LTPP Seasonal Monitoring Program

Site Installation Report for GPS Section 831801 (83A) Oak Lake, Manitoba

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 831801, which is a core section in the LTPP Seasonal Monitoring Program. This asphalt concrete pavement section on Trans-Canada Highway 1 by Oak Lake, Manitoba (46 kilometers west of Brandon), was instrumented October 12, 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 831801 (83A)
Oak Lake, Manitoba

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 831801, 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 12, 1993, and had regular data collection through June 21, 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 831801 is located on the westbound driving lane of Trans-Canada Highway 1 in the southwest corner of Manitoba near Oak Lake, which is about 46 kilometers west of Brandon.

B. General Test Section Information

This four-lane divided highway has a 112-mm thick asphaltic concrete surface, which consists of the original asphalt surface placed in 1984 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 475 mm and a coarse-grain subgrade. Drilling and sampling data identified two base layers, crushed and uncrushed gravel, with the combined thickness ranging from 455-mm to 500-mm thick. 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 sixth 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

The Manitoba Highways and Transportation, sometimes referred to as "the agency" in this report, currently has a long-term monitoring plan where Benkelman Beam deflection data is collected yearly on the entire highway network from April through May. The deflection data is used for pavement designs and for setting spring load restrictions on secondary highways. In this respect, the agency was very willing to participate in the SMP regarding GPS sections 831801 and 833802.

Mr. Ray Van Cauwenberghe and Mr. Fred Young of Manitoba Highways and Transportation were initially contacted regarding potential sections identified for the seasonal monitoring pilot activities started in 1991 under the Strategic Highway Research Program (SHRP). GPS section 831801 was included in the pilot study, and falling weight deflectometer (FWD) data was collected during seven 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, Mr. Dennis Watson of Manitoba Highways and Transportation was contacted to confirm continued agency support for GPS section 831801 as a core section in experimental Cell 7 of the SMP study administered by the FHWA LTPP Division. The agency 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 831801 is also the control section for the SPS-3 sections at this location.

On August 27, 1993, a pre-installation meeting was held with Manitoba Highways and Transportation staff in Winnipeg, Manitoba. Staff involved with instrumentation installation and monitoring activities for both GPS section 831801 and 833802 attended the meeting. A presentation was given on the SMP and arrangements were made for the agency to supply equipment and materials required for the installation. Installation dates were 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, list of participants, and notes from the meeting are included in Appendix B-1.

After the pre-installation meeting, Mr. Robert Van Sambeek and Mr. Watson stopped at GPS section 833802 to identify any installation concerns with the site and to select which end of the section to monitor. No visit was made to GPS section 831801, because of the distance to the site. Also, information from the SHRP SMP pilot testing done in 1991/1992 was available to make the necessary installation decisions.

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. However, this was not realized until after the probes had been installed, and it is beyond the scope of this installation report to determine if the noise filter has any effect on the calibration results.

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. Pavement distress data and FWDCHECK program analysis for FWD testing done June 14, 1993 were used to select Station 0-30 to Station 2+00 for monitoring with instrumentation placed at Station 0-20. This is the same end of the section monitored in the SHRP SMP pilot study done in 1991/1992.

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 831801 after termination of monitoring is included in Appendix C-1.

Instrumentation installation was completed at GPS section 831801 on October 12, 1993. 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 0-20 using the pavement edge stripe as a transverse reference. FWD testing was done on the SMP portion of the section from Station 0-30 to Station 2+00 including a test over the instrumentation hole. The FWD locations were very close to white paint marks still visible from the SHRP SMP pilot testing done in 1991/1992.

The block and conduit trench were sawed after the FWD testing over the instrumentation hole was done, and the block was lifted out using anchors tapped into the pavement. The block was placed in a heated truck cab to help accelerate setting of epoxy used later in the day to bond the asphalt block back in place. The "Derric Digger," used by the agency to install sign posts, 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 not placed according to protocol on this site, because there would not have been a probe in the crushed gravel base, and there would have been three probes in the uncrushed gravel base. Therefore, RCO staff proposed a modified placement to FHWA LTPP Division staff, which was accepted, and TDR probe 1 was placed mid-depth in the crushed gravel base layer, and TDR probes 2 and 3 were placed in the uncrushed gravel base. The remaining TDR probes were placed according to protocol.

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. A plot comparing the TDR probe moisture data to the field and laboratory data is also included in Appendix C-1.

- 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 compared to the difference of 2.9 percentage points for TDR probe 9.

- The moisture estimate from TDR probe 1 for the crushed gravel base is 3.9 percentage points higher than the average obtained between the field and laboratory data. Also, the average moisture from TDR probes 2 and 3 in the uncrushed gravel base are 1.8 percentage points higher than the average from field and laboratory data.

- The moisture estimates from TDR probes 4 and 5 in the upper part of the subgrade are nearly identical to results from the field and laboratory tests. However, the results are less consistent for the remaining five TDR probes in the subgrade. For these TDR probes, moisture estimates average 4.4 percentage points higher than the

field and laboratory results. The subgrade changes to fine-grain for TDR probes 8 and 9, which would impact the calculated TDR moisture estimate if the dry density for this material is different than the coarse-grain part of the subgrade; the dry density is used to convert volumetric moisture data obtained from the TDR probe to the gravimetric equivalent.

- 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 same equations used appropriate for all the materials on this site including fine-grain subgrade, coarse-grain subgrade, uncrushed-gravel base, and crushed-gravel base?
  2. Are better estimates of dry density for the various layers available to convert from volumetric to gravimetric moisture?
  3. 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 7.5 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 the original, and the warmed asphalt block was placed in the hole. A loaded truck was driven across the block several times to seat the block until it was the same height as the pavement. The block was carefully removed, and a thin layer of very warm 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 asphalt, and heated 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 at room temperature, 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. By keeping the block warm, and heating the epoxy, the RCO staff had hoped the epoxy would set up quickly; however, the epoxy was still soft when the road was opened to traffic.

On the following day, the block was inspected to see if it had shifted. The block had not moved, and the epoxy had set up. Dow Corning 890-SL crack sealant was used to fill the saw cuts flush with the pavement surface.

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

- On April 29, 1994, a low-severity transverse crack was recorded extending from the right saw cut for the block. On June 17, 1994 the crack had closed back up. On July 25, 1994, the crack was back.

- On December 14, 1994, some spalling was noted between the block and the trench, and the sealant was starting to pull away from the block.

- By February 15, 1995, the transverse crack extending across the lane from the right saw cut had deteriorated to medium severity. However, the crack was not recorded on March 13, 1995. Only a short crack was noted on April 11, 1995 and June 21, 1995.

III. SMP Data Collection

A. Initial SMP Data Collection

On October 13, 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 13, 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 13, 1993 through June 21, 1995, and Manitoba Highways and Transportation has continued to collect temperature and frost data from the site. LTPP's standard data tracking log, which summarizes the data collected on the site, is included in Appendix D-2.

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

- On November 12, 1993, a relay was added to the datalogger at the site, which included a change in the data format for subsequent files.

- Between November 12, 1993 and December 13, 1993, the weather pole was vandalized, and the air temperature sensor and tipping-bucket rain gauge were on the

ground. Air temperature and precipitation data for this period should be compared with local weather station data to see if edits are required.

- On May 13, 1994, the FWD deflection sensor located at the center of the loadplate was not working.

- On August 18, 1994, water ponding at the piezometer location from heavy rains ran inside the piezometer when the cap was removed.

- Temperature data for the period from January 25, 1995 to March 14, 1995 is only available for a partial day on February 15, 1995. This section experienced two consecutive months with battery failures for the datalogger and subsequent loss of temperature and precipitation data for the site. Local weather station data could provide air temperature and precipitation data, but no subsurface temperature data will be available.

- TDR probe 8 data collected on both January 25, 1995 and March 14, 1995 indicates an open-circuit failure, and the data is not useable.

Instrumentation and equipment problems at the site include the following:

- Battery failures for the datalogger noted on January 25, 1995 and February 15, 1995 resulted in two months of lost data.

- Cold temperature 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.

- TDR probe 8 open-circuit failures on January 25, 1995 and March 14, 1995 indicate the signal does not transfer from the cable into the printed circuit board at the probe. This same failure mode was observed on one of the TDR probes installed at GPS section 271018 in Little Falls, Minnesota.

- The signal generator used to collect manual resistivity data does not always have the power output required to get sufficient current flow through the 150 mm of frozen soil between the electrodes in four-point mode, and corresponding voltage drops recorded on the data sheets are misleading. It is beyond the scope of this report to determine what minimum current flow to require before the corresponding voltage drop observed can be considered valid for resistivity calculations.

- Vertical movement of the piezometer has been documented on other SMP installations with both a piezometer and an agency benchmark. On this installation with a single elevation reference, agency staff have tied the piezometer elevation to another reference on three occasions to help determine the piezometer stability. Elevation data shown on the plot in Appendix D-2 indicates 4.0 mm and 9.0 mm of change in elevation for the piezometer for successive surveys. This indicates one of the references is moving, and elevation data analysis for estimating frost heave will have to account for movement of the reference.

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 sixth SMP installation in the LTPP North Central Region, and GPS section 831801 was one of the seven sections monitored for the SHRP SMP pilot testing done the fall of 1991 through the spring of 1992.
- Section 831801 has predicted frost penetration to 2.3 m, which is among the deepest for sections in the North Central Region. However, the resistivity probe has the last electrode 1.97-m deep to monitor maximum frost/thaw depths.
- Agency staff are collecting temperature, precipitation, and frost/thaw data at the site to obtain continuous data records instead of typical SMP monitoring data obtained every other year.
- 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

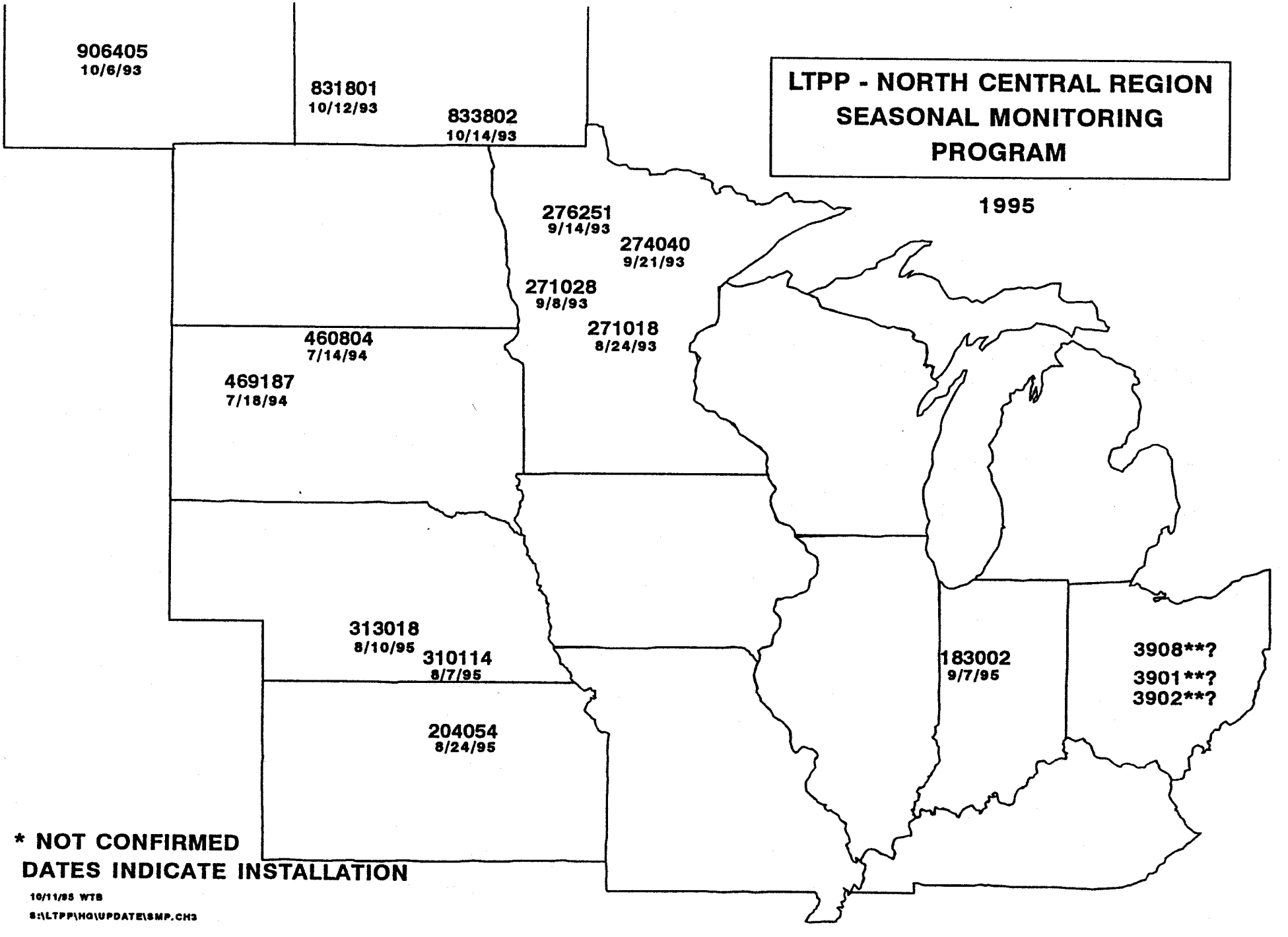
In addition to previous modifications from other installations, the following procedure and equipment changes from protocol were used during this installation:

- Recommended changes in the guidelines to include at least one TDR probe in each base and subbase layer.
- Use rapid-set epoxy, instead of medium-set epoxy, for pavement repair on installations done in cold weather .

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.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LTPP - NORTH CENTRAL REGION
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PROGRAM
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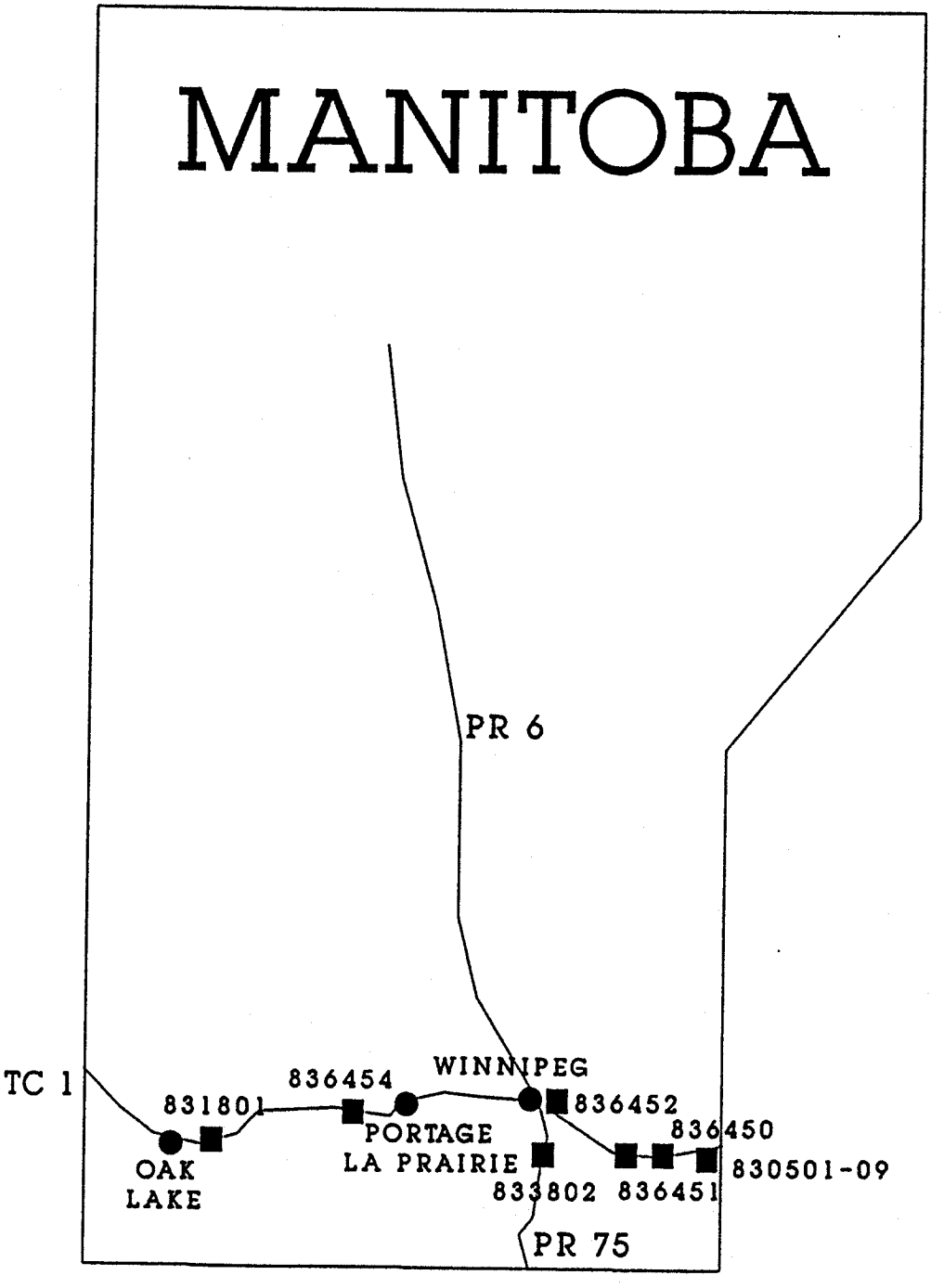
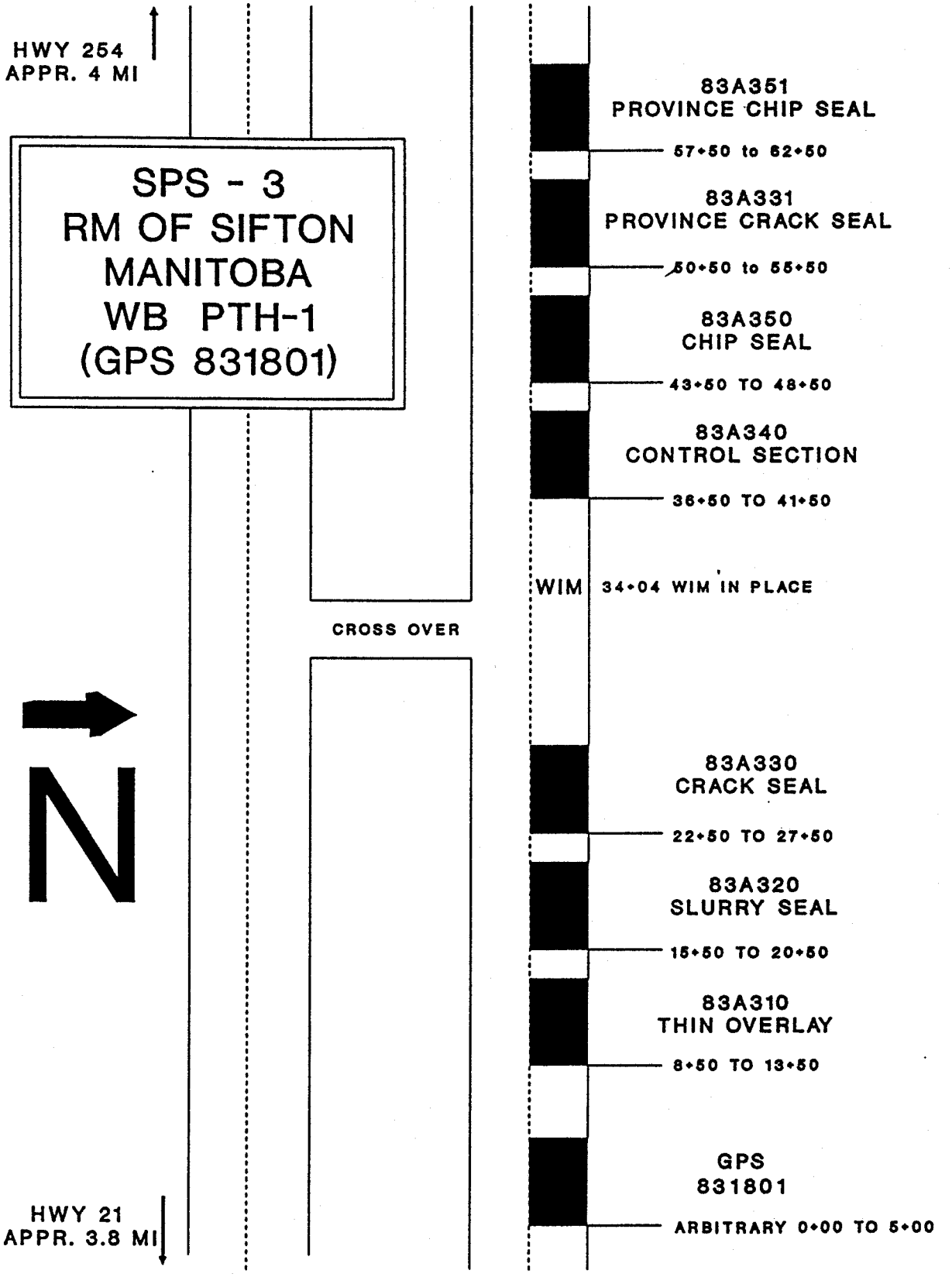
MANITOBA SHRP-LTPP SECTIONS

