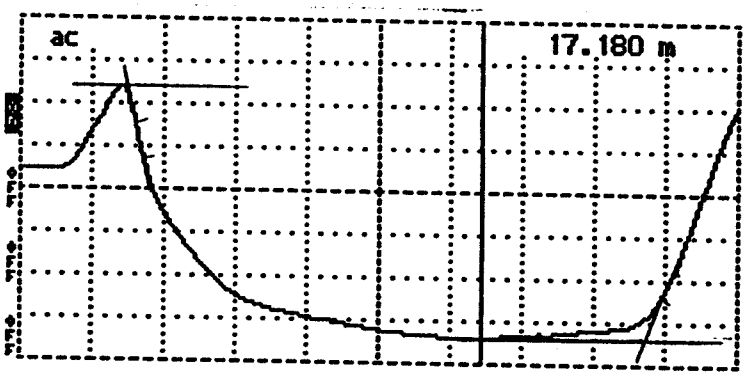


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 90A04
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.25	1.55

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.180 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 96405 - 90A04
Notes H2O
cable 7 increase
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.81	81.11

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A04 TDR Probe Length, L: .(1) m Length of Coax Cable: (1) m

Comments: (1) Not measured in 1993, used 0.203 m for "L"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993

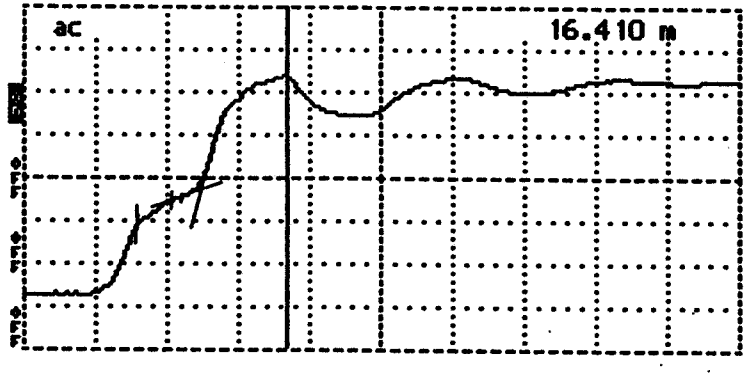
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.440 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 890405
Notes SHORTED
Input Trace _____
Stored Trace _____
Difference Trace _____

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

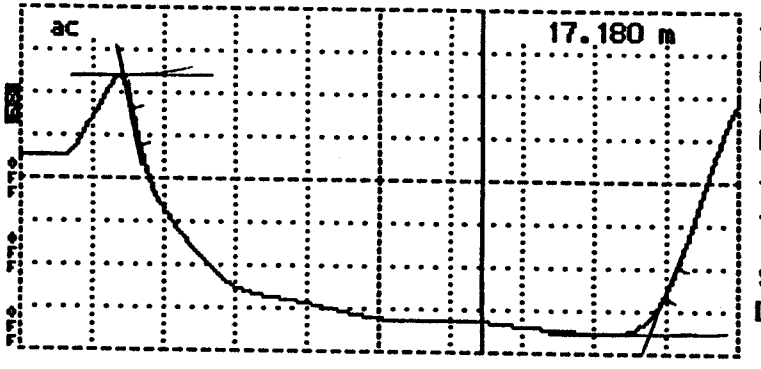


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 890405
Notes AIR
Input Trace _____
Stored Trace _____
Difference Trace _____

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	1.22	1.20

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.180 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mV/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90405 - #90A05
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.93	82.92

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A05 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

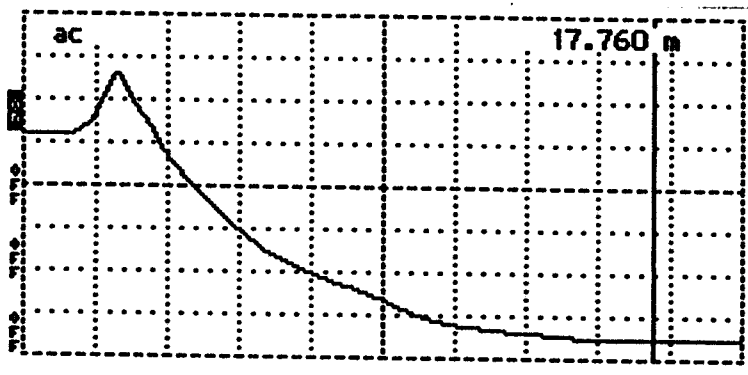
Comments: (1) Not measured in 1993, used 0.203 m for "L"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [96] LTPP Section ID [6405]

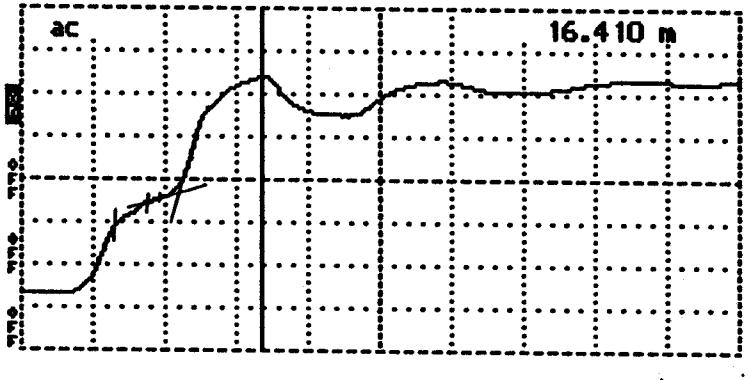
Cursor ..... 17.760 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 590AC6
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

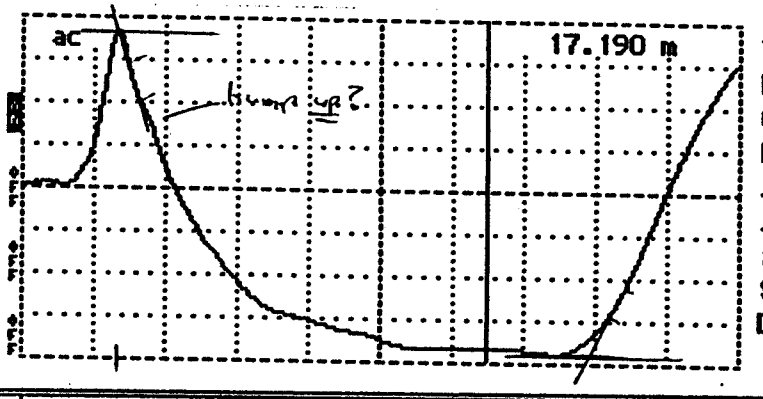


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 590AC6
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	1.22	1.20

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.190 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90A06
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.65 ← out of range	*67.4

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

67.4

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A06 TDR Probe Length, L: .(1)__ m Length of Coax Cable: (1).__ m

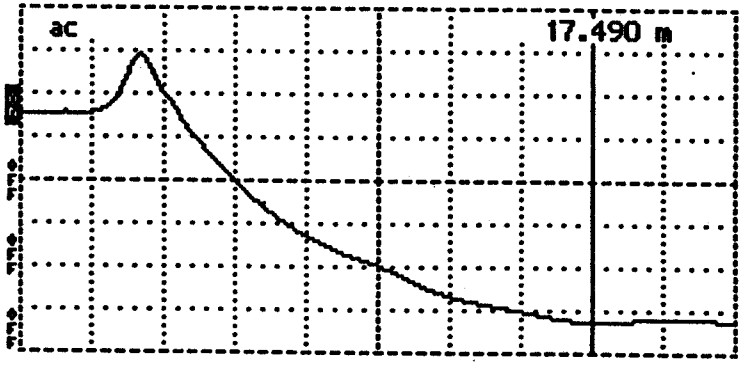
Comments: (1) Not measured in 1993, used 0.203 m for "L"
* OUT OF RANGE SPECIFIED IN GUIDELINES

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

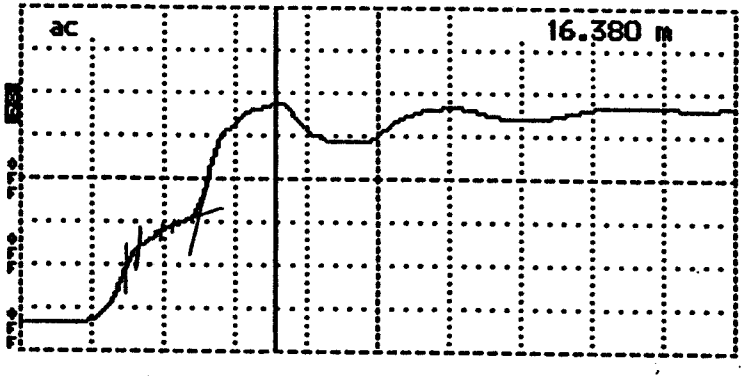
Cursor ..... 17.490 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 90A07
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.380 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

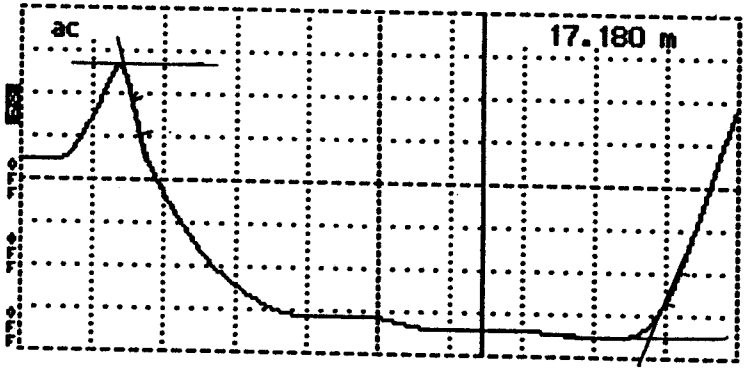


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 90A07
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.22	1.20

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.180 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90605 - 90A07
Notes 1420
Input Trace
Stored Trace
Difference Trace

TDR Trace[1]	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.93	92.92

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A07 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

Comments: (1) Not measured in 1993, used 0.203 m for "L"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

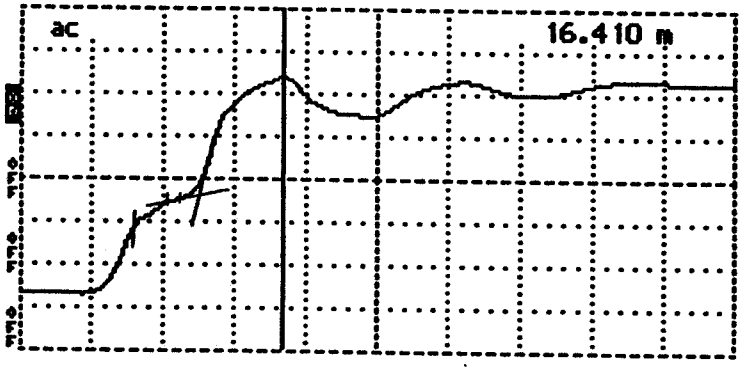
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.580 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

Tektronix 1502B TDR
Date 10-7-93
Cable 90405 & 90A08
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

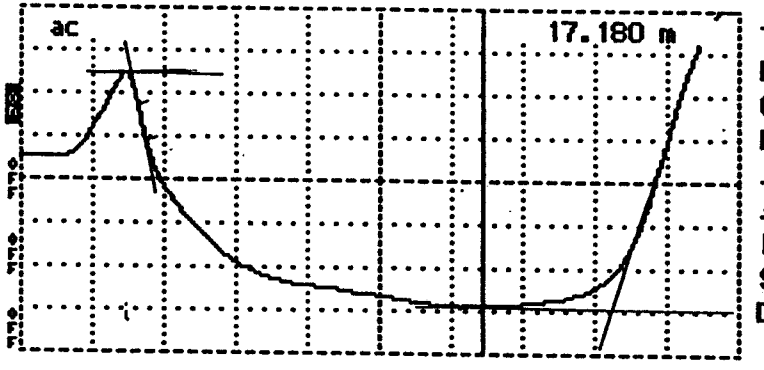


Tektronix 1502B TDR
Date 10-7-93
Cable 90405 & 90A08
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.22	1.20

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.180 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90405 - 90A08
Notes H2O
-why Z increase
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.67 ↖ off range	* 69.05

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A08 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

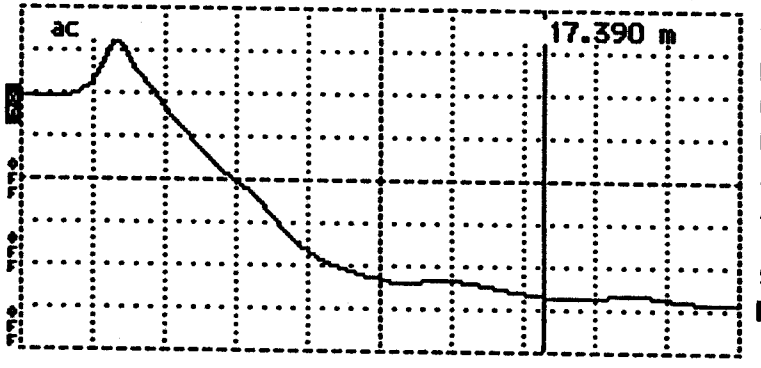
Comments: (1) Not measured in 1993, used 0.203 m for "L"
* OUTSIDE RANGE" LISTED IN GUIDELINES

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

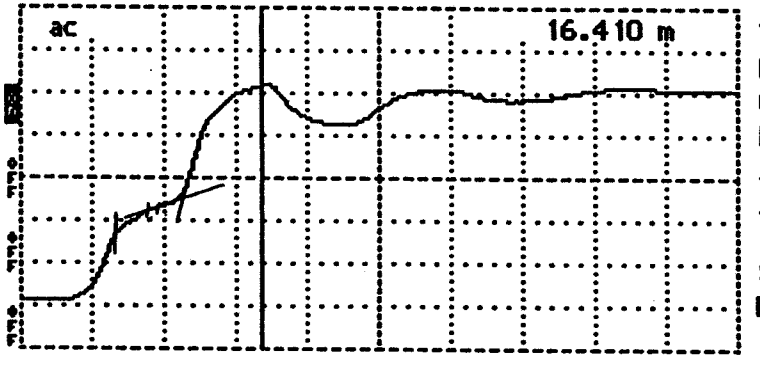
Cursor ..... 17.390 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405-90A09
Notes Shorted
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

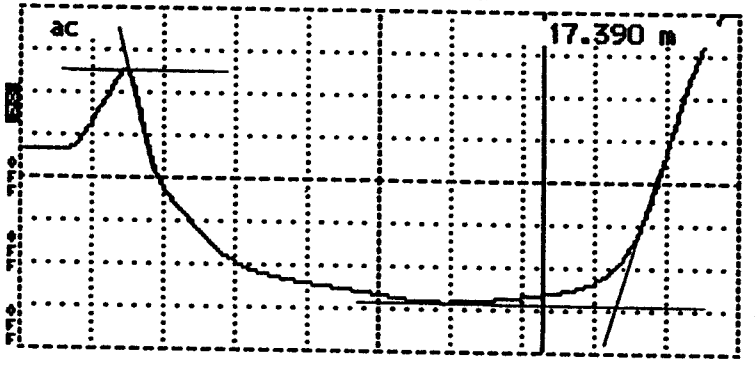


Tektronix 1502B TDR
Date 10-7-93
Cable 906405-90A09
Notes Air
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.23	1.31

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.390 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 90405-90409
Notes H2O
—only 1 increase before
Input Trace end of probe
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.70 ← off range	*68.73

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A09 TDR Probe Length, L: .(1)__ m Length of Coax Cable: (1).__ m

Comments: (1) Not measured in 1993, used 0.203 M for "L"
* OUTSIDE RANGE "LISTED IN GUIDELINES

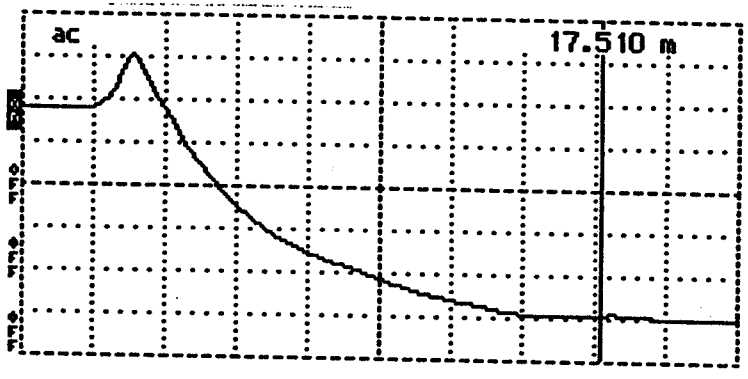
Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

Data Sheet SMP-C01: TDR Probe Check (Continued)

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

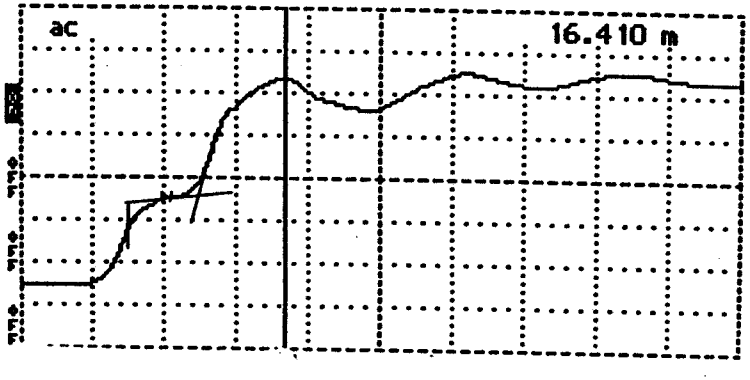
Cursor ..... 17.510 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 -90A10
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	N/A	N/A

Cursor ..... 16.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

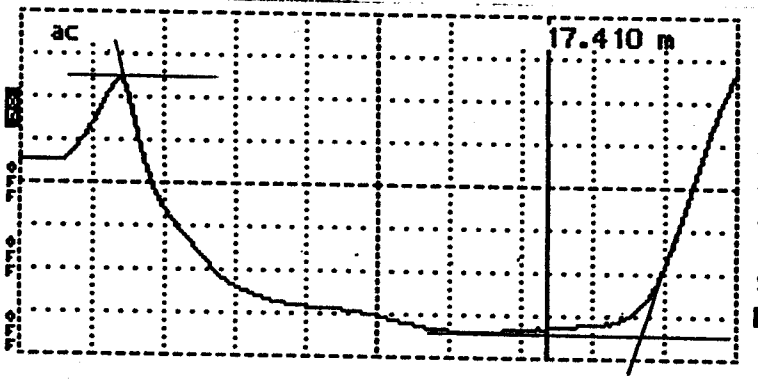


Tektronix 1502B TDR
Date 10-7-93
Cable 906405 90A10
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.23	1.31

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [90] LTPP Section ID [6405]

Cursor ..... 17.410 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 906405 - 90410
Notes H2O

Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.81	81.11

[1] If dielectric constant not between 0.75 and 2.0, contact FHWA LTPP Division
[2] If dielectric constant not between 76 and 84, contact FHWA LTPP Division

Note: Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

TDR Probe Serial Number: 90A10 TDR Probe Length, L: .(1)__ m Length of Coax Cable: (1).__ m

Comments: (1) Not measured in 1993, used 0.203 m for "L"

Prepared by: JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [90] LTPP Section ID [6405]

Thermistor Probe Assigned Serial Number : [90 AT]

Air Temperature Probe Assigned Serial Number: [90 A A T]

E
1-8-96
BY

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = (1) °C	Other ~~Hot Water~~; T = (1) °C	Comments
1	0.000	1.1	40.2	
2	0.152	0.0	40.4	
3	0.305	0.0	40.5	
4	.023	1.8	40.3	
5	.097	0.4	41.1	
6	.175	0.4	41.1	
7	.247	0.3	41.0	
8	.323	0.5	41.0	
9	.477	0.5	40.7	
10	.628	1.0	40.4	
11	.782	0.9	40.5	
12	.932	1.8	40.4	
13	1.083	0.8	40.5	
14	1.237	1.9	40.4	
15	1.392	1.0	40.5	
16	1.545	1.3	40.6	
17	1.712	1.8	40.6	
18	1.845	1.3	40.5	
End	(1)	n/a	n/a	
Air Probe	n/a	(1)	(1)	

Comments: (1) DATA NOT RECORDED IN 1993.

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 / NOV / 95 (FROM 1993 DATA SHEETS)

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [90] LTPP Section ID [6405]

Electrical Resistivity Serial Number: 90AR

DB37 Connector Pin Number	Electrode Number	Distance from Top (m)			Continuity ✓	Spacing (m)	Comments
		Line 1	Line 2	Ave.			
36	1	_.___	_.___	_.030		_.___	
35	2	_.___	_.___	_.080		0.051	
34	3	_.___	_.___	_.130		_.051	
33	4	_.___	_.___	_.180		_.051	
32	5	_.___	_.___	_.230		_.052	
31	6	_.___	_.___	_.280		_.051	
30	7	_.___	_.___	_.330		_.051	
29	8	_.___	_.___	_.384		_.051	
28	9	_.___	_.___	_.434		_.051	
27	10	_.___	_.___	_.485		_.050	
26	11	_.___	_.___	_.536		_.051	
25	12	_.___	_.___	_.587		_.051	
24	13	_.___	_.___	_.637		_.051	
23	14	_.___	_.___	_.689		_.051	
22	15	_.___	_.___	_.739		_.051	
21	16	_.___	_.___	_.790		_.051	
20	17	_.___	_.___	_.840		_.052	
19	18	_.___	_.___	_.890		_.051	
18	19	_.___	_.___	_.940		_.052	
17	20	_.___	_.___	_.993		_.051	
16	21	_.___	_.___	1.040		_.051	
15	22	_.___	_.___	1.093		_.051	
14	23	_.___	_.___	1.145		_.052	
13	24	_.___	_.___	1.195		_.051	
12	25	_.___	_.___	1.246		_.051	
11	26	_.___	_.___	1.296		_.051	
10	27	_.___	_.___	1.346		_.052	
9	28	_.___	_.___	1.400		_.051	
8	29	_.___	_.___	1.449		_.051	
7	30	_.___	_.___	1.500		_.051	
6	31	_.___	_.___	1.550		_.051	
5	32	_.___	_.___	1.600		_.051	
4	33	_.___	_.___	1.654		_.051	
3	34	_.___	_.___	1.702		_.051	
2	35	_.___	_.___	1.754		_.052	
1	36	_.___	_.___	1.805		_.051	
	Bottom	_.___	_.___	1.830	n/a	n/a	

Comments: From 1993 DATA SHEETS

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/NOV/95 (FOR 1993 INSTALLATION)

Data Sheet SMP-C03: Electrical Resistivity Probe Check

Data from 1993 spacings adjusted to get distance from top

LTPP Seasonal Monitoring Program Data Sheet SMP-C04 Function Generator, Multimeter, and Switch Box Checks	Agency Code [90] LTPP Section ID [6405]

Start Time (military): _ _ _ _

Test Position	Switch Settings		Voltage (ACV)		Current (ACA)		Measured Resistance R = V/I (ohms)	Known Resistance (ohms)
	I_1 V_1	I_2 V_2	Range Setting	Reading	Range Setting	Reading		
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R2 =
38	38	39					R3 =	R3 =
39	39	00					R4 =	R4 =
36	36	37					R1 =	R1 =
37	37	38					R2 =	R1 =
38	38	39					R3 =	R1 =
39	39	00					R4 =	R2 =

Comments: NOT PART OF PROCEDURE IN 1993

Prepared by: RJV

Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 02/JAN/96

LTPP Seasonal Monitoring Program Data Sheet SMP-C05 Rain Gauge Calibration	Agency Code [90] LTPP Section ID [6405]

General Information:

Manufacturer: TEXAS ELECTRONICS INC

Model Number: TRP-525M

Serial Number: 12049

Note: The screen should be tacked inside the funnel using silicon at three to four points to prevent loss from wind.

Rain Gauge Calibration Data					
Trial	Start Time (Military)	End Time (Military)	Volume (ml)	Number of Tips	Adjustment[1] No. of Turns
1	0845	0907	473.	97.	~~0.5~~
2	0910	0950	473.	96.	0.5
3	1101	1122	473.	99.	-.-

[1] Adjust gauge to obtain 100 tips ± 3 for 473 ml of water.

Comments: _____

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/NOV/95 (For 1993 INSTALLATION)

Appendix C-1: Instrumentation Installation Information

Appendix C-1 contains the following installation data sheets and associated field notes, as well as, certificate of registration for instrumentation, and photographs documenting the installation:

- Data Sheet SMP-I01: List of Installed Instrumentation;
- Data Sheet SMP-I02: Instrumentation Locations;
- Data Sheet SMP-I03: Log of Piezometer Hole;
- Data Sheet SMP-I04: Log of Instrumentation Hole;
- Data Sheet SMP-I05: Field Gravimetric Moisture Contents;
- Data Sheet SMP-I05(A): Lab Gravimetric Moisture Contents;
- Data Sheet SMP-I05(B): Gravimetric Moisture Comparison;
- Data Sheet SMP-I06: TDR Moisture Content;
- Data Sheet SMP-I07: Representative Dry Density;
- Plot of Gravimetric Moisture Results;
- Certificate of Registration from the United States Customs Service; and
- Installation Photographs.

90SA 93A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [90] LTPP Section ID [6405]

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	90AT
Resistivity Probe	01	90AR
TDR Sensors	10	90A01 to 90A10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	01	16588
Battery Package	01	5682
Weather Station:		
Rain Gauge	01	12049
Air Temperature Probe	01	90AAT
Radiation Shield	01	~~~~~
Observation Piezometer/Bench Mark:	01	n/a

List of Participants:

Name of Participant	Agency/Employer
BOB VAN SAMBEEK	BRAUN INTERTEC CORP
RON URBACH	" " "
DANA MILLER	" " "
JOEL RECTOR	" " "
STELLA WHITE	SASKATCHEWAN HWY.S + TRANS.
JOHN ERIS	" " "

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/Dec/95 (for 06-Oct-93 Install)

Data Sheet SMP-I01: List of Installed Instrumentation

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [90] LTPP Section ID [6405]

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	5+20	5+15	+0.76	+0.76
Observation Piezometer	4+00	4+01	-3.35	-3.05
Equipment Cabinet	5+20	5+15	-7.93	-7.62
Weather Station	5+20	5+15	-8.23	-7.93

[1] Transverse distance in meters from pavement edge (see LTTP Manual for FWD Testing) with (+) values toward mid-lane and (-) towards shoulder

Depth Location of Instrumentation:

Instrument		Depth from Pavement Surface to Top of Probe (m)		Comments
		Planned	Actual	
Thermistor Probe	Metal Top	0.025	0.025	Measured to 1/8" during
	Metal Bottom	0.046	0.044	installation in 1993
	PVC Top	0.127	0.124	
Resistivity Probe		0.127	0.127	

PIEZ IS 0.3417 METERS BELOW THE P.E. @ Sta. 4+00

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.216	0.210	All depth ±0.005m
2	0.368	0.370	as rounded from
3	0.521	0.525	measurement in inches
4	0.673	0.675	in 1993 (nearest 1/8")
5	0.826	0.825	
6	0.978	0.970	
7	1.130	1.135	
8	1.283	1.275	
9	1.588	1.590	
10	1.892	1.900	

for duplicate entry

1-8-96 BB

ATTACH TOP-VIEW SKETCH OF INSTRUMENTATION HOLE SHOWING DIRECTION OF TRAFFIC AND LOCATION OF THERMISTOR AND RESISTIVITY PROBES. LABEL PROBES "T" AND "R", RESPECTIVELY

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/Dec/95 (For 06Oct-93 Install)

9 0 S A 9 3 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [9 0] LTPP Section ID [6 4 0 5]

Operator: n/A Equipment Used: Agency Rig

Location: Station: 4+01 Offset: −3.05 m (from lane edge)

Bore Hole Diameter: 152. mm Auger Type: 152mm solid stem

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
0.5	0.762	SAND DARK BROWN	202
1.0	1.067	SILTY SAND DARK BROWN	214
1.5	1.829	SILTY SAND VERY FINE GRAINED, MOIST.	214
2.0 2.5 3.0	3.048	CLAYEY SAND, BROWN, WET	216
3.5 4.0 4.5	4.572	SILTY CLAY, LIGHT BROWN, VERY WET.	131
5.0			

[1] Format: __.____ m; [2] Format: ____

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 12/Dec/95 (For 06-Oct-93 Installation)

BRAUN[SM]
INTERTEC 906405

10-6-93

PIEZOMETER/BENCH MARK

DRILLED A 6 INCH DIAMETER HOLE.