OCT. 23, 1989

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83A331
PROVINCE CRACK SEAL
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83A350
CHIP SEAL
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WIM
34+04 WIM IN PLACE
83A330
CRACK SEAL
22+50 TO 27+50
83A320
SLURRY SEAL
15+50 TO 20+50
83A310
THIN OVERLAY
8+50 TO 13+50
GPS
831801
ARBITRARY 0+00 TO 5+00

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: Manitoba

SHRP Assigned ID:	831801	District:	5	Year Open:	1984
State Assigned ID:	2	Highway:	PTH- 1	Year Traffic:	1984
Design Cell ID:	1-103	Length:	3.5 miles	AADT:	2802
		Lanes:	2	Trucks:	15.0 %
		Shoulder Surface Type:	Unspecified		
		Project Status:	Approved		

DESIGN FACTORS - Moisture: Dry
Temperature: Freeze
Subgrade: 55 - Sandy Silt — 55 code = 214 (Coarse)
Traffic: 56 KESAL/Yr "
AC Thickness: 4.0 in. — 4.4
Base Thickness: 18.0 in.
AC Stiffness: 520 ksi

Fine
Low (85)
Med (3.0, 8.0)
High (10.0)
Low (650)

LAYER CONFIGURATION

LAYER NO.	LAYER DESCRIPTION	LAYER THICKNESS		LAYER MATERIAL TYPE
4	3 - Orig Surface	2.0	1 -	HMAC, Dense Graded
3	4 - HMAC Below Surf	2.0	28 -	Bituminous Base, Dense, Hot, CPM
2	5 - Base Layer	18.0	23 -	Crushed Stone, Gravel, or Slag
1	7 - Subgrade		51 -	Clay (Liq Lim>50)

PAVEMENT LAYER INFORMATION

	ASPHALT CONCRETE LAYERS										
LAY	-- GRADE ---		AC	AC		ACVIS	ACVIS	PEN	AC	AC	AGG	AC
NUM	VISC	PENETR	CONT	DENS	S	140	275	77	TRBF	VOID	SPGR	STIFF
4		175	6.6	143	2	731	252	181		4.5		511
3		175	6.4	143	2	731	252	181		4.5		530

SECTION FIELD VERIFICATION FORM

Date _____

Rater _____

State Project Code 02
State Code 83
SHRP Section I.D. 1801

Project and Section Identification

State District No. ___ ___
County or Parish RM of SIFTON 1

Route Signing (Numeric Code)
- Interstate 1
- Primary 2
- State 3
- Other 4

Route Number HWY 1
LTPP Experiment Code 1-103
Number of Through Lanes (One Direction) 2
Direction of Travel 2
- Eastbound 1
- Westbound 2
- Northbound 3
- Southbound 4

Available Project Length (Without Discontinuities) 2000'

	Start Point	End Point
Test Section Milepoints	___ ___ ___.___ ___	___ ___ ___.___ ___

Additional Section Location Information*:
0' is 6.1 KM (3.81 miles) W of PROVINCIAL HWY 21
0' is 6.9 KM (4.3 miles) E of NB HWY 254

* Include distances from two landmarks (refer to specific procedures outlined in the Initial State Visit Guidelines).

Location of monument: _____

Geometric Information

Lane Width (Feet) 12.
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)	9.	6.
Paved Width (Feet)	0.	0.
Surface Type		

Surface Type
- Turf 1
- Granular 2
- Asphalt Concrete ... 3
- Concrete 4
- Surface Treatment 5
- 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

Date _____

Rater _____

State Project Code __ __ 0 2
State Code - 8 3
SHRP Section I.D. 1 8 2 1

Project and Section Identification

State District No. __ __
County or Parish [illegible] 1

Route Signing (Numeric Code)
Interstate 1
Primary 2
State 3
Other 4

Route Number __ __ __ 1
LTPP Experiment Code 1-103
Number of Through Lanes (One Direction) 2
Direction of Travel 2
Eastbound 1
Westbound 2
Northbound 3
Southbound 4

Available Project Length (Without Discontinuities) 2000 FT

	Start Point	End Point
Test Section Milepoints	___.___	___.___

Additional Section Location Information*:
1.15 km W of [illegible] MEDIAN
2.38 km W of PROVINCIAL HWY 21

* Include distances from two landmarks (refer to specific procedures outlined in the Initial State Visit Guidelines).

Location of monument: _____

Geometric Information

Lane Width (Feet) 12.
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)	2.	6.
Paved Width (Feet)	5.	2.
Surface Type		5

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

Additional Data for PCC Shoulders:

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

SECTION FIELD VERIFICATION FORM (CONTINUED)

State Code
SHRP Section I.D. 1 8 0 1 — 8 3

Vertical Alignment (from plans)

Cut, Fill, or At Grade: Fill
Depth of Cut/Fill at Start of Section: 3'
Depth of Cut/Fill at End of Section: 5'

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)		Silty loam (A4-A6)
2	B	8"	Silty Sand
3	B	21"	3/4" minus - 35% crush class "A"
4	A	2"	Same mix - Two lifts
5	A	2"	Tight compaction
6	A	< 5/8"	
7			

Notes:

CORE 2 (End of Project)

Layer No.	Layer Types*	Thickness	Brief Material Description
1	Subgrade (G)		Sandy Silt (A4)
2	B	8"	Silty Sand slightly more plastic than above
3	B	17"	Silty Sand
4	A	2"	Same mix - Two lifts
5	A	1 3/4"	Tight compaction
6	A	< 5/8"	chip seal - well penetrated into surface
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_____ State Code 83

Rater_____ SHRP Section ID 1801

	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.)			
6. Transverse Cracking (Number of Cracks)			

7. Bleeding (Measure only when extensive enough to cause a reduction in skid resistance, Sq. Ft.) Low - of Seal in owP

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

Comments Localized Rutting & Flushing with bulge on outer side
0+080 & 0+350 indicating failure below
0+00 - 0+110 - Shoulder drop off caused by blow-off of granular

SHRP/LTPP LAYER THICKNESS

L05A - L05B TABLES

26-AUG-93

		L05A								L05 B REPRESENTATIVE					
		CON	LAYER	DESC	TYPE	STA 0 THICK	STA 0 MATL	STA 5 THICK	STA 5 MATL	LAYER	DESC	TYPE	THICK	MATL	INVENTORY
83	1801	1	1	7	SS		214		214	1	7	SS		214	1
		1	2	6	GS	12	302	14.5	302	2	6	GS	13.2	302	2
		1	3	5	GB	6	304	5.2	304	3	5	GB	5.6	304	3
		1	4	4	AC	2.2	1	2.2	1	4	4	AC	2.2	1	4
		1	5	3	AC	2.1	1	2.3	1	5	3	AC	2.2	1	5

} 18.8

4.4" AC

7 TDR # 2 and # 3 Depth

SMPC 0-20

SHRP REGION NC | SHRP-LTPP | STATE CODE 83
STATE MB | FIELD MATERIAL SAMPLING AND FIELD TESTING | SHRP ASSIGNED ID 831801

LTPP EXPERIMENT GPS 1 | ROUTE/HIGHWAY TC TT 1 | Lane 1 | Direction W
SAMPLE/TEST: (a) Before Section ✓ (b) After Section ____ | FIELD SET NO. 1

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

OPERATOR B. WAREHAM | NUCLEAR DENSITY GAUGE I.D. T-23 | SHEET NUMBER 9 OF 21
TEST DATE 6-7-90 | LOCATION: STATION 0-46 | TEST PIT NUMBER TP-1
DATE OF LAST MAJOR CALIBRATION 3-12-89 | OFFSET 3 feet from °/s
Note: Use additional sheets if necessary

BJW

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (SEE S03)		10 (0.23m)		22 (0.60m)		30 (0.91m)	
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	138.6	131.1	138.6	129.9	116.7	108.0
	2	136.7	129.8	145.4	136.7	115.5	105.5
	3	137.9	130.4	143.6	134.9	116.7	106.7
	4	136.7	129.2	139.2	130.5	116.7	106.7
AVERAGE		137.5	130.1	141.7	133.0	116.4	106.7
Method (A,B,or C)							
Rod Depth, inches		4"		8"		8"	
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	7.5 (155 pcf)	5.7	8.7	6.7	8.7	8.1
	2	6.9	5.3	8.7	6.4	10.0	9.5
	3	7.5	5.8	8.7	6.4	10.0	9.4
	4	7.5	5.8	8.7	6.7	10.0	9.4
AVERAGE			5.7		6.6		9.1

GENERAL REMARKS: 4 AC 6 BASE 12 SUB BASE

CERTIFIED
Crew Chief, Contractor
Affiliation: MATERIALS AND RESEARCH 1181 PORTAGE AVENUE (ANNEX) WINNIPEG, MANITOBA R3G 0T3

VERIFIED AND APPROVED Thomas Rilbock
SHRP Representative
Affiliation: DPT

MONTH-DAY-YEAR 6-7-1990
Date

SHRP REGION NC
STATE MB

SHRP-LTPP
FIELD MATERIAL SAMPLING
AND FIELD TESTING

STATE CODE 83
SHRP ASSIGNED ID 831801

LTPP EXPERIMENT GPS 1 ROUTE/HIGHWAY TCH 1 Lane 1 Direction W
SAMPLE/TEST: (a) Before Section _____ (b) After Section ✓ FIELD SET NO. 1

IN SITU DENSITY AND MOISTURE TESTS

DCG SHEET: 24

OPERATOR B. WAREHAM NUCLEAR DENSITY GAUGE I.D. T-23 SHEET NUMBER 10 OF 21
TEST DATE 6-7-90 LOCATION: STATION 5762 TEST PIT NUMBER TP2
DATE OF LAST MAJOR CALIBRATION 3-12-89 OFFSET 3 feet from °/s
Note: Use additional sheets if necessary

BSW

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (SEE S03)		9.25 (0.235m)		23.75 (0.603m)		35.75 (0.908m)	
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	138.6	131.7	142.3	134.8	123.6	109.9
	2	141.1	134.2	142.9	135.4	124.8	110.4
	3	139.8	132.9	144.8	136.7	122.3	109.2
	4	141.1	134.2	143.6	136.1	122.3	109.2
AVERAGE		140.2	133.3	143.4	135.8	123.3	109.7
Method (A,B,or C)							
Rod Depth, inches		4"		8"		8"	
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	6.9 lbs/ft³	5.2	7.5 lbs/ft³	5.6	13.7 lbs/ft³	12.5
	2	6.9 "	5.1	7.5	5.5	14.4	13.0
	3	6.9 "	5.2	8.1	5.9	13.1	12.0
	4	6.9 "	5.1	7.5	5.5	13.1	12.0
AVERAGE			5.2		5.6		12.4

GENERAL REMARKS: 4 AC 5 1/4 BASE 14 1/2 SUBBASE

CERTIFIED
Crew Chief, Contractor
Affiliation: MATERIALS AND RESEARCH
1 PORTAGE AVENUE (ANNEX)
NNIPEG, MANITOBA R3G 0T3

VERIFIED AND APPROVED Ronald R Ulrich
SHRP Representative
Affiliation: SPT

MONTH-DAY-YEAR 6-7-1990
Date

FIELD BOOK NO: 5855 B
PAGE NO: 1

HOLE NUM	STATION	CL	SAMPLE NUMBER	DEPTH	CA	CS	FS	SI	CL	LL	PL	PI	ASSHTO	SOIL TYPE	ORGANIC %	DESC	MC
SHRP 831801																	
1	0+00	2 N	72369	0.00- 0.10												(ASPHALT	)
			72370	0.10- 0.75												(GRAVEL NS	)
			72371	0.75- 0.95	0	0	61	14	25	NON-PLAST			A-4(1)	SANDY SILT			
			72372	0.95- 1.15	0	0	65	13	22	24	19	5	(1) A-2-4(0)	F.S. SILTY SAND		(BRN CLAY SAND	)
			72373	1.15- 1.50	0	0	32	32	36	33	17	16	(0) A-6(9)	F.S. LOW PLASTIC CLAY		(BRN SND SLT CLAY)	
2	0+00	2 N	72374	0.00- 0.10									(10)			(STF BRN SLT CLAY)	
			72375	0.10- 0.55												(ASPHALT	)
			72376	0.55- 0.75	0	0	66	13	21	21	17	4	A-2-4(0)	SILTY SAND		(GRAVEL NS	)
			72377	0.75- 1.05	0	0	58	16	26	25	16	9	(0) A-4(1)	F.S. SANDY SILT		(BRN CLAY SAND	)
			72378	1.05- 1.50	0	0	56	15	29	26	15	11	(1) A-6(2)	SANDY CLAY		(DARK SAND SILT	)
													(2)			(DK SND CLAY SILT)	

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

STATE ASSIGNED ID ____

DISTRESS SURVEY

STATE CODE 83

LTPP PROGRAM

SHRP SECTION ID 1801

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/14/93

SURVEYORS: BJW, ____ PHOTOS, VIDEO, OR BOTH WITH SURVEY (P, V, B) B

PAVEMENT SURFACE TEMP - BEFORE ____ °C; AFTER ____ °C
63°F

DISTRESS TYPE	SEVERITY LEVEL LOW	MODERATE	HIGH
CRACKING			
1. ALLIGATOR (FATIGUE) CRACKING (Square Meters)			
2. BLOCK CRACKING (Square Meters)			
3. EDGE CRACKING (Meters)			
4. LONGITUDINAL CRACKING (Meters)			
Paving Lane-edge Related	280.0		
Length Sealed (Meters)	0.		
Other			
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	16		
Length (Meters)	57.1		
Length Sealed (Meters)	0.2		
PATCHING AND POTHOLES			
7. PATCH/PATCH DETERIORATION (Number)			
(Square Meters)			
8. Potholes (Number)			
(Square Meters)			

Revised May 29, 1992

SHEET 2

STATE ASSIGNED ID _ _ _ _

DISTRESS SURVEY

STATE CODE 32

LTPP PROGRAM

SHRP SECTION ID 1801

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/14/93

SURVEYORS: BEW, _ _ _

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) _____			

Revised May 29, 1992

SHEET 3

STATE ASSIGNED ID _ _ _ _

DISTRESS SURVEY

STATE CODE 83

LTPP PROGRAM

SHRP SECTION ID 1801

DATE OF DISTRESS SURVEY (MONTH/DAY/YEAR) 06/14/93

SURVEYORS: B S W. _ _ _

DISTRESS SURVEY FOR PAVEMENTS WITH ASPHALT CONCRETE SURFACES (CONTINUED)

9. RUTTING (FOR SPS-3 SITE SURVEYS)

INNER WHEEL PATH				OUTER WHEEL PATH		
Point No.	Point Distance[1] (Meters)	Rut Depth (mm)		Point No.	Point Distance[1] (Meters)	Rut Depth (mm)
1	0.	_ _ _.	GPS	1	0.	_ _ _.
2	15.25	_ _ _.		2	15.25	_ _ _.
3	30.5	_ _ _.	DIPSTICK	3	30.5	_ _ _.
4	45.75	_ _ _.		4	45.75	_ _ _.
5	61.	_ _ _.	DATA	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.	_ _ _.	NO FAULTMETER
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	_ _ _.	

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: 6/14/93 AGENCY: MANITOBA

TIME: 900 SECTION: 831801

OPERATOR: RJW

RECORDER: MANITOBA DOT

COMMENT:

*BRAIN DIPSTICK

* COARSE AGG ON SURFACE WHICH MAY EFFECT DIPSTICK ACCURACY (CHIP SEAL).

	DIPSTICK READING (+/-)														
STA	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL	SUM
0	187	210	142	262	420	281	-009	188	289	234	240			2.444	
-1.1	-197	-211	-158	-251	-416	-250	013	-179	-290	-242	-240			-2.420	+.024
50	167	275	111	213	449	276	-047	262	289	237	227			2.459	
-1.0	-195	-265	-105	-215	-448	280	046	-262	-289	-240	-227			-2.480	-.021
100	273	383	193	207	469	290	072	056	279	225	194			2.603	
-.8	-279	-383	-189	-218	-471	-295	-080	-037	-238	-222	-194			-2.606	-.003
150	143	173	116	259	418	281	049	120	209	206	174			2.148	
-.9	-119	-195	-115	-239	-418	-281	-046	-122	-201	-205	-179			-2.135	+.013
200	099	236	085	192	461	270	076	123	330	190	230			2.292	
.9	-098	-240	-084	-197	-464	-272	-081	-110	-326	-192	-230			-2.289	+.003
250	152	192	094	283	466	270	027	252	271	198	178			2.383	
-.9	-140	-191	-079	-284	-464	-279	-056	-242	-275	-202	-178			-2.390	-.007
300	149	174	107	220	459	291	100	163	260	174	207			2.304	
1.0	-151	-178	-102	-218	-460	-300	-103	-169	-255	-178	-207			-2.321	-.017
350	239 165	468	-073	184	539	286	034	027	240	209	279			2.358	
.7	-168	-466	+070	-187	-539	-292	-034	-021	-240	-210	-279			-2.366	-.008
400	239	176	058	185	483	299	100	169	271	182	292			2.454	
.8	-202	-182	-061	-188	-462	-315	-083	-174	-265	-184	-292			-2.408	+.046
450	174	300	032	206	522	307	152	139	223	196	207			2.458	
-.4	-170	-299	-037	-209	-507	-306	-140	-148	-219	-193	-207			-2.435	+.023
500	196	213	117	251	506	357	209	133	200	171	237			2.586	
.4	-180	-217	-118	-227	-503	-343	-199	-121	-199	-172	-253			-2.512	+.074

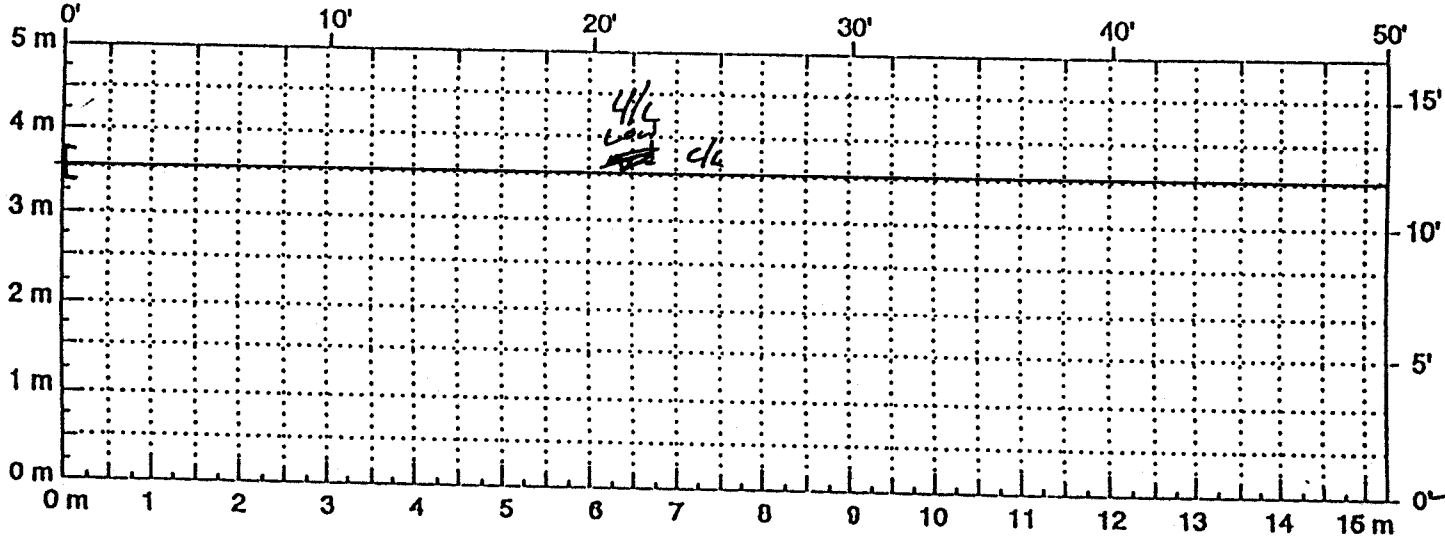
State Assigned ID 831801

State Code B5N

SHRP Section ID 6/14/93

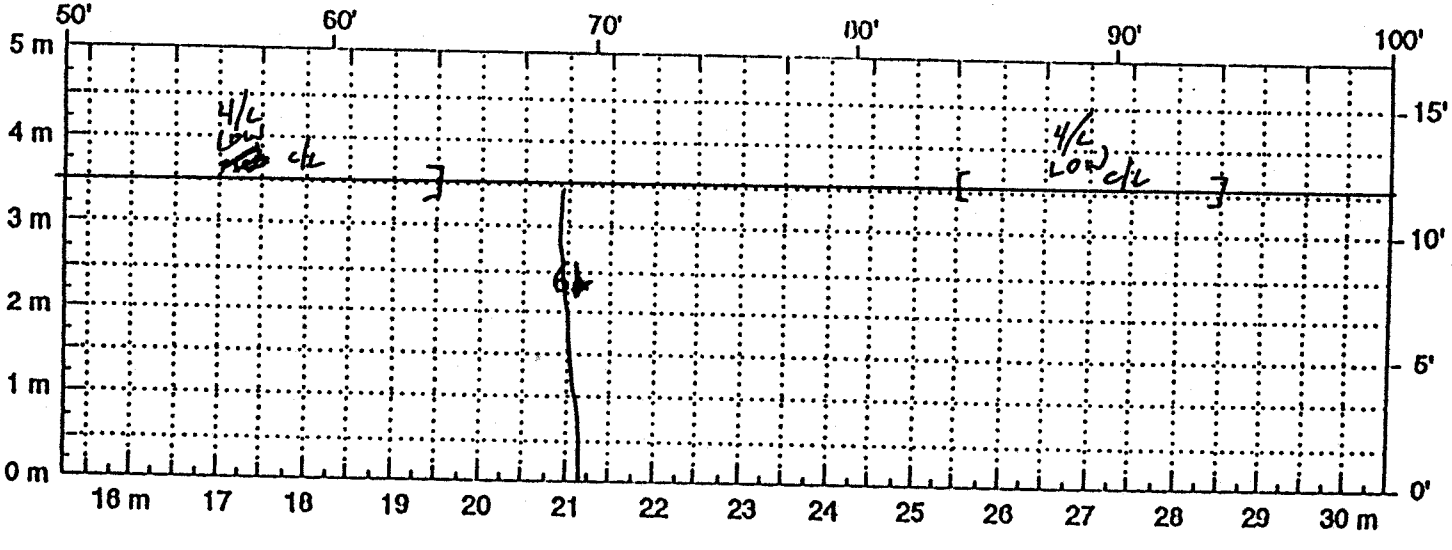
4L – 22½M
else

TRANS
6L/1/3.65



22½ c/L
1 – TRANS
3.65

Comments: _____



*NOTE
TRANSVERSE CRACK ARE ALL SPALLED AND IF SPALL IS TAKEN INTO CONSIDERATION ALL CRACKS ARE MED. SEV.