BOTTOM 15 FEET BELOW GROUND SURFACE.

A 5 GALLON PAIL OF SOIL TO BE USED FOR POSSIBLE TESTING AT A LATER DATE.

FILTER SAND WAS AROUND THE PIEZOMETER FROM 10 FOOT 10 INCH DEPTH TO THE BOTTOM AT 15 FOOT DEPTH

BENTONITE PELLETS WERE PLACED FROM THE TOP OF THE FILTER SAND, TO THE DEPTH OF 6 FEET 10 INCHES.

SILTY SAND THAT WAS REMOVED DURING THE DRILLING. WAS USED AS BACK FILL ABOVE THE BENTONITE TO A DEPTH OF ABOUT 2 FEET BELOW THE SURFACE.

SAKRETE WAS USED AS BACK FILL AROUND THE STEEL SLEEVE. TO ABOUT BELOW THE TOP OF THE SLEEVE

FILTER SAND WAS USED TO FILL THE VOID BETWEEN THE INSIDE OF THE STEEL SLEEVE AND THE PIEZOMETER/BENCH MARK PIPE.

ALL MATERIAL PLACED WAS COMPACTED WHEN IT WAS PLACED

9 0 5 A 9 3 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [90] LTPP Section ID [6405]

Operator: N/A Equipment Used: Agency Rig

Location: Station: 5+15 Offset: 0.76 m (from lane edge)

Bore Hole Diameter: 305. mm

Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10	0.076	AC	700
0.20	0.330	SAND BASE	202
0.30			
0.40		SILTY SAND. LT. BROWN	
0.50			214
0.60	0.699		
0.70			
0.80		CLAYEY SAND, BROWN	216
0.90	1.000		
1.00			
1.10	1.105	(OLD TOPSOIL) SILTY CLAY DK. BROWN	131
1.20	1.321	SILTY SAND DARK GRAY	214
1.30			
1.40	1.448	SILTY SAND DARK GRAY, TRACE WOOD.	214
1.50			
1.60	1.727	SILTY SAND DARK GRAY WITH WOOD	214
1.70			
1.80		SILTY SAND BROWN	
1.90			214
2.00			
2.10	2.108		
2.20			
2.30			
2.40			
2.50			

[1] Format: __.____m; [2] Format: ____

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 12/Dec/95 (For 06-Oct-93 Installation)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [90] LTPP Section ID [6405]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.210	10		224.0	874.0	851.0	627.0	23.0	3.7
2	0.370	9		224.0	1020.0	994.0	770.0	26.0	3.4
3	0.530	8		224.0	739.0	724.0	500.0	15.0	3.0
4	0.675	7		223.7	879.0	854.0	630.3	25.0	4.0
5	0.825	6		224.0	881.0	847.0	623.0	34.0	5.5
6	0.970	5		223.7	824.5	782.5	558.8	42.0	7.5
7	1.135	4		224.0	769.0	728.0	504.0	41.0	8.1
8	1.275	3		223.7	836.0	793.0	569.3	43.0	7.6
9	1.590	2		224.0	711.7	630.0	406.0	81.7	*20.1
10	1.900	1		223.7	771.0	725.5	501.8	45.5	9.1

[1] Distance in meters from pavement surface to TDR probe

Comments: - DATA FROM 1993 SHEET

* ORGANICS IN # 9 TDR SAMPLE. ORGANICS STARTED TO BURN

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 / NOV / 95 (FOR 06-OCT-1993 INSTALLATION)

1-8-96

LTPP Seasonal Monitoring Program Data Sheet SMP-I05(A) LAB ~~Field~~ Gravimetric Moisture Content	Agency Code [90] LTPP Section ID [6405]

TDR Probe	Probe Depth[1] (m)	Moisture Sample No.	Pan No.	Wt. of Pan (gms) = A	Wt. of Pan + Wet Soil (gms) = B	Wt. of Pan + Dry Soil (gms) = C	Wt. of Dry Soil (gms) = D = C - A	Wt. of Water (gms) = E = B - C	Moisture Content (%) = w = E/D * 100
1	0.210			104.7	720.2	697.4	592.7	22.8	3.8
2	0.370			98.7	949.6	919.3	820.6	30.3	3.7
3	0.530			104.2	633.0	619.9	515.7	13.2	2.6
4	0.675			102.7	705.8	685.2	582.5	20.6	3.5
5	0.825			106.2	720.1	685.6	579.3	34.5	6.0
6	0.970			97.8	827.2	777.9	680.0	49.4	7.3
7	1.135			103.0	641.9	599.7	496.6	42.2	8.5
8	1.275			103.7	623.9	583.7	480.1	40.2	8.4
9	1.590			98.0	511.8	448.7	350.7	63.1	*18.0
10	1.900			99.9	612.1	568.7	468.8	43.4	9.3

[1] Distance in meters from pavement surface to TDR probe

Comments: LAB MOISTURE RESULTS FROM SASKATCHEWAN

*TDR #9 SAMPLE CONTAINED ORGANICS, AS WELL AS, #8 AND #10.

Prepared by: RSV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21 / NOV / 95 (FOR INSTALLATION DONE 06-OCT-1993)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (B) Gravimetric Moisture Comparison	Agency Code [90] LTPP Section ID [6405]

TDR	SMP-I02 TDR Depth (m)	SMP-I04 Material Code	Lab Data Dry Density (pcf)	TDR Installation Data		Gravimetric Moistures		Comments
				SMP-I06 La (ni)	Calculated Gravimetric (percent)	SMP-I05 Field (percent)	SMP-I05A Lab (percent)	
1	0.210	202	133.7	0.55	6.4	3.7	3.8	
2	0.370	214	127.3	0.53	6.2	3.4	3.7	
3	0.525	214	127.3	0.44	3.7	3.0	2.6	
4	0.675	214	127.3	0.50	5.3	4.0	3.5	
5	0.825	216	127.3	0.59	7.9	5.5	6.0	
6	0.970	216	127.3	0.63	9.1	7.5	7.3	
7	1.135	214	127.3	0.66	10.0	8.1	8.5	
8	1.275	214	127.3	0.63	9.1	7.6	8.4	Contains organics
9	1.590	214	127.3	0.82	14.8	*20.1	18.0	Contains organics?
10	1.900	214	127.3	0.64	9.4	9.1	9.3	Some organics

TDR Gravimetric moistures calculated using equations on pages II-2 and II-5 of FHWA-RD-94-110 with La = 0.203 m, and Vp = 0.99.

Comments: Dry Density from Form 504 with test location at 5+58 as follows;
@ 0.089 meters → 133.7 pcf and @ 0.508 meters → 127.3 pcf.
- Note: Probes 6, 8, and 9 failed calibration checks in water.
- * Organics started to burn in moisture sample. Result maybe on the high side

Prepared by: RJV Employer: Braun Intertec Corporation Date (dd/mmm/yy): 23/JAN/96

$$\omega = \left(-330.72 + 4526.78\,La^2 - 2103.88\,La^4 + 402.25\,La^6\right)/\gamma_d \quad ;$$

La (meters)
γ_d (pcf)
ω (%)

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I06 TDR Moisture Content	Agency Code [90] LTPP Section ID [6405]

Required Settings:

Dist./Division: 0.25 m
Phase Velocity: 0.99
Noise Filter: 1 average

Probe Number	Probe Depth[1] (m)	Time (military)	Apparent Length (m)	Dielectric Constant[2]	Comments
1	0.210	(1)	0.55	7.49	
2	0.370	"	0.53	6.95	
3	0.530	"	0.44	4.79	
4	0.675	"	0.50	6.19	
5	0.825	"	0.59	8.62	
6	0.970	"	0.63	9.82	
7	1.135	"	0.66	10.78	
8	1.275	"	0.63	9.82	Contains Organics
9	1.590	"	0.82	16.64	Contains Organics
10	1.900	"	0.64	10.14	Some Organics

[1] Distance in meters from pavement surface to TDR probe
[2] Dielectric constant is determined as follows:

$$\varepsilon = \left[\frac{(L_a)}{(L)(V_p)}\right]^2 = \left[\frac{(D_2 - D_1)}{(L)(V_p)}\right]^2$$

where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

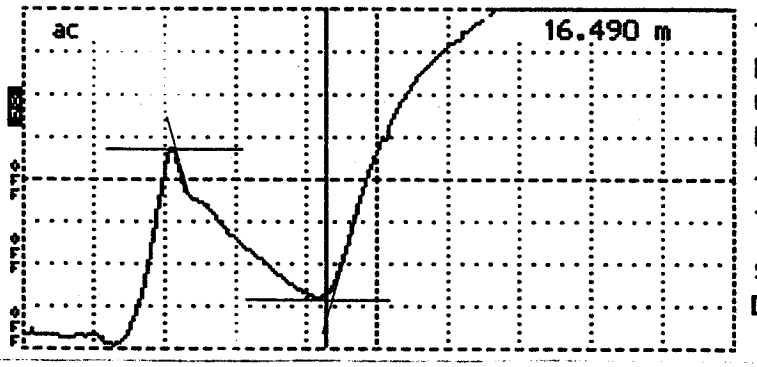
ATTACH TDR TRACES TO THIS DATA SHEET.

Comments: (1) NOT RECORDED IN 1993

Prepared by: RJV FROM INSTALLATION DATA FROM 06-OCT-1993. Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 17 / NOV / 95 (FOR 06-OCT-1993 INSTALLATION)

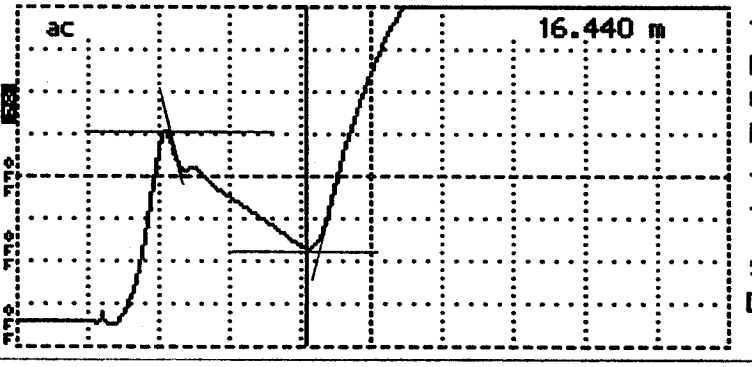
..... 16.490 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 -1
Notes (90A01)

Input Trace
Stored Trace
Difference Trace

..... 16.440 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 -2
Notes (90A02)

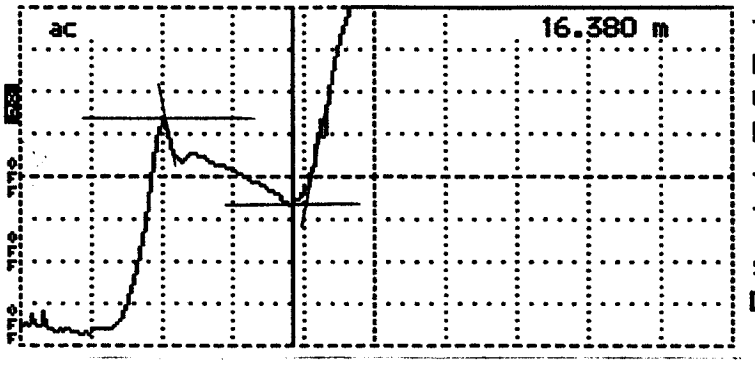
Input Trace
Stored Trace
Difference Trace

..... 16.330 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-6-93
Cable 906405 -3
Notes (90A03)

Input Trace
Stored Trace
Difference Trace

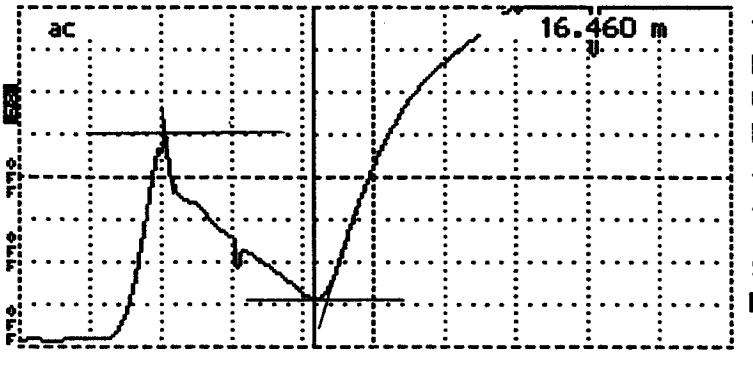
..... 16.380 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 -4
Notes (90A04)

Input Trace
Stored Trace
Difference Trace

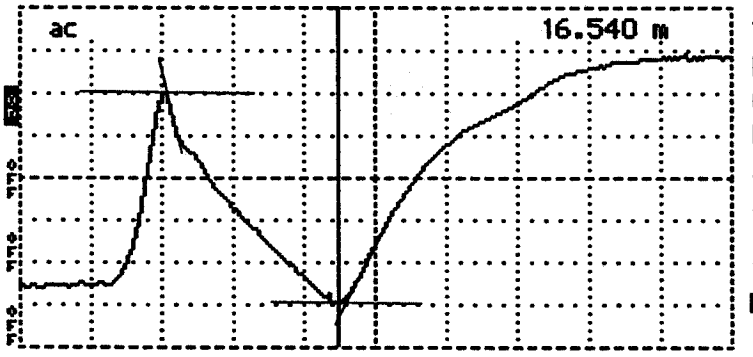
..... 16.460 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 -5
Notes (90A05)

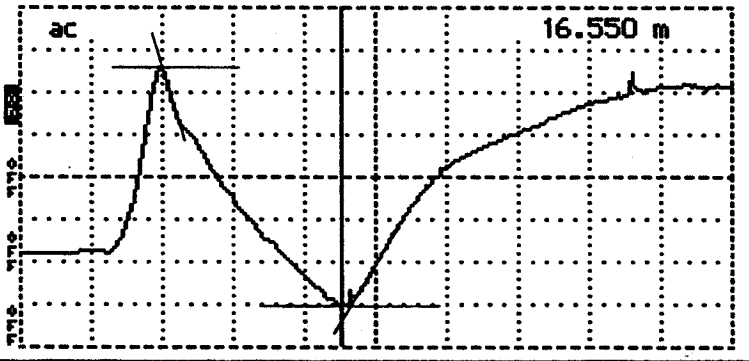
Input Trace
Stored Trace
Difference Trace

..... 16.540 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



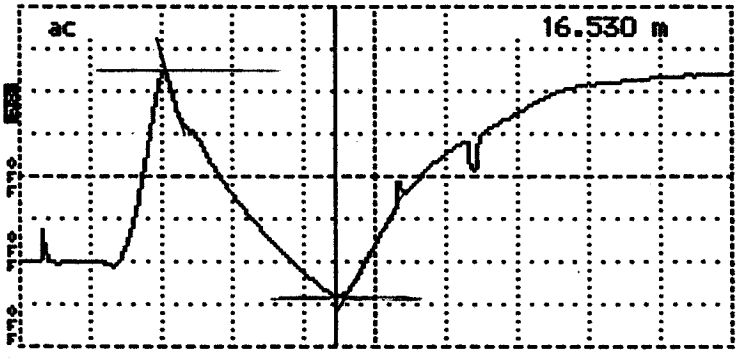
Tektronix 1502B TDR
Date 10-6-93
Cable 906405 - 6
Notes (90A06)
SC
Input Trace
Stored Trace
Difference Trace

..... 16.550 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



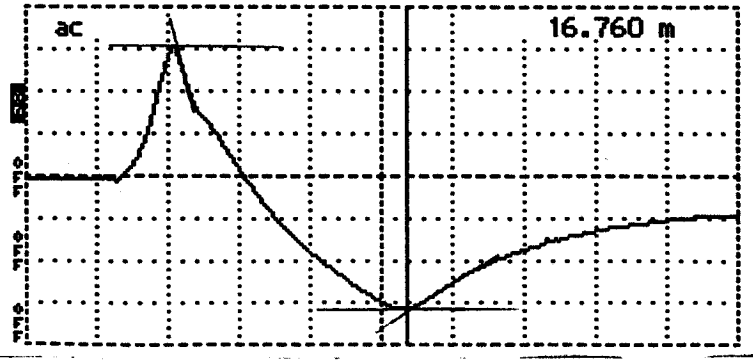
Tektronix 1502B TDR
Date 10-6-93
Cable 906405 - 7
Notes (90A07)
Input Trace
Stored Trace
Difference Trace

..... 16.530 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



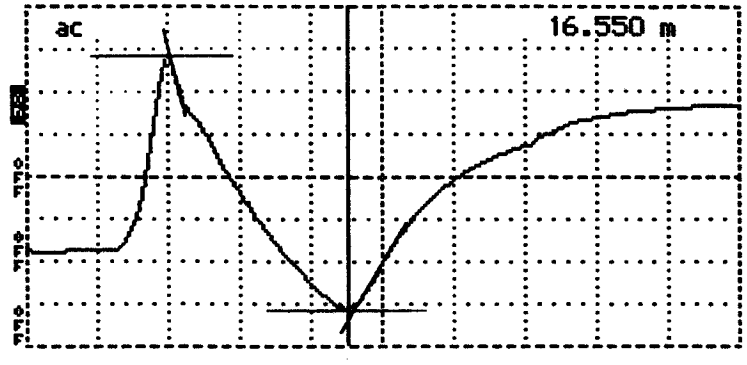
Tektronix 1502B TDR
Date 10-6-93
Cable 906405 8
Notes (90A08)
ORGANIC MATL IN SOIL
Input Trace
Stored Trace
Difference Trace

..... 16.760 m
Div..... .25 m/div
Scale.... 66.7 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 9
Notes (90A09)
* ORGANIC MATL IN SOIL
Input Trace
Stored Trace
Difference Trace

..... 16.550 m
Div..... .25 m/div
Scale.... 50.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac



Tektronix 1502B TDR
Date 10-6-93
Cable 906405 10
Notes (90A10)
SOME ORGANIC MATL IN SAMPLE
Input Trace
Stored Trace
Difference Trace

90 S A 9 3 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I07 Representative Dry Density	Agency Code [90] LTPP Section ID [6405]

Depth of Representative Sample (from pavement surface): __.___ m

Dry Density Determination:

a. Tare Weight of Empty Mold: _____ g (__.__ lb)

b. Weight of Mold and Compacted Soil: _____ g (__.__ lb)

c. Weight of Compacted Sample (b - a): _____ g (__.__ lb)

d. Unit Weight of Compacted Soil = [(b - a) / 943.0] = __.__ g/cm³

([(b - a) * 30] = ____.__ lb/ft³)

e. Dry Density of Compacted Soil = [d / (100 - r)] = __.__ g/cm³

(____.__ lb/ft³)

Moisture Content Determination:

m. Tare Weight of Pan: ____.__ g

n. Weight of Pan and Moisture Sample: ____.__ g

o. Weight of Pan and Dry Sample: ____.__ g

p. Weight of Moisture (n - o): ____.__ g

q. Weight of Dry Sample (o - m): ____.__ g

r. Moisture Content by Weight = [(p / (p + q) * 100] = ___.__ %

Comments: NOT PART OF PROCEDURE IN 1993.

Prepared by: RJV Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 02/JAN/96

BRAUN[SM]
INTERTEC 906405

10-6-93

TIPPING BUCKET RAIN GAGE/ AIR TEMP PROBE

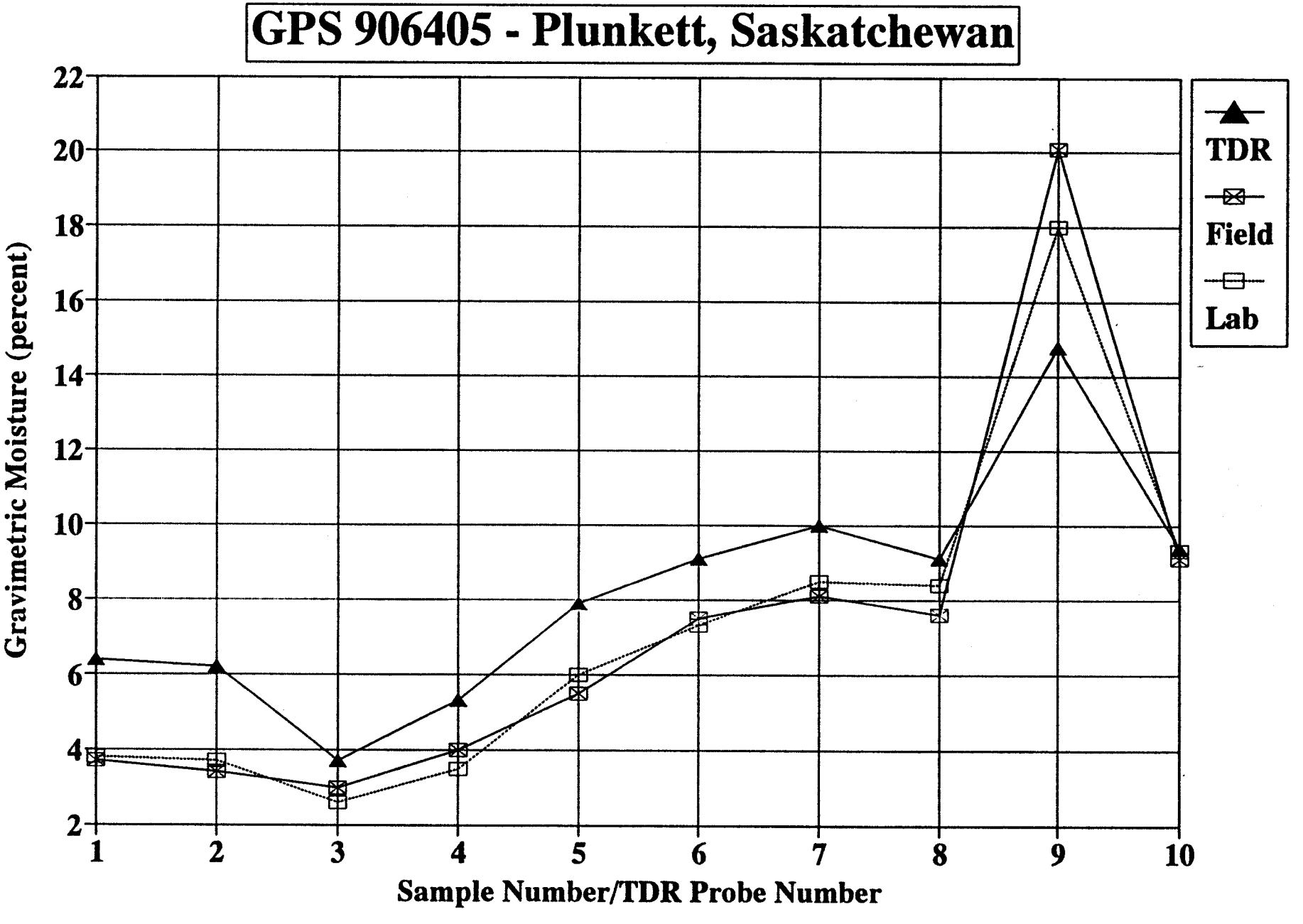
BOTTOM SECTION OF 2" PIPE 10' 4" TIP TO TIP. BOTTOM HAS A FLOOR FLANGE 5½ INCHES IN DIAMETER.

THE POLE WAS ABOUT 5 INCHES BEHIND THE EQUIPMENT CABINET.

THE HOLE WAS DRILLED WITH A 6" AUGER

AFTER THE PIPE WAS PUT IN THE HOLE. DRY SAKRETE WAS COMPACTED IN AROUND THE PIPE. SAKRETE WAS PLACED FROM THE BOTTOM TO ABOUT 4 FEET BELOW THE SURFACE.

SOIL REMOVED WITH AUGER WAS RECOMPACTED AROUND THE PIPE TO THE SURFACE.


GPS 906405 - Plunkett, Saskatchewan
Gravimetric Moisture (percent)
22
20
18
16
14
12
10
8
6
4
2
1
2
3
4
5
6
7
8
9
10
Sample Number/TDR Probe Number
TDR
Field
Lab

DEPARTMENT OF THE TREASURY
UNITED STATES CUSTOMS SERVICE

Form Approved.
OMB No. 1515-0014

CERTIFICATE OF REGISTRATION

NO.

19 CFR 10.8, 10.9, 10.68, 148.8, 148.32, 148.37

(NOTE: Number of copies to be submitted varies with type of transaction. Inquire at District Director's office as to number of copies required.)

...Carrier)	B/L or INSURED NO.	DATE
		10/4/93

NAME, ADDRESS, AND ZIP CODE TO WHICH CERTIFIED FORM IS TO BE MAILED *(If Applicable)*

BRAUN INTERTEC
1983 SLOAN PLACE
ST. PAUL, MN 55117

ARTICLES EXPORTED FOR:

- ☐ ALTERATION*
- ☐ REPAIR*
- ☒ USE ABROAD
- ☐ REPLACEMENT
- ☐ PROCESSING*
- ☐ OTHER, *(specify)* _____

* ***NOTE:*** *The cost or value of alterations, repairs, or processing abroad is subject to Customs duty.*

LIST ARTICLES EXPORTED

Number Packages	Kind of Packages	Description
		SEE ATTACHED 3 PAGES ↑ only page for 906405

SIGNATURE OF OWNER OR AGENT *(Print or Type and Sign)* Robert Van Sambeek — ROBERT VAN SAMBEEK — DATE 10/4/93

The Above-Described Articles Were:

EXAMINED	LADEN under my supervision
DATE OCT 04 1993	DATE OCT 04 1993 — PORT U S Customs Pembina, N.D. 58271
SIGNATURE OF CUSTOMS OFFICER	SIGNATURE OF CUSTOMS OFFICER

U S Customs Pembina N.D. 58271

CERTIFICATE ON RETURN

...uty-free entry is claimed for the described articles as having been exported without benefit of drawback and are returned unchanged except as noted: *(use ...verse if needed)*

...TURE OF IMPORTER *(Print or Type and Sign)* — DATE

NOTE: Certifying officers shall draw lines through all unused spaces with ink or indelible pencil.

...PERWORK REDUCTION ACT NOTICE: The Paperwork Reduction Act of 1980 says we must tell you why we are collecting this information, how we will use it, and whether you have to give it to us. We ask ...the information to carry out the Customs Service laws of the United States. We need the information to ensure that importers/exporters are complying with these laws in claiming duty free entry for exported ...cles which are then returned into the United States. Your response is mandatory and to your benefit.