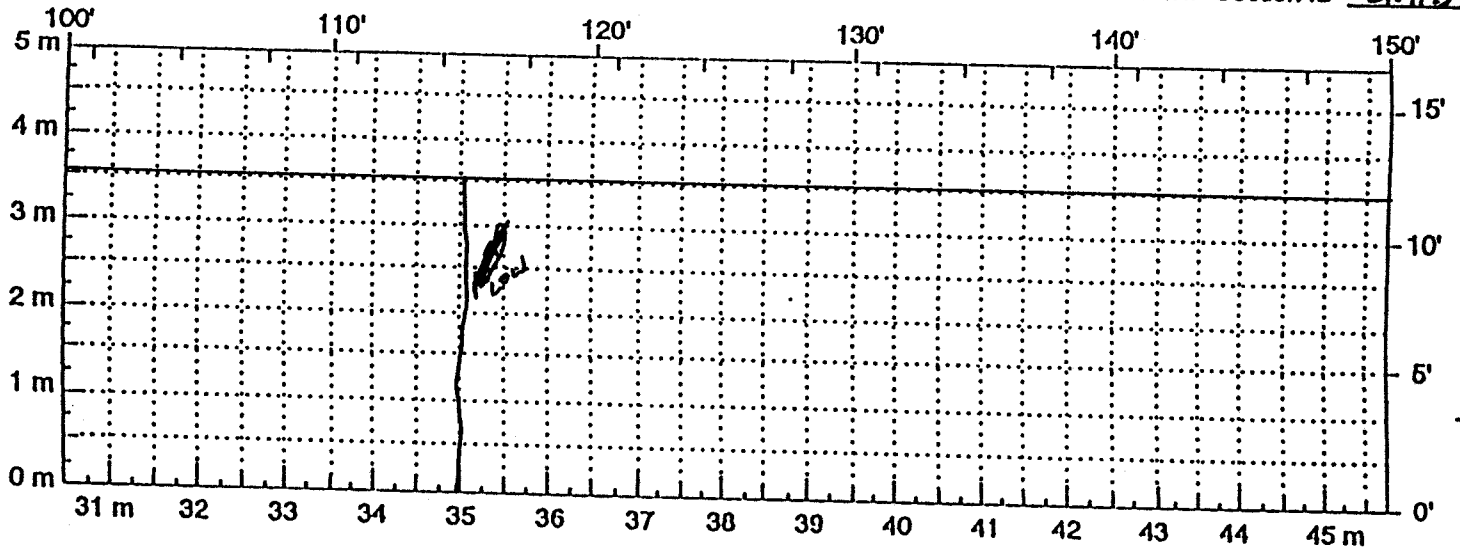
Comments: _____

State Assigned ID 831801

State Code BJU

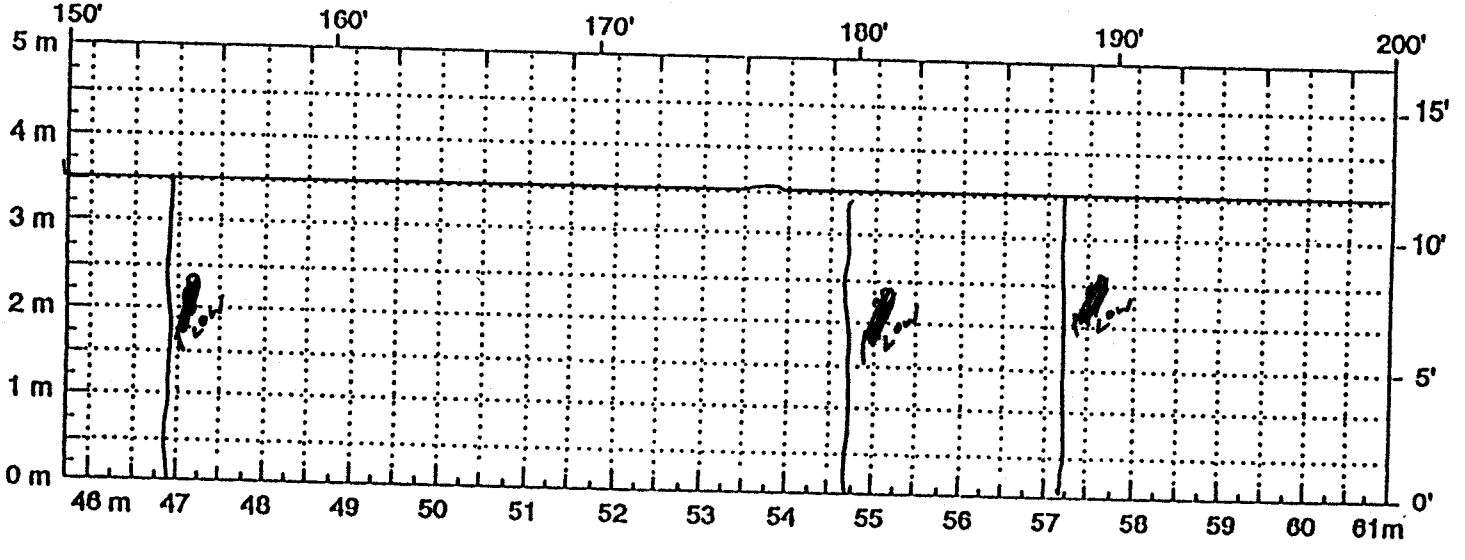
SHRP Section ID 6/14/93

6/4/4#3.65 14.6



TRANS 4 4#3.65 =

Comments: _____

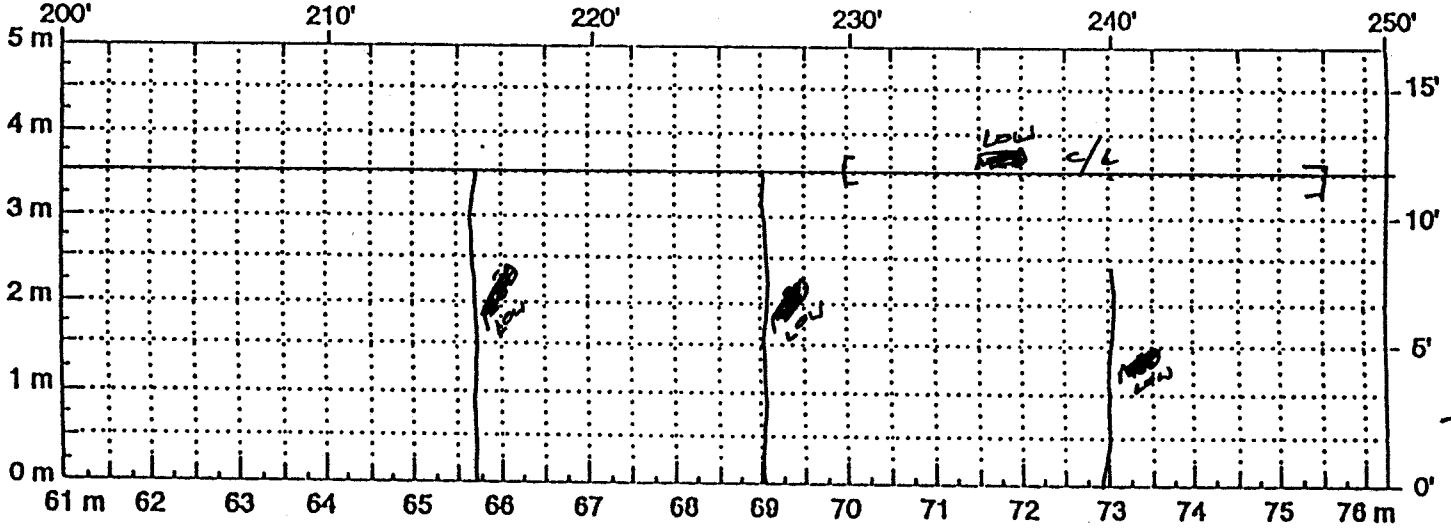


Comments: _____

State Assigned ID 831801

State Code BJW

SHRP Section ID 6/14/93

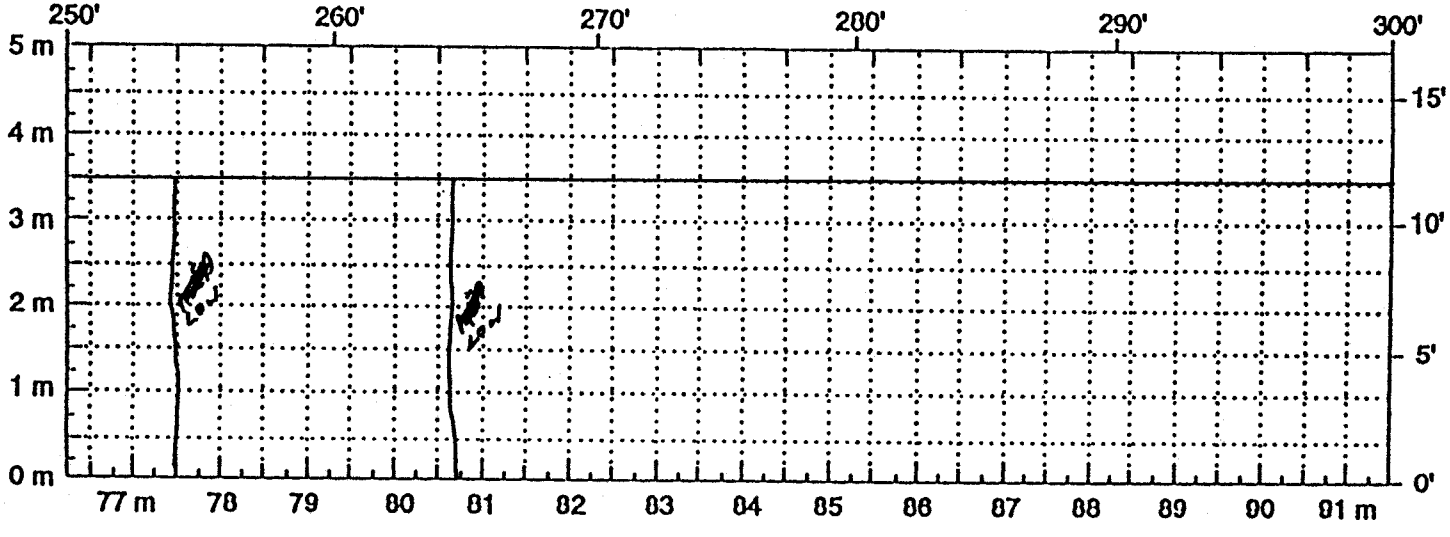


- 5.5 c/L LOW

- 5 TRANS

4*3.65+2.4=

Comments: _____

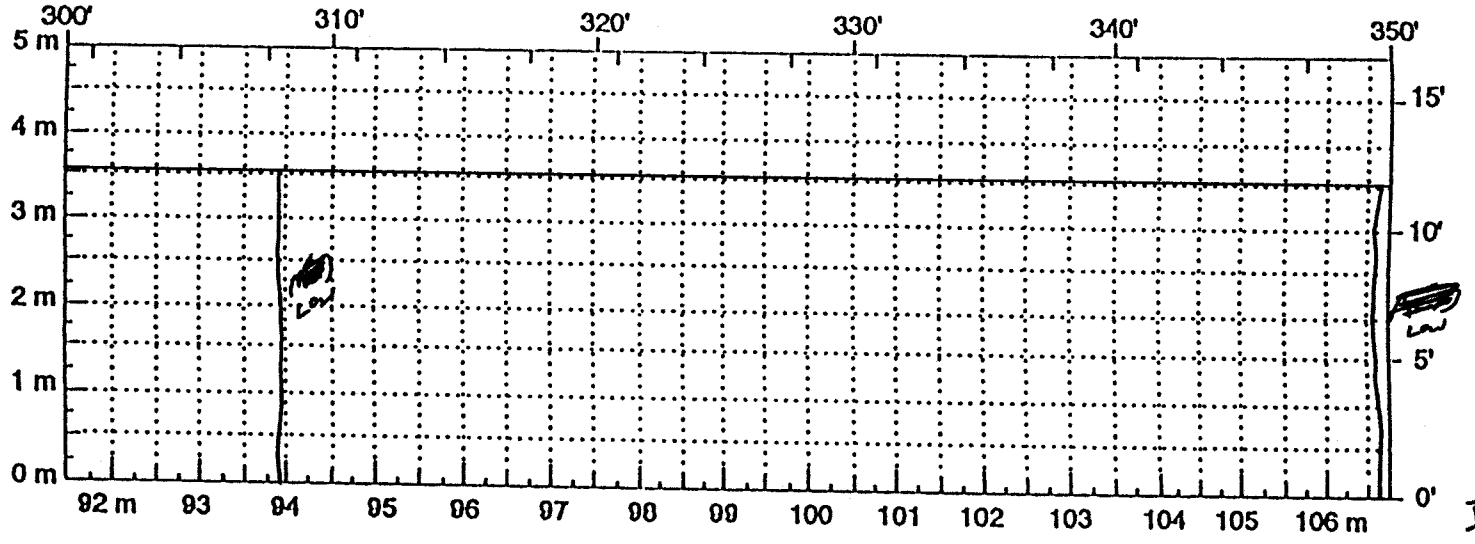


Comments: _____

State Assigned ID 931801

State Code BJW

SHRP Section ID 6/14/93



TRANS
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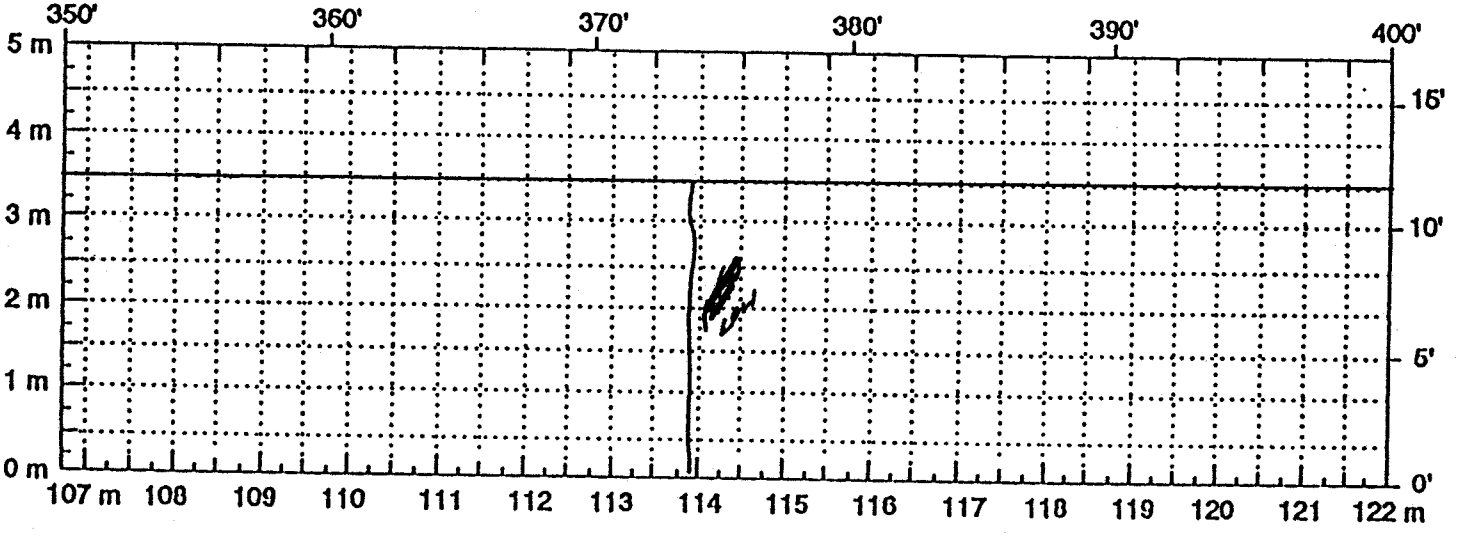
Comments: _____

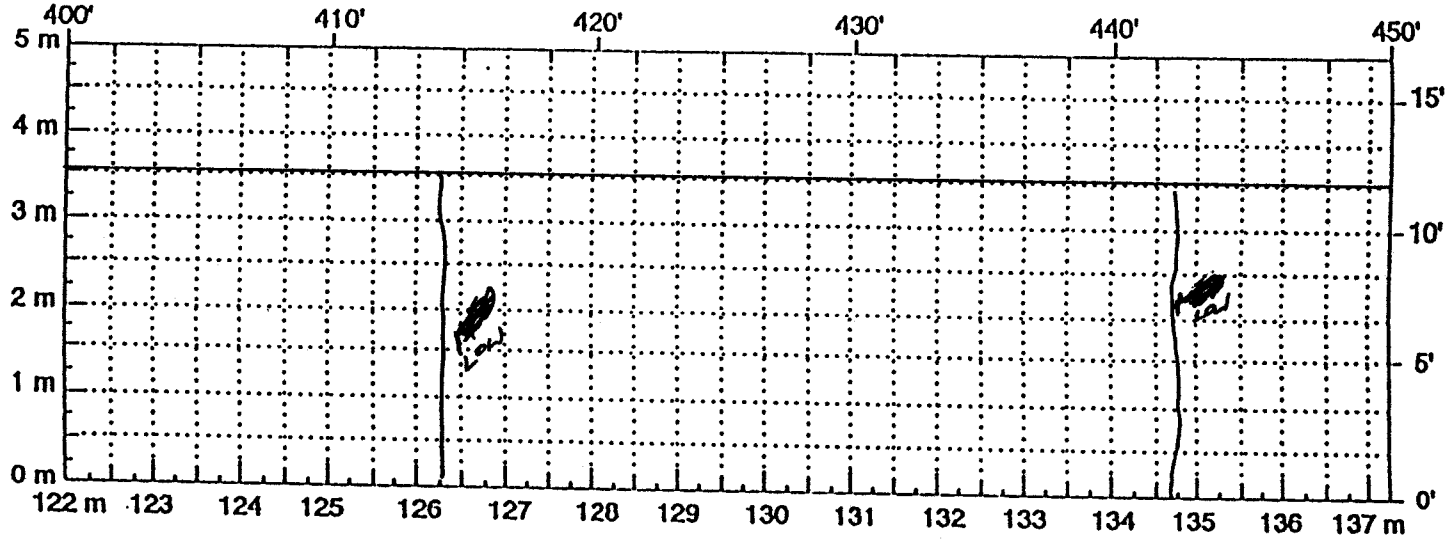


Comments: _____

State Assigned ID 831801

State Code BSU

SHRP Section ID 6/14/93



TRANS
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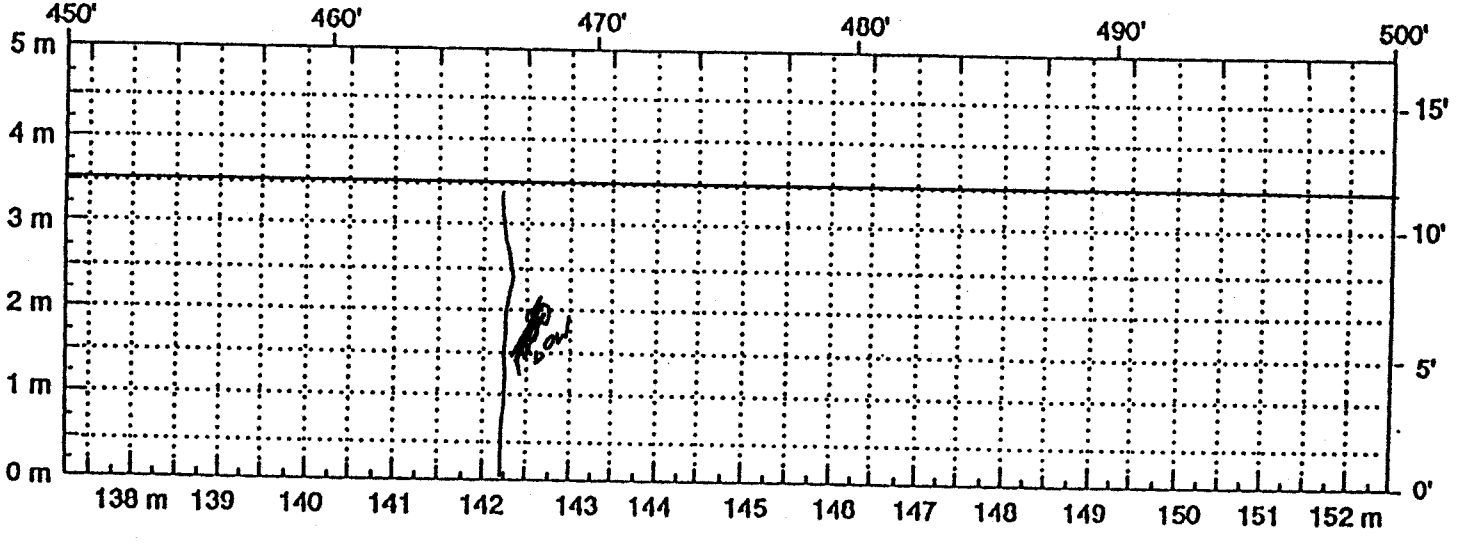
Comments: _____



Comments: _____

*** LTPP Section ID : 831801 ***

Date Surveyed : 06/29/89
Unit : #1
Camera : #1

Operator : SHUMAK
Date Digitized : 02/13/90

Rut Depth(mm)

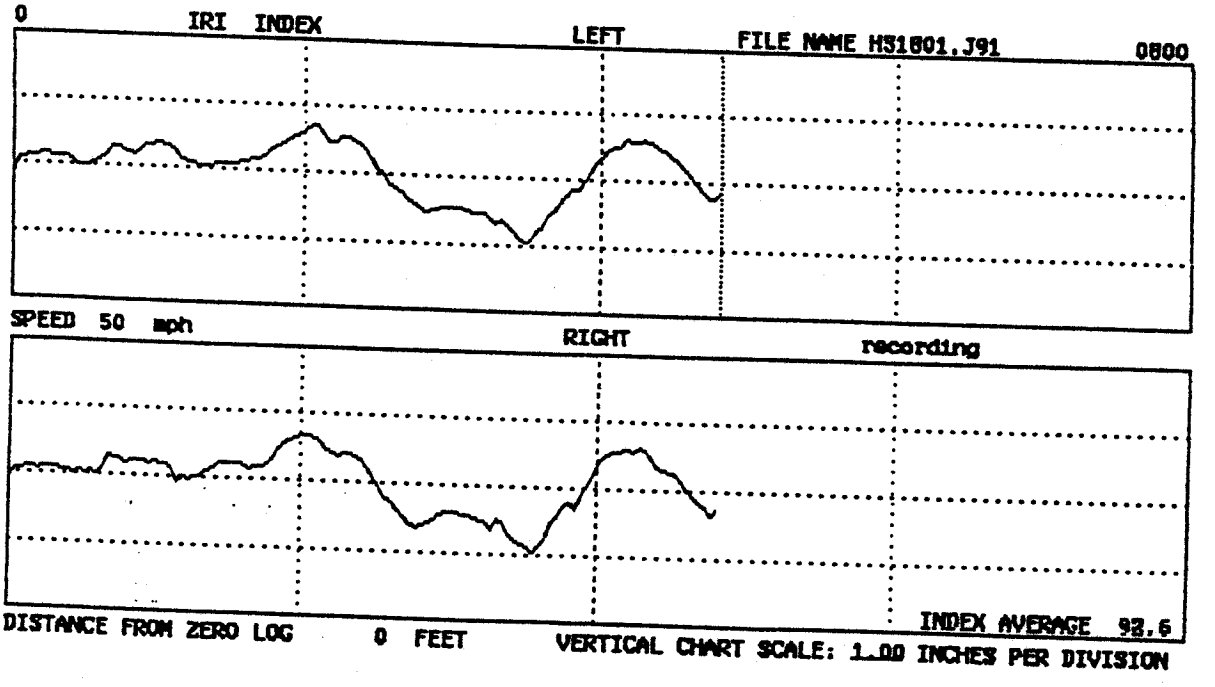
No.	Station	Leftside	Rightside
01	0+02	5	8
02	0+53	7	7
03	1+05	5	6
04	1+55	4	8
05	2+05	7	10
06	2+55	5	8
07	3+05	4	7
08	3+55	6	10
09	4+06	5	10
10	4+56	4	10
11	5+06	3	9
Summary			
Maximum		7	10
Minimum		3	6
Average		5.0	8.5
SD		1.3	1.4

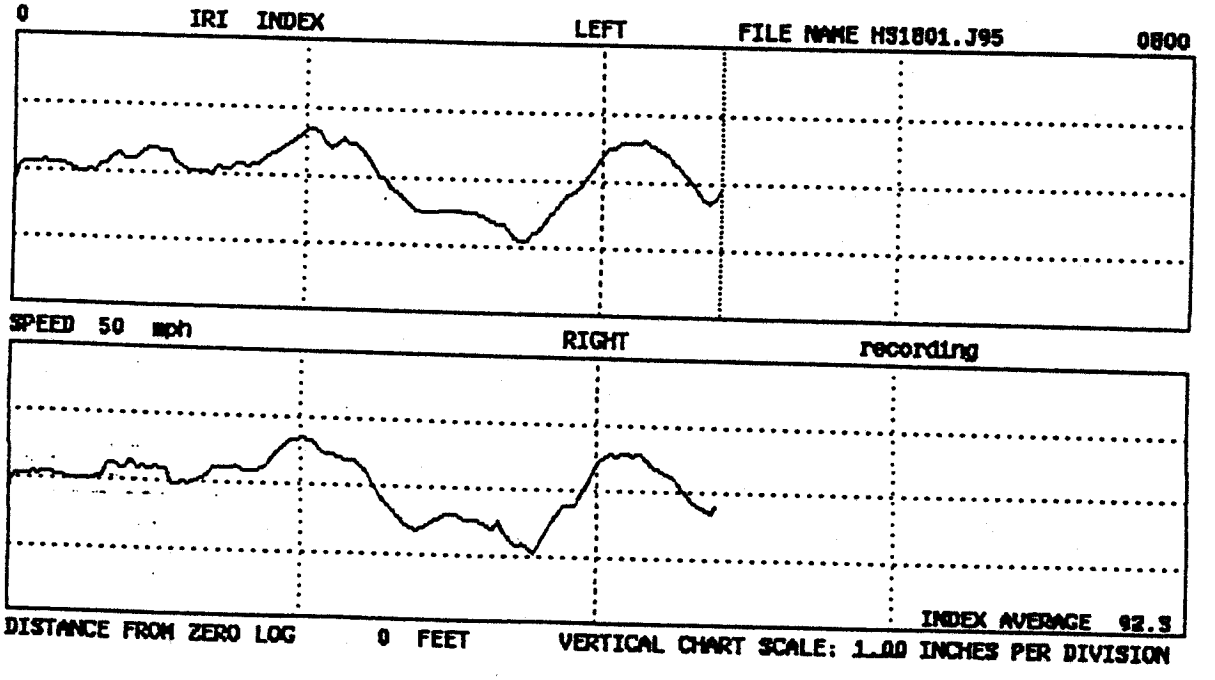
*** LTPP Section ID : 831801 ***

Date Surveyed : 06/21/91
Unit : #1
Camera : #1

Operator : CHAN
Date Digitized : 09/13/91

No.	Station	Rut Depth(mm) Leftside	Rightside
01	0-02	4	5
02	0+48	7	6
03	0+98	6	6
04	1+49	6	6
05	1+99	4	7
06	2+49	5	9
07	2+99	5	7
08	3+50	9	11
09	4+00	4	7
10	4+50	4	8
11	5+01	3	7
Summary			
Maximum		9	11
Minimum		3	5
Average		5.2	7.2
SD		1.7	1.7


0
IRI INDEX
LEFT
FILE NAME HS1601.J91
0800
SPEED 50 mph
RIGHT
recording
INDEX AVERAGE 92.6
DISTANCE FROM ZERO LOG 0 FEET
VERTICAL CHART SCALE: 1.00 INCHES PER DIVISION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IRI INDEX
LEFT
FILE NAME H31801.J95
0800
SPEED 50 mph
RIGHT
recording
INDEX AVERAGE 92.3
DISTANCE FROM ZERO LOG 0 FEET
VERTICAL CHART SCALE: 1.00 INCHES PER DIVISION

08:47 930614

Add Comm & Stn. Stn

File: C:\FWD\DATA\631601E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631601

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

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: 51 PvT: 54 08:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.3	11872	18.60	14.99	12.47	9.58	7.42	4.77	2.65
	C	109.7	12024	18.52	14.99	12.51	9.58	7.42	4.85	2.73
	C	109.3	11984	18.35	14.87	12.38	9.50	7.33	4.77	2.65
*	1	55.4	6072	9.26	7.41	6.13	4.60	3.51	2.25	1.26
*	1	55.4	6072	9.26	7.45	6.17	4.64	3.56	2.34	1.30
*	1	55.5	6080	9.22	7.41	6.13	4.64	3.51	2.30	1.34
*	1	55.5	6080	9.22	7.45	6.13	4.60	3.51	2.30	1.30
*	2	83.8	9184	13.83	11.16	9.30	7.05	5.42	3.51	1.95
*	2	84.5	9256	13.99	11.29	9.38	7.13	5.51	3.55	2.00
*	2	84.6	9260	13.99	11.33	9.38	7.13	5.51	3.55	2.00
*	2	84.6	9272	14.03	11.33	9.43	7.18	5.56	3.60	2.04
*	3	108.8	11936	18.10	14.69	12.25	9.41	7.29	4.77	2.65
*	3	109.3	11976	18.10	14.69	12.30	9.37	7.25	4.72	2.65
*	3	109.7	12024	18.27	14.87	12.47	9.54	7.38	4.90	2.73
*	3	109.4	12000	18.22	14.87	12.42	9.54	7.42	4.85	2.73
*	4	145.9	16008	23.17	19.00	15.94	12.33	9.65	6.33	3.56
*	4	146.2	16024	23.54	19.26	16.11	12.45	9.73	6.33	3.60
*	4	145.5	15952	23.17	19.05	15.98	12.33	9.65	6.33	3.56
*	4	144.6	15856	23.34	19.13	16.02	12.41	9.69	6.37	3.56

Stn: -35 Lane:F1 Temp: J/C: Air: 50 PvT: 54 08:52

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	18.73	15.12	12.60	9.54	7.33	4.77	2.65
	C	110.0	12064	18.39	14.78	12.42	9.41	7.29	4.81	2.73
	C	109.9	12040	18.31	14.62	12.30	9.37	7.25	4.81	2.73
*	1	55.9	6136	9.13	7.28	5.96	4.35V	3.29V	2.08V	1.13V
*	1	56.1	6152	9.22	7.41	6.08	4.47	3.42	2.25	1.26
*	1	55.9	6136	9.17	7.37	6.08	4.47	3.47	2.25	1.30
*	1	55.8	6120	9.17	7.45	6.08	4.52	3.51	2.30	1.34
*	2	83.6	9176	13.66	11.07	9.17	6.92	5.33	3.51	2.04
*	2	84.9	9312	13.83	11.20	9.25	6.97	5.38	3.51	2.00
*	2	84.6	9288	13.78	11.20	9.30	7.01	5.42	3.55	2.00
*	2	84.6	9272	13.87	11.20	9.38	7.05	5.42	3.60	2.04
*	3	109.9	12040	17.93	14.52	12.17	9.24	7.16	4.77	2.73
*	3	110.1	12080	18.01	14.56	12.21	9.29	7.20	4.77	2.69
*	3	109.9	12040	18.01	14.61	12.25	9.33	7.25	4.77	2.73
*	3	110.0	12064	17.97	14.61	12.30	9.33	7.25	4.77	2.69
*	4	149.1	16360	23.29	18.96	15.94	12.16	9.47	6.24	3.47
*	4	145.8	15984	23.04	18.74	15.85	12.12	9.47	6.24	3.51
*	4	145.8	15992	22.96	18.70	15.85	12.16	9.47	6.24	3.51
*	4	145.2	15920	22.87	18.70	15.77	12.07	9.42	6.24	3.51

Stn: -30 Lane:F1 Temp: J/C: Air: 51 PvT: 54 08:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.4	12000	18.98	15.21	12.60	9.62	7.38	4.68	2.65
	C	109.7	12040	18.56	14.91	12.38	9.54	7.29	4.72	2.65
	C	110.3	12096	18.48	14.87	12.34	9.50	7.29	4.68	2.65
*	1	55.5	6088	9.43	7.50	6.17	4.64	3.51	2.25	1.30
*	1	55.9	6128	9.34	7.45	6.17	4.64	3.51	2.25	1.30
*	1	56.2	6168	9.34	7.45	6.17	4.64	3.51	2.21	1.26
*	1	55.9	6128	9.34	7.45	6.21	4.69	3.51	2.30	1.30
*	2	84.5	9264	13.95	11.16	9.25	7.05	5.38	3.42	1.95
*	2	84.9	9312	14.08	11.29	9.34	7.13	5.47	3.51	2.04
*	2	84.6	9280	14.03	11.29	9.30	7.09	5.47	3.47	2.00
*	2	85.1	9328	14.08	11.33	9.38	7.18	5.47	3.51	2.00
*	3	110.6	12120	18.22	14.69	12.30	9.50	7.25	4.77	2.69
*	3	110.6	12128	18.31	14.78	12.30	9.50	7.29	4.72	2.69

File: C:\FWD\DATA\631601E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631601

*	3	110.3	12096	18.22	14.74	12.30	9.46	7.25	4.68	2.60
*	3	110.9	12152	18.27	14.82	12.38	9.58	7.33	4.77	2.69
*	4	144.8	15880	23.46	19.09	15.94	12.33	9.56	6.20	3.51
*	4	145.8	15984	23.46	19.13	16.02	12.41	9.60	6.24	3.56
*	4	146.1	16008	23.50	19.13	16.02	12.41	9.60	6.24	3.51
*	4	144.8	15872	23.42	19.09	15.94	12.41	9.60	6.20	3.47

Stn: -25 Lane:F1 Temp: J/C: Air: 52 PvT: 54 08:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12056	19.98	15.86	13.20	10.00	7.60	4.81	2.65
	C	110.6	12120	19.56	15.51	12.94	9.79	7.47	4.77	2.65
	C	111.0	12168	19.48	15.47	12.90	9.79	7.42	4.77	2.65
*	1	55.7	6096	9.76	7.71	6.38	4.77	3.56	2.30	1.26
*	1	55.7	6096	9.76	7.71	6.38	4.77	3.60	2.25	1.30
*	1	55.9	6136	9.85	7.80	6.43	4.81	3.64	2.34	1.34
*	1	55.5	6088	9.68	7.67	6.30	4.69	3.51	2.25	1.21
*	2	83.9	9208	14.50	11.50	9.55	7.22	5.47	3.51	1.95
*	2	84.8	9288	14.66	11.68	9.73	7.35	5.51	3.55	1.95
*	2	84.9	9312	14.62	11.63	9.73	7.35	5.51	3.60	2.00
*	2	84.6	9280	14.58	11.59	9.68	7.30	5.51	3.51	1.91
*	3	110.3	12096	19.06	15.21	12.72	9.71	7.33	4.77	2.65
*	3	110.6	12128	19.19	15.25	12.81	9.75	7.38	4.81	2.65
*	3	110.9	12152	19.19	15.30	12.77	9.75	7.47	4.77	2.65
*	3	110.6	12128	19.19	15.30	12.81	9.79	7.47	4.81	2.69
*	4	144.6	15864	24.63	19.69	16.54	12.75	9.78	6.33	3.56
*	4	144.9	15880	24.72	19.82	16.62	12.79	9.82	6.37	3.56
*	4	144.9	15896	24.63	19.78	16.62	12.75	9.78	6.33	3.47
*	4	144.9	15888	24.76	19.86	16.67	12.83	9.87	6.37	3.51

Stn: -20 Lane:F1 Temp: J/C: Air: 52 PvT: 54 09:01

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.6	12128	20.15	15.99	13.37	10.09	7.60	4.85	2.69
	C	110.0	12064	20.11	15.90	13.28	10.05	7.56	4.81	2.69
	C	110.4	12112	20.15	15.94	13.32	10.05	7.60	4.81	2.69
*	1	55.4	6080	10.22	8.06	6.68	5.02	3.64	2.43	1.34
*	1	55.4	6072	10.14	7.97	6.60	4.94	3.60	2.38	1.26
*	1	55.2	6056	10.14	7.97	6.60	4.94	3.60	2.34	1.26
*	1	55.5	6088	10.22	8.10	6.64	4.98	3.69	2.34	1.30
*	2	83.9	9200	15.21	12.02	9.98	7.47	5.60	3.51	1.95
*	2	84.1	9216	15.38	12.19	10.11	7.51	5.69	3.51	2.04
*	2	84.2	9224	15.33	12.19	10.15	7.64	5.69	3.60	2.08
*	2	84.2	9240	15.33	12.19	10.11	7.60	5.69	3.60	2.08
*	3	110.4	12104	19.98	15.90	13.28	10.00	7.60	4.77	2.78
*	3	110.4	12112	20.07	16.03	13.32	10.09	7.65	4.85	2.73
*	3	110.7	12136	20.07	16.03	13.32	10.09	7.65	4.85	2.73
*	3	110.4	12112	20.03	15.94	13.24	10.00	7.60	4.81	2.73
*	4	144.6	15856	25.56	20.42	17.05	12.96	9.87	6.24	3.51
*	4	144.8	15864	25.64	20.51	17.18	13.13	9.96	6.33	3.60
*	4	144.6	15856	25.64	20.51	17.09	13.04	9.91	6.33	3.51
*	4	144.5	15848	25.72	20.55	17.14	13.09	9.96	6.33	3.60

Stn: -15 Lane:F1 Temp: J/C: Air: 51 PvT: 54 09:04

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	20.15	16.24	13.54	10.26	7.69	4.90	2.69
	C	109.4	11992	19.73	15.86	13.24	10.09	7.60	4.81	2.65
	C	109.3	11976	19.65	15.86	13.24	10.05	7.60	4.81	2.65
*	1	55.1	6040	9.89	7.93	6.51	4.85	3.60	2.25	1.26
*	1	54.9	6032	9.89	7.93	6.56	4.90	3.64	2.30	1.34
*	1	55.1	6040	9.97	7.97	6.56	4.90	3.64	2.30	1.34
*	1	55.2	6048	9.89	7.93	6.51	4.85	3.60	2.25	1.26
*	2	83.5	9152	14.79	11.89	9.94	7.47	5.60	3.55	2.00
*	2	83.8	9184	14.87	11.98	9.98	7.51	5.60	3.55	2.00
*	2	83.6	9192	14.83	11.98	9.94	7.51	5.60	3.51	1.95
*	2	83.6	9168	14.79	11.98	9.94	7.51	5.56	3.51	1.95
*	3	109.3	11984	19.27	15.64	13.07	9.96	7.51	4.77	2.65
*	3	109.7	12024	19.36	15.60	13.07	9.96	7.56	4.81	2.65
*	3	109.9	12040	19.40	15.73	13.15	10.00	7.56	4.81	2.65
*	3	110.0	12064	19.40	15.73	13.15	10.00	7.60	4.81	2.65
*	4	144.3	15832	24.72	20.21	16.97	13.04	9.91	6.41	3.60
*	4	145.1	15912	25.05	20.47	17.18	13.17	10.05	6.46	3.60

File: C:\FWD\DATA\831801E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	4	143.6	15744	24.69	20.29	17.09	13.13	9.96	6.41	3.56
*	4	144.2	15816	24.64	20.29	17.05	13.09	9.96	6.41	3.56

Stn: -10 Lane:F1 Temp: J/C: Air: 51 PvT: 54 09:06

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12072	19.94	16.24	13.32	10.09	7.73	4.81	2.65
	C	110.6	12128	19.61	15.90	13.07	9.92	7.51	4.90	2.60
	C	110.6	12128	19.52	15.86	13.11	9.96	7.56	4.90	2.65
*	1	55.7	6104	9.80	7.93	6.47	4.81	3.60	2.34	1.30
*	1	55.9	6128	9.89	8.01	6.56	4.94	3.73	2.38	1.39
*	1	55.8	6112	9.80	7.97	6.51	4.90	3.64	2.34	1.30
*	1	55.9	6128	9.80	7.93	6.47	4.85	3.60	2.30	1.26
*	2	83.5	9152	14.56	11.81	9.73	7.35	5.51	3.60	1.95
*	2	84.3	9248	14.70	11.94	9.85	7.39	5.56	3.64	1.95
*	2	84.5	9272	14.70	11.94	9.81	7.43	5.60	3.60	1.95
*	2	84.3	9248	14.66	11.94	9.85	7.43	5.56	3.68	2.00
*	3	110.1	12080	19.06	15.55	12.85	9.79	7.42	4.77	2.60
*	3	110.7	12144	19.23	15.68	13.02	9.86	7.56	4.85	2.69
*	3	110.6	12128	19.15	15.64	12.94	9.84	7.51	4.81	2.65
*	3	110.7	12144	19.19	15.64	12.98	9.84	7.51	4.85	2.60
*	4	144.6	15864	24.51	20.12	16.71	12.79	9.82	6.28	3.43
*	4	143.6	15744	24.68	20.21	16.75	12.88	9.91	6.41	3.47
*	4	144.3	15824	24.59	20.17	16.75	12.88	9.87	6.37	3.47
*	4	143.8	15760	24.68	20.25	16.79	12.92	9.91	6.50	3.56

Stn: -5 Lane:F1 Temp: J/C: Air: 50 PvT: 54 09:09

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12032	19.86	15.86	13.20	9.96	7.56	4.77	2.65
	C	110.7	12144	19.48	15.55	12.94	9.79	7.38	4.77	2.65
	C	110.4	12112	19.40	15.51	12.90	9.79	7.42	4.81	2.69
*	1	55.8	6112	9.80	7.76	6.34	4.73	3.51	2.30	1.30
*	1	55.5	6080	9.80	7.76	6.38	4.73	3.56	2.30	1.30
*	1	55.8	6112	9.76	7.76	6.34	4.73	3.51	2.30	1.30
*	1	55.9	6136	9.89	7.80	6.43	4.77	3.60	2.34	1.30
*	2	83.6	9160	14.50	11.55	9.55	7.18	5.42	3.47	1.95
*	2	84.1	9224	14.58	11.63	9.60	7.22	5.38	3.47	1.95
*	2	84.5	9264	14.62	11.72	9.73	7.30	5.51	3.55	2.04
*	2	84.6	9280	14.66	11.72	9.73	7.30	5.47	3.55	2.04
*	3	109.9	12048	18.98	15.21	12.64	9.62	7.29	4.72	2.60
*	3	111.0	12176	19.15	15.47	12.85	9.75	7.47	4.85	2.73
*	3	110.6	12120	19.06	15.30	12.81	9.75	7.38	4.72	2.65
*	3	110.9	12152	19.10	15.38	12.85	9.75	7.47	4.77	2.69
*	4	144.1	15800	24.51	19.73	16.54	12.66	9.69	6.33	3.56
*	4	144.6	15864	24.63	19.86	16.58	12.66	9.69	6.28	3.47
*	4	144.8	15872	24.63	19.86	16.58	12.75	9.78	6.33	3.56
*	4	144.2	15816	24.59	19.82	16.58	12.66	9.73	6.24	3.47

Stn: 0 Lane:F1 Temp: J/C: Air: 50 PvT: 54 09:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.9	12384	20.03	15.38	12.72	9.58	7.33	4.77	2.69
	C	112.9	12384	19.61	14.99	12.47	9.41	7.16	4.72	2.65
	C	113.0	12400	19.56	14.99	12.47	9.41	7.20	4.72	2.65
*	1	56.5	6200	9.72	7.50	6.17	4.56	3.47	2.30	1.30
*	1	56.1	6144	9.59	7.41	6.13	4.52	3.42	2.21	1.26
*	1	56.2	6168	9.59	7.37	6.08	4.52	3.42	2.21	1.26
*	1	56.5	6200	9.68	7.41	6.13	4.52	3.42	2.21	1.26
*	2	85.5	9376	14.66	11.25	9.30	6.97	5.33	3.51	2.08
*	2	86.2	9448	14.79	11.38	9.38	7.05	5.42	3.60	2.04
*	2	85.9	9416	14.70	11.29	9.34	6.97	5.33	3.47	1.95
*	2	85.2	9344	14.62	11.20	9.25	6.92	5.29	3.51	1.95
*	3	112.3	12312	19.10	14.69	12.21	9.20	7.07	4.68	2.60
*	3	113.2	12416	19.27	14.87	12.38	9.37	7.20	4.68	2.65
*	3	113.2	12416	19.31	14.91	12.42	9.41	7.25	4.81	2.73
*	3	113.2	12416	19.19	14.87	12.34	9.33	7.16	4.68	2.65
*	4	145.2	15928	24.84	19.17	16.07	12.20	9.42	6.24	3.51
*	4	145.8	15984	25.05	19.30	16.20	12.33	9.51	6.33	3.64
*	4	145.4	15944	24.97	19.17	16.15	12.28	9.47	6.33	3.56
*	4	145.5	15952	25.01	19.26	16.20	12.33	9.51	6.37	3.60

File: C:\FWD\DATA\831801E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

Stn: 25 Lane:F1 Temp: J/C: Air: 50 PvT: 54 09:14

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11968	19.02	15.30	12.77	9.75	7.42	4.72	2.60
	C	110.3	12096	18.46	14.82	12.42	9.50	7.25	4.68	2.60
	C	109.9	12040	18.31	14.74	12.34	9.41	7.25	4.68	2.60
*	1	55.5	6080	9.17	7.33	6.13	4.56	3.51	2.21	1.26
*	1	55.1	6048	9.09	7.28	6.04	4.52	3.47	2.21	1.21
*	1	55.4	6072	9.17	7.28	6.06	4.56	3.47	2.25	1.30
*	1	55.1	6040	9.13	7.28	6.04	4.56	3.47	2.25	1.30
*	2	83.2	9120	13.78	11.03	9.21	7.01	5.33	3.47	2.00
*	2	83.9	9200	13.87	11.12	9.34	7.09	5.42	3.51	2.04
*	2	83.6	9168	13.83	11.07	9.25	7.05	5.38	3.47	1.95
*	2	84.1	9208	13.83	11.12	9.34	7.05	5.47	3.51	2.04
*	3	109.7	12032	18.06	14.56	12.25	9.37	7.25	4.68	2.65
*	3	110.3	12096	18.22	14.65	12.34	9.46	7.25	4.68	2.60
*	3	109.7	12032	18.14	14.69	12.34	9.46	7.29	4.72	2.65
*	3	110.1	12080	18.14	14.69	12.30	9.41	7.29	4.72	2.60
*	4	143.0	15680	23.34	18.87	15.94	12.28	9.51	6.15	3.43
*	4	143.5	15736	23.42	19.09	16.07	12.41	9.65	6.24	3.51
*	4	143.2	15704	23.46	19.09	16.07	12.41	9.69	6.28	3.51
*	4	143.3	15720	23.38	19.05	15.98	12.37	9.60	6.24	3.47