U.S.GPO:1992-0-343-023/70539

Seasonal Testing SHRP 906405 Lanigan, Saskatchewan

Salvageable Equipment

Telephone cabinet manufactured by Reliance

CR 10 data logger manufactured by Campbell Scientific, Inc. (SN. 16588)

PS12 power supply manufactured by Campbell Scientific, Inc. (SN. 5682)

Electronic rain gauge manufactured by Texas Electronics, Inc (SN. 12049-693)

Air temperature probe with radiation shield Model 107-L Part #LT421316

Instrumentation pole (2" galvanized pipe) 10 foot section placed in the ground and 8 foot section above ground

Materials installed in the ground (non recoverable)

Resistivity probe (SN. 90AR)

MRC thermistor probe (SN. 90AT)

Ten time-domain reflectometry (TDR) probes (SN. 90A01 to 90A10)

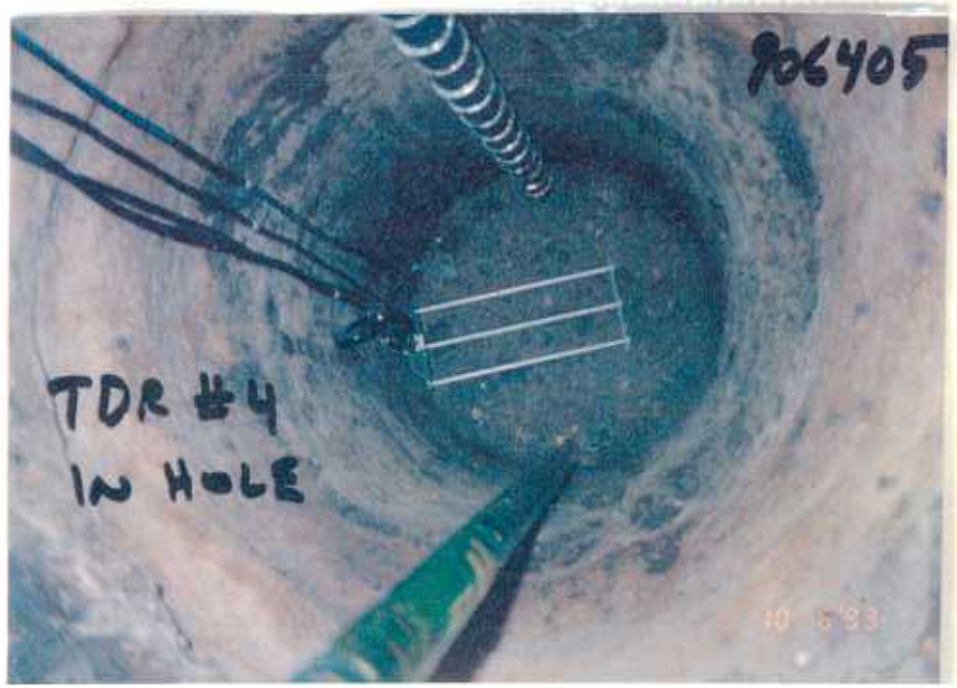
Eight foot copper grounding rod

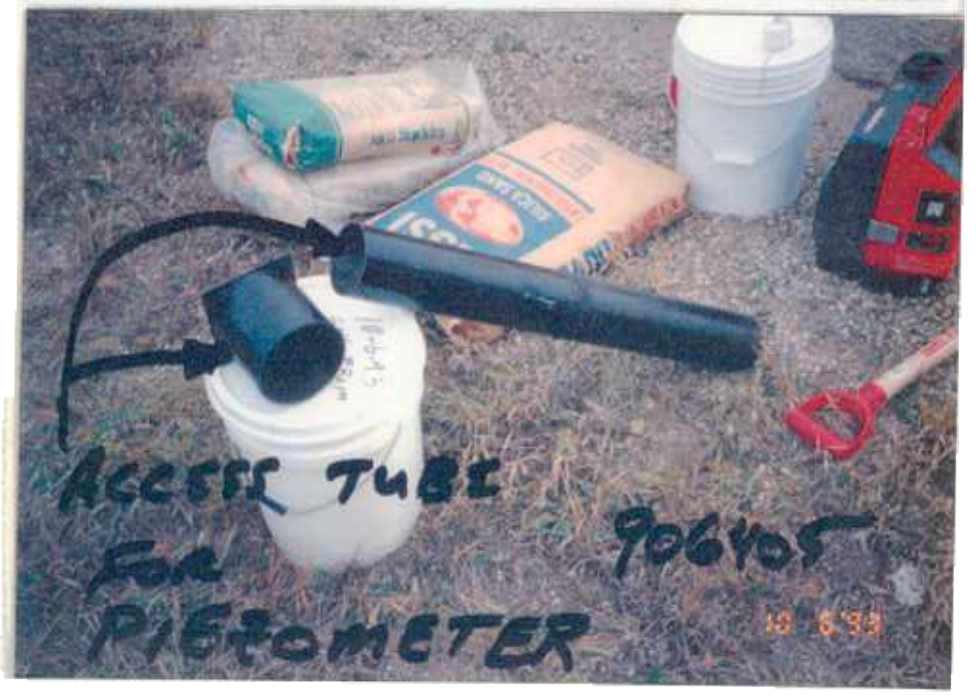
14 foot galvanized pipe with eight foot grease sleeve

32 foot flexible conduit

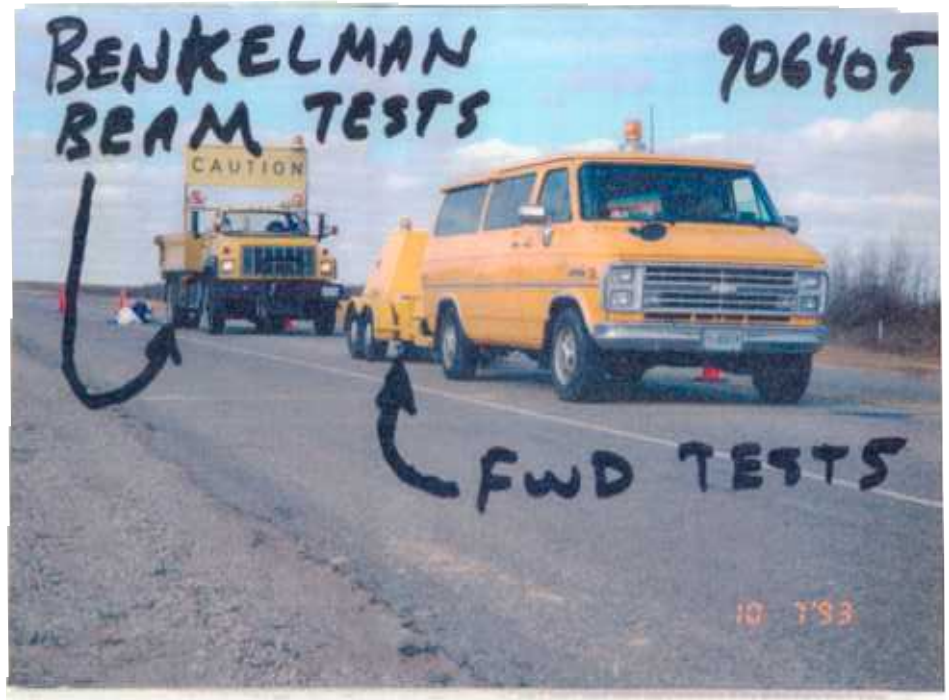

906405
'DRY' SAW
PAVEMENT
FWD
PRIOR
TO
SAWING
10 6'93


PIEZOMETER
906405
10 6'93

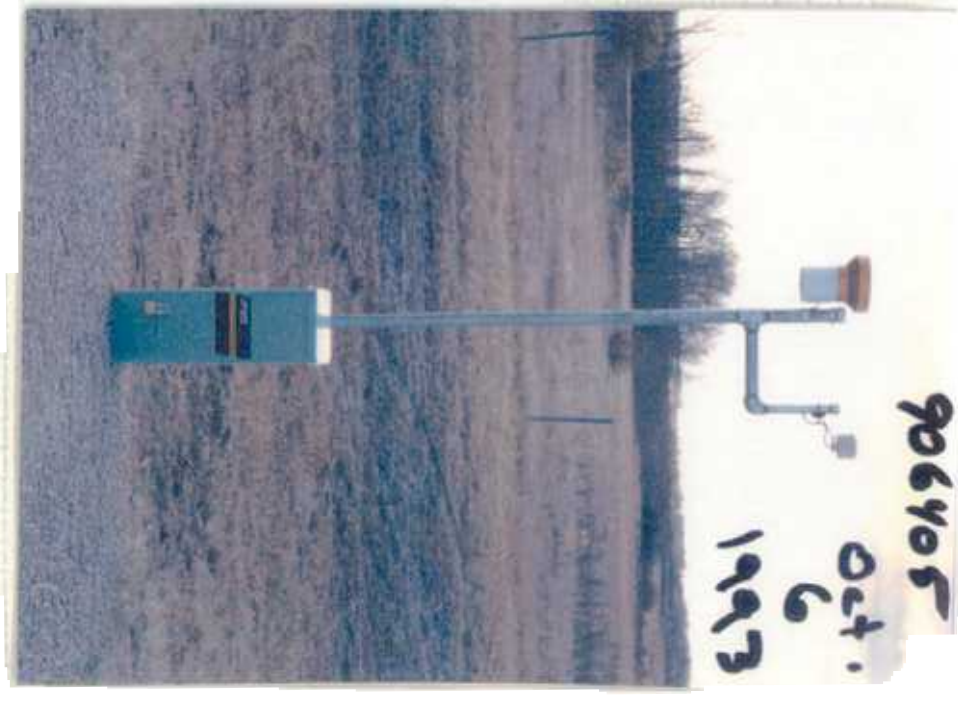

906405
TDR #4
IN HOLE
10 6'93


ACCESS TUBE
FOR
PIEZOMETER
906405
10 6'93


New tent.
906405


BENKELMAN
BEAM TESTS
906405
CAUTION
FWD TESTS


906405
New
box
and
tent

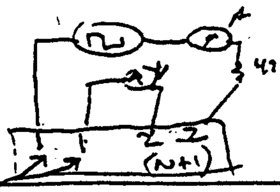

906405
Oct. 6
1993

Appendix D-1: Initial SMP Monitoring Data Collection

Appendix D-1 contains the following data sheets with information collected the day after instrumentation installation:

- Data Sheet SMP-D03: Contact Resistance Measurements;
- Data Sheet SMP-D04: Four-Point Resistivity Measurements;
- Data Sheet SMP-D05: Ground Water Table Measurements; and
- Data Sheet SMP-D08: Surface Elevation Measurements - AC Pavements.

905A93C (#2)



LTPP Seasonal Monitoring Study Data Sheet R1 DO B Contact Resistance Measurements	* State Code [9 0] * Test Section Number [6 4 0 5]

1. Date (Month - Day - Year) Nov [11 - 1 0 - 9 3]

2. Time Measurements Began (Military) [1 0 : 3 0]

3. Comments SIGNAL GENERATOR ON AC POWER AND FHWA BOX

	Test Position (N)	Connections I_1 V_1	I_2 V_2	Voltage (ACV) Range Setting	Voltage (ACV) Reading	Current (ACA) Range Setting	Current (ACA) Reading	Notes	RESIST.
5	1	1	2	V	9.78	milli	1106		8800
7	2	3	2		9.73	milli	1162		8400 ↑ FROST?
11	3	3	4		9.66		1.211		8000
13	4	5	4		9.46		1.377		6900 ?
15	5	5	6		9.13		1.603		5700
17	6	7	6		8.52		1.928		4400 ↓
19	7	7	8		8.27		2061		4000 NO
21	8	9	8		8.23		2.061		4000 FROST
23	9	9	10		8.09		2.126		3800 ?
25	10	11	10		8.20		2.086		3900
27	11	11	12		8.45		1.973		4300
29	12	13	12		7.80		2215		3500
31	13	13	14		6.01		3054		2000
33	14	15	14		5.82		3227		1800
35	15	15	16		5.83		3.225		1800
37	16	17	16		5.31		3.500		1500
39	17	17	18		6.92		2730		2500
41	18	19	18		6.60		2820		2300
43	19	19	20		4.28		4048		1100
45	20	21	20		4.60		3933		1200
47	21	21	22		5.21		3581		1500
49	22	23	22		4.87		3770	[illegible] 23 [illegible]	1300
~~51~~	~~23~~	~~23~~	~~24~~		~~.01 *~~		~~14.7 *~~	~~24 [illegible]~~	* do not enter.
53	24	25	24		5.36		3,490		1500
55	25	25	26		4.93	milli	3770		1300
57	26	27	26		4.36	mA	4.33		1000
59	27	27	28		3.66		5.02		700
61	28	29	28		3.61		5.00		700
63	29	29	30		3.89		4.78		800
65	30	31	30		3.86		4.73		800
67	31	31	32		4.04		4.63		900
69	32	33	32		4.73		4.25		1100
71	33	33	34		6.11		3.36		1800
73	34	35	34		6.33		3.18		2000
75	35	35	36		5.18		3.83		1400
	36	37	38						
	37	38	39						
	38	39	40						

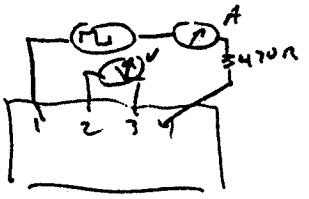
Preparer RJV / DLM Employer BRAUN INTERTEC

E 1-8-96

Figure III-5 - Contact Resistant Measurements - Data Sheet R1

TEST OF AC VS DC ON SIG. GEN.

TIME	AC	.410 V	1066 μA
1014	DC (in?)	.408	1170



905A93C (#2)

Seasonal Monitoring Program Guidelines: Version 1.1/June 1993

LTPP Seasonal Monitoring Study Data Sheet ~~R2~~ D04 Four-Point Resistivity Measurements	* State Code [90] * Test Section Number [6405]

1. Date (Month - Day - Year) NOV [11-10-93]
2. Time Measurements Began (Military) [10:29]
3. Comments SIGNAL GENERATOR ON AC POWER AND FIELD BOX

Test Position	Connections				Voltage (ACV)		Current (ACA)		Notes
	I_1	V_1	V_2	I_2	Range Setting	Reading	Range Setting	Reading	
~~1~~	~~1~~	2	3	4	V	.412	mA	1132	
~~2~~	2	3	4	5	"	.460	"	129.2	
~~3~~	3	4	5	6		.424		1364	
~~4~~	4	5	6	7		.413		1592	
5	5	6	7	8		.393		1687	
6	6	7	8	9		.340		1896	
7	7	8	9	10		.343		2070	
8	8	9	10	11		.258		1983	
9	9	10	11	12		.236		2010	
10	10	11	12	13		.210		2323	
11	11	12	13	14		.154		2580	
12	12	13	14	15		.142		2303	
13	13	14	15	16		.122		2981	
14	14	15	16	17	V	.161		3452	
15	15	16	17	18	mV	97.1		2587	
16	16	17	18	19		150.9		3501	
17	17	18	19	20		177.9		3831	
18	18	19	20	21		94.7		2740	
19	19	20	21	22		122.6		3618	
20	20	21	22	23		157.0		4030	
~~21~~	~~21~~	~~22~~	~~23~~	~~24~~		.3 *		12.3 *	BOARD CH 24 BAD OUT
22	22	23	24	25		155.0		3500	
23	23	24	25	26		196.1		3754	
24	24	25	26	27		178.1	V	3273	
25	25	26	27	28		172.5	mA	3939	
26	26	27	28	29		123.5		4.23	
27	27	28	29	30		103.1		4.59	
28	28	29	30	31		87.2		4.82	
29	29	30	31	32		89.3		4.61	
30	30	31	32	33		101.0		4.13	
31	31	32	33	34		109.0		3.62	
32	32	33	34	35		136.0		3.84	
33	33	34	35	36	V	155.0	V	4.05	

NOTE: SET #1 DONE W/ DC POWER NOT GOOD (Duncan 11/10/93)

Do not enter. E 1.8.96 BP

Preparer RJV / DLM Employer BRAUN INTERTEC

Figure III-6 - Four-Point Resistivity Measurements - Data Sheet R2

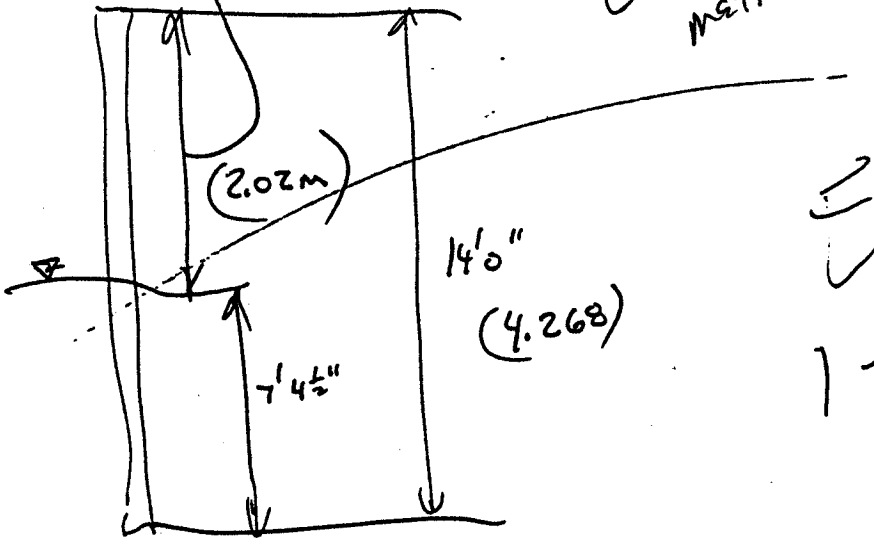
90SA93B

LTPP Seasonal Monitoring Study Form W1 905 Ground Water Table Measurement	State Code 906405 [90] Test Section Number [ ]

Depth to H2O M

Number	Time	Well Depth (ft)	Water Depth (ft)	Weather Conditions*	Comments
1	10-7-93 0916	14' 2.02M	~~7' 4½"~~	CLOUDY	
2					
3					
4					
5					

* Use only these weather terms: Sunny, Partly Cloudy, Cloudy, Drizzle, Rain



1-8-93 BP

Collected by: BRU Employer: BRAUN INTERTEC Date: 10-7-93 Oct

Figure III-7 - Ground Water Table Measurements - Data Sheet W1

9054938

Assume Time ~~2:30~~ 1430 And Comment in SMPCheck

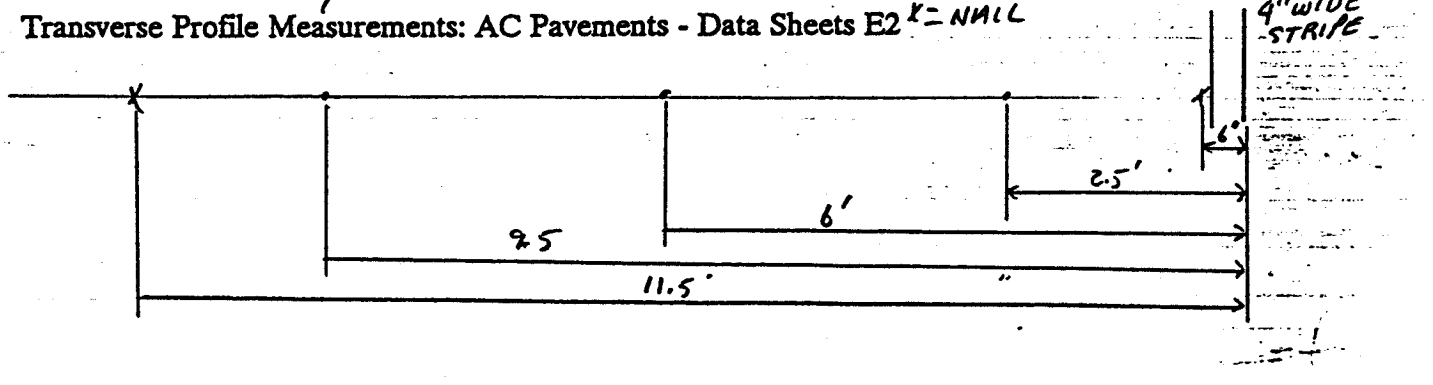
LTPP Seasonal Monitoring Study Form E2 Doc Transverse Profile Measurements- AC			State Code ( ) GPS Section No. 906405 Test Section Number ( ) Sheet 1 of 2			
STA	BS	HI	IFS	TFS	ELEV	REMARKS
BM	1.7540	~~11.7540~~			~~10.0000M~~	
	1.7542				~~9.9998~~	CHECK BACK INTO BM
0.16, 6"	2.5	TYPE OF INSTRUMENT 9.5	6'		LEICA WILD NA2000 11.5	
STA	EOP	0.76 OWP	1.23 MID	2.99 IWP	3.5 CL	REMARKS
3+00 ELEV	1.3769 ~~10.3511~~	1.3888 ~~10.3652~~	1.3694 ~~10.3847~~	1.3631 ~~10.3909~~	1.3505 ~~10.4035~~	91.4
3+25 ELEV	1.4065 ~~10.3475~~	1.4006 ~~10.3534~~	1.3817 ~~10.3727~~	1.3753 ~~10.3787~~	1.3658 ~~10.3882~~	99.1
3+50 ELEV	1.4171 ~~10.3369~~	1.4133 ~~10.3407~~	1.3916 ~~10.3624~~	1.3895 ~~10.3645~~	1.3747 ~~10.3793~~	106.7
3+75 ELEV	1.4028 ~~10.3512~~	1.4120 ~~10.3420~~	1.3917 ~~10.3623~~	1.3887 ~~10.3653~~	13790 ~~10.3750~~	114.3
4+00 ELEV	1.4123 ~~10.3417~~	1.4096 ~~10.3444~~	1.3900 ~~10.3640~~	1.3859 ~~10.3681~~	1.3745 ~~10.3795~~	121.9
4+25 ELEV	1.4226 ~~10.3314~~	1.4195 ~~10.3345~~	1.3998 ~~10.3542~~	1.3956 ~~10.3584~~	1.3845 ~~10.3695~~	129.5
4+50 ELEV	1.4429 ~~10.3111~~	1.4344 ~~10.3196~~	1.4138 ~~10.3402~~	1.4086 ~~10.3454~~	1.3991 ~~10.3549~~	137.2
4+75 ELEV	1.4706 ~~10.2834~~	1.4576 ~~10.2964~~	1.4353 ~~10.3187~~	1.4280 ~~10.3260~~	1.4126 ~~10.3414~~	144.8

E

1.9.96

Prepared by: BRU/DM Employer: BRAUN INTERTEC Date: Oct 10-7-93

Transverse Profile Measurements: AC Pavements - Data Sheets E2 X = NAIL



2:30

905A936

LTPP Seasonal Monitoring Study Form E2 DOB Transverse Profile Measurements-AC			State Code (_) GPS Section No. 906405 Test Section Number (_ _ _) Sheet 2 of 2			
STA	BS	HI	IFS	TFS	ELEV	REMARKS
BM		11.7540			10.0000	
TYPE OF INSTRUMENT LEICA WILD NA2000						
STA	EOP	OWP	MID	IWP	CL	REMARKS
5+00	1.4960	1.4839	1.4607	1.4553	1.4398	152.4
ELEV	~~10.2580~~	~~10.2707~~	~~10.2933~~	~~10.2987~~	~~10.3142~~	
5+10	1.5100	1.4960	1.4715	1.4662	1.4483	155.4 INST HOLE 1.5001 10.2539
ELEV	~~10.2440~~	~~10.2580~~	~~10.2825~~	~~10.2878~~	~~10.3057~~	
5+15	1.5148	AVE	1.4774	1.4711	1.4580	UP SIDE 157.0 DOWN SIDE 1.5027 10.2513
ELEV	~~10.2397~~	~~10.2526~~	~~10.2771~~	~~10.2834~~	~~10.2965~~	
5+20	1.5185	1.5071	1.4839	1.4767	1.4624	158.5
ELEV	~~10.2355~~	~~10.2469~~	~~10.2701~~	~~10.2773~~	~~10.2916~~	
5+25	1.5226	1.5123	1.4905	1.4837	1.4702	160.0
ELEV	~~10.2314~~	~~10.2417~~	~~10.2635~~	~~10.2703~~	~~10.2838~~	
+						
ELEV						
+						
ELEV						
+						
ELEV						

5014

Prepared by: RRW/DM Employer: BRAUN INTERTEC Date: 10-7-93 Oct

Transverse Profile Measurements: AC Pavements - Data Sheets E2

E 1-8-96

Appendix D-2: Routine SMP Monitoring Data Collection Summary

Appendix D-2 contains the following information:

- Standard LTPP SMP data tracking log;
- Field testing information sheet; and
- Screen prints documenting equipment problems.

90SA - 906405, PTH-16 EB LANE, 5 MILES EEAST OF PLUNKETT, SK

Date		ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
dd/mmm/yy	Visit	Pvmt.	Air			Frost	Backup	Backup	Frost	Frost	Water	Pvmt.	Joint	Joint	Man.	No. of Cycles/Visit							
(ctrl+shft+d)	ID	Temp.	Temp.	Rain	TDR	Volts	Temp	TDR	2-Pt.	4-Pt.	Table	Elev.	Open.	Fault	Temp.	OWP	ML	PE	M	P	P	D	
11-Jun-93																				X			
12-Jun-93																					X		
16-Jun-93																			X				
06-Oct-93	93A														X	1	1						ONLY PARTIAL SET OF FWD TESTING. INSTALLATION, MANUAL TDR DATA
07-Oct-93	93B	X	X	X	X	X					X	X			X	3	3						NO RESISTIVITY SWITCH BOX.
10-Nov-93	93C	X	X	X	X	X			X	X	X	X			X	3	3						BAT. DEAD, ONSITE DOA, ADDED RELAY TO PANEL.
18-Nov-93																					X		
10-Dec-93	93D	X	X	X							X				X	2	2						WEATHER CONDITIONS LIMITED TESTING. BAD RESISTIVITY SWITCH BOX
14-Jan-94	94A	X	X	X	X	X					X	X			X	1	1						COLDEST FWD TESTING TO DATE. BAD RESISTIVITY SWITCH BOX.
11-Feb-94	94B	X	X	X	X	X			X	X	X	X			X	2	2		X				
19-Feb-94																					X		
11-Mar-94	94C	X	X	X	X	X			X	X	X	X			X	3	3						
25-Mar-94	94D	X	X	X	X	X			X	X	X	X			X	3	3						
08-Apr-94	94E	X	X	X	X	X			X	X	X	X			X	3	3						
17-Apr-94																					X		PROFILE DATA NOT RECIEVED BY RCO.
28-Apr-94	94F	X	X	X	X	X			X	X	X	X			X	3	3						
12-May-94	94G	X	X	X	X	X			X	X	X				X	3	3						
16-Jun-94	94H	X	X	X	X	X			X	X	X	X			X	2	2						
19-Jul-94																					X		
21-Jul-94	94I	X	X	X	X	X			X	X	X				X	3	3						
16-Aug-94	94J	X	X	X	X	X			X	X	X	X			X	3	3		X				
22-Sep-94	94K	X	X	X	X	X			X	X	X	X			X	3	3						
20-Oct-94	94L	X	X	X	X	X			X	X	X	X			X	4	4						
11-Nov-94																					X		
17-Nov-94	94M	X	X	X	X	X			X	X	X				X	1	1						
16-Dec-94	94N	X	X	X	X	X			X	X	X	X			X	3	3						
22-Jan-95																							PROFILE DATA NOT RECIEVED BY RCO.
23-Jan-95	95A	X	X	X	X	X			X	X	X				X	1	1						

90SA - 906405, PTH-16 EB LANE, 5 MILES EEAST OF PLUNKETT, SK

Date dd/mmm/yy (ctrl+shft+d)	Visit ID	ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
		Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup Temp	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	No. of Cycles/Visit OWP	ML	PE	M	P	P	D	
16-Feb-95	95B				X	X			X	X	X	X				0	0						WEATHER CONDITIONS LIMITED TESTING. ONSITE DOA.
13-Mar-95	95C	X	X	X	X	X			X	X	X				X	3	3						
27-Mar-95	95D	X	X	X	X	X			X	X						0	0						WEATHER CONDITIONS LIMITED TESTING.
10-Apr-95	95E	X	X	X	X	X			X	X	X	X			X	2	2		X				
24-Apr-95	95F	X	X	X	X	X			X	X	X					0	0						
18-May-95	95G	X	X	X	X	X			X	X	X	X			X	3	3						
23-Jun-95	95H	X	X	X	X	X			X	X	X	X			X	3	3		X				ONSITE PANEL AND INSTRUMENT POLE REMOVED.

906405 - 90SA

Updated 12-JUN-95

LOCATION - PTH-16 EB Lane, 5 Miles East of Plunkett, SK
CONTACTS - Merle (306) 365-2835, Ray McMurtry (306) 933-5269.
TEMP HOLES - Sta 5+03, Depths are about 0.8", 1.4", and 1.8" (AC thickness = 2.75")

DISTRESS COMMENTS:

Sta F1 - Tests at 25 foot intervals from Sta 3+00 to Sta 5+00, and at Sta 5+15.

300 M-LONG.CR. ALONG ALL SENSORS
325 L-TRANS.CR. 2' BEHIND LP
350 H-TRANS.CR. 1" BEHIND LP
375 M-TRANS.CR. UNDER LP
425 H-TRANS.CR. 30" BEHIND LP
450 M-TRANS.CR. UNDER D5
475 H-TRANS.CR. BETWEEN D6 AND D7
515 LP ADJACENT TO INSTRUMENTATION HOLE

Sta F3 - Tests at 25 foot intervals from Sta 3+00 to Sta 5+00, and at Sta 5+10, 5+20, and 5+25.

300 L-TRANS.CR. UNDER LP
325 L-TRANS.CR. 18" BEHIND LP
350 H-TRANS.CR. 1' BEHIND LP
375 M-TRANS.CR. 1' BEHIND LP AND L-LONG.CR. FROM D1 to D7
400 L-TRANS.CR. 1' BEHIND LP
425 M-TRANS.CR. 30" BEHIND LP
450 M-TRANS.CR. UNDER D5
475 H-TRANS.CR. BETWEEN D6 AND D7
500 M-TRANS.CR. IN FRONT OF D7 AND PARTIAL L-TRANS.CR. UNDER LP
510 D7 ON INSTRUMENT HOLE AND PARTIAL L-TRANS.CR. D4 AND D5
525 M-TRANS.CR. BETWEEN D5 AND D6

PIEZOMETER - Sta 4+01, 1.0 feet from the edge of paved shoulder, Depth = 4.286M?.

FROST TUBE - Sta 5+45, on shoulder next to the driving lane.

ELEVATIONS - No DOT BM.

Offsets:	PE	OWP	ML	IWP	ILE
(M)	0.16	0.76	1.83	2.90	3.51
(ft)	0.5	2.5	6.0	9.5	11.5
	(nail)	(hole)	(hole)	(hole)	(nail)

Sta: Transverse profiles every 25 feet from Sta 3+00 to Sta 5+00, and at Sta 5+10, 5+15, 5+20, and 5+25.

COMMENTS - Call Harvey Kock at (306) 787-4921 to arrange Benkelman Beam tests.
- Traffic control is Leonard.
- In 1996, may want to install nails according to current guide lines.

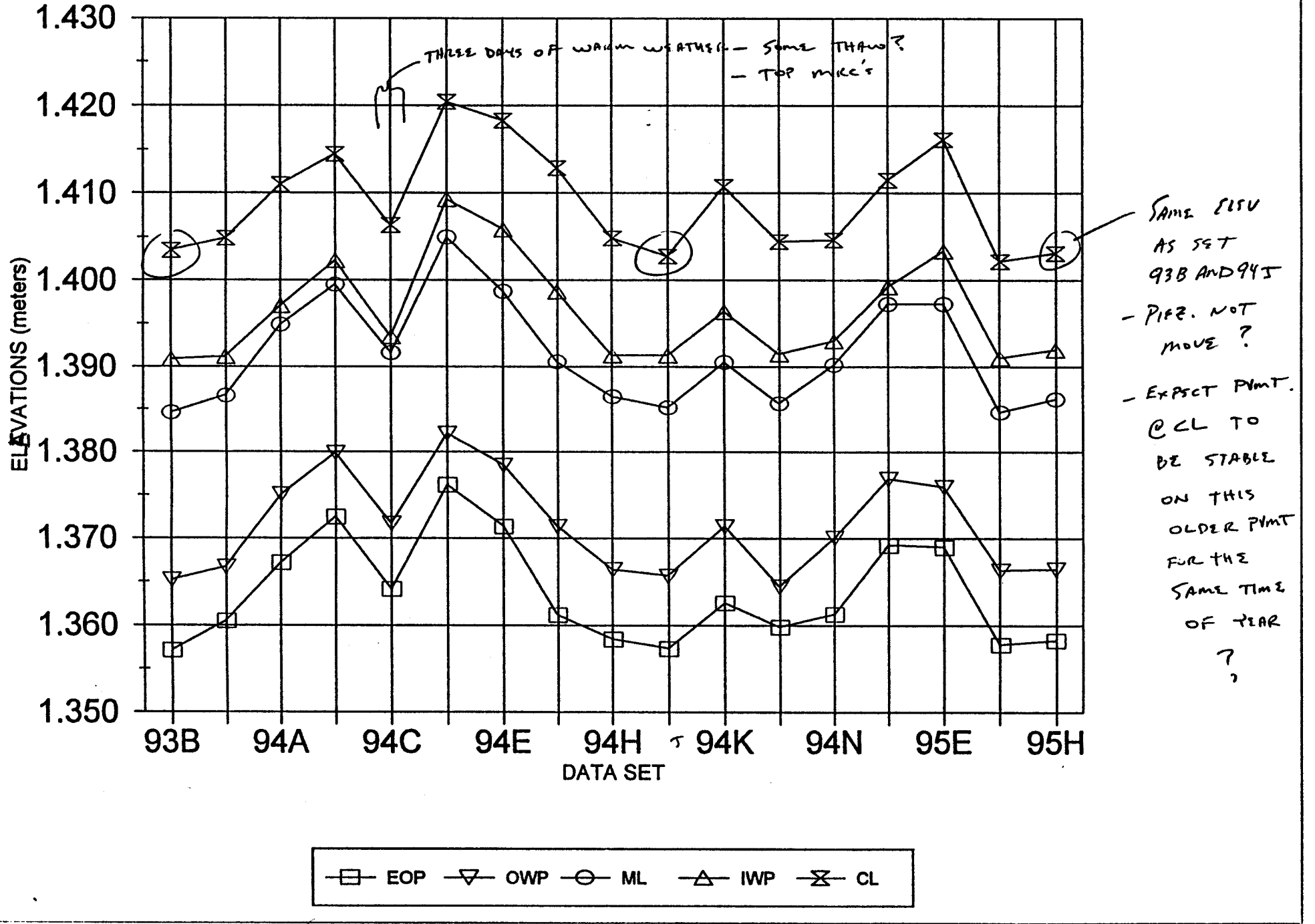

906405
D.O.T.
Frost
tube

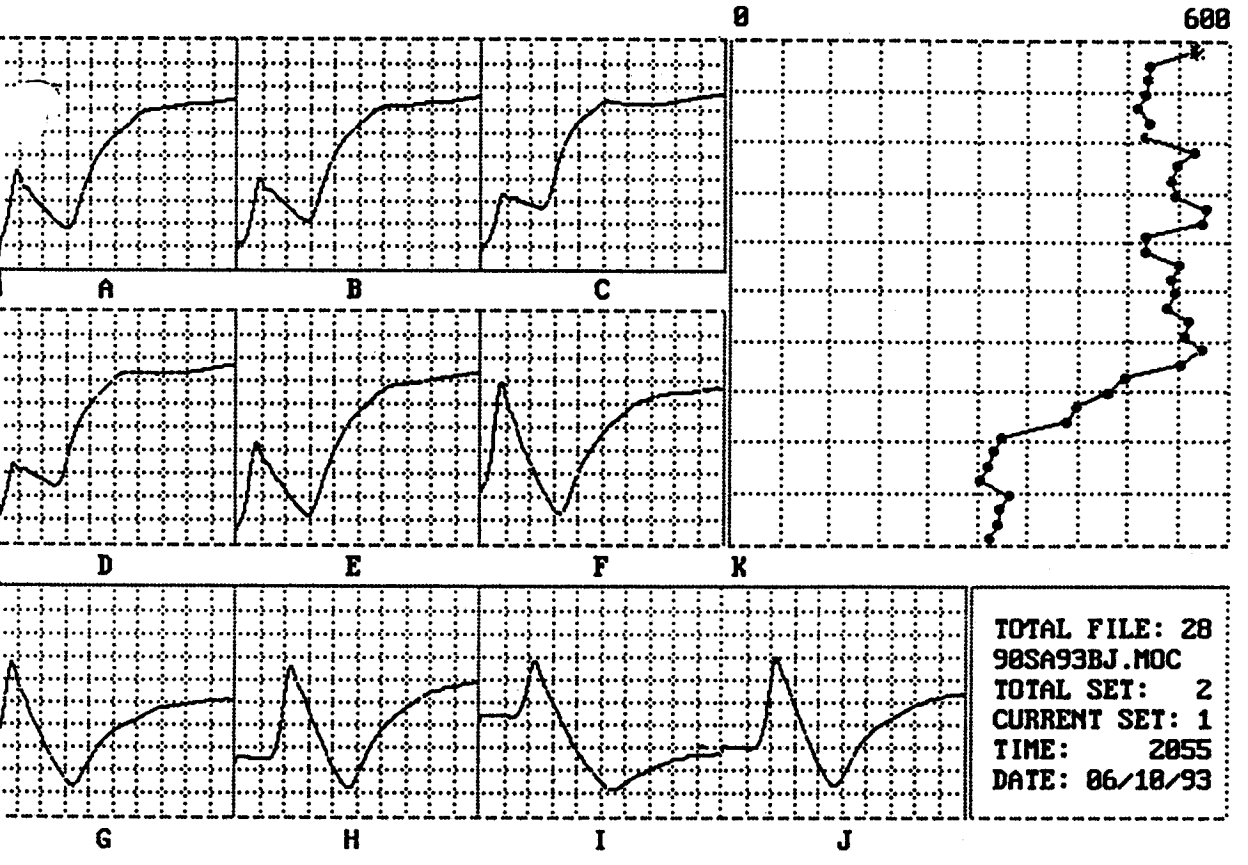

DANGER
SUDDEN STOPS
906405
4-94


1.5 years after
install.
905A
906405

- ONLY LOOK AT RETURN TO STABLE ELEV. WAS CHECH FOR PIER. SHIFT.

906405 (station 3+00)





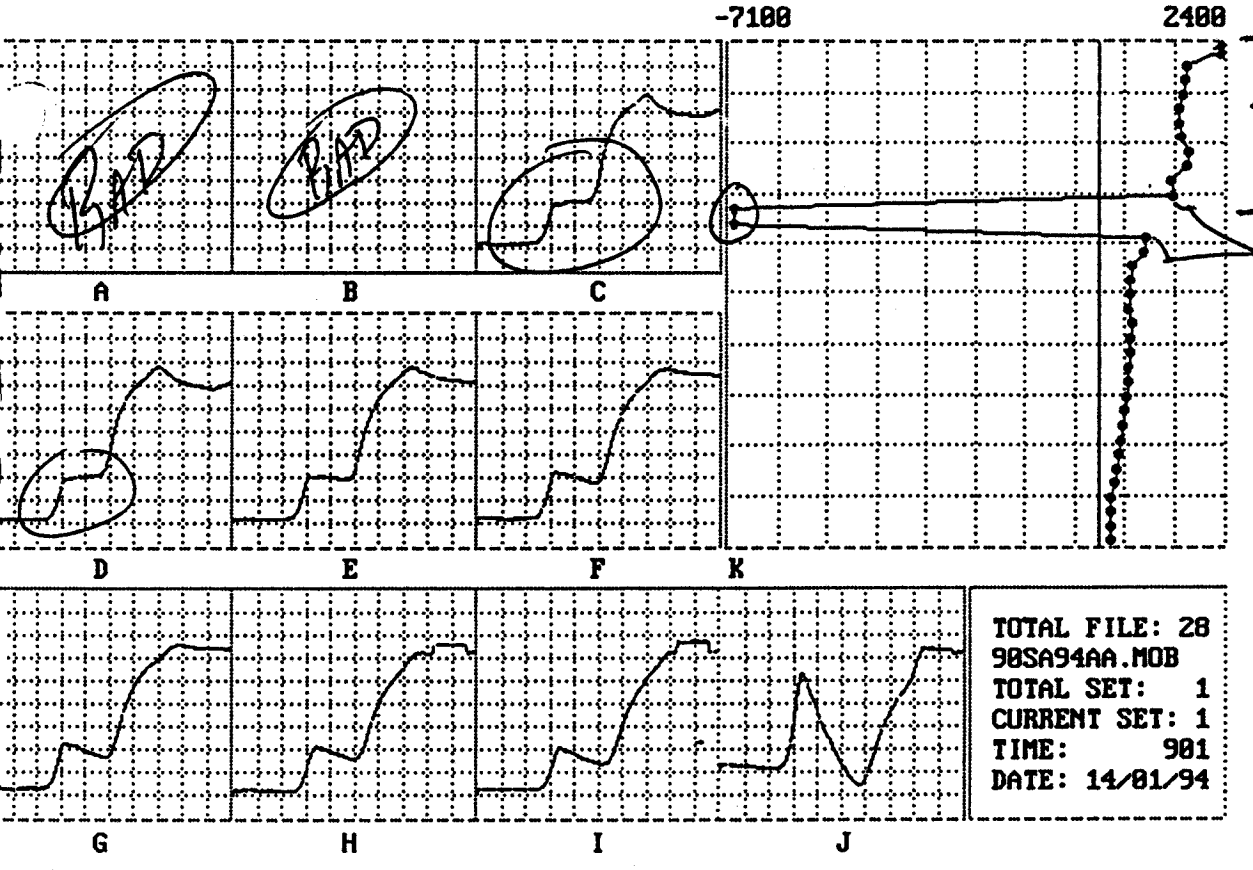
No FROST !

DAY AFTER INSTALL

r**er=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

ORGANICS IN LOWER MATERIALS

- AFFECT VOLTAGE PROFILE
- AFFECT TDR SHAPE



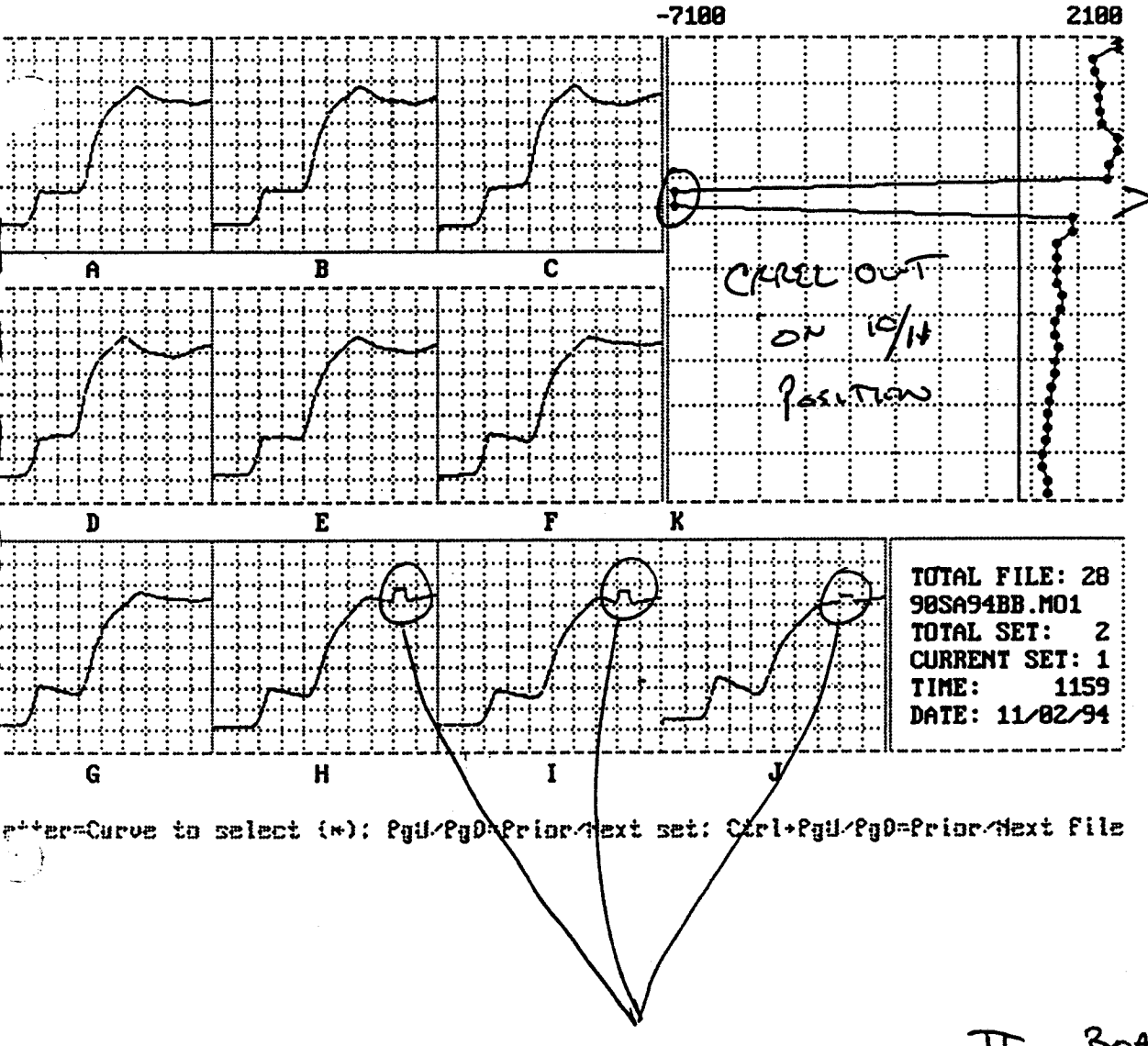
er=Curve to select (*); PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

※ PROBES C+D NOT TYPICAL 2ND INFLECTION

- SLOPE REMAINS POSITIVE
- PROBABLY FROZEN MATERIAL

(IMPEDENCE REMAINS HIGH THROUGH THE PROBE)

?

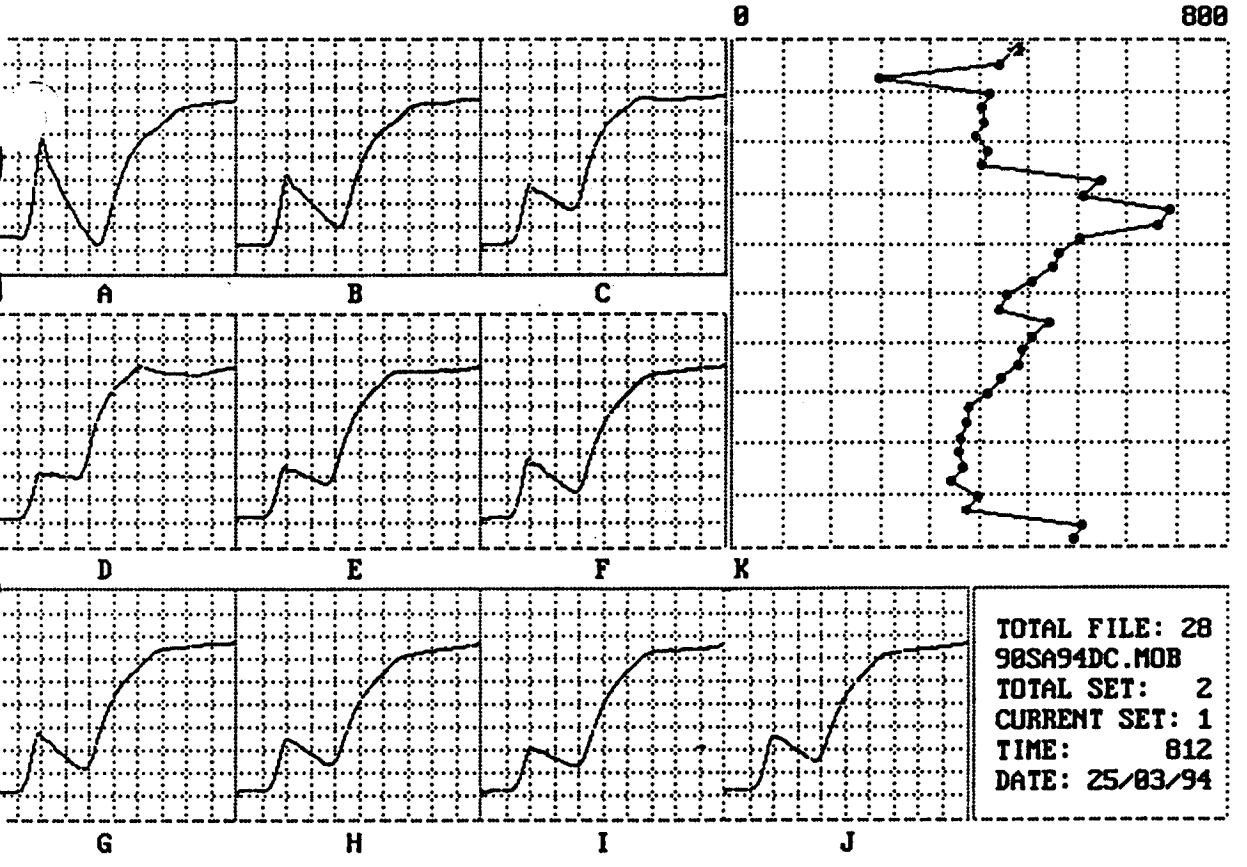


ASSIGN -6999 to -1

CHECK OUT ON 10/14 POSITION

PROBLEM W/ LEVEL II BOARD?

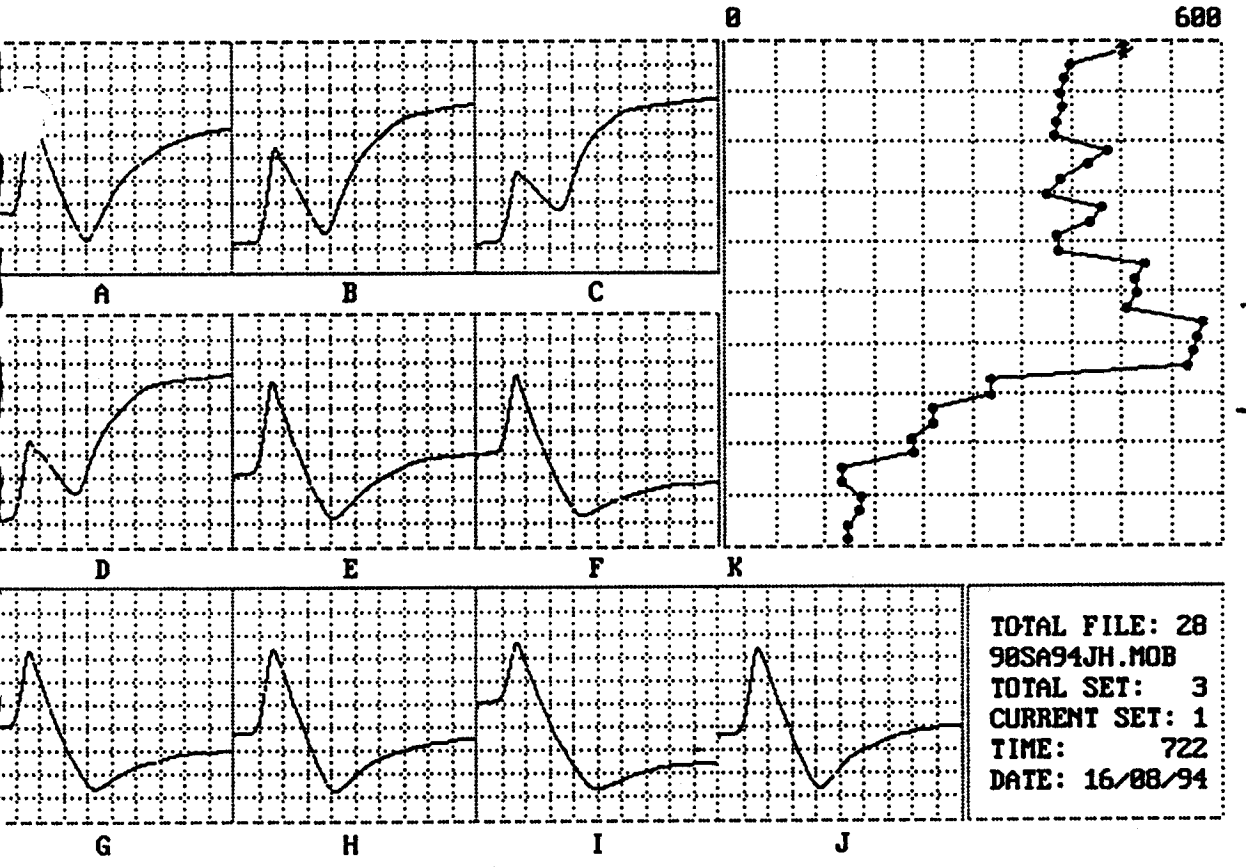
DOES NOT AFFECT MOISTURE INTERPETATION.



Letter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

COMPARE TDR #1 TO EARLIER TRACES.

- ESTIMATE #1, 2 AND 3 ARE IN UNFROZEN MATERIAL ON THIS DAY
- IMPEDENCE DECREASE THROUGH THE PROBE.

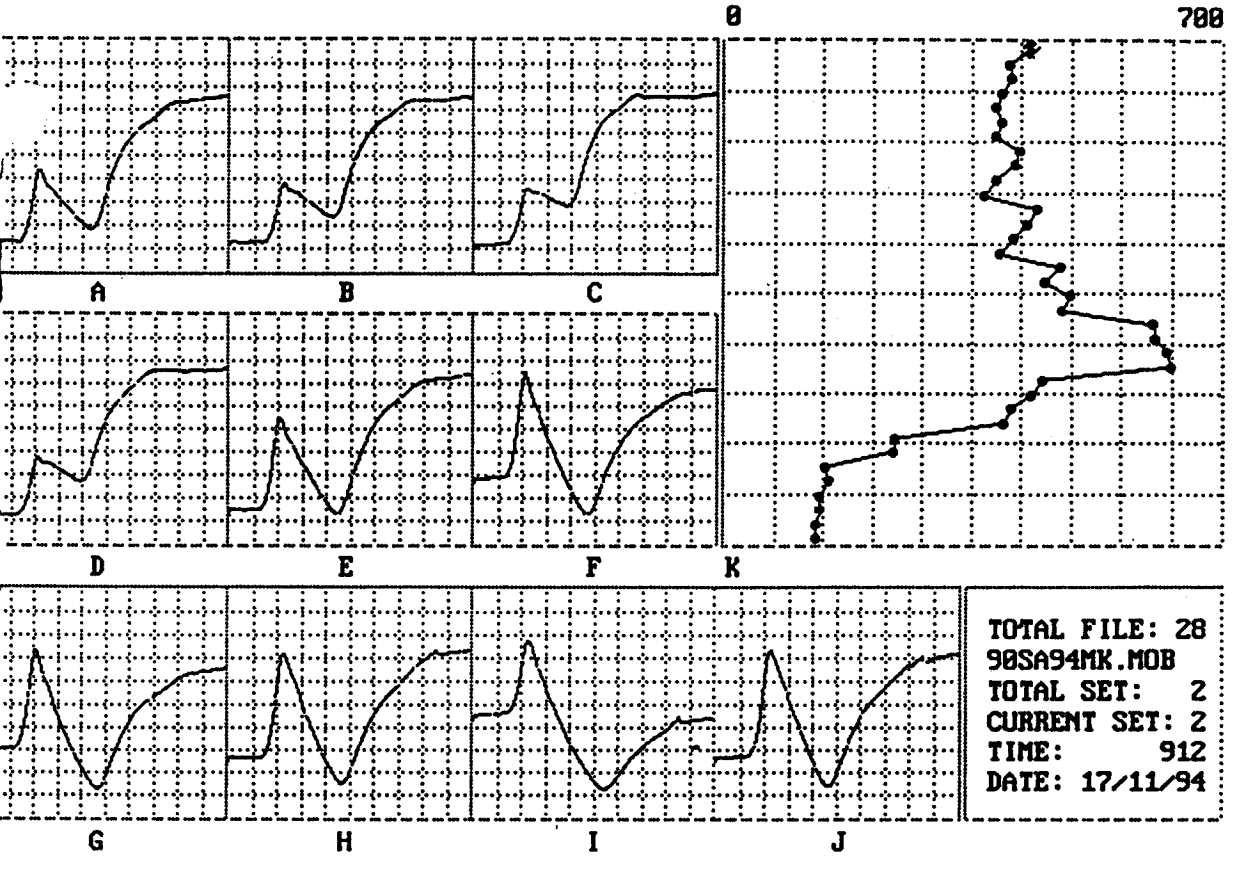


NOT FROST IN AUGUST ?

etter=Curve to select (*); PgU/PgD=Prior/Next set; Ctrl+PgU/PgD=Prior/Next File

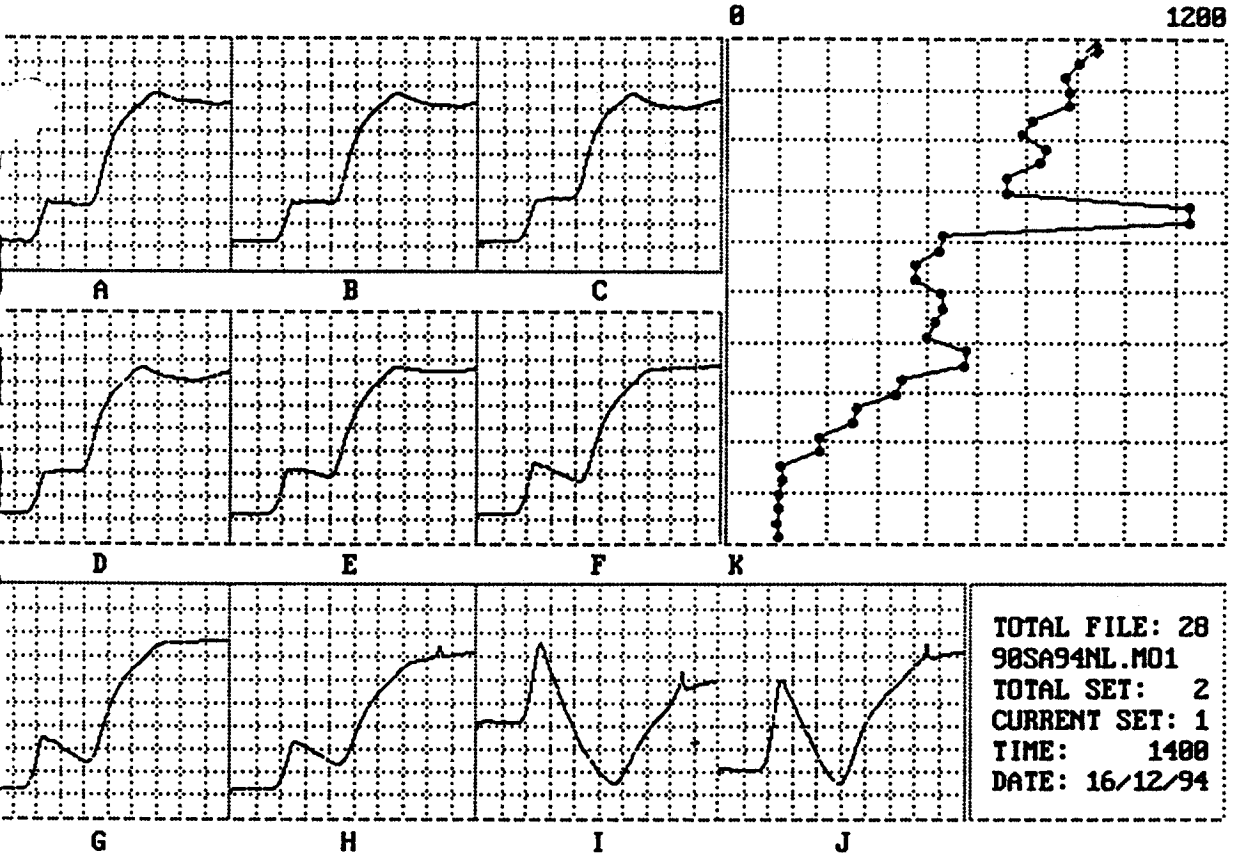
WHAT IS CAUSING CHANGE IN VOLTAGE PROFILE?