Stn: 50 Lane:F1 Temp: J/C: Air: 50 PvT: 54 09:17

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.6	12128	19.02	15.66	13.11	9.96	7.65	4.94	2.78
	C	111.0	12176	18.56	15.30	12.77	9.71	7.51	4.90	2.78
	C	111.4	12216	18.56	15.34	12.85	9.75	7.60	4.94	2.82
*	1	56.2	6168	9.22	7.54	6.26	4.64	3.60	2.34	1.30
*	1	56.5	6200	9.22	7.58	6.30	4.73	3.64	2.38	1.39
*	1	56.7	6216	9.22	7.58	6.30	4.69	3.64	2.38	1.39
*	1	56.7	6208	9.17	7.54	6.21	4.69	3.56	2.34	1.30
*	2	84.3	9240	13.83	11.33	9.47	7.13	5.51	3.60	2.04
*	2	84.9	9320	13.91	11.46	9.55	7.22	5.60	3.64	2.08
*	2	84.9	9304	13.95	11.46	9.60	7.30	5.64	3.68	2.13
*	2	85.4	9360	13.95	11.50	9.60	7.26	5.60	3.64	2.04
*	3	111.2	12192	18.27	15.12	12.68	9.71	7.51	4.98	2.82
*	3	111.4	12224	18.31	15.17	12.72	9.75	7.60	4.94	2.78
*	3	111.6	12232	18.35	15.25	12.77	9.79	7.60	4.98	2.82
*	3	111.4	12216	18.27	15.17	12.72	9.71	7.51	4.90	2.73
*	4	143.8	15760	23.54	19.61	16.50	12.66	9.91	6.50	3.56
*	4	143.8	15768	23.63	19.65	16.54	12.71	9.96	6.54	3.60
*	4	143.8	15760	23.67	19.69	16.58	12.75	10.00	6.54	3.64
*	4	143.8	15768	23.63	19.69	16.58	12.75	10.00	6.54	3.60

Stn: 75 Lane:F1 Temp: J/C: Air: 50 PvT: 54 09:19

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11968	22.37	17.92	14.78	11.02	8.36	5.20	2.73
	C	108.8	11936	27.40	17.45	14.44	10.81	8.13	5.07	2.65
	C	109.7	12024	21.79	17.54	14.48	10.85	8.22	5.16	2.65
*	1	55.4	6064	10.93	8.79	7.20	5.28	3.96	2.43	1.30
*	1	55.4	6072	10.89	8.70	7.11	5.23	3.87	2.38	1.21
*	1	55.2	6056	10.81	8.66	7.11	5.15	3.82	2.38	1.21
*	1	55.2	6048	10.85	8.70	7.15	5.19	3.91	2.47	1.34
*	2	83.0	9104	16.30	13.06	10.75	7.98	6.00	3.73	1.95
*	2	83.8	9176	16.46	13.23	10.93	8.15	6.09	3.77	2.04
*	2	83.3	9144	16.42	13.14	10.84	8.06	6.09	3.81	2.08
*	2	83.6	9168	16.34	13.10	10.84	7.98	6.04	3.77	1.95
*	3	109.7	12024	21.32	17.19	14.27	10.72	8.09	5.07	2.65
*	3	109.9	12040	21.49	17.41	14.44	10.98	8.22	5.11	2.82V
*	3	109.9	12040	21.49	17.32	14.35	10.76	8.18	5.16	2.69
*	3	109.6	12016	21.37	17.24	14.31	10.76	8.13	5.07	2.69
*	4	143.2	15704	33.26V	22.32	16.59	14.10	10.76	6.76	3.60
*	4	143.2	15704	27.44V	22.45	16.72	14.27	10.85	6.76	3.73
*	4	143.2	15704	27.44V	22.45	16.72	14.27	10.85	6.72	3.64
*	4	143.2	15696	27.32V	22.41	16.68	14.23	10.80	6.72	3.64

Stn: 100 Lane:F1 Temp: J/C: Air: 51 PvT: 54 09:22

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.3	11872	20.91	16.55	13.67	10.30	7.78	4.90	2.69
	C	109.0	11960	20.49	16.16	13.41	10.13	7.56	4.90	2.60
	C	109.1	11960	20.36	16.12	13.37	10.13	7.51	4.90	2.60

File: C:\FWD\DATA\631801E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631801

*	1	54.6	5984	10.18	8.01	6.56	4.94	3.60	2.38	1.30
*	1	54.6	5984	10.22	8.01	6.60	4.94	3.60	2.38	1.30
*	1	54.6	5984	10.14	8.01	6.56	4.90	3.64	2.38	1.30
*	1	54.8	6008	10.10	7.97	6.56	4.90	3.60	2.36	1.30
*	2	82.5	9048	15.21	11.98	9.90	7.43	5.56	3.51	1.91
*	2	83.2	9128	15.38	12.15	10.07	7.60	5.64	3.68	2.04
*	2	83.2	9120	15.29	12.11	10.03	7.51	5.60	3.60	1.95
*	2	83.2	9120	15.36	12.11	10.03	7.60	5.64	3.64	2.04
*	3	108.8	11936	19.94	15.86	13.20	9.96	7.51	4.81	2.60
*	3	109.0	11944	20.07	15.94	13.28	10.09	7.51	4.94	2.65
*	3	109.3	11976	20.11	15.99	13.28	10.13	7.60	4.90	2.65
*	3	109.3	11976	20.07	15.99	13.28	10.09	7.60	4.90	2.65
*	4	142.9	15672	25.93	20.73	17.31	13.21	9.96	6.46	3.56
*	4	142.9	15672	25.89	20.73	17.31	13.25	9.96	6.50	3.51
*	4	142.8	15648	25.93	20.73	17.27	13.25	9.96	6.46	3.47
*	4	143.0	15680	25.89	20.81	17.35	13.38	9.96	6.63	3.60

Stn: 125 Lane:F1 Temp: J/C: Air: 52 PvT: 54 09:24

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	21.11	16.93	13.97	10.68	8.09	5.20	2.86
	C	110.0	12056	20.74	16.68	13.71	10.55	8.05	5.16	2.82
	C	110.3	12088	20.65	16.63	13.71	10.55	8.05	5.16	2.91
*	1	55.4	6064	10.31	8.19	6.68	5.07	3.78	2.43	1.39
*	1	55.4	6072	10.35	8.27	6.73	5.11	3.87	2.51	1.43
*	1	55.7	6096	10.31	8.27	6.73	5.11	3.87	2.51	1.43
*	1	55.4	6064	10.22	8.23	6.68	5.11	3.82	2.47	1.43
*	2	83.6	9160	15.50	12.37	10.20	7.81	5.67	3.77	2.08
*	2	84.2	9224	15.56	12.50	10.28	7.89	5.96	3.81	2.13
*	2	84.1	9224	15.58	12.50	10.28	7.94	6.00	3.86	2.13
*	2	84.1	9224	15.50	12.45	10.24	7.81	5.91	3.77	2.04
*	3	110.0	12064	20.28	16.37	13.54	10.47	8.00	5.16	2.86
*	3	110.0	12064	20.40	16.46	13.67	10.51	8.05	5.20	2.86
*	3	110.1	12072	20.40	16.46	13.62	10.51	8.00	5.16	2.82
*	3	110.1	12080	20.36	16.50	13.67	10.55	8.05	5.20	2.86
*	4	143.3	15712	26.23	21.24	17.65	13.68	10.49	6.80	3.73
*	4	143.6	15744	26.31	21.37	17.74	13.76	10.53	6.84	3.77
*	4	143.5	15736	26.18	21.29	17.69	13.72	10.49	6.80	3.69
*	4	142.5	15624	26.27	21.33	17.69	13.76	10.53	6.84	3.73

Stn: 150 Lane:F1 Temp: J/C: Air: 51 PvT: 54 09:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12096	21.03	17.32	14.48	11.06	8.45	5.20	2.60
	C	111.0	12168	20.61	16.89	14.18	10.89	8.31	5.16	2.60
	C	111.2	12192	20.61	16.89	14.14	10.89	8.36	5.20	2.69
*	1	56.1	6152	10.22	8.32	6.94	5.23	4.00	2.47	1.30
*	1	55.5	6088	10.22	8.36	6.94	5.23	4.00	2.51	1.34
*	1	56.2	6160	10.10	8.27	6.90	5.19	3.96	2.47	1.26
*	1	55.9	6128	10.10	8.27	6.86	5.19	3.96	2.47	1.26
*	2	84.3	9248	15.38	12.58	10.54	8.06	6.13	3.81	2.00
*	2	84.6	9272	15.46	12.62	10.54	8.10	6.18	3.86	1.95
*	2	84.9	9320	15.50	12.67	10.67	8.15	6.22	3.90	2.04
*	2	84.5	9264	15.38	12.62	10.58	8.10	6.18	3.90	2.04
*	3	110.9	12160	20.19	16.55	13.97	10.76	8.27	5.16	2.65
*	3	111.7	12248	20.32	16.76	14.10	10.85	8.36	5.20	2.73
*	3	111.4	12208	20.40	16.76	14.14	10.89	8.40	5.24	2.78
*	3	111.0	12176	20.24	16.63	14.05	10.85	8.31	5.20	2.69
*	4	143.9	15784	26.10	21.59	18.25	14.18	10.93	6.84	3.60
*	4	144.2	15808	26.14	21.67	18.34	14.27	11.02	6.93	3.69
*	4	144.5	15840	26.23	21.76	18.34	14.27	10.98	6.89	3.60
*	4	145.4	15928	26.35	21.80	18.42	14.31	11.02	6.93	3.64

Stn: 175 Lane:F1 Temp: J/C: Air: 52 PvT: 54 09:31

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.4	12104	22.20	17.75	14.65	10.98	8.22	5.11	2.65
	C	110.9	12152	21.74	17.36	14.35	10.72	8.05	5.07	2.60
	C	110.4	12112	21.58	17.28	14.31	10.72	8.05	5.07	2.65
*	1	55.2	6056	10.64	8.49	6.90	5.11	3.69	2.34	1.21
*	1	55.4	6072	10.68	8.45	6.90	5.11	3.73	2.38	1.30
*	1	55.5	6088	10.64	8.40	6.94	5.11	3.78	2.38	1.30
*	1	55.5	6080	10.68	8.45	6.94	5.15	3.82	2.43	1.34
*	2	84.2	9232	16.05	12.84	10.58	7.89	5.87	3.68	1.95

File: C:\FWD\DATA\631601E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631601

*	2	84.5	9264	16.21	12.97	10.71	7.98	5.96	3.77	2.00
*	2	84.5	9272	16.17	12.93	10.67	7.89	5.91	3.73	1.91
*	2	84.6	9280	16.21	12.97	10.67	7.98	6.00	3.73	2.00
*	3	111.0	12168	21.28	17.06	14.16	10.68	8.05	5.07	2.65
*	3	111.2	12192	21.32	17.15	14.18	10.68	8.00	5.03	2.56
*	3	110.9	12160	21.32	17.06	14.14	10.64	8.00	5.03	2.60
*	3	110.6	12128	21.24	17.06	14.14	10.68	8.00	5.07	2.69
*	4	143.0	15688	27.36	22.02	18.29	13.93	10.49	6.63	3.43
*	4	143.8	15768	27.61	22.23	18.55	14.10	10.62	6.72	3.56
*	4	143.5	15736	27.52	22.19	18.47	14.01	10.62	6.72	3.47
*	4	143.5	15728	27.52	22.19	18.51	14.06	10.71	6.76	3.56

Stn: 200 Lane:F1 Temp: J/C: Air: 53 PvT: 55 09:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	21.79	17.19	13.88	10.43	7.73	4.85	2.69
	C	110.9	12160	21.41	16.85	13.58	10.26	7.60	4.77	2.65
	C	110.7	12144	21.28	16.85	13.54	10.30	7.65	4.81	2.65
*	1	55.5	6096	10.56	8.32	6.56	4.94	3.60	2.25	1.26
*	1	55.7	6096	10.64	8.32	6.56	4.94	3.60	2.25	1.26
*	1	55.8	6112	10.60	8.32	6.60	4.98	3.60	2.30	1.34
*	1	55.4	6072	10.56	8.32	6.56	4.94	3.60	2.25	1.30
*	2	83.8	9176	15.92	12.54	10.07	7.60	5.60	3.55	2.00
*	2	84.1	9216	15.96	12.62	10.15	7.64	5.64	3.55	2.04
*	2	84.3	9248	16.05	12.62	10.15	7.68	5.64	3.60	2.08
*	2	84.3	9246	15.92	12.54	10.11	7.60	5.60	3.51	2.00
*	3	110.9	12152	20.91	16.59	13.41	10.17	7.56	4.77	2.65
*	3	110.9	12160	20.91	16.63	13.45	10.22	7.60	4.81	2.65
*	3	111.3	12200	21.03	16.72	13.54	10.30	7.69	4.85	2.73
*	3	111.2	12184	20.99	16.68	13.50	10.26	7.65	4.85	2.73
*	4	143.3	15712	26.94	21.50	17.46	13.38	10.05	6.37	3.56
*	4	143.5	15728	27.15	21.63	17.57	13.42	10.09	6.46	3.60
*	4	143.2	15704	27.11	21.59	17.61	13.42	10.09	6.41	3.56
*	4	143.3	15712	27.06	21.54	17.61	13.42	10.09	6.41	3.64

Stn: 225 Lane:F1 Temp: J/C: Air: 52 PvT: 55 09:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12064	20.61	16.24	13.32	10.05	7.47	4.77	2.52
	C	110.1	12080	20.07	15.86	13.02	9.88	7.33	4.77	2.60
	C	110.4	12112	19.98	15.81	12.94	9.84	7.33	4.72	2.60
*	1	55.1	6040	9.89	7.67	6.26	4.60	3.42	2.17	1.26
*	1	55.4	6072	9.85	7.71	6.30	4.69	3.47	2.25	1.34
*	1	54.6	5984	9.76	7.63	6.17	4.56	3.38	2.12	1.30
*	1	54.9	6032	9.76	7.63	6.17	4.60	3.38	2.17	1.26
*	2	83.5	9152	14.83	11.72	9.55	7.22	5.33	3.42	1.91
*	2	84.2	9224	15.04	11.89	9.77	7.35	5.47	3.55	2.00
*	2	84.3	9248	15.00	11.89	9.73	7.30	5.42	3.51	1.87
*	2	84.2	9232	15.00	11.85	9.68	7.30	5.42	3.47	1.95
*	3	110.7	12144	19.69	15.68	12.90	9.84	7.33	4.77	2.65
*	3	111.2	12184	19.77	15.68	12.94	9.84	7.33	4.72	2.60
*	3	110.9	12152	19.77	15.68	12.90	9.84	7.33	4.72	2.60
*	3	110.7	12144	19.73	15.68	12.94	9.84	7.33	4.72	2.60
*	4	143.2	15704	25.35	20.21	16.71	12.79	9.69	6.20	3.38
*	4	143.6	15744	25.56	20.38	16.88	12.96	9.78	6.37	3.51
*	4	143.8	15768	25.51	20.38	16.88	12.96	9.78	6.33	3.47
*	4	143.8	15760	25.51	20.38	16.88	12.96	9.78	6.33	3.47

Stn: 250 Lane:F1 Temp: J/C: Air: 52 PvT: 55 09:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12024	18.81	15.12	12.55	9.67	7.33	4.81	2.52
	C	110.1	12088	18.31	14.78	12.21	9.46	7.25	4.77	2.52
	C	110.3	12096	18.27	14.69	12.21	9.41	7.25	4.81	2.56
*	1	55.4	6080	9.09	7.20	5.96	4.52	3.47	2.30	1.26
*	1	55.4	6072	9.01	7.20	5.91	4.47	3.42	2.21	1.21
*	1	55.5	6088	9.05	7.24	5.96	4.56	3.47	2.30	1.30
*	1	55.2	6056	9.05	7.20	5.96	4.52	3.47	2.30	1.30
*	2	83.2	9128	13.62	10.86	9.00	6.88	5.29	3.47	1.87
*	2	84.3	9248	13.74	11.12	9.13	7.01	5.33	3.51	1.87
*	2	84.1	9216	13.74	11.07	9.13	7.05	5.38	3.55	1.91
*	2	84.2	9240	13.70	10.99	9.08	7.01	5.38	3.51	1.91
*	3	110.4	12104	17.97	14.43	12.08	9.33	7.25	4.77	2.60
*	3	110.7	12144	18.01	14.56	12.12	9.37	7.29	4.81	2.60

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*	3	110.9	12160	18.06	14.52	12.12	9.37	7.25	4.77	2.52
*	3	110.7	12136	18.01	14.52	12.08	9.37	7.25	4.72	2.52
*	4	143.0	15680	23.25	18.74	15.68	12.24	9.47	6.20	3.30
*	4	143.0	15680	23.29	18.92	15.77	12.33	9.51	6.28	3.34
*	4	143.0	15688	23.25	18.83	15.72	12.24	9.51	6.24	3.34
*	4	143.5	15736	23.29	18.83	15.72	12.28	9.51	6.24	3.30

Stn: 275 Lane:F1 Temp: J/C: Air: 51 PvT: 55 09:41

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12088	19.02	15.21	12.64	9.71	7.38	4.72	2.56
	C	110.7	12144	18.60	14.91	12.38	9.54	7.29	4.72	2.65
	C	110.9	12160	18.56	14.87	12.38	9.58	7.29	4.77	2.65
*	1	55.5	6088	9.17	7.33	6.08	4.60	3.51	2.30	1.34
*	1	55.8	6112	9.13	7.28	6.04	4.56	3.42	2.21	1.26
*	1	55.8	6120	9.13	7.28	6.00	4.56	3.42	2.21	1.26
*	1	55.5	6096	9.17	7.33	6.04	4.60	3.47	2.30	1.30
*	2	84.1	9216	13.74	10.99	9.13	7.01	5.33	3.47	1.95
*	2	84.5	9264	13.83	11.07	9.21	7.09	5.33	3.47	1.91
*	2	84.5	9272	13.83	11.07	9.21	7.13	5.38	3.51	1.95
*	2	84.9	9304	13.87	11.12	9.25	7.09	5.38	3.47	1.91
*	3	110.9	12160	18.18	14.61	12.21	9.46	7.16	4.72	2.65
*	3	111.0	12176	18.31	14.69	12.30	9.54	7.25	4.77	2.65
*	3	111.2	12184	18.31	14.69	12.30	9.54	7.25	4.77	2.65
*	3	111.2	12184	18.22	14.65	12.25	9.46	7.20	4.72	2.60
*	4	143.0	15688	23.42	18.92	15.77	12.28	9.42	6.15	3.38
*	4	143.8	15768	23.59	19.00	15.94	12.41	9.51	6.24	3.47
*	4	143.6	15752	23.54	19.00	15.94	12.37	9.51	6.20	3.47
*	4	143.6	15752	23.54	18.96	15.90	12.45	9.51	6.20	3.43