— MOISTURE CHANGES?

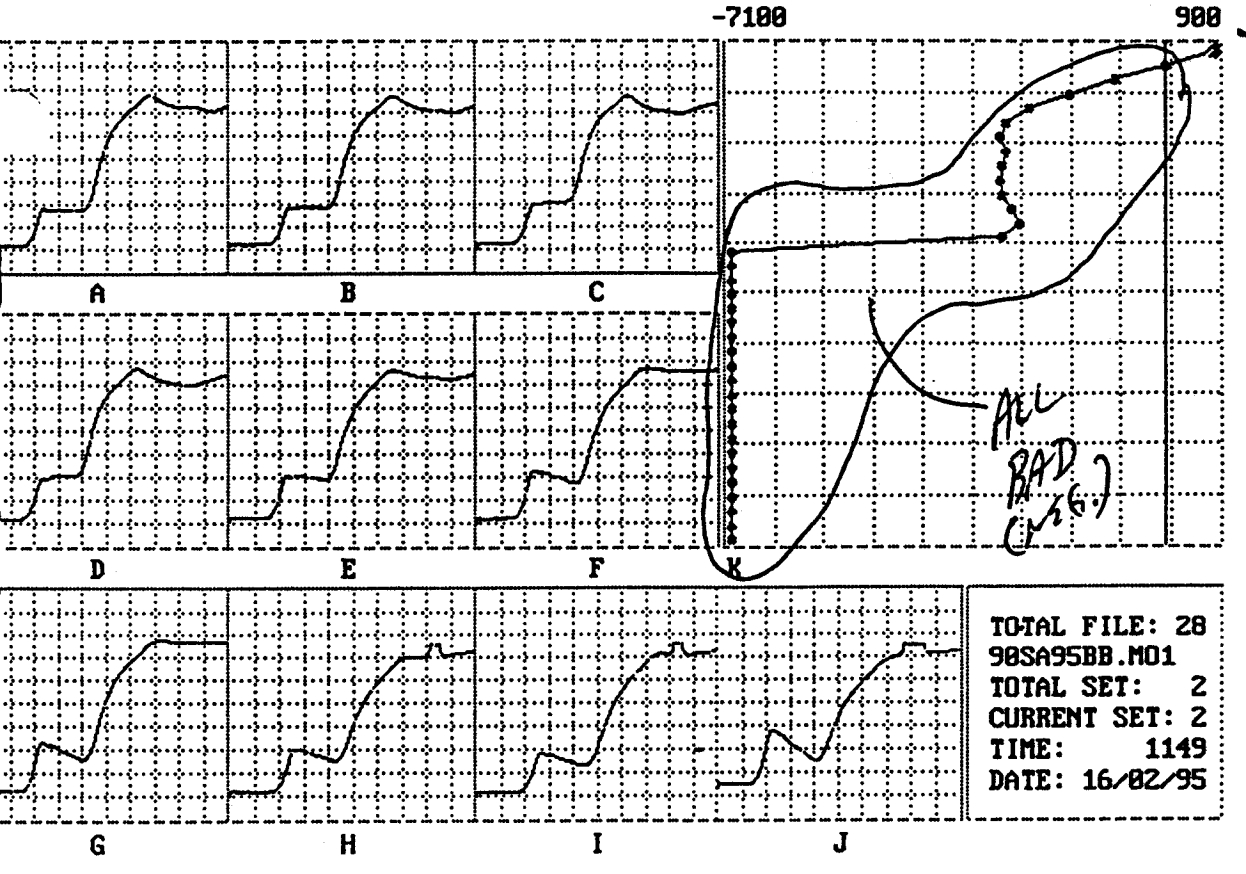


Enter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

- NOTE CHANGE NEXT MONTH FROM PROBE SHAPES IN NOVEMBER.



- CHANGE IN TDR SHAPE FROM NOV. TO DEC.
  FOR #1 (A)* THROUGH #8 (H).
- NOTE HORIZONTAL SIGNAL FOR #1 (A) to #4 (D)
  COMPARED TO VOLTAGE PROFILE CHANGE (FROST)



FHWA/TAC ADVISE GOOD/BAD

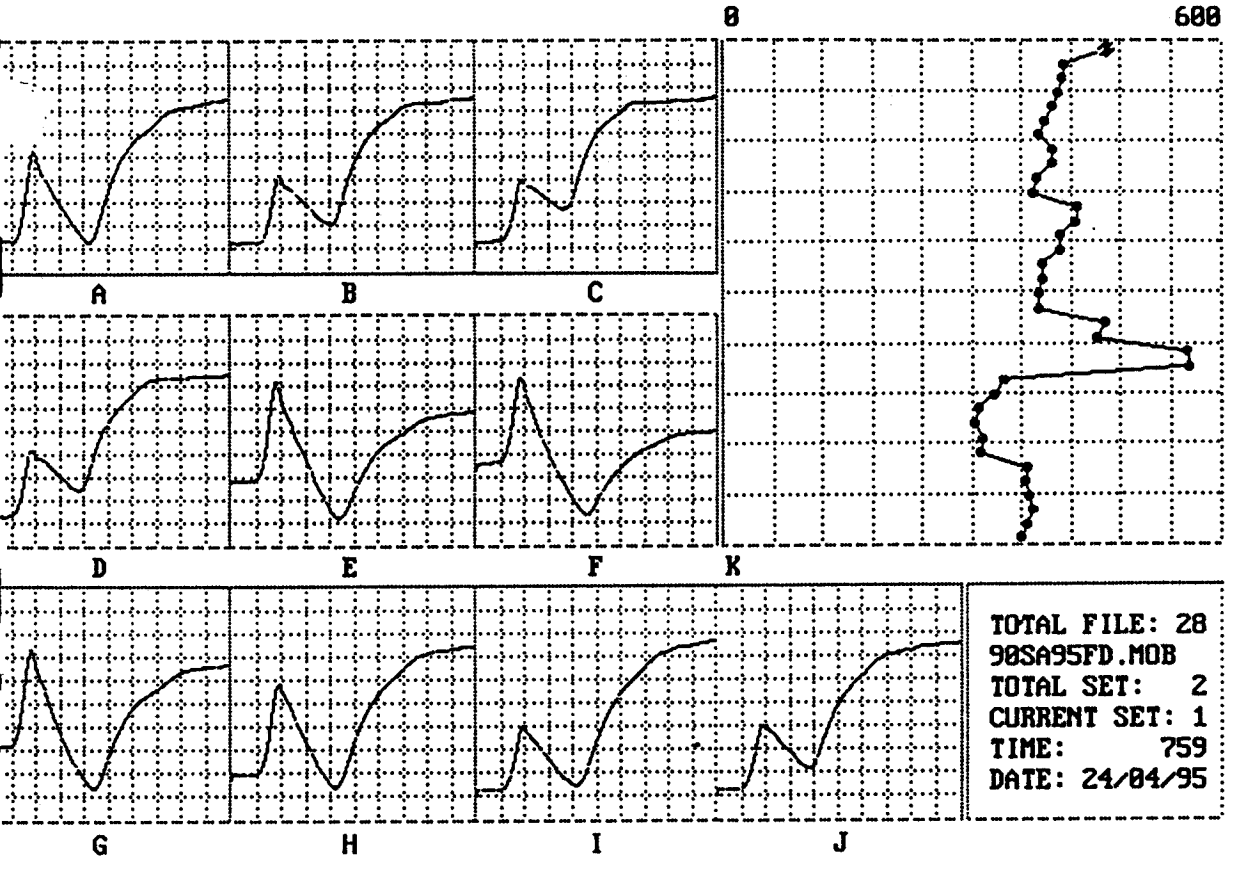
ALL BAD (?)

?

ter=Curve to select (↵): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

PROBLEM W/ CRREL DEVICE

- SHOULD NOT GET NEGATIVE VALUES.

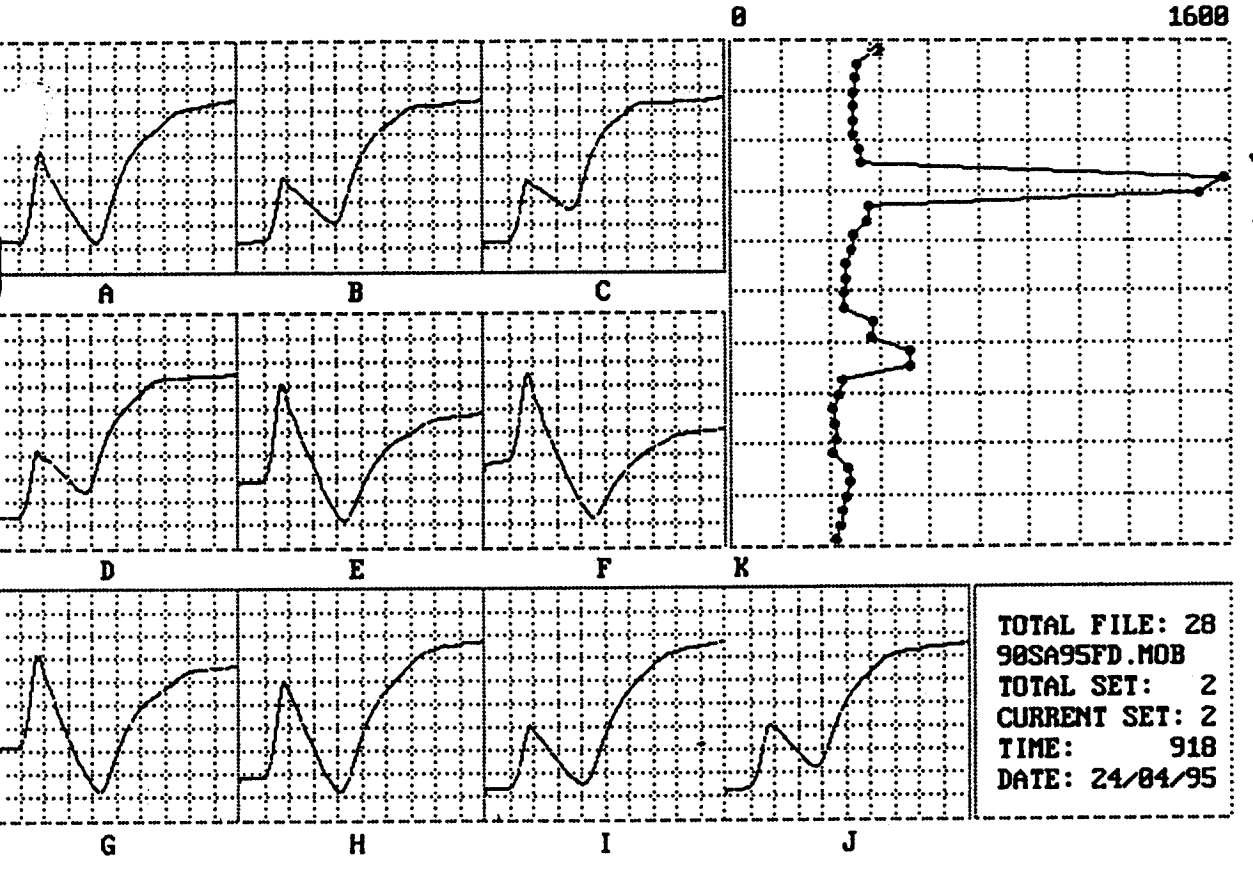


ter=Curve to select (↵): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

COMPARE VOLTAGE PROFILE TO SET 2.

ABOUT 1½ HOURS LATER.

— PROBLEM WITH 11/12 ?



} FHWA/TAC ADVISE GOOD/BAD?

er=Curve to select (↵): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

COMPARE TO SET 1 FOR CRREL

1½ HOURS EARLIER

Appendix D-3: GPS Section 906405 SHRP SMP Pilot Results

Appendix D-3 contains the following information:

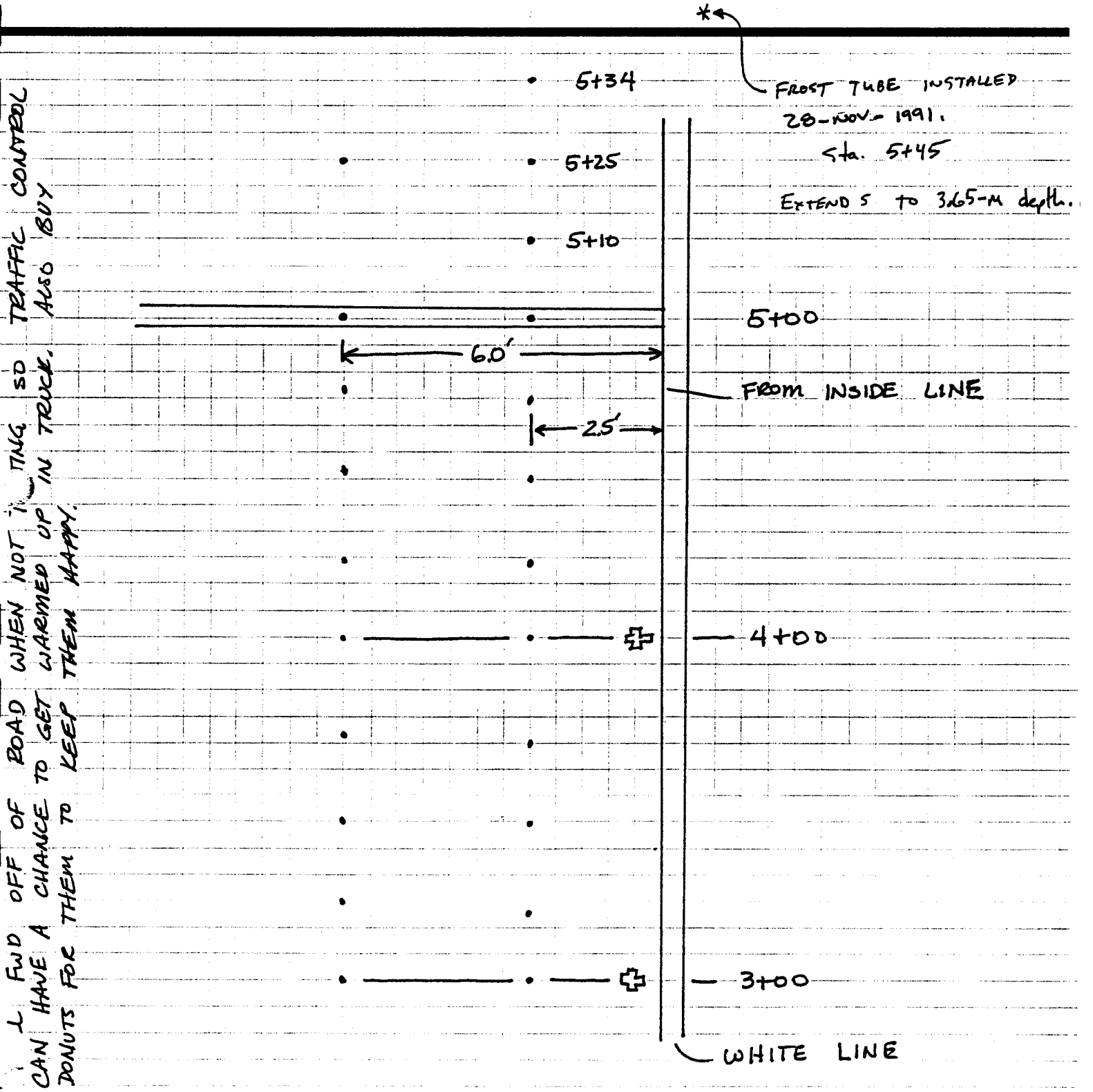
- Notes from pilot site selection and testing; and
- Seasonal Monitoring Data Analysis Report for the SHRP pilot.

BRAUN℠
INTERTEC

Description: 906405 SASKATCHEWAN
SEASONAL FWD LAYOUT

Project No:

Date: 1991 By:

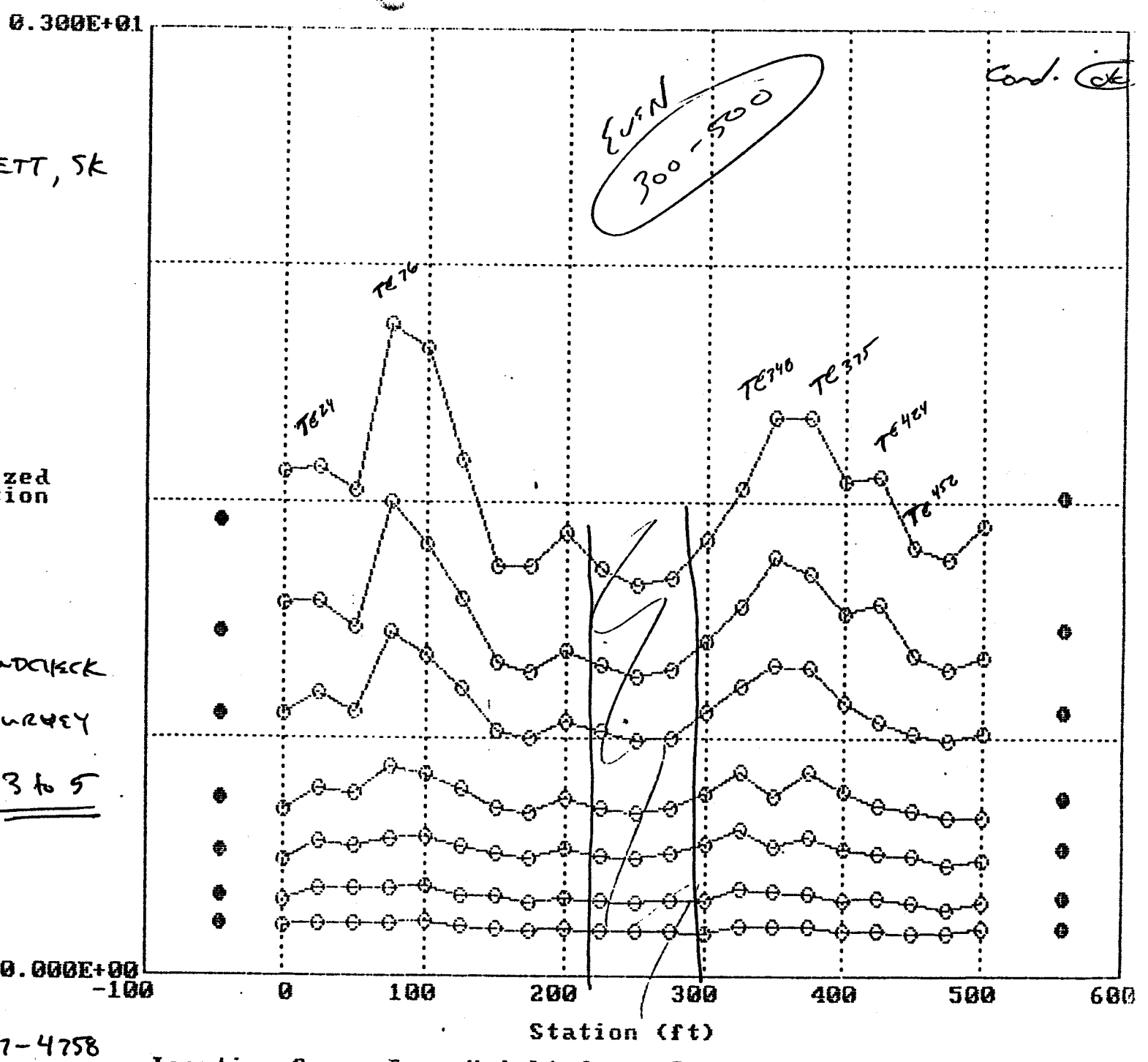


I FWD CAN HAVE A CHANCE TO GET OFF OF ROAD WHEN NOT IN TRUCK. ALSO BUY DONUTS FOR THEM TO KEEP THEM HAPPY. TRAFFIC CONTROL

DBMX91: 3

Deflection Data for Section: 906405A

- SECTION 906405
  - EAST OF PLUNKETT, SK
  - PART OF SPS-3



CONCLUSION FROM FUDCHECK AND DISTRESS SURVEY

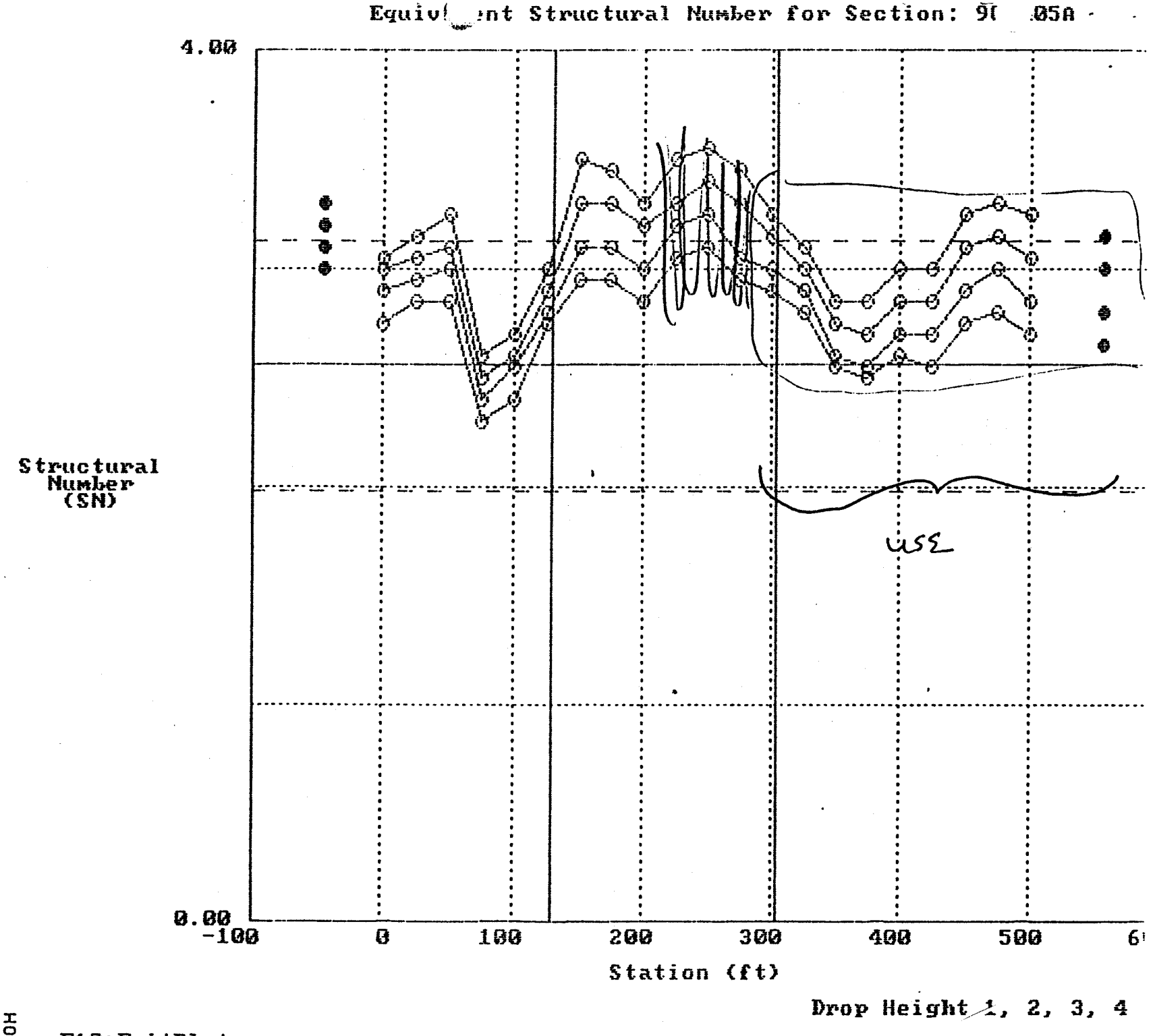
- USE Sta. 3 to 5

Traffic Control

- Roger Couturier/ Greg Gilks 306-787-4758

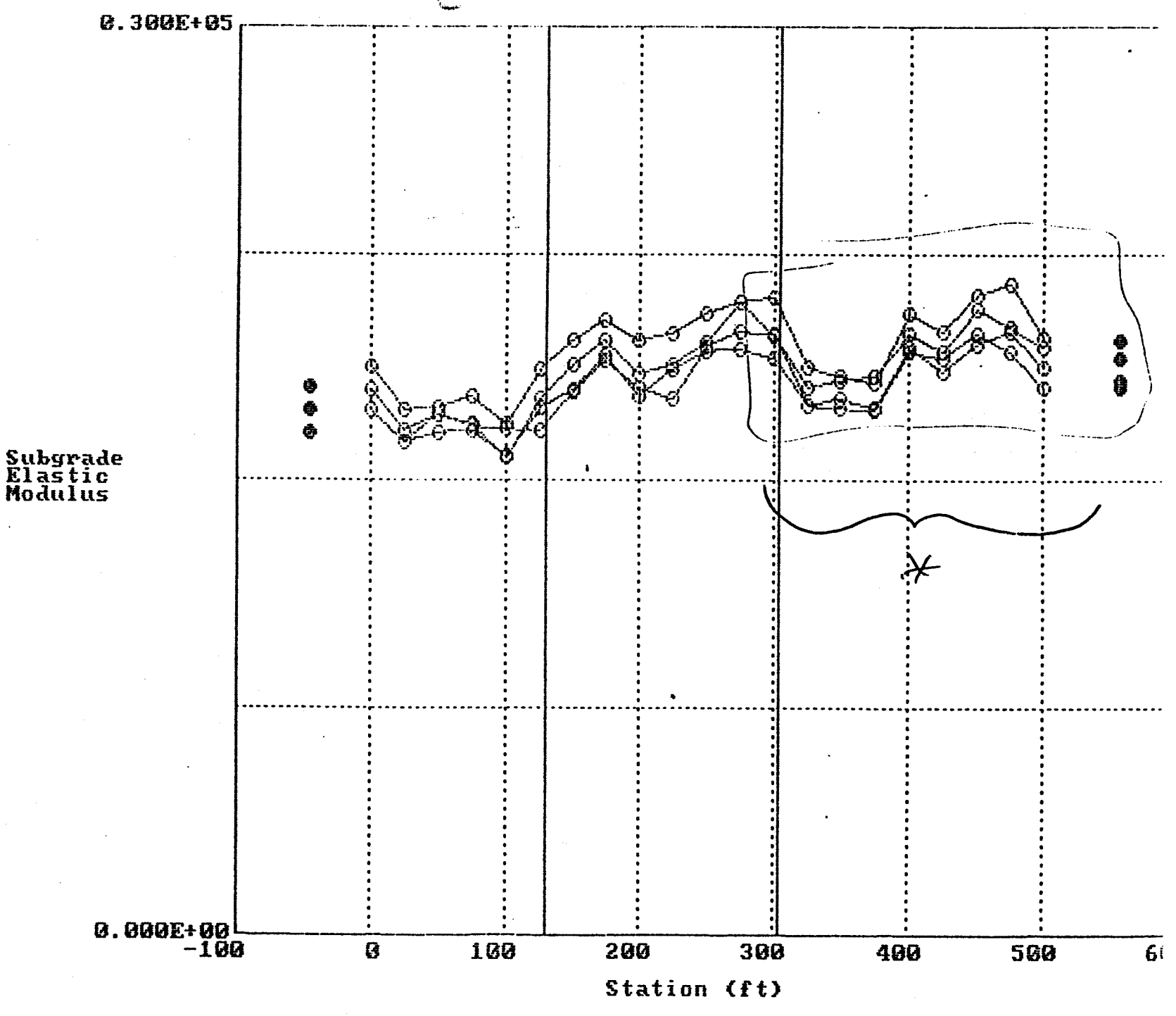
Location 3 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7

F2:ScrnDump F10:Exit



F10:ExitPlots

Subgrade Elastic Modulus for Section: 90 50



Drop Height 1, 2, 3, 4

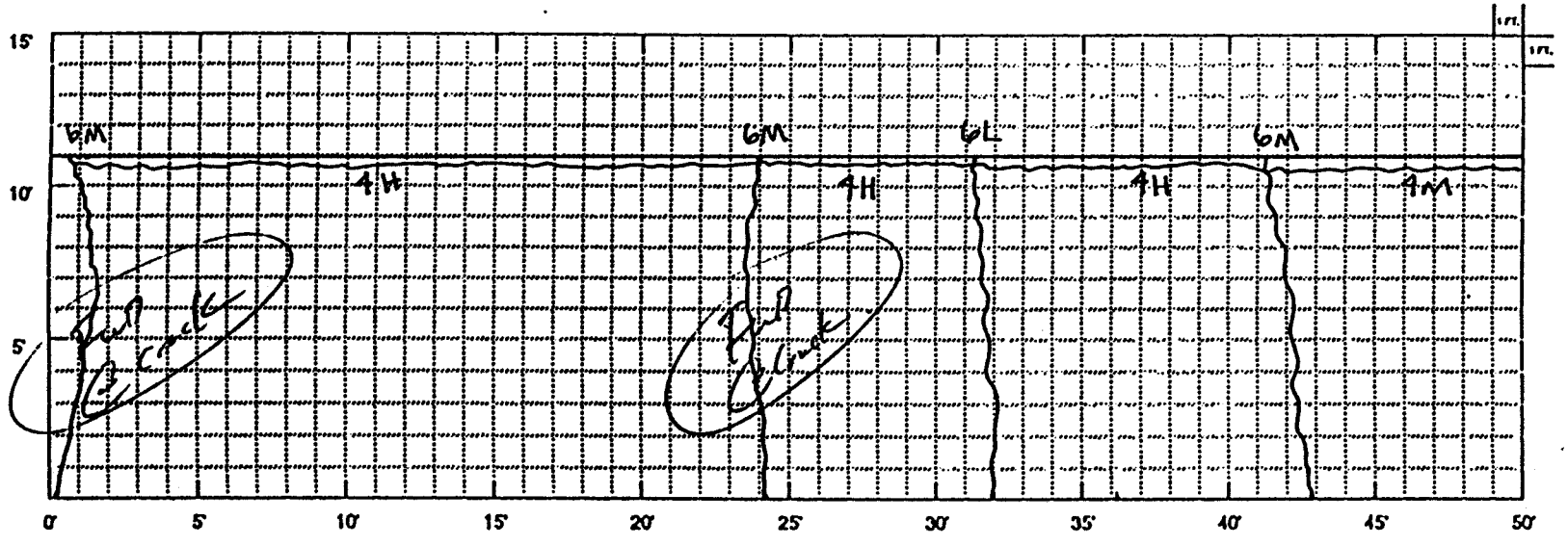
F10:ExitPlots

Date 5/8/91

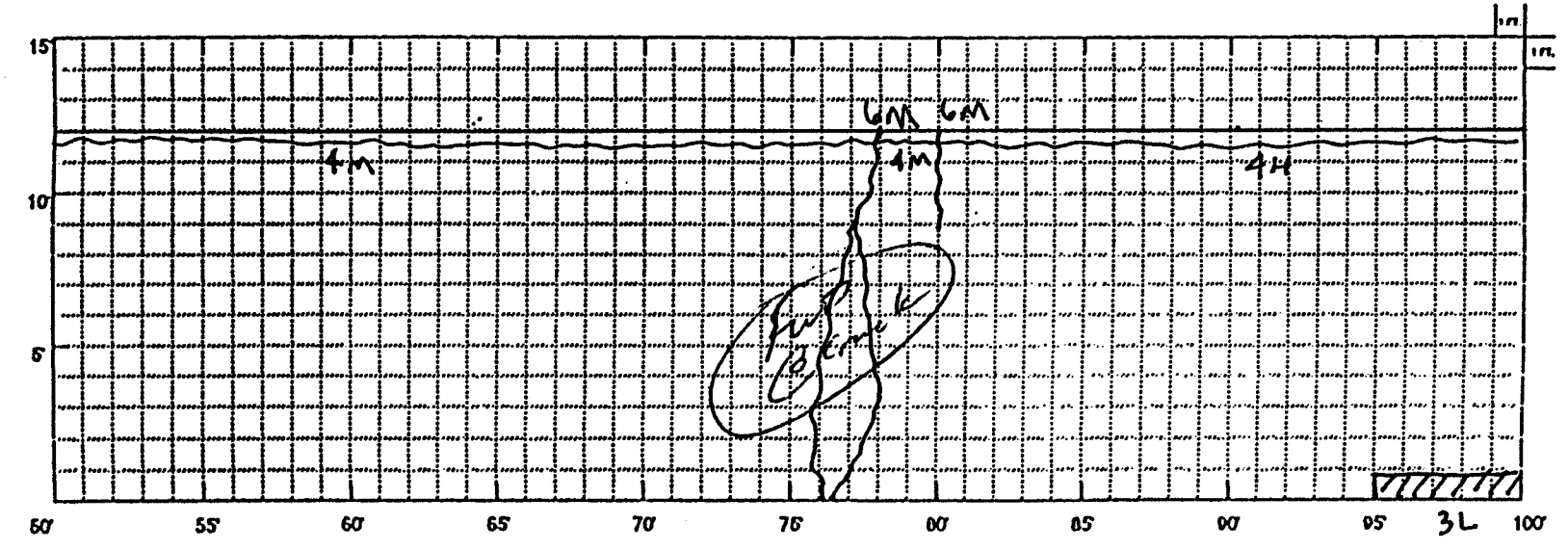
State Assigned ID ____

State Code 90

SHRP Section ID 6405



Comments: _____

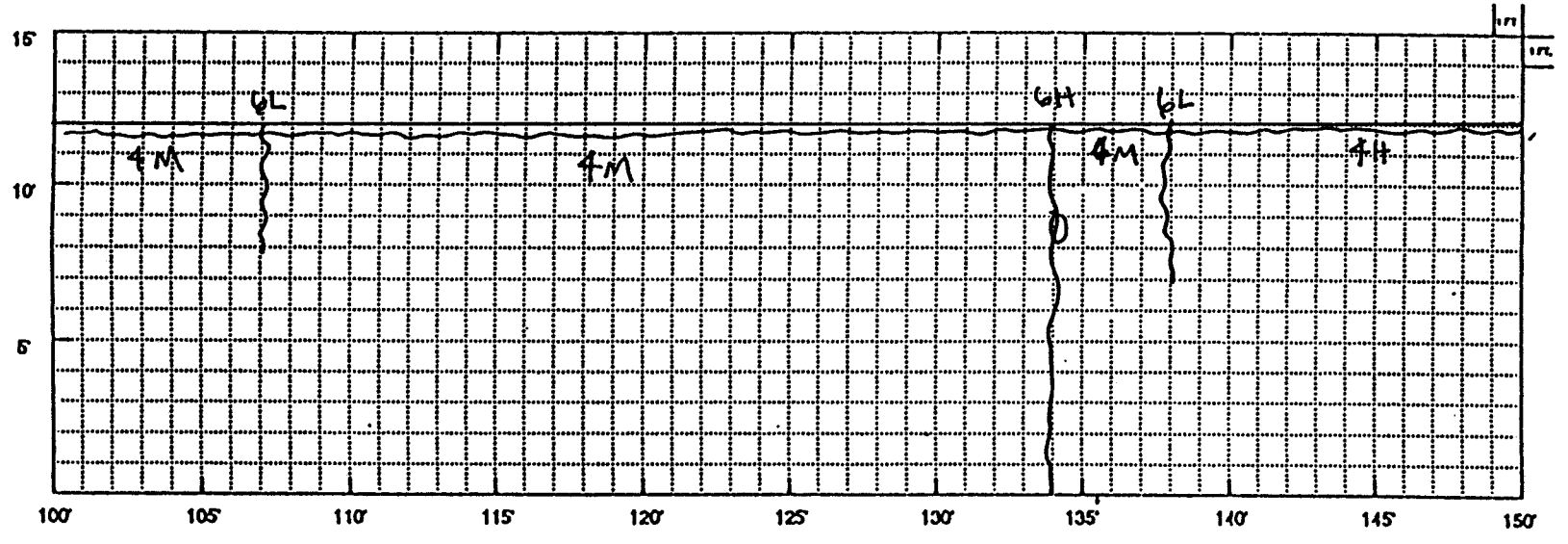


Comments: _____

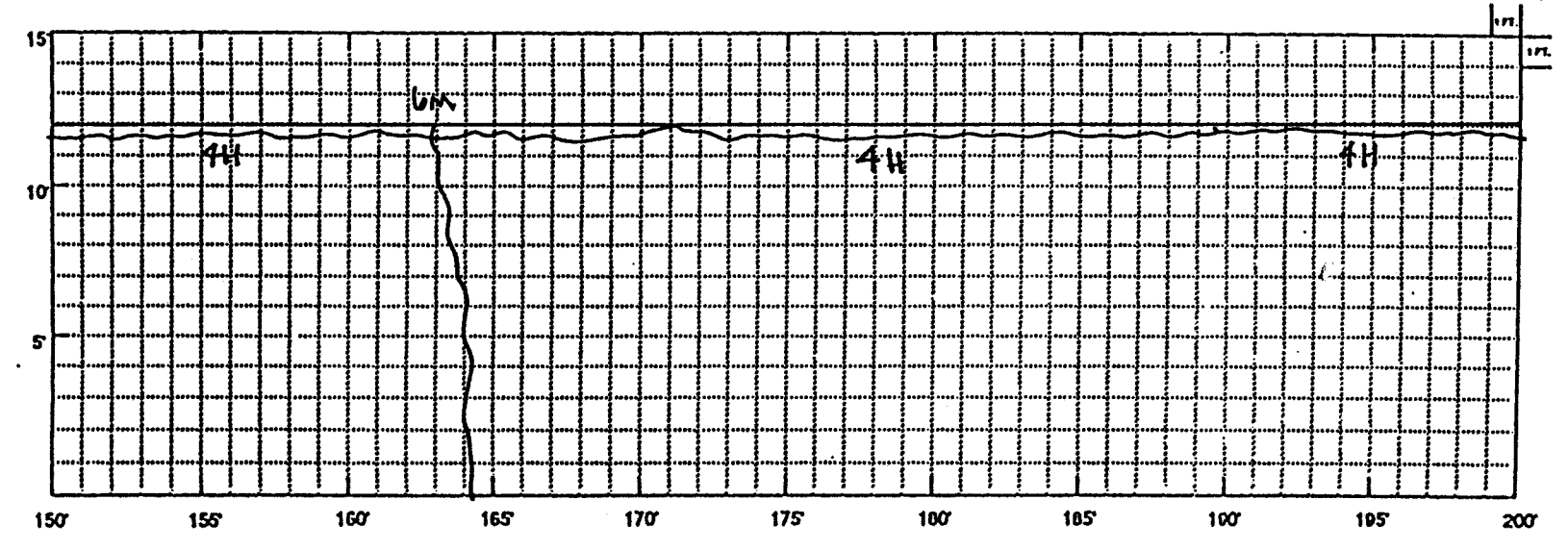
State Assigned ID _____

State Code 90

SHRP Section ID 6405



Comments: _____

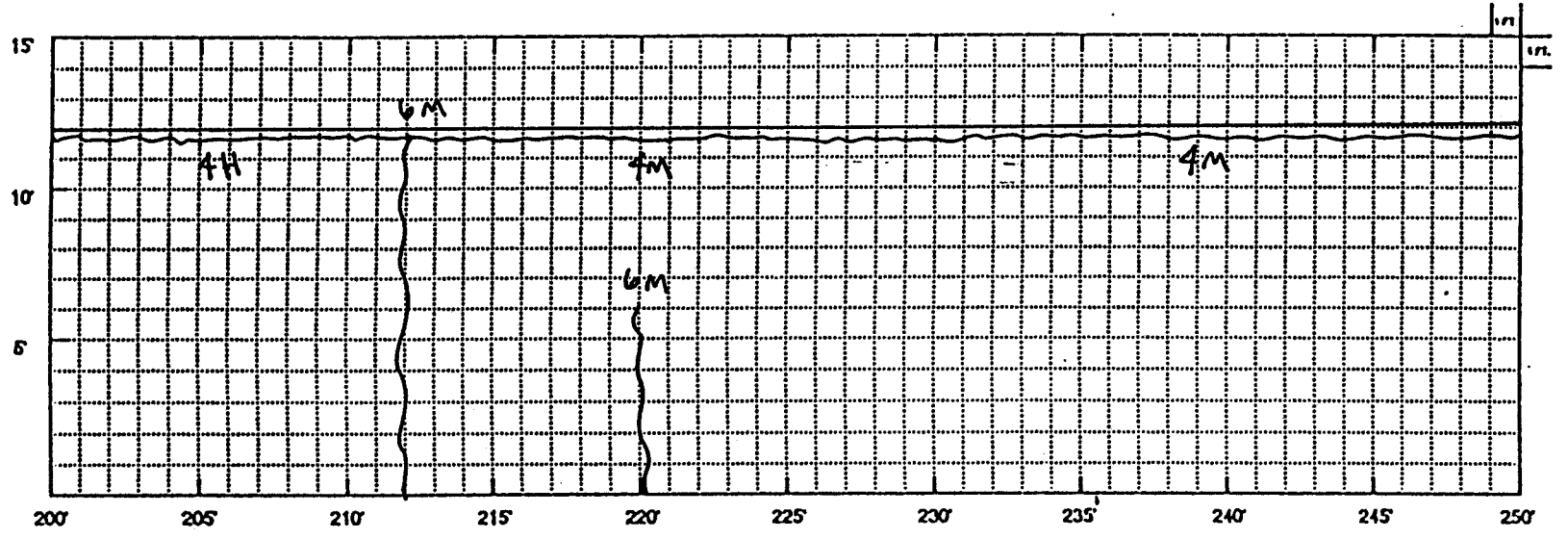


Comments: _____

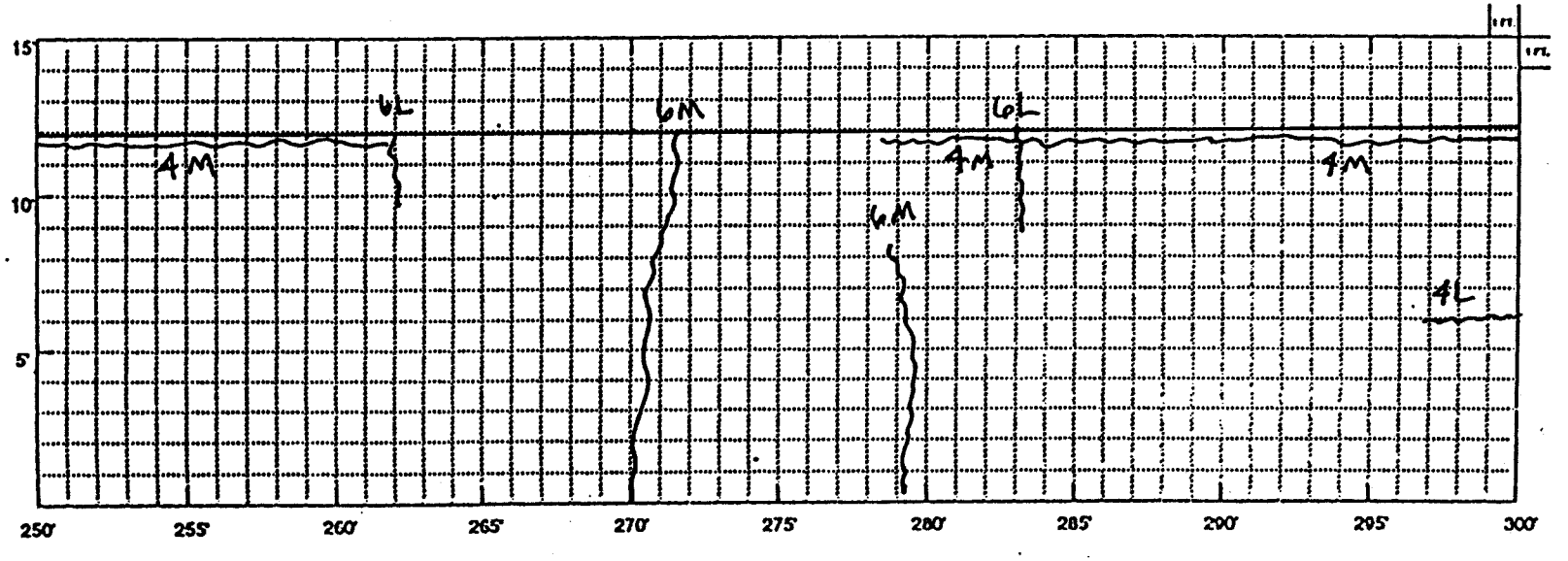
State Assigned ID ___ ___ ___

State Code 9 0

SHRP Section ID 6 4 0 5



Comments: _____

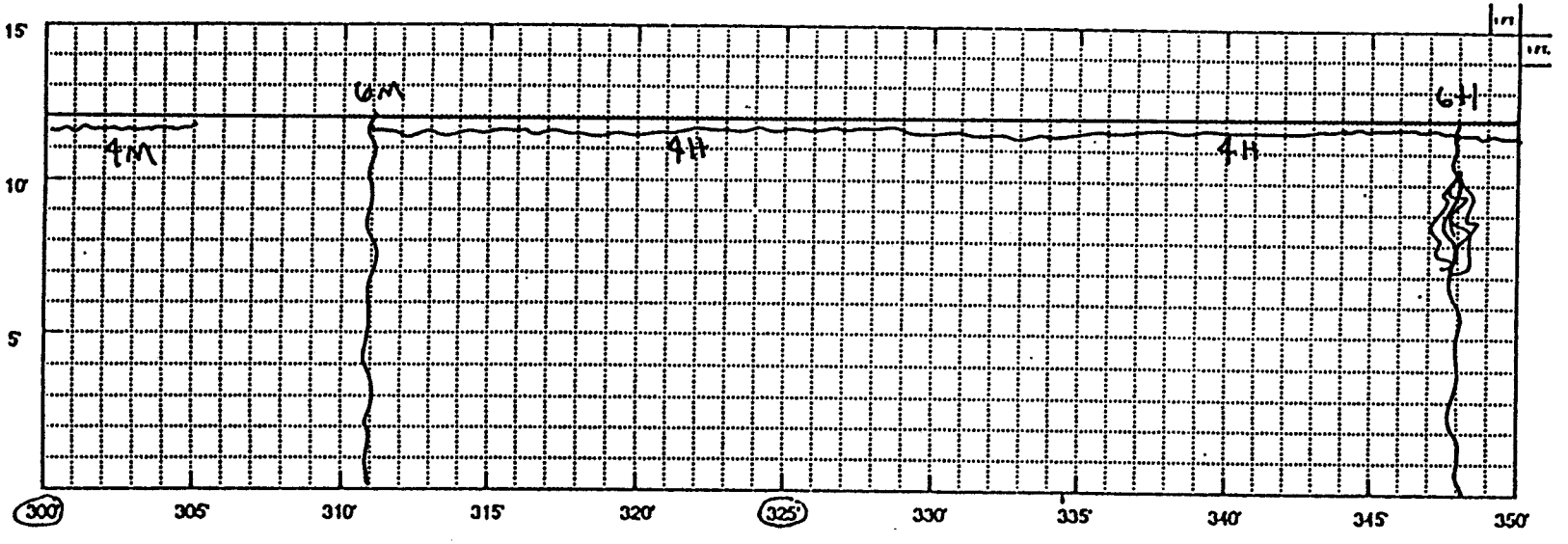


Comments: _____

State Assigned ID _____

State Code 9 0

SHRP Section ID 6 4 0 5



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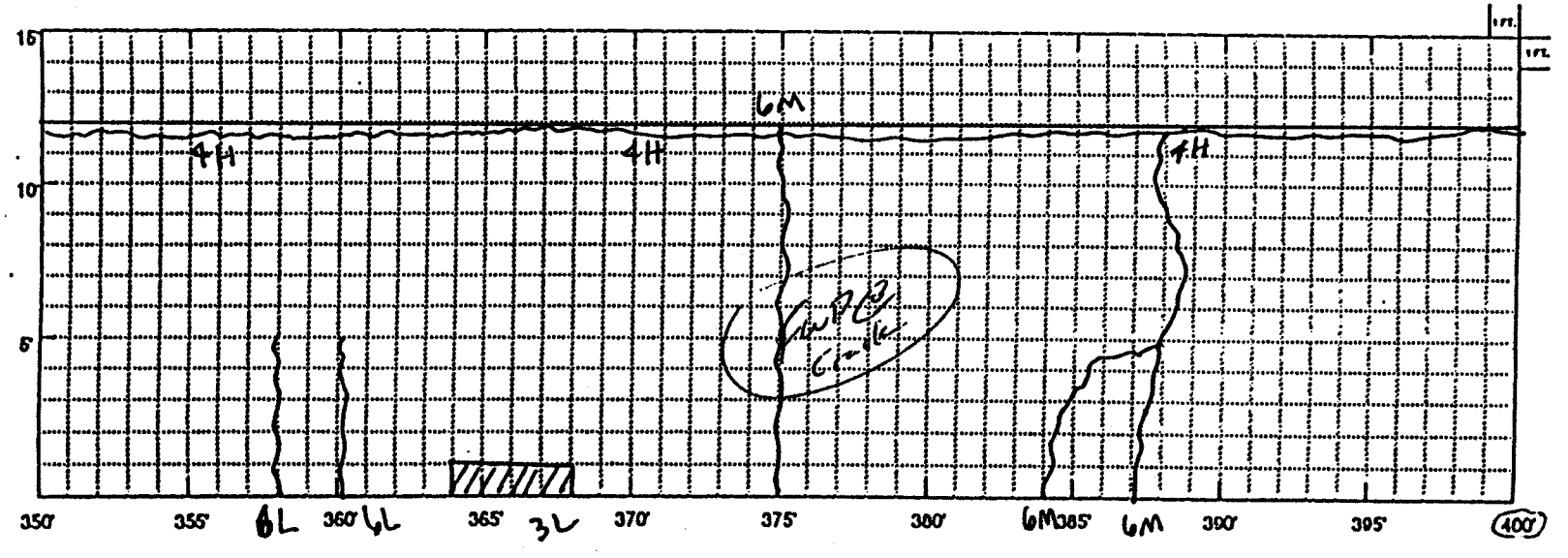
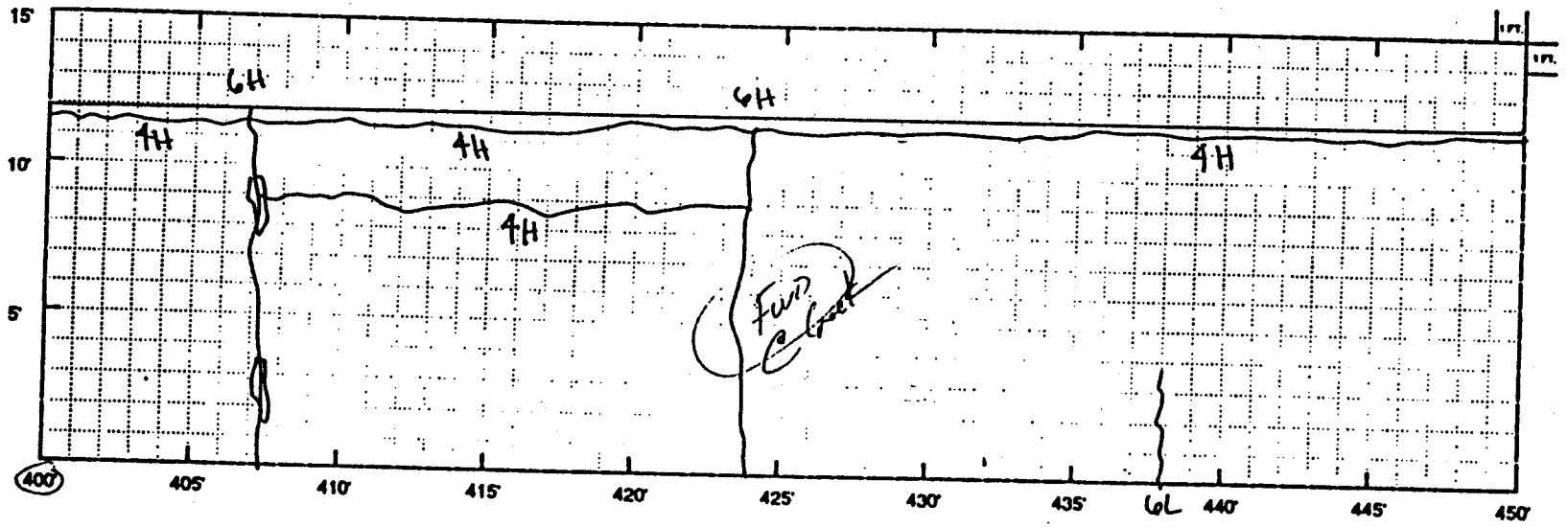


Comments: _____

State Assigned ID ____

State Code 90

SHRP Section ID 6405



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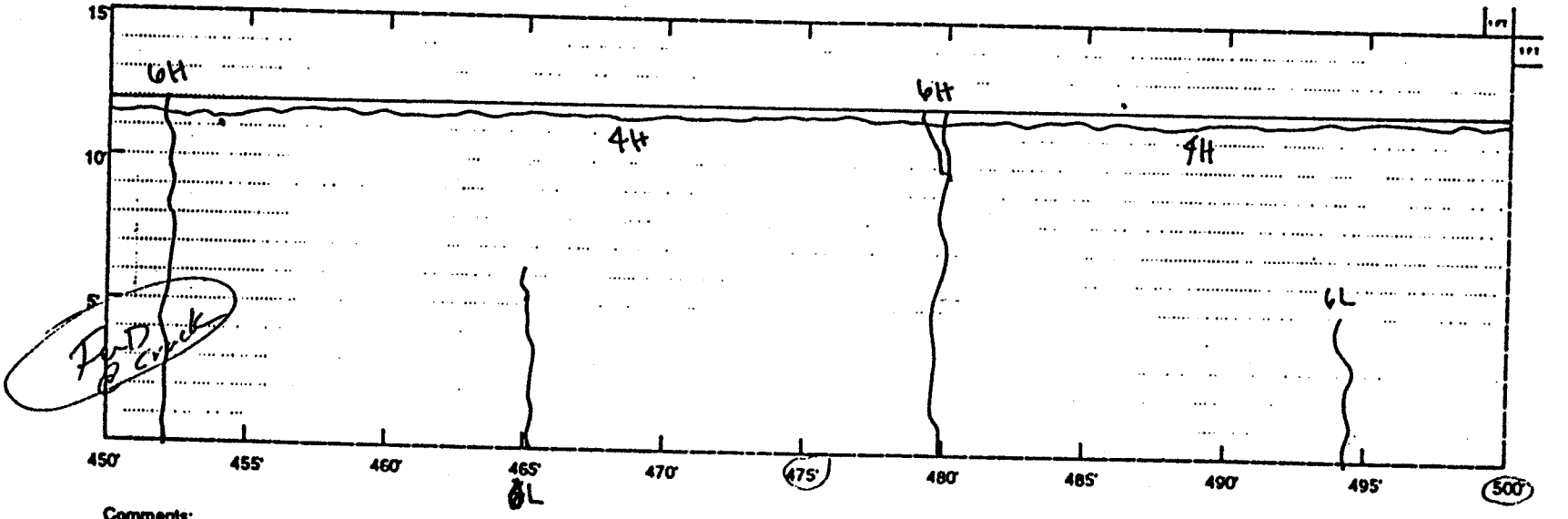

Comments: _____

A.5

Frost heave

~~550~~

545

Paper No. 940903

PREPRINT

Title: Seasonal Characterization and Fatigue Damage of Flexible Pavements in the North Central Region of FHWA-LTPP Study

Author(s): Chunhua Han

Erland O. Lukanen

Robert Van Sambeek

Transportation Research Board
73rd Annual Meeting
January 9-13, 1994
Washington, D.C.