Stn: 300 Lane:F1 Temp: J/C: Air: 51 PvT: 56 09:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12064	19.10	15.68	13.02	10.00	7.60	4.81	2.60
	C	110.1	12080	18.73	15.38	12.77	9.84	7.51	4.85	2.65
	C	110.4	12112	18.68	15.34	12.72	9.79	7.47	4.81	2.60
*	1	55.4	6080	9.30	7.58	6.21	4.73	3.56	2.25	1.26
*	1	55.8	6112	9.26	7.63	6.26	4.77	3.60	2.30	1.30
*	1	56.4	6176	9.34	7.63	6.30	4.77	3.64	2.30	1.30
*	1	55.7	6096	9.26	7.58	6.21	4.73	3.56	2.25	1.26
*	2	83.6	9160	13.95	11.38	9.43	7.26	5.51	3.47	1.91V
*	2	84.5	9272	14.08	11.50	9.55	7.35	5.60	3.60	2.08
*	2	84.5	9272	14.08	11.50	9.51	7.30	5.56	3.55	1.95
*	2	84.5	9264	14.08	11.55	9.60	7.35	5.60	3.64	2.08
*	3	110.7	12136	18.43	15.12	12.60	9.71	7.42	4.81	2.69
*	3	110.9	12152	18.43	15.17	12.60	9.75	7.47	4.81	2.65
*	3	111.0	12176	18.52	15.21	12.64	9.75	7.47	4.81	2.65
*	3	111.2	12192	18.52	15.17	12.64	9.75	7.47	4.77	2.65
*	4	143.6	15744	23.71	19.56	16.32	12.66	9.73	6.28	3.47
*	4	143.8	15760	23.84	19.69	16.41	12.75	9.82	6.37	3.56
*	4	143.6	15752	23.84	19.69	16.50	12.79	9.87	6.37	3.51
*	4	143.6	15744	23.80	19.65	16.45	12.71	9.82	6.33	3.51

Stn: 325 Lane:F1 Temp: J/C: Air: 51 PvT: 55 09:46

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12056	19.98	16.33	13.50	10.34	7.82	4.90	2.56
	C	110.1	12088	19.61	15.99	13.24	10.17	7.69	4.85	2.60
	C	110.7	12136	19.65	16.03	13.28	10.22	7.78	4.94	2.69
*	1	55.4	6080	9.72	7.93	6.51	4.94	3.69	2.34	1.26
*	1	55.5	6088	9.85	7.97	6.56	5.02	3.82	2.43	1.34
*	1	55.5	6088	9.80	7.97	6.56	4.98	3.78	2.43	1.34
*	1	55.5	6088	9.72	7.93	6.47	4.94	3.69	2.38	1.30
*	2	83.8	9192	14.66	11.98	9.90	7.56	5.73	3.60	1.95
*	2	84.5	9264	14.83	12.06	9.98	7.60	5.78	3.64	1.95
*	2	84.5	9264	14.79	12.02	9.98	7.64	5.78	3.64	1.95
*	2	84.5	9264	14.83	12.15	10.07	7.73	5.87	3.68	2.04
*	3	110.7	12136	19.27	15.77	13.11	10.09	7.69	4.85	2.60
*	3	110.9	12152	19.36	15.90	13.24	10.17	7.87	4.98	2.65
*	3	110.9	12152	19.36	15.86	13.20	10.17	7.82	4.94	2.60
*	3	110.7	12136	19.31	15.77	13.15	10.13	7.73	4.90	2.60
*	4	143.0	15688	24.97	20.47	17.05	13.25	10.18	6.50	3.51
*	4	143.0	15680	24.89	20.47	17.05	13.21	10.13	6.41	3.47
*	4	143.0	15688	24.89	20.47	17.01	13.21	10.13	6.46	3.43

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*	4	143.0	15688	24.93	20.51	17.09	13.30	10.22	6.50	3.51

Stn: 350 Lane:F1 Temp: J/C: Air: 50 PvT: 56 09:49

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11952	23.92	17.80	14.14	10.43	7.69	4.64	2.52
	C	109.3	11984	23.34	17.45	13.84	10.30	7.60	4.68	2.52
	C	109.6	12016	23.25	17.36	13.80	10.26	7.60	4.68	2.56
*	1	54.5	5976	11.98	8.70	6.77	4.94	3.60	2.21	1.21
*	1	54.8	6000	11.98	8.66	6.77	4.94	3.60	2.21	1.21
*	1	54.5	5968	11.98	8.70	6.81	4.94	3.60	2.21	1.21
*	1	54.6	5984	11.94	8.70	6.81	4.98	3.64	2.25	1.26
*	2	82.9	9088	17.64	13.06	10.33	7.60	5.60	3.42	1.87
*	2	83.2	9128	17.81	13.19	10.41	7.68	5.64	3.47	1.87
*	2	83.5	9144	17.81	13.23	10.45	7.73	5.73	3.51	1.91
*	2	83.9	9200	17.85	13.27	10.45	7.77	5.69	3.55	1.95
*	3	109.4	12000	22.83	17.15	13.67	10.17	7.56	4.68	2.52
*	3	109.6	12016	22.96	17.24	13.75	10.26	7.65	4.72	2.60
*	3	109.7	12024	23.00	17.24	13.75	10.22	7.60	4.72	2.56
*	3	109.4	12000	22.92	17.24	13.75	10.26	7.65	4.72	2.56
*	4	142.8	15656	29.12	22.06	17.65	13.21	9.82	6.07	3.30
*	4	143.0	15688	29.26	22.19	17.78	13.38	9.96	6.20	3.43
*	4	143.2	15696	29.24	22.15	17.74	13.34	9.91	6.15	3.34
*	4	142.9	15672	29.33	22.15	17.78	13.34	10.00	6.20	3.38

'L-TRANS.CR. UNDER LP

Stn: 375 Lane:F1 Temp: J/C: Air: 51 PvT: 55 09:51

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12024	19.15	15.30	12.64	9.33	6.98	4.25	2.26
	C	110.4	12104	18.77	14.99	12.42	9.20	6.85	4.25	2.30
	C	110.4	12112	18.68	14.95	12.42	9.24	6.98	4.29	2.39
*	1	55.2	6056	9.47	7.54	6.21	4.47	3.29	2.04	1.17
*	1	55.7	6104	9.51	7.63	6.26	4.56	3.33	2.08	1.21
*	1	55.9	6144	9.55	7.63	6.26	4.56	3.33	2.08	1.17
*	1	55.9	6128	9.55	7.63	6.26	4.56	3.38	2.08	1.21
*	2	83.6	9160	14.12	11.29	9.34	6.84	5.11	3.12	1.73
*	2	84.1	9216	14.24	11.38	9.43	6.97	5.20	3.16	1.78
*	2	84.2	9232	14.29	11.38	9.43	6.97	5.20	3.21	1.78
*	2	84.2	9232	14.16	11.29	9.38	6.88	5.16	3.16	1.73
*	3	110.6	12128	18.35	14.74	12.25	9.12	6.89	4.20	2.34
*	3	110.6	12128	18.48	14.82	12.34	9.16	6.93	4.29	2.34
*	3	110.7	12144	18.43	14.82	12.38	9.20	6.93	4.29	2.34
*	3	111.0	12168	18.43	14.87	12.38	9.24	6.98	4.33	2.39
*	4	143.2	15696	23.34	18.87	15.72	11.78	8.93	5.50	2.99
*	4	143.8	15760	23.54	19.05	15.94	11.90	9.07	5.63	3.08
*	4	143.6	15752	23.54	19.05	15.90	11.95	9.11	5.66	3.12
*	4	143.6	15736	23.50	19.05	15.90	11.95	9.02	5.68	3.08

Stn: 400 Lane:F1 Temp: J/C: Air: 51 PvT: 56 09:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12032	19.36	15.30	12.60	9.24	6.76	4.12	2.26
	C	110.3	12096	18.94	14.95	12.25	9.03	6.62	4.03	2.17
	C	111.3	12200	18.81	14.91	12.25	9.08	6.67	4.07	2.21
*	1	55.4	6072	9.55	7.58	6.21	4.52	3.24	1.99	1.13
*	1	55.4	6064	9.43	7.50	6.13	4.43	3.20	1.95	1.08
*	1	55.7	6096	9.59	7.63	6.17	4.52	3.24	1.99	1.13
*	1	55.8	6120	9.55	7.58	6.21	4.47	3.24	1.99	1.13
*	2	83.9	9208	14.16	11.25	9.25	6.75	4.98	3.03	1.69
*	2	84.5	9264	14.24	11.33	9.25	6.80	4.98	3.03	1.65
*	2	84.3	9256	14.24	11.33	9.30	6.80	4.98	3.03	1.60
*	2	84.6	9272	14.24	11.33	9.30	6.80	5.02	3.03	1.65
*	3	110.1	12088	18.39	14.65	12.04	8.91	6.58	4.03	2.17
*	3	110.9	12152	18.52	14.82	12.21	9.03	6.67	4.12	2.26
*	3	110.9	12160	18.52	14.74	12.12	8.99	6.67	4.07	2.21
*	3	110.6	12120	18.48	14.74	12.17	9.03	6.62	4.12	2.21
*	4	142.9	15664	23.50	18.74	15.55	11.61	8.62	5.29	2.91
*	4	143.2	15696	23.59	18.83	15.60	11.65	8.67	5.33	2.91
*	4	143.6	15744	23.67	18.87	15.64	11.65	8.71	5.42	2.99
*	4	143.2	15696	23.67	18.92	15.64	11.69	8.71	5.42	2.99

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Subsection: 631801

Stn: 425 Lane:F1 Temp: J/C: Air: 51 PvT: 55 09:58

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12096	19.69	15.25	12.25	8.91	6.44	3.86	2.13
	C	110.7	12136	19.23	14.91	12.00	8.70	6.36	3.86	2.13
	C	110.7	12144	19.06	14.82	11.95	8.65	6.36	3.86	2.13
*	1	55.5	6088	9.89	7.67	6.13	4.35	3.11	1.91	1.17
*	1	55.1	6040	9.68	7.50	6.00	4.26	3.02	1.82	1.04
*	1	55.4	6080	9.72	7.54	6.04	4.26	3.07	1.82	1.04
*	1	55.5	6088	9.76	7.58	6.08	4.31	3.11	1.91	1.13
*	2	84.1	9216	14.45	11.20	9.00	6.46	4.71	2.86	1.60
*	2	84.3	9248	14.54	11.29	9.08	6.54	4.76	2.86	1.60
*	2	84.2	9232	14.54	11.29	9.08	6.54	4.76	2.86	1.65
*	2	84.3	9256	14.54	11.33	9.13	6.59	4.80	2.95	1.69
*	3	110.6	12128	18.64	14.56	11.78	8.57	6.27	3.77	2.08
*	3	111.0	12176	18.81	14.65	11.83	8.65	6.31	3.81	2.13
*	3	111.0	12168	18.77	14.61	11.83	8.65	6.27	3.77	2.08
*	3	111.0	12176	18.85	14.65	11.78	8.70	6.31	3.77	2.13
*	4	143.2	15696	24.01	18.74	15.21	11.23	8.22	5.03	2.82
*	4	144.1	15800	24.01	18.79	15.25	11.27	8.22	4.98	2.78
*	4	143.0	15680	24.01	18.79	15.30	11.31	8.31	5.07	2.86
*	4	143.2	15696	24.01	18.79	15.21	11.23	8.27	5.03	2.82

Stn: 450 Lane:F1 Temp: J/C: Air: 52 PvT: 55 10:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	19.94	15.55	12.68	9.08	6.53	3.86	2.08
	C	109.4	11992	19.56	15.25	12.47	9.03	6.49	3.90	2.13
	C	109.7	12024	19.44	15.17	12.42	8.99	6.49	3.86	2.08
*	1	54.6	5984	9.97	7.67	6.26	4.52	3.16	1.86	1.08
*	1	54.3	5968	9.85	7.63	6.21	4.47	3.16	1.86	1.08
*	1	54.8	6016	9.93	7.67	6.26	4.52	3.16	1.91	1.08
*	1	54.6	5992	9.85	7.58	6.17	4.39	3.11	1.78	1.00
*	2	82.9	9088	14.75	11.42	9.34	6.71	4.60	2.82	1.56
*	2	83.5	9152	14.83	11.59	9.47	6.75	4.89	2.86	1.60
*	2	83.2	9120	14.70	11.55	9.38	6.71	4.89	2.86	1.60
*	2	83.3	9136	14.79	11.55	9.43	6.71	4.89	2.86	1.60
*	3	109.7	12032	19.06	14.99	12.30	8.91	6.49	3.86	2.13
*	3	109.9	12040	19.15	15.04	12.38	8.95	6.53	3.90	2.13
*	3	109.9	12048	19.15	15.06	12.38	8.95	6.53	3.90	2.13
*	3	110.0	12064	19.15	15.04	12.34	8.99	6.53	3.90	2.13
*	4	143.3	15712	24.38	19.17	15.85	11.65	8.49	5.07	2.78
*	4	143.2	15704	24.38	19.26	15.85	11.65	8.49	5.07	2.78
*	4	143.0	15680	24.42	19.30	15.94	11.69	8.53	5.11	2.82
*	4	143.0	15680	24.34	19.26	15.90	11.61	8.53	5.11	2.78

Stn: 475 Lane:F1 Temp: J/C: Air: 52 PvT: 56 10:03

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	18.68	14.52	11.83	8.61	6.22	3.77	2.00
	C	110.0	12056	18.22	14.13	11.53	8.44	6.13	3.73	2.00
	C	110.3	12096	18.10	14.09	11.48	8.40	6.09	3.68	1.95
*	1	54.6	5992	9.17	6.98	5.61	3.93	2.84	1.60	0.91
*	1	54.1	5928	9.05	6.98	5.61	4.01	2.84	1.69	0.95
*	1	54.6	5984	9.09	7.07	5.70	4.09	2.93	1.73	1.08V
*	1	54.2	5944	9.09	6.98	5.61	4.01	2.84	1.73	0.95
*	2	82.9	9088	13.62	10.56	8.57	6.21	4.53	2.69	1.47
*	2	82.8	9072	13.66	10.56	8.57	6.16	4.49	2.64V	1.43
*	2	82.6	9064	13.62	10.43	8.57	6.37	4.49	2.86	1.43
*	2	82.5	9040	13.66	10.47	8.61	6.37	4.53	2.90V	1.52
*	3	108.8	11936	17.51	13.70	11.27	8.36	6.00	3.81	1.95
*	3	109.7	12024	17.72	13.79	11.40	8.44	6.04	3.81	1.95
*	3	109.3	11984	17.60	13.79	11.31	8.27	6.04	3.68	1.95
*	3	109.7	12024	17.68	13.87	11.40	8.36	6.13	3.73	2.00
*	4	141.4	15504	22.75	17.84	14.74	10.93	8.00	4.90	2.60
*	4	141.6	15520	22.75	17.80	14.78	11.02	8.00	5.03V	2.60
*	4	141.6	15528	22.75	17.97	14.78	10.93	8.05	4.90	2.65
*	4	141.7	15544	22.79	17.97	14.74	10.85	8.00	4.81	2.60

Stn: 500 Lane:F1 Temp: J/C: Air: 53 PvT: 56 10:05

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.0	12280	18.98	14.69	12.12	9.03	6.09	3.81	2.13
	C	112.2	12304	18.48	14.35	11.74	8.78	5.96	3.77	2.08
	C	112.6	12344	18.43	14.31	11.78	8.78	6.00	3.77	2.04

File: C:\FWD\DATA\631601E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631601

*	1	54.9	6032	9.05	6.98	5.74	4.22	2.80	1.78	1.04
*	1	55.1	6040	9.05	6.98	5.74	4.22	2.80	1.78	1.08
*	1	55.8	6112	9.01	6.98	5.74	4.22	2.80	1.78	1.04
*	1	55.5	6080	9.09	7.07	5.74	4.22	2.84	1.82	1.08
*	2	83.9	9208	13.74	10.60	8.74	6.54	4.40	2.77	1.60
*	2	84.5	9264	13.87	10.64	8.78	6.50	4.40	2.73	1.56
*	2	84.2	9232	13.83	10.69	8.83	6.59	4.44	2.77	1.56
*	2	84.2	9232	13.78	10.64	8.78	6.54	4.40	2.82	1.56
*	3	112.5	12328	18.18	14.09	11.65	8.74	6.00	3.81	2.13
*	3	112.6	12352	18.22	14.13	11.70	8.78	6.00	3.81	2.13
*	3	112.6	12352	18.22	14.13	11.70	8.78	6.04	3.81	2.13
*	3	112.8	12360	18.18	14.09	11.70	8.74	6.00	3.77	2.13
*	4	145.8	15984	23.54	18.27	15.12	11.40	7.91	4.98	2.73
*	4	145.1	15912	23.67	18.27	15.21	11.44	8.00	5.03	2.78
*	4	145.7	15976	23.63	18.31	15.17	11.44	7.91	4.98	2.73
*	4	145.2	15928	23.63	18.27	15.17	11.44	7.91	4.98	2.73

Stn: 505 Lane:F1 Temp: J/C: Air: 53 PvT: 56 10:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12080	17.22	13.66	11.44	8.70	6.49	3.99	2.13
	C	110.3	12096	16.93	13.40	11.23	8.57	6.44	3.94	2.08
	C	110.9	12152	16.84	13.36	11.18	8.53	6.44	3.94	2.13
*	1	54.6	5992	8.38	6.55	5.48	4.14	3.07	1.91	1.04
*	1	54.6	5992	8.34	6.55	5.48	4.18	3.07	1.95	1.04
*	1	54.5	5984	8.30	6.55	5.48	4.18	3.07	1.99	1.08
*	1	54.9	6016	8.38	6.59	5.53	4.18	3.11	1.95	1.08
*	2	83.3	9136	12.44	9.91	8.27	6.21	4.71	2.82	1.56
*	2	83.6	9168	12.57	10.04	8.40	6.33	4.80	2.95	1.60
*	2	83.6	9168	12.57	10.04	8.40	6.29	4.76	2.90	1.60
*	2	83.3	9136	12.53	10.00	8.31	6.29	4.76	2.86	1.56
*	3	110.4	12112	16.59	13.14	11.05	8.44	6.36	3.90	2.13
*	3	110.7	12144	16.59	13.19	11.10	8.48	6.40	3.94	2.13
*	3	110.9	12152	16.59	13.19	11.10	8.44	6.40	3.94	2.08
*	3	111.0	12168	16.63	13.19	11.10	8.48	6.40	3.94	2.13
*	4	142.8	15648	21.28	16.98	14.31	10.98	8.36	5.16	2.78
*	4	142.2	15592	21.28	17.02	14.35	11.02	8.36	5.16	2.78
*	4	142.0	15576	21.32	17.06	14.35	11.06	8.45	5.20	2.86
*	4	142.2	15584	21.37	17.06	14.40	11.06	8.45	5.24	2.86