SEASONAL CHARACTERIZATION AND FATIGUE DAMAGE OF FLEXIBLE PAVEMENTS IN THE NORTH CENTRAL REGION OF FHWA-LTPP STUDY

by

Chunhua Han, Erland O. Lukanen, and Robert Van Sambeek

Braun Intertec Corporation
St. Paul, MN 55117-2004

ABSTRACT

This paper contains analysis results of Falling Weight Deflectometer (FWD) data that was collected on a monthly basis for seven General Pavement Studies (GPS) sections in the North Central Region of the Federal Highway Administration Long-Term Pavement Performance (FHWA-LTPP) study. All seven sections had an asphaltic concrete surface, each with different structural designs. About 1400 tests were run on each section during a test day. The testing was on a monthly basis over a one-year period according to the "SHRP LTPP Seasonal Monitoring Program." The paper examines daily, seasonal and spatial variation in pavement deflection, as well as, daily variation in temperature for selected test sections.

Layer modulus values were backcalculated using the LTPP study procedure and WESDEF. The results indicate that the backcalculated modulus values of the asphaltic concrete surface layer are mainly dominated by the pavement temperature and the logarithms of the modulus values are linearly related to the mid-depth pavement temperature. The seasonal variation of the backcalculated modulus of the supporting layers was also examined and characterized. This shows that the monthly backcalculated modulus of the subgrade strongly depend on the local climate conditions such as freezing and thawing.

Fatigue damage over the year was estimated for two typical sections based on the available field instrumentation data. A monthly damage percentage was than developed which shows the variation in structural capacity over that particular year. To do this, the horizontal tensile strain at the bottom of the asphalt layer was obtained using a forward calculation technique. Witczak's fatigue failure criterion was used to sum monthly damage in each season assuming a constant monthly cumulative 18,000 pound (80 kN) Equivalent Single Axle Load (ESAL). A probability distribution of pavement temperature was used to weigh the monthly fatigue damage. The results show that, with the in-field testing data and developed methodology, the fatigue damage can be quantified and the period or season with the most damage can be identified.

INTRODUCTION

Nondestructive testing (NDT), along with temperature, moisture and frost/thaw depth instrumentation, provides data to evaluate the long-term structural performance of pavements. In the Federal Highway Administration Long Term Pavement Performance (FHWA-LTPP) study, 64 carefully selected pavement test sections will be monitored *(1)*. These sections, called seasonal monitoring sections, include four pavement categories, two subgrade soil types, and four climat iczones. In a pavement service life cycle, each climate (yearly) cycle is different from another and produces different impacts on pavement structures. In each climate cycle, seasonal variation in environmental conditions may dramatically change pavement support and material properties. Seasonal characterization, therefore, is a crucial step toward the analysis of the environmental effect on structural characteristics of pavements. The seasonal monitoring program of LTPP will be the first national study on the effects seasons have on pavement performance.

Distresses induced by fatigue damage are sensitive to climate conditions. Various fatigue criteria were developed using laboratory and field measurements and expressed by a general logarithmic relation between the tensile strain at the bottom of the asphalt layer and the number of load repetitions at a standard temperature, 70°F (21°C). In Witczak's fatigue failure criterion *(2)*, pavement temperature is included as a variable rather than a standard condition after the strain-modulus relations at different temperatures were idealized. This generalization by Witczak made it practical to estimate pavement fatigue damage using only field-testing data.

This paper deals with the seasonal characterization of seven General Pavement Studies (GPS) pilot sections monitored in the North Central Region of the FHWA-LTPP study prior to installation of instrumentation. The sections are asphalt pavements on fine-grained subgrades. The analysis results were based on falling-weight-deflectometer (FWD) data collected on a monthly basis. Results of a comprehensive study on the seasonal characteristics of selected flexible pavements and the relative seasonal fatigue damage are presented. The study focused on deflection results. However, other data such as Drilling and Sampling data, Laboratory Testing data, pavement temperature data, and frost tube data were also used to obtain layer structure and thermal gradient information. Data from the instrumented sections will be more complete and the results presented in this paper indicate the importance of understanding the effects seasonal variation have on the performance of pavements. Such understanding will be valuable in scheduling routine data collection, such as weigh-in-motion and deflection. Factors to adjust measurments made during non-critical times could also be developed based on seasonal sensitivities.

FIELD TESTING

FWD testing in the pilot phase only included seven asphalt pavement sections built on fine-grained subgrade in the dry-freeze climate of the North Central Region. Adequate structural data was collected for all seven sections. One section was instrumented with a frost tube by the highway agency. Currently, the second phase of seasonal field testing is underway. Sixteen test sections including four pavement types (thin asphalt, thick asphalt, jointed plain concrete, and jointed reinforced concrete), two subgrade soil types (fine and coarse), and two climate zones (dry-freeze and wet-freeze) will be monitored in the North Central Region. Instrumentation for measuring temperature, moisture, and frost/thaw depth have been installed on seven of these sixteen sections to date *(1)*. The field testing described in this paper, however, is limited to the pilot phase without the benefit of instrumentation.

Regional Layout of Test Sections

Seven pilot test sections were monitored from November 1991 to August 1992 for studying the seasonal performance of asphalt concrete pavements (Figure 1). Of these seven sections, five were used in the study because these five are geographically representative of the North Central Region. These include Site 201009 in Kansas, Site 311030 in Nebraska, Site 469187 in South Dakota, Site 831801 in Manitoba, and Site 906405 in Saskatchewan. Consequently, only one section was selected from three in Kansas.

Falling Weight Deflectometer (FWD)

A Dynatest Model 8000E FWD was used for testing the seasonal sections. FWD calibration was maintained according to procedures established by FHWA-LTPP Study for yearly reference calibration and monthly relative calibrations *(3)*.

Testing Program

FWD testing was done according to the Strategic Highway Research Program LTPP guidelines *(3)*. However, not all of the procedures in the guidelines were applicable because instrumentation was not installed on the sections.

The following points summarize the FWD testing that was done:

- only asphaltic concrete pavements were monitored,
- FWDCHECK *(4)* results and distress data from earlier testing were used to select which end of the sections to monitor,
- 1/2 inch (1.27 cm) diameter holes, one inch deep, were drilled at 2.5 feet (0.76 m) and 6.0 feet (1.83 m) from the edge at either station 0 or 5 to serve as reference points for positioning the FWD load plate,
- test locations were measured out with a tape and marked with paint on the first round of testing and remarked as needed on subsequent visits,
- the "FLEX" Testing Plan *(3)* was used for the sensor spacing, drop sequence, load levels, data stored, test checks, etc.,
- testing was done both in the midlane and the outer wheel path at 25 foot (7.62 m) intervals for 200 feet (61 m) of the section plus at four additional locations outside the section limits in the area for future instrumentation (Figure 2),
- efforts were made to test within two inches of the original test point locations,
- testing was repeated on a monthly cycle unless other testing took priority,
- efforts were made to collect four sets of data at two hour intervals for each visit unless equipment problems or weather delays prohibited,
- temperature gradient measurements were recorded hourly at three depths for each section during the testing.

Surface condition and layer structure

A condition survey was conducted on Nov.29, 1990. The survey results are shown in Figure 3b along with the layer structure. No other distress, except simple cracks, were observed.

Deflection and temperature

Sensor 1, 4, and 7 deflections measured at the midlane at station 150 are plotted against the time in Figure 5a. The deflections are the lowest in January and highest in August. The biggest daily variation occurred in August; the corresponding spatial deflection variation is shown in Figure 5b. The four deflection basins measured that day are shown in Figure 5c. The daily variation in temperature is shown in Figure 5d.

Site 469187 in South Dakota

Site 469187 is 0.11 miles (0.18 km) north of reference post 156 on south bound ST 73 in South Dakota. The road has one 12-foot (3.66 m) wide lane in each direction. It is geographically at latitude 45°00', longitude 102°09', and elevation 2360 ft (719 m). The site was constructed in 1989 and is in a Dry-Freeze Region.

Surface condition and layer structure

The Pavement surface is in excellent condition and has the structure shown in Figure 3c.

Deflection and temperature

The seasonal deflections have minimal change from November to April, as shown in Figure 6a, with maximum deflection in August. Spatial and daily variation in deflection is relatively small as shown in Figures 6b and 6c. The daily variation in temperature is shown in Figure 6d.

Site 831801 in Manitoba

Site 831801 is on west bound Highway 1 west of Oak Lake, Manitoba. This road is a divided four-lane road with two lanes in each direction. It is located geographically at latitude 49°50', longitude 100°30', and elevation 1400 ft (427 m). The road was constructed in 1984. The site is in a Dry-Freeze zone.

Surface condition and layer structure

The condition survey from May 9, 1992 is illustrated on Figure 3d, including the layer structure.

FIELD DATA INTERPRETATION

In the analysis, a typical station and a typical date were selected to show seasonal and daily variation in deflection and pavement temperature respectively. For a clear graphical interpretation, the deflection data at the sensor offsets of 0 in. (0 cm, Sensor 1), 18 in. (46 cm, Sensor 4), and 60 in. (152 cm, sensor 7) were included in the figures. All plotted points represent the average of four drops at each point. Multiple points plotted at any station represent additional passes at approximate two hour intervals.

Site 201009 in Kansas

Site 201009 is 0.65 miles (1.05 km) north of reference post 78 on south bound US 281 in Kansas. The road has one 12-foot (3.66 m) wide lane in each direction. It is located geographically at latitude 37°59', longitude 98°45', and elevation 1922 feet (586 m) above sea level. The road was constructed in 1985.

Surface condition and layer structure

A condition survey was conducted on Nov.19, 1991 when the seasonal monitoring program was started. The survey results and layer structure are shown in Figure 3a.

Deflection and temperature

Figure 4a shows the seasonal deflection variation by date for the midlane test location at station 300, for about 6,000 lbs (26.7 kN) or 55 psi (379 kPa) plate pressure. On a test day, each test location was tested two to four times. Sensor 7 deflection shows little change with time of year. However, over the year, Sensor 1 and Sensor 4 deflection vary by 2 mils and 1 mil (0.050 and 0.025 mm), respectively. The lowest deflection occurred in January. Spatial (longitudinal) and daily deflection variation on April 14, 1992 are shown in Figure 4b. Again, Sensor 7 deflection fluctuates within a small range. Four deflection basins measured at station 300 on Apr.14, 1992 are shown in Figure 4c. The daily variation in temperature is shown in Figure 4d.

Site 311030 in Nebraska

Site 311030 is 0.89 mile (1.43 km) east of reference post 129 on west bound US 6 in Nebraska. The road has one 12-foot (3.66 m) wide lane in each direction. It is geographically at latitude 40°19'20", longitude 99°50'02", and elevation 2300 ft (701 m). The road was constructed in 1982 and opened to traffic in 1986. The section is located in an area classified as a dry-freeze.

Deflection and temperature

Figure 7a shows the seasonal variation in the deflection. The deflections clearly define a pattern, with a minimum in February and a maximum in May. In contrast to other sites, this site has a shorter time between the minimum and the maximum deflection. However, the spatial and daily variations remain relatively small (Figures 7b and 7c). The daily change in temperature is shown in Figure 6d.

Site 906405 in Saskatchewan

Site 906405 is on east bound Highway 16 near Plunkett, Saskatchewan. This road is an undivided two-lane road with one lane in each direction. It is located geographically at latitude 51°54', longitude 105°19', and elevation 1785 ft (544 m). The road was constructed in 1969.

Surface condition and layer structure

The condition survey from May 9, 1992 is illustrated on Figure 8; also included is the layer structure with thaw/frozen/unfrozen subgrade. Climatic effects on soils in this section introduces additional layers with different properties into the pavement layer structure, as defined by the frost tube data.

Deflection and temperature

Figure 9a shows the seasonal variation in deflection. The deflections clearly define a pattern, with a minimum in February and a maximum in May. This site, similar to 831801 in Manitoba, has a shorter time between the minimum and the maximum deflection. However, the spatial and daily variation still remains relatively small (Figure 9b and 9c). The daily variation in temperature is shown in Figure 9d.

SEASONAL CHARACTERIZATION

The deflection data were analyzed using two methods of layer moduli backcalculation: the SHRP procedure *(5)* which is based on MODULUS *(6)*, and WESDEF *(7)*. Four sections shown in Figure 3 were analyzed using the SHRP method. Different weight factors were applied to deflections from these four sections according to the layer information and sensor offset locations. The center deflection weight factor was 1.0 while the other deflections had lower weight factors.

The frost tube instrumentation in Saskatchewan allowed four different seasonal layer structures to be used as shown in Figure 8. For this particular case, the WESDEF program was used to backcalculate layer moduli in each seasonal structure *(8)* because the SHRP process would not run the layer configurations and low deflections during the frozen periods.

Asphalt Layer

For each test section, all the backcalculated asphalt modulus values at a fixed testing spot or station were correlated to the mid-depth pavement temperature. The relationship between these two attributes was determined from linear regressions based on the following equation:

$$E_{ac} = 10^{(\log_{10}E_0 - \alpha T)} \quad \text{(ksi)} \tag{1}$$

where E_{ac} is asphalt modulus in ksi; T is the mid-depth temperature (°F); $\log_{10}E_0$ and α are regression coefficients. The regression results for all selected five sections are listed in Table 1.

Subgrade

The backcalculated subgrade modulus are hardly related to the pavement temperature and are characterized against the month. Monthly variations in subgrade modulus for each section are shown in Figure 10, where the subgrade modulus in ksi were plotted against the numbered month. Some data points in this figure were interpolated when testing data was not available. There are two different seasonal patterns in subgrade modulus identified by the pilot testing program which show if a freeze-thaw period is included in the climatic cycle. As expected, when subgrade is frozen, the modulus is dramatically increased, and during the thaw, the modulus is significantly decreased. It should be noted that the subgrade moduli for Site 831801 in Manitoba were backcalculated based on a fixed pavement layer structure because no frost/thaw depth data was collected at this site; frost /thaw depth data will be available at this site for the current round of testing.

FATIGUE DAMAGE

The stiffness properties of the in-situ pavement materials needed for the structural analysis, were evaluated through the field nondestructive testing program discussed above. The seasonal variation in these properties results in different seasonal fatigue damage. Two major dominating factors are considered: the temperature of the asphalt surface layer and the stiffness of the supporting layers.

Theory of Relative Fatigue Damage

Theoretically, for an infinitesimal time period dt, the temperature distribution can be expressed by a probability density function f(T):

$$\int_{T_0}^{T_1} f(T)dT = 1 \tag{2}$$

where function f(T) statistically describes the variation in temperature over the period of dt. The function f(T) is useful as a weighting function of a fatigue failure function. Based on Minor's hypothesis, Witczak's failure function *(2)* is used and has the following form:

$$N(T,\varepsilon_t) = ab^{T^d}\left(\frac{1}{\varepsilon_t}\right)^c \tag{3}$$

Where $N(T,\varepsilon_t)$ is the equivalent number of 18-kip (80-kN) axle loads to 10% Class 2 fatigue cracking (slightly spalled alligator cracking); T is the pavement temperature (°F); ε_t is the critical horizontal

strain at the bottom of the asphalt layer; a, b, c and d are fatigue coefficients and equal 1.86351×10^{-17}, 1.01996, 4.995, and 1.45, respectively. Equation 3 resulted from the idealization of Kingham's tensile strain criteria that were derived directly from the results of flexible pavements at the AASHO Road Test *(9)*. It is seen from Equation 1 that $N(T,\varepsilon_t)$ depends only upon the temperature T for the period of dt if moduli of supporting layers are constant in the period of dt. Therefore, it follows that the fatigue damage in the period of dt has the form as:

$$d_t = P_t \int_{T_0}^{T_1} \frac{f(T)}{N_t(T)} dT \tag{4}$$

where P_t is the actual equivalent number of 18-kip (80-kN) axle loads applied over the period of dt. For a longer time period with t_0 and t_1 as the starting and ending time, the total damage can be obtained by integrating Equation 4:

$$d = \int_{t_0}^{t_1} \int_{T_0}^{T_1} \frac{f(T)}{N(T,t)} dT \; P(t) dt \tag{5}$$

With the help of Equations 4 and 5, the relative fatigue damage in the period of dt to the period of (t_1-t_0) is estimated using the ratio in percentage:

$$d_r = \frac{d_t}{d} \tag{6}$$

Analysis Method

The analysis process involved the discretization of Equations 4 and 5, forward calculation of the tensile strain ε_t, and estimation of the relative fatigue damage. The discretization is based on the variation in temperature for a month and the variation in material properties of supporting layers for a year. Due to lack of continuous temperature measurements, and for illustration sake, it is assumed that the variation in temperature during a testing day is representative for the month. In addition, the monthly projection of annual ESAL is assumed to be constant and evenly distributed for a year. When more data are available, these two assumptions can be eliminated. Steps to carry out the analysis process are as follows:

1. determine the discrete probability distribution of daily temperature using 10°F as the bin size.
2. calculate the asphalt moduli from Equation 1 using the central value temperature of each bin and use constant moduli of supporting layers for each month.
3. Calculate the tensile strain ε_t using the WESLEA layered elastic program and in turn the critical load repetition $N(T,\varepsilon_t)$ for the same central value temperature.
4. Sum the division of temperature frequency by the critical load repetition bin by bin.
5. Repeat above steps for every month and sum the results for the whole year.
6. Determine the relative fatigue damage in percentage (yearly damage percentage) from the ratio of the month sum and year sum.

Analysis Results

Two sections were selected since they represent two completely different climate cycles. Other conditions such as construction and instrumentation were also considered in the section selection for analysis. The sections selected are Site 311030 in Nebraska with no freeze-thaw period and Site 906405 in Saskatchewan with a freeze-thaw period. Figures 11 and 12 show the analysis results of relative fatigue damage for these two test sections. In terms of yearly damage percentage, the relative fatigue damage is plotted against the numbered month for one year in these two figures. It is clear from the figures that, as indicated by the model, the most fatigue damage occurs in winter if there is no freeze-thaw and if there is freeze-thaw, the most fatigue damage occurs when thawing starts, as is expected.

CONCLUSIONS

The following conclusions were reached on the basis of the results presented in this paper:

1. Practically, the FWD testing, along with field instrumentation, is effective in seasonally monitoring the long-term structural performance of pavements. The results presented could facilitate better performance prediction of flexible pavements, depending on the climate zone in question, regardless of when FWD testing is conducted. As long as the seasonal variation of subgrade in thaw/frozen state is known, adjustments, season by season, can be made, analytically.

2. On a semilog scale, backcalculated elastic modulus of asphalt surface is linearly dependent upon mid-depth temperature in the asphalt surface layer.

3. In a climate cycle, the period when the most fatigue damage to flexible pavements occurs depends the existance of a significant freeze-thaw period. The most fatigue damage occurs when thawing just starts. If no significant freeze-thaw period exists, the most fatigue damage is limited to colder temperature period such as winter.

4. This primary data analysis may help scheduling future FWD testing by highlighting periods when more tests are needed and when fewer tests are needed to define changes in moduli. It confirms that additional tests may be needed in the spring in the frost zones but may not be needed in the southern states in the North Central Region. It also may allow seasonal adjustment factors to be developed/refined to increase the value of deflection data colleted at non-critical times of the year.

5. It also may be very useful in collecting truck loading information if seasonal weigh-in-motion is used.

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DISCLAIMER

The contents of this study reflect the views of the authors who are solely responsible for the facts and accuracy of the material presented. The contents do not necessarily reflect the official views or policy of the FHWA. The study does not constitute a standard, specification, or regulation.

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Table 1 Regression Results

Section	Agency	$\log_{10}E_0$	α	R^2
201009	Kansas	3.70	-0.013	0.94
311030	Nebraska	3.92	-0.017	0.98
469187	South Dakota	3.53	-0.011	0.95
831801	Manitoba	3.64	-0.012	0.95
906405	Saskatchewan	3.41	-0.010	0.96

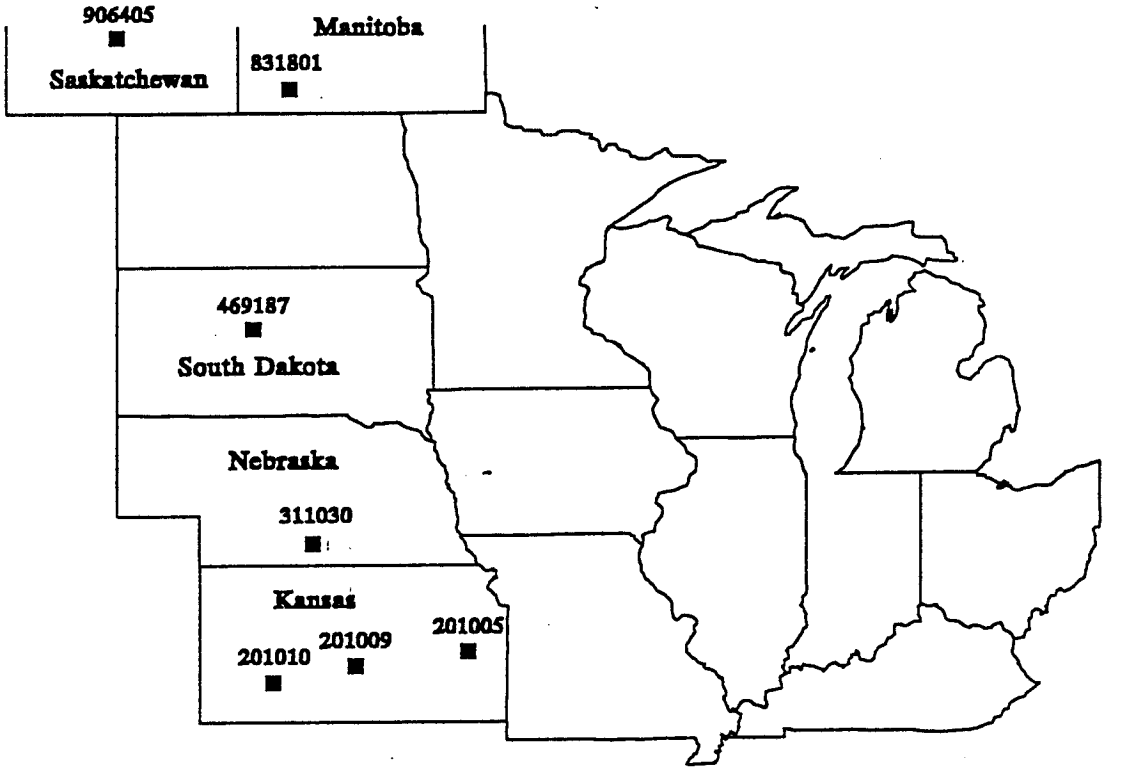

Figure 1 Testing Section Layout

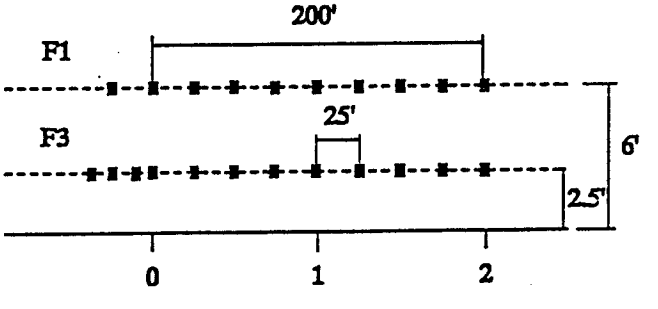

Figure 2 Testing Location Layout

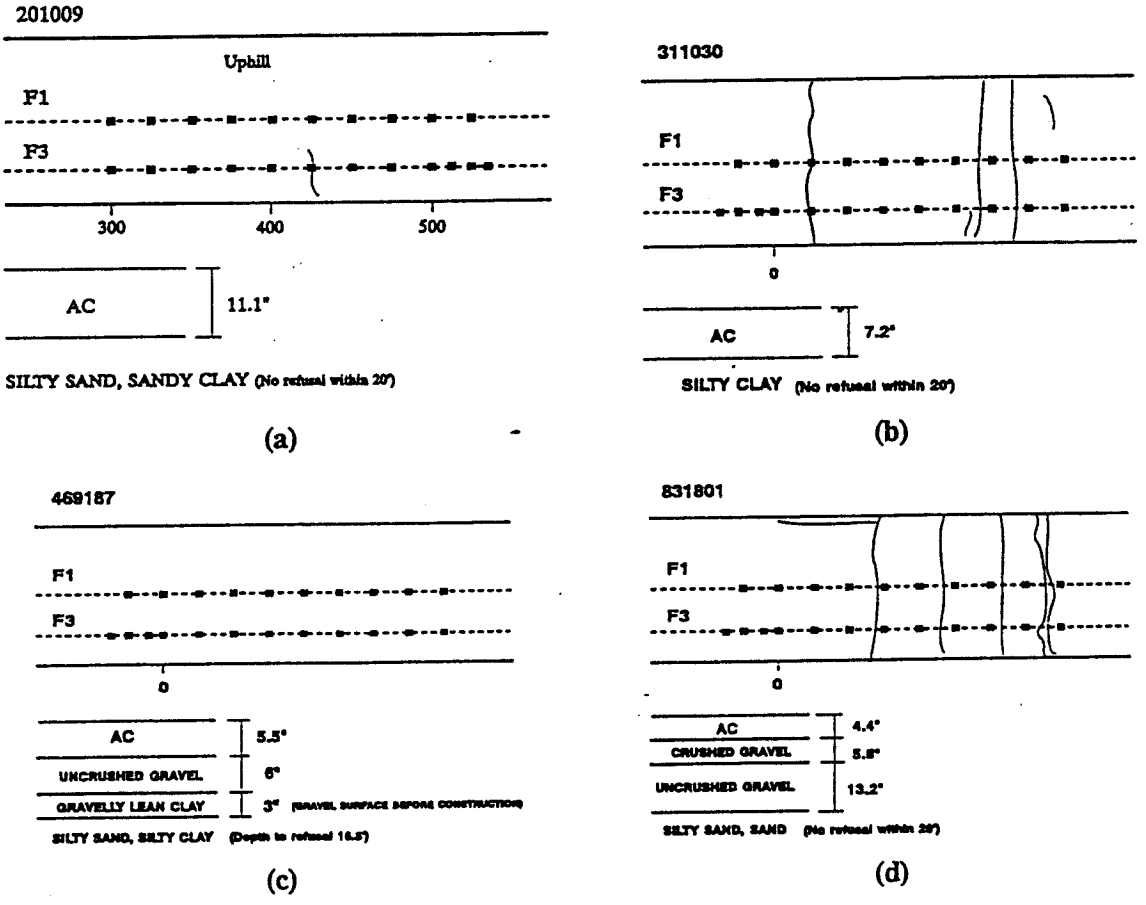

Figure 3 Survey Results and Layer Structures

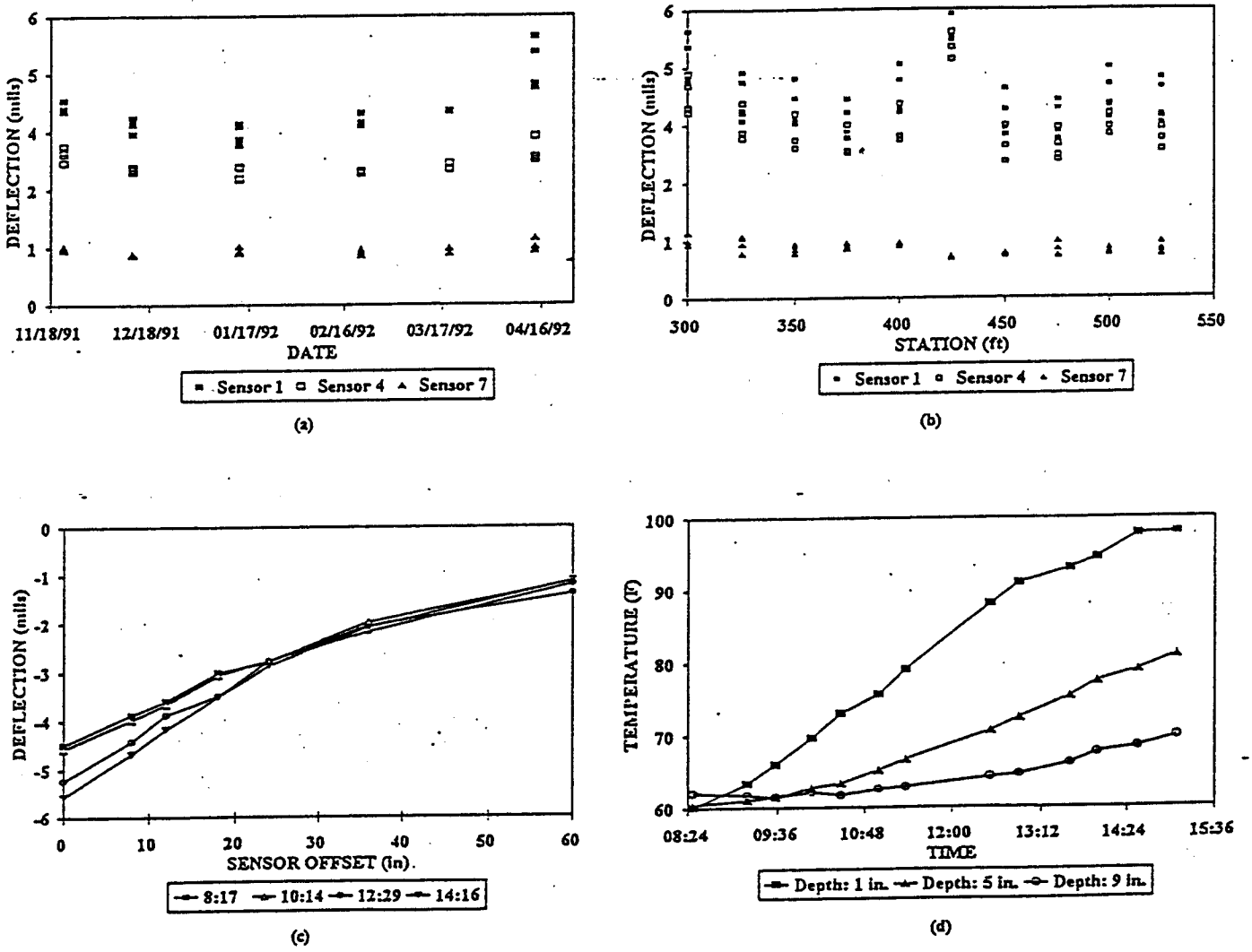

Figure 4. Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 201009 in Kansas: (a) deflections vs. testing date at Station 300; (b) deflections across test section on April 4, 1992; (c) deflection basins; (d) pavement temperature vs. time.

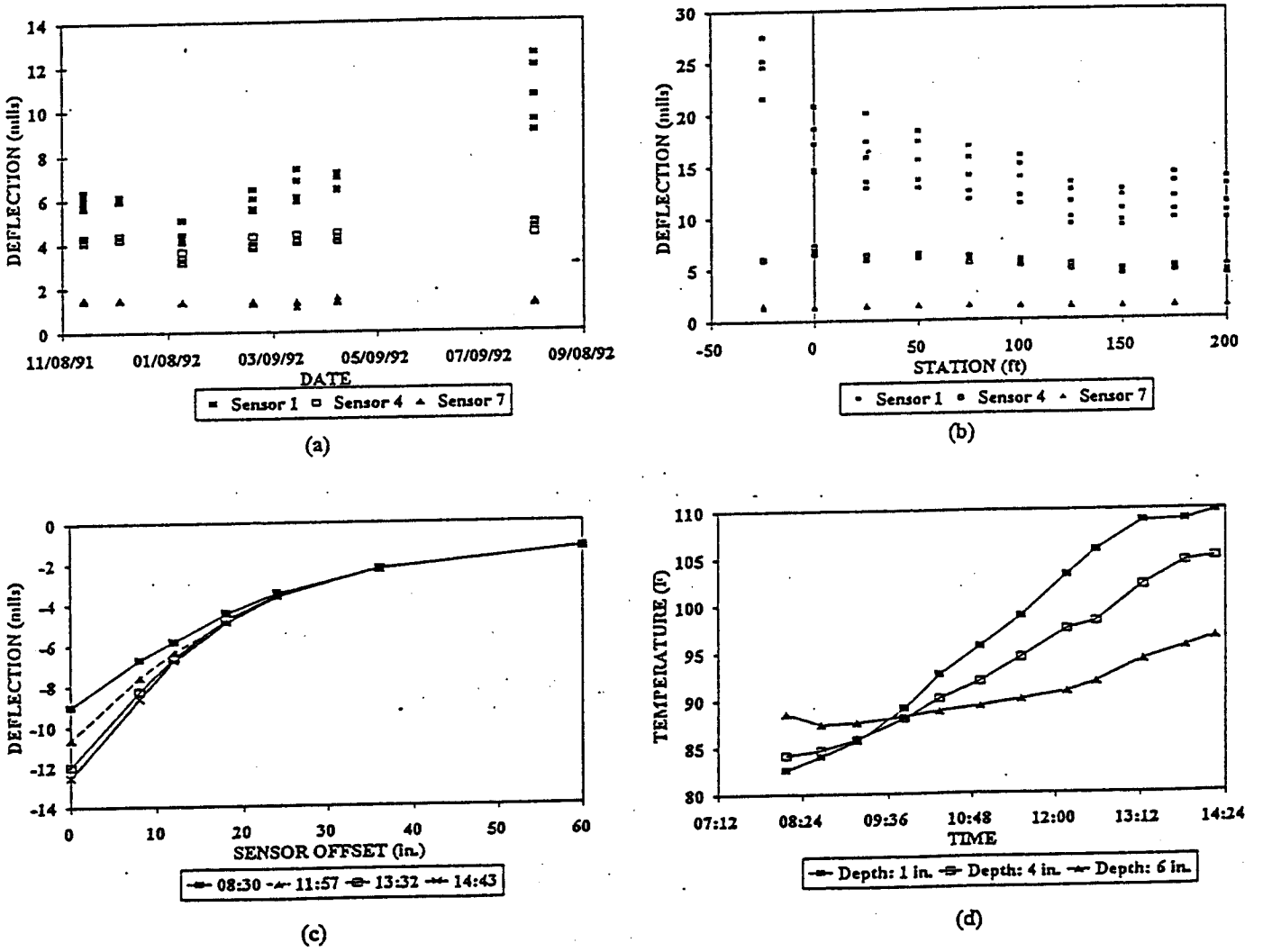

Figure 5 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 311030 in Nebraska: (a) deflections vs. testing date at Station 150; (b) deflections across test section on August 10, 1992; (c) deflection basins; (d) pavement temperature vs. time.

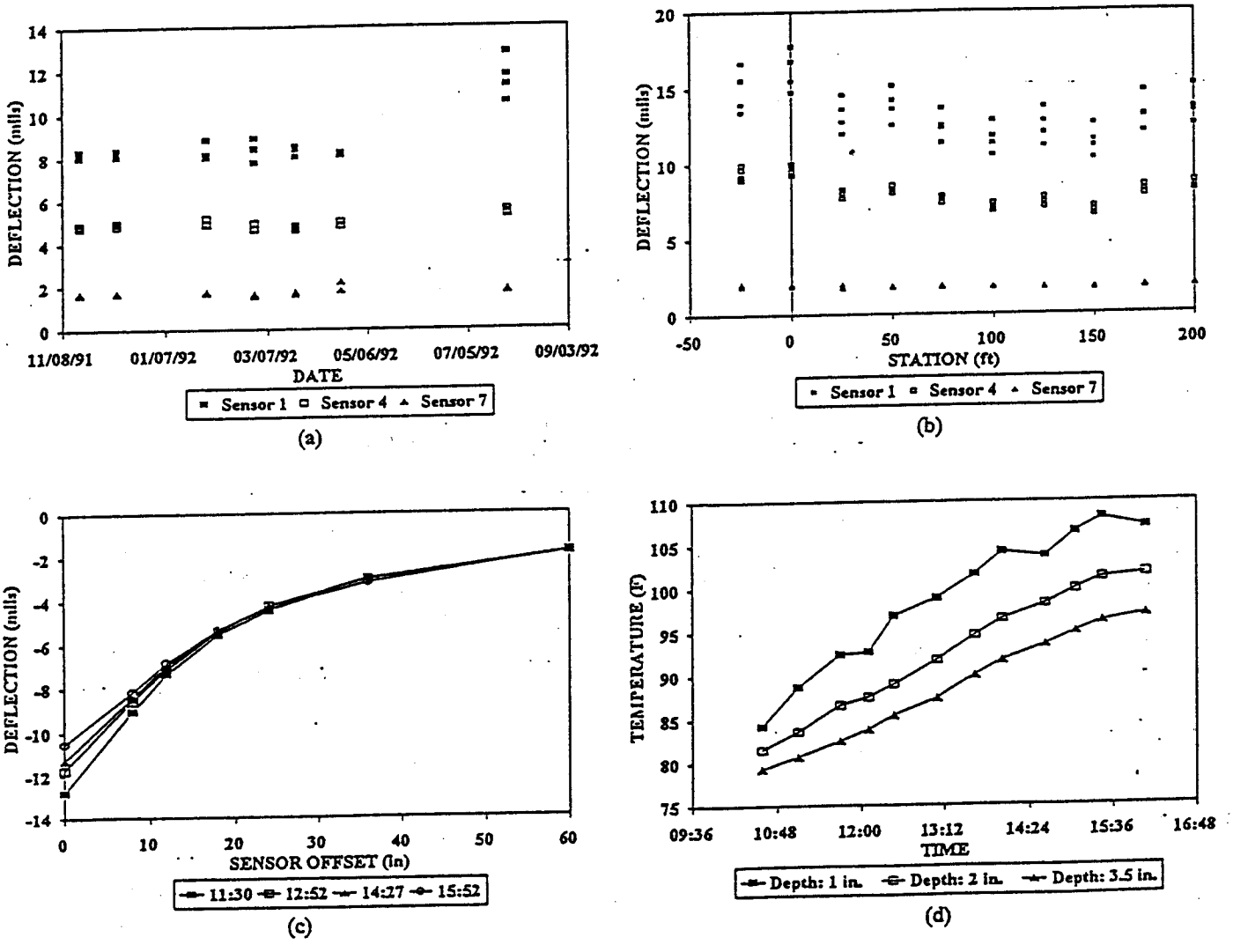

Figure 6 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 469187 in South Dakota: (a) deflections vs. testing date at Station 100; (b) deflections across test section on July 28, 1992; (c) deflection basins; (d) pavement temperature vs. time.

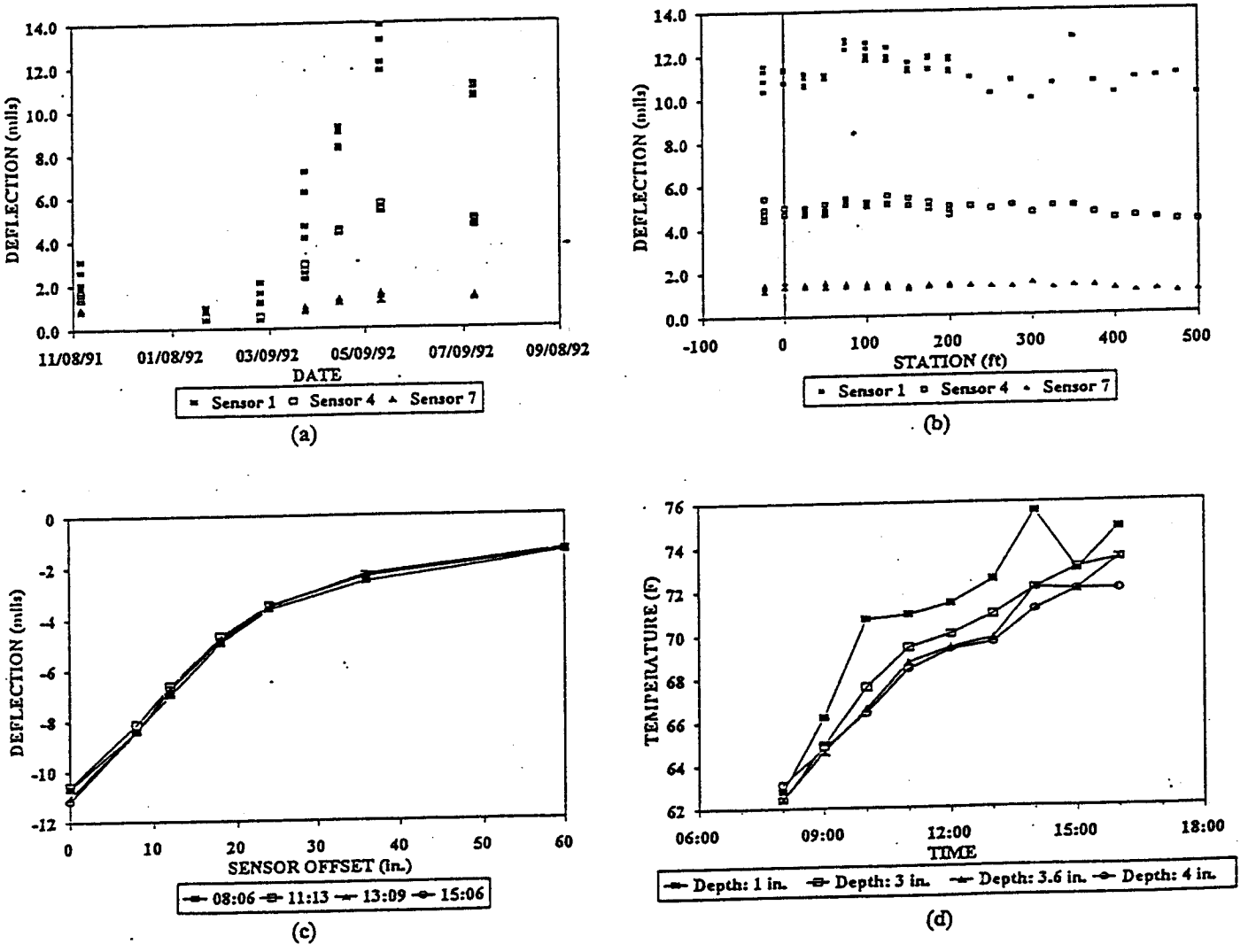

Figure 7 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 831801 in Manitoba: (a) deflections vs. testing date at Station 25; (b) deflections across test section on July 16, 1992; (c) deflection basins; (d) pavement temperature vs. time.

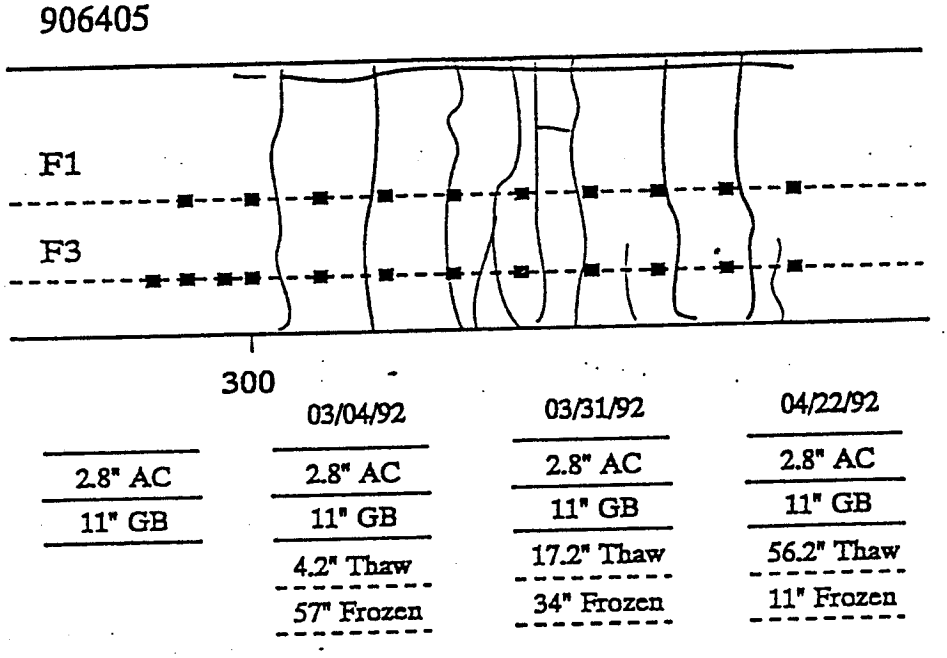

Figure 8 Survey Results and Layer Structures

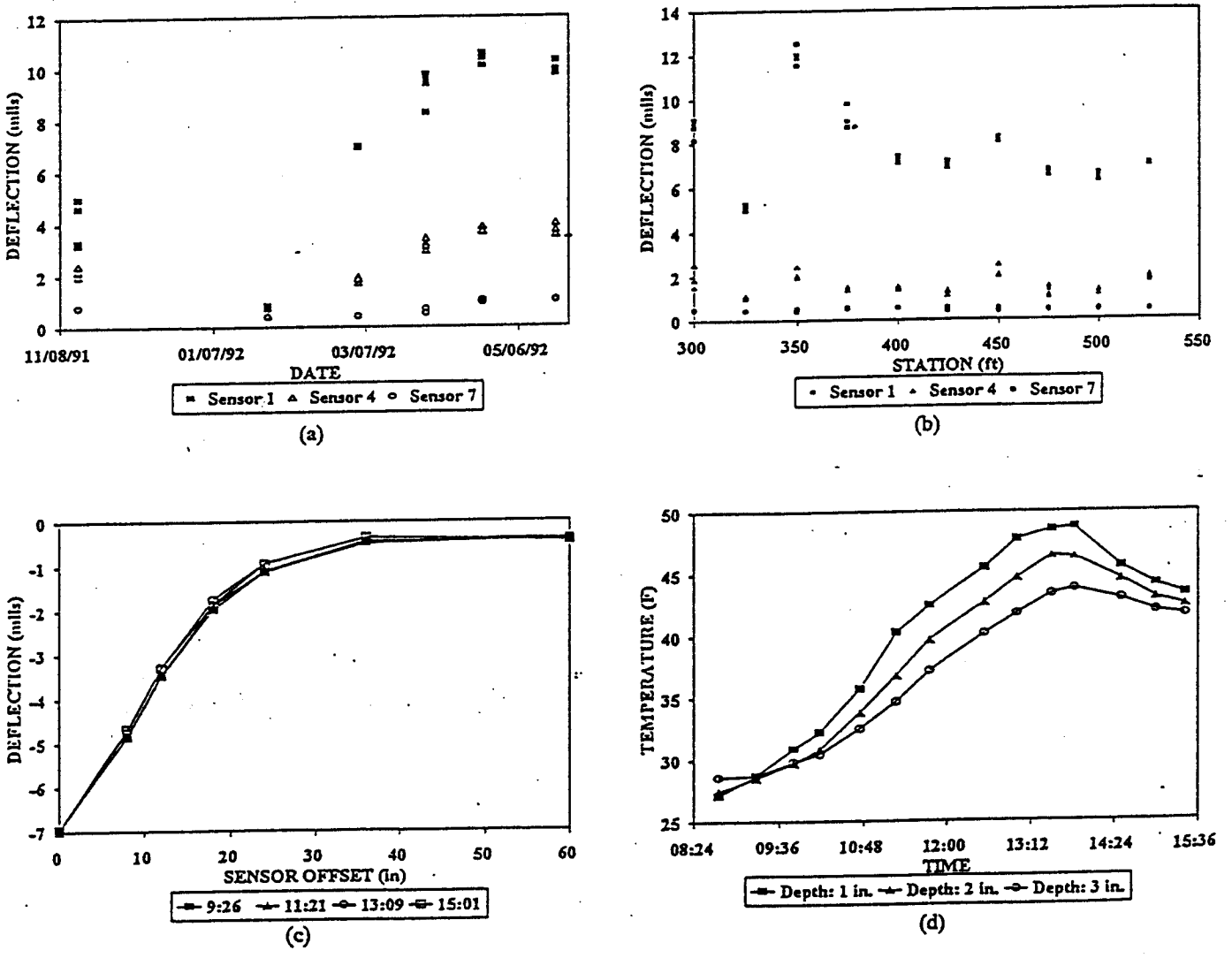

Figure 9 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 906405 in Saskatchewan: (a) deflections vs. testing date at Station 525; (b) deflections across test section on March 4, 1992; (c) deflection basins; (d) pavement temperature vs. time.

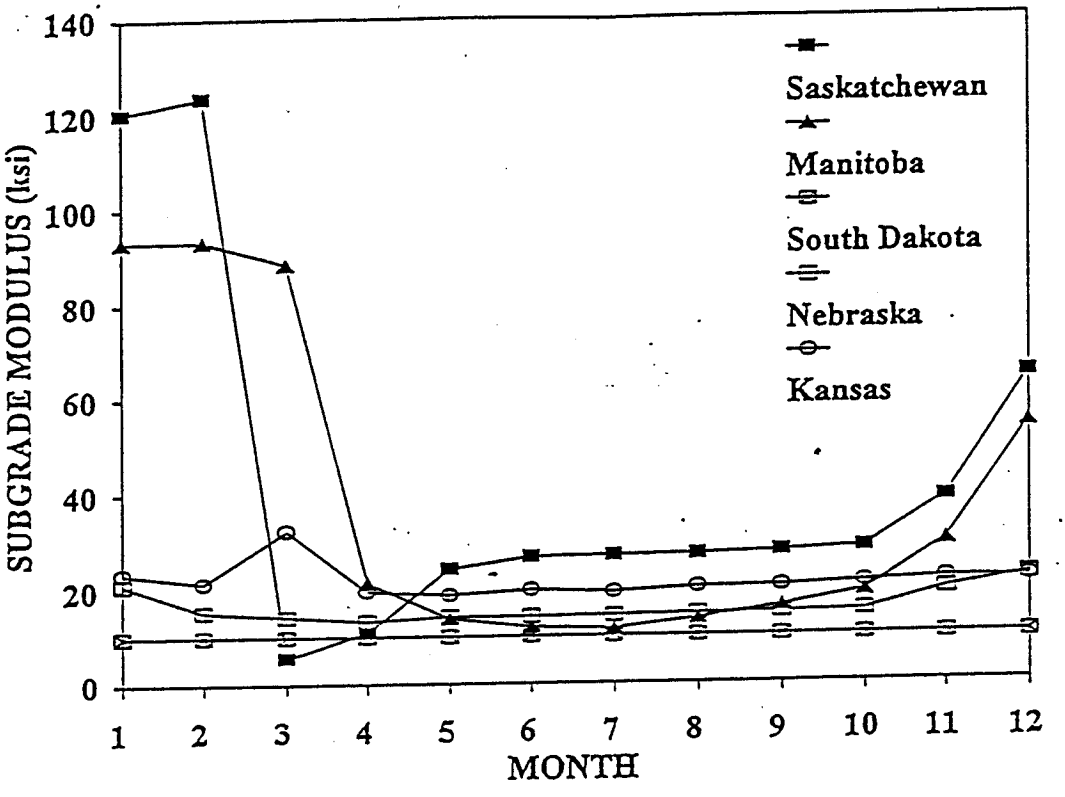

Figure 10 Monthly variation of subgrade moduli

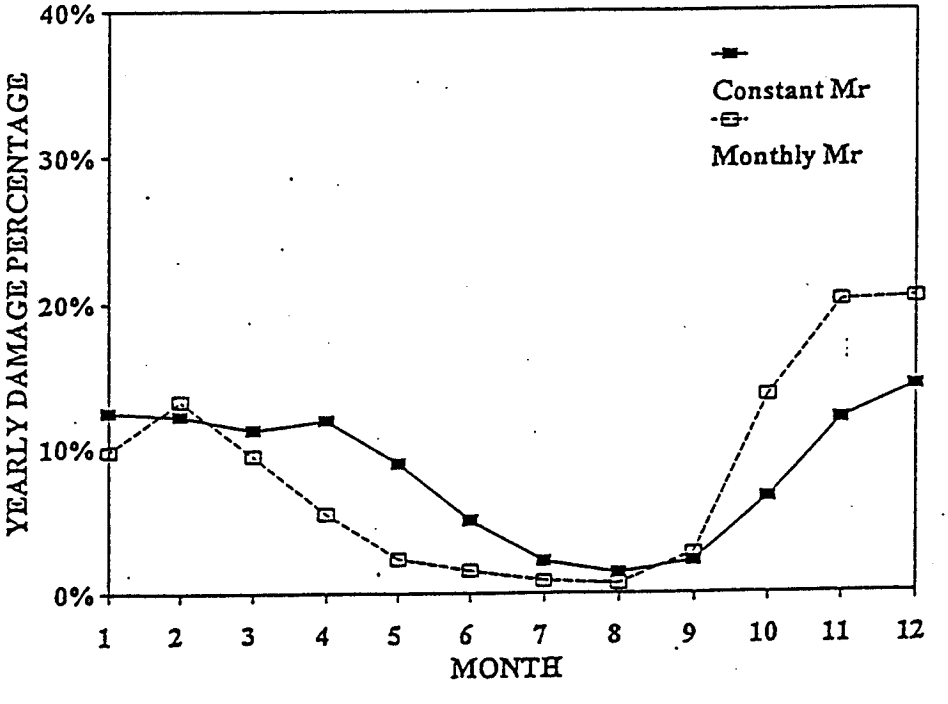

Figure 11 Yearly damage percentage in each month (GPS Section 311030 in Nebraska)

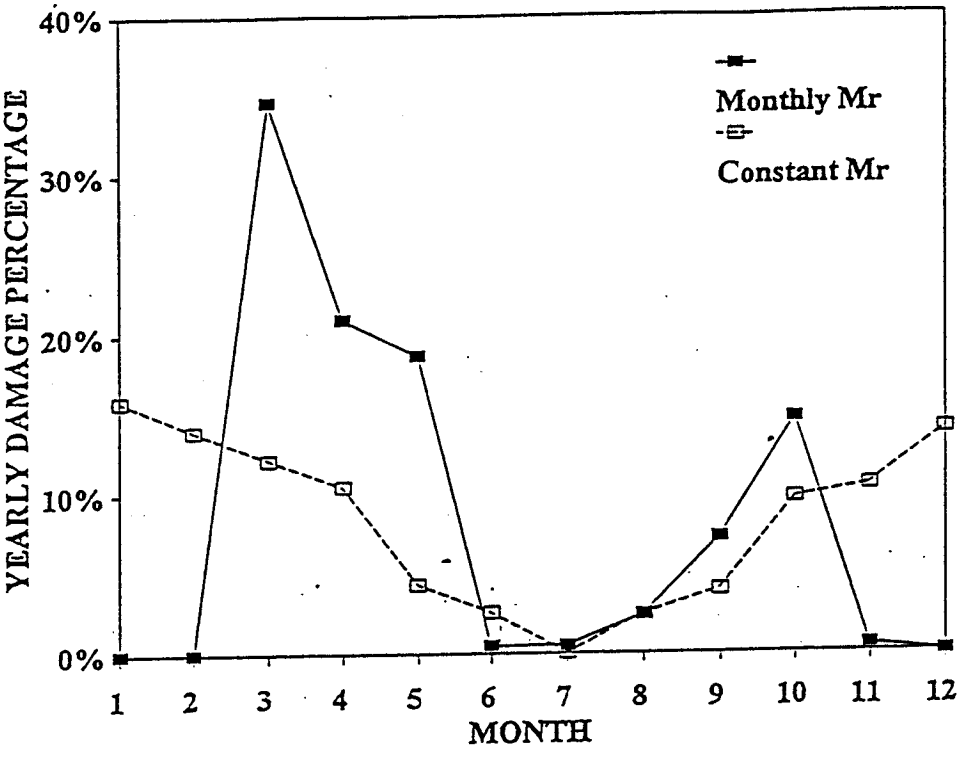

Figure 12 Yearly damage percentage in each month (GPS Section 906405 in Saskatchewan)