Stn: 510 Lane:F1 Temp: J/C: Air: 53 PvT: 55 10:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.0	12064	16.88	13.75	11.48	8.70	6.58	3.94	2.08
	C	110.3	12096	16.59	13.49	11.31	8.57	6.40	3.99	2.08
	C	110.7	12144	16.51	13.49	11.27	8.57	6.44	3.94	2.13
*	1	55.1	6040	8.17	6.59	5.36	4.05	3.07	1.73	1.04
*	1	55.1	6032	8.09	6.55	5.40	4.05	3.02	1.82	1.00
*	1	54.6	5992	8.09	6.55	5.40	4.05	3.07	1.82	1.08
*	1	54.5	5976	8.17	6.59	5.44	4.09	3.07	1.86	1.08
*	2	83.2	9120	12.32	10.04	8.31	6.29	4.76	2.86	1.56
*	2	83.8	9192	12.40	10.08	8.35	6.29	4.76	2.86	1.47
*	2	84.1	9216	12.40	10.13	8.40	6.37	4.80	2.90	1.56
*	2	83.6	9160	12.36	10.08	8.48	6.33	4.76	2.90	1.56
*	3	110.7	12144	16.21	13.27	11.10	8.44	6.40	3.90	2.04
*	3	110.9	12152	16.26	13.23	11.10	8.44	6.36	3.86	2.00
*	3	111.2	12192	16.30	13.27	11.10	8.44	6.36	3.90	2.00
*	3	110.9	12152	16.30	13.31	11.14	8.48	6.40	3.90	2.08
*	4	142.8	15656	20.95	17.15	14.44	11.06	8.45	5.20	2.78
*	4	143.2	15696	21.03	17.15	14.52	11.06	8.40	5.20	2.73
*	4	142.2	15592	20.95	17.15	14.48	11.06	8.40	5.20	2.69
*	4	142.5	15616	20.95	17.11	14.48	11.06	8.40	5.20	2.78

Stn: 515 Lane:F1 Temp: J/C: Air: 53 PvT: 55 10:13

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	16.67	13.40	11.23	8.48	6.36	3.86	2.13
	C	109.3	11984	16.38	13.10	10.93	8.27	6.22	3.81	2.08
	C	109.3	11984	16.21	13.06	10.88	8.23	6.18	3.81	2.04
*	1	54.9	6024	8.09	6.51	5.36	4.01	2.93	1.78	1.00
*	1	54.6	5984	8.09	6.51	5.31	4.01	2.93	1.78	1.04
*	1	54.3	5960	8.17	6.55	5.40	4.05	3.02	1.86	1.13V
*	1	54.8	6016	8.04	6.46	5.36	3.97	2.93	1.78	1.04

File: C:\FWD\DATA\631801E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631801

*	2	83.0	9096	12.19	9.78	8.18	6.12	4.53	2.73	1.52
*	2	83.3	9136	12.40	9.91	8.27	6.21	4.67	2.82	1.56
*	2	83.3	9144	12.36	9.87	8.23	6.21	4.62	2.77	1.47
*	2	83.5	9152	12.36	9.87	8.23	6.21	4.62	2.82	1.56
*	3	109.6	12016	16.00	12.84	10.80	8.19	6.13	3.77	2.04
*	3	109.6	12016	16.09	12.97	10.88	8.23	6.22	3.81	2.08
*	3	109.7	12032	16.09	12.88	10.84	8.19	6.13	3.77	2.00
*	3	109.7	12032	16.09	12.88	10.84	8.19	6.18	3.77	2.08
*	4	142.8	15648	20.70	16.72	14.05	10.76	8.13	4.98	2.69
*	4	142.5	15624	20.61	16.68	14.05	10.72	8.09	4.98	2.69
*	4	142.8	15648	20.70	16.72	14.05	10.81	8.18	5.03	2.73
*	4	142.6	15632	20.65	16.68	14.05	10.72	8.09	4.94	2.65

Stn: 520 Lane:F1 Temp: J/C: Air: 53 PvT: 55 10:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.4	12000	16.76	13.10	10.97	8.23	6.18	3.81	2.04
	C	110.0	12056	16.55	12.97	10.84	8.19	6.13	3.81	2.08
	C	109.7	12032	16.42	12.88	10.80	8.15	6.13	3.81	2.08
*	1	54.8	6008	8.25	6.42	5.36	4.01	2.93	1.78	1.04
*	1	54.5	5976	8.17	6.38	5.27	3.93	2.89	1.73	1.00
*	1	54.6	5984	8.25	6.33	5.27	3.93	2.89	1.78	1.00
*	1	54.3	5960	8.21	6.33	5.27	3.93	2.89	1.78	1.00
*	2	82.9	9088	12.23	9.61	8.05	6.04	4.49	2.73	1.52
*	2	83.5	9144	12.36	9.69	8.10	6.08	4.58	2.82	1.56
*	2	83.6	9160	12.40	9.69	8.14	6.08	4.58	2.82	1.56
*	2	83.9	9200	12.44	9.78	8.18	6.12	4.62	2.82	1.60
*	3	110.0	12056	16.21	12.71	10.71	8.06	6.09	3.77	2.08
*	3	110.1	12072	16.34	12.80	10.80	8.15	6.13	3.81	2.13
*	3	110.0	12064	16.34	12.80	10.75	8.15	6.09	3.81	2.13
*	3	110.1	12080	16.26	12.75	10.71	8.10	6.04	3.77	2.04
*	4	141.9	15560	20.86	16.46	13.88	10.60	7.96	4.98	2.78
*	4	142.0	15576	20.91	16.46	13.88	10.60	7.96	4.98	2.78
*	4	142.2	15592	20.91	16.50	13.88	10.55	7.96	4.94	2.69
*	4	142.2	15584	20.95	16.55	13.92	10.60	7.96	4.98	2.78

Error: 558

Stn: 525 Lane:F1 Temp: J/C: Air: 52 PvT: 55 10:19

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.4	11992	15.67	12.58	10.41	7.85	5.96	3.68	2.00
	C	110.3	12096	15.75	12.67	10.50	7.89	6.00	3.73	2.04
	C	110.3	12096	15.71	12.62	10.50	7.85	5.96	3.68	2.00
*	1	54.8	6008	7.92	6.33	5.23	3.84	2.89	1.82	1.04
*	1	54.9	6032	7.92	6.29	5.23	3.84	2.89	1.78	1.04
*	1	54.8	6000	7.83	6.29	5.14	3.80	2.84	1.78	1.00
*	1	55.2	6048	7.79	6.25	5.14	3.76	2.80	1.73	0.95
*	2	82.6	9048	11.77	9.39	7.84	5.87	4.40	2.73	1.52
*	2	83.5	9152	11.94	9.57	7.93	5.95	4.49	2.82	1.52
*	2	83.8	9176	11.86	9.57	7.88	5.95	4.44	2.77	1.52
*	2	83.5	9152	11.90	9.57	7.93	5.99	4.49	2.82	1.60
*	3	109.4	12000	15.46	12.50	10.41	7.85	5.96	3.68	2.04
*	3	110.3	12088	15.58	12.58	10.41	7.89	5.96	3.68	2.00
*	3	110.3	12096	15.54	12.58	10.45	7.94	6.00	3.77	2.04
*	3	109.7	12032	15.58	12.62	10.50	7.89	6.00	3.77	2.08
*	4	142.8	15656	19.98	16.20	13.54	10.26	7.82	4.85	2.60
*	4	142.5	15616	20.03	16.24	13.54	10.26	7.82	4.85	2.60
*	4	142.5	15616	20.03	16.24	13.58	10.17	7.82	4.85	2.60
*	4	142.5	15616	20.03	16.24	13.58	10.30	7.87	4.90	2.65

Stn: 530 Lane:F1 Temp: J/C: Air: 52 PvT: 55 10:22

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11976	16.05	12.84	10.58	7.98	6.04	3.73	2.00
	C	109.7	12032	15.71	12.62	10.41	7.85	5.96	3.68	2.00
	C	109.9	12040	15.63	12.58	10.37	7.85	5.96	3.68	1.95
*	1	54.6	5984	7.75	6.25	5.10	3.76	2.80	1.69	0.95
*	1	54.6	5984	7.75	6.29	5.14	3.80	2.84	1.73	0.95
*	1	54.5	5976	7.71	6.16	5.01	3.71	2.80	1.69	0.91
*	1	55.1	6040	7.71	6.16	5.06	3.76	2.80	1.73	0.95
*	2	82.9	9096	11.60	9.31	7.67	5.74	4.31	2.64	1.43
*	2	83.9	9208	11.73	9.44	7.75	5.78	4.36	2.64	1.43
*	2	83.6	9168	11.73	9.44	7.75	5.78	4.36	2.64	1.43

File: C:\FWD\DATA\831801E1.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	2	83.5	9160	11.73	9.44	7.75	5.83	4.36	2.64	1.43
*	3	109.6	12008	15.33	12.37	10.20	7.73	5.87	3.64	1.91
*	3	110.0	12064	15.42	12.45	10.24	7.77	5.91	3.64	1.95
*	3	110.0	12064	15.42	12.41	10.24	7.77	5.91	3.68	2.00
*	3	110.0	12064	15.38	12.41	10.24	7.81	5.91	3.68	1.95
*	4	142.5	15616	19.73	15.94	13.20	10.09	7.69	4.81	2.52
*	4	142.6	15632	19.77	16.03	13.24	10.13	7.73	4.81	2.52
*	4	142.6	15632	19.77	15.99	13.28	10.09	7.69	4.81	2.52
*	4	142.6	15640	19.82	15.99	13.28	10.13	7.73	4.85	2.52

Stn: 535 Lane:F1 Temp: J/C: Air: 52 PvT: 55 10:25

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12080	16.09	13.23	10.88	8.10	6.09	3.73	1.95
	C	110.1	12072	15.84	12.97	10.67	7.98	6.04	3.73	2.00
	C	110.6	12120	15.75	12.93	10.67	7.98	6.04	3.73	2.00
*	1	54.9	6024	7.83	6.46	5.23	3.84	2.89	1.73	1.00
*	1	55.1	6040	7.75	6.42	5.23	3.84	2.84	1.78	1.00
*	1	54.9	6016	7.67	6.38	5.18	3.80	2.80	1.69	0.91
*	1	54.9	6032	7.71	6.38	5.18	3.80	2.84	1.73	0.95
*	2	83.3	9136	11.77	9.61	7.93	5.87	4.40	2.64	1.43
*	2	83.9	9208	11.90	9.69	7.97	5.91	4.44	2.64	1.43
*	2	83.9	9200	11.90	9.74	7.97	5.95	4.49	2.69	1.43
*	2	84.1	9216	11.94	9.82	8.05	5.99	4.53	2.73	1.47
*	3	110.4	12104	15.42	12.71	10.50	7.85	6.00	3.68	1.95
*	3	111.2	12184	15.63	12.84	10.63	7.94	6.04	3.73	2.00
*	3	110.9	12160	15.58	12.75	10.54	7.94	6.00	3.68	1.91
*	3	111.0	12168	15.58	12.84	10.63	7.94	6.04	3.73	2.00
*	4	142.8	15656	19.90	16.42	13.62	10.30	7.82	4.81	2.52
*	4	142.2	15592	19.90	16.46	13.67	10.30	7.87	4.85	2.52
*	4	142.3	15600	19.90	16.46	13.67	10.34	7.91	4.85	2.56
*	4	142.5	15616	19.86	16.46	13.62	10.30	7.87	4.85	2.52

Error: 558

Stn: 540 Lane:F1 Temp: J/C: Air: 52 PvT: 55 10:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12088	16.26	12.84	10.63	7.94	5.87	3.64	1.95
	C	110.7	12144	16.26	12.84	10.58	7.94	5.82	3.60	1.91
	C	110.4	12104	16.21	12.84	10.58	7.89	5.87	3.55	1.91
*	1	55.5	6080	8.21	6.51	5.31	3.88	2.80	1.69	0.95
*	1	55.4	6064	8.21	6.51	5.36	3.97	2.84	1.78	1.08V
*	1	55.2	6056	8.09	6.38	5.27	3.84	2.76	1.69	0.91
*	1	55.1	6040	8.13	6.46	5.36	3.93	2.84	1.78	1.00
*	2	84.1	9216	12.23	9.78	7.97	5.87	4.40	2.64	1.43
*	2	84.1	9224	12.23	9.74	8.01	5.95	4.36	2.64	1.43
*	2	84.6	9280	12.36	9.82	8.18	6.08	4.40	2.73	1.47
*	2	84.2	9224	12.32	9.82	8.10	6.04	4.40	2.69	1.47
*	3	110.4	12104	16.17	12.80	10.58	7.89	5.91	3.64	1.95
*	3	110.9	12152	16.21	12.84	10.58	7.89	5.87	3.64	1.91
*	3	110.9	12160	16.21	12.84	10.63	7.98	5.87	3.64	1.95
*	3	110.4	12112	16.17	12.84	10.58	7.94	5.87	3.60	1.91
*	4	143.0	15680	20.70	16.50	13.67	10.30	7.69	4.77	2.56
*	4	142.3	15608	20.70	16.55	13.71	10.34	7.78	4.81	2.60
*	4	144.1	15792	20.91	16.72	13.80	10.43	7.78	4.85	2.60
*	4	142.9	15672	20.70	16.55	13.71	10.34	7.73	4.81	2.52

Mileage:-.008 -> .102

Correct count @ STA 57+.

10:32 930614

File: C:\FWD\DATA\631801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631801

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

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:F3 Temp: J/C: Air: 54 PvT: 56 10:34

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12096	18.94	15.77	13.28	10.09	7.73	4.85	2.65
	C	111.4	12208	18.60	15.43	12.94	9.92	7.56	4.77	2.60
	C	112.0	12272	18.52	15.34	12.90	9.88	7.51	4.77	2.60
*	1	55.1	6040	9.30	7.63	6.34	4.73	3.56	2.21	1.26
*	1	55.5	6088	9.30	7.63	6.38	4.77	3.56	2.25	1.30
*	1	55.7	6096	9.22	7.63	6.30	4.69	3.56	2.21	1.21
*	1	55.5	6088	9.26	7.67	6.38	4.73	3.60	2.25	1.26
*	2	83.9	9208	13.91	11.50	9.64	7.26	5.51	3.47	1.91V
*	2	84.3	9248	14.03	11.68	9.77	7.43	5.64	3.55	2.00
*	2	84.2	9240	14.03	11.72	9.85	7.47	5.73	3.68V	2.08
*	2	84.5	9264	14.03	11.63	9.77	7.43	5.64	3.55	2.04
*	3	111.2	12184	18.22	15.21	12.81	9.88	7.51	4.81	2.65
*	3	111.4	12224	18.27	15.17	12.81	9.88	7.51	4.77	2.60
*	3	110.9	12152	18.27	15.17	12.85	9.92	7.56	4.85	2.69
*	3	111.4	12216	18.22	15.21	12.85	9.88	7.51	4.77	2.56
*	4	143.0	15688	23.04	19.39	16.45	12.79	9.91	6.33	3.47
*	4	143.2	15688	23.08	19.39	16.41	12.75	9.87	6.28	3.43
*	4	143.2	15688	23.04	19.39	16.45	12.83	9.87	6.33	3.47
*	4	147.4	16160	23.17V	19.43V	16.50V	12.88V	9.91V	6.33	3.47

Stn: -35 Lane:F3 Temp: J/C: Air: 54 PvT: 56 10:37

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11976	18.98	15.60	13.02	10.00	7.60	4.85	2.56
	C	109.7	12040	18.52	15.25	12.77	9.75	7.47	4.72	2.56
	C	109.3	11984	18.48	15.21	12.77	9.75	7.56	4.77	2.60
*	1	54.6	5984	9.38	7.63	6.34	4.77	3.56	2.30	1.30
*	1	54.3	5960	9.30	7.63	6.30	4.69	3.51	2.25	1.26
*	1	54.3	5968	9.26	7.54	6.26	4.69	3.47	2.21	1.21
*	1	54.2	5944	9.26	7.54	6.30	4.73	3.56	2.25	1.26
*	2	83.0	9104	14.03	11.55	9.64	7.30	5.56	3.55	2.00
*	2	83.5	9152	14.08	11.55	9.68	7.26	5.60	3.51	1.95
*	2	83.5	9160	14.03	11.55	9.64	7.26	5.56	3.51	1.91
*	2	83.6	9160	14.03	11.59	9.68	7.26	5.56	3.51	1.95
*	3	109.9	12040	18.22	15.12	12.72	9.71	7.51	4.77	2.65
*	3	110.0	12056	18.35	15.17	12.77	9.71	7.60	4.77	2.65
*	3	109.9	12048	18.31	15.12	12.72	9.75	7.56	4.81	2.65
*	3	110.1	12080	18.31	15.17	12.77	9.79	7.56	4.81	2.60
*	4	143.2	15704	23.04	19.17	16.24	12.58	9.78	6.28	3.38
*	4	147.8V	16216V	23.34V	19.43V	16.37V	12.79V	9.78V	6.37V	3.43
*	4	142.8	15648	23.21	19.35	16.37	12.75	9.82	6.41	3.47
*	4	143.3	15720	23.21	19.43	16.37	12.71	9.87	6.41	3.47

Stn: -30 Lane:F3 Temp: J/C: Air: 54 PvT: 56 10:39

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12024	18.85	15.47	13.02	10.00	7.65	4.81	2.60
	C	110.1	12080	18.52	15.17	12.77	9.88	7.51	4.72	2.56
	C	110.3	12096	18.52	15.12	12.77	9.92	7.56	4.81	2.60
*	1	55.2	6048	9.38	7.63	6.34	4.77	3.56	2.21	1.26
*	1	54.6	6000	9.38	7.58	6.34	4.77	3.60	2.25	1.30
*	1	54.9	6016	9.26	7.54	6.30	4.77	3.56	2.25	1.26
*	1	54.8	6008	9.34	7.58	6.34	4.77	3.56	2.21	1.26
*	2	83.9	9200	14.06	11.42	9.60	7.35	5.51	3.47	1.91
*	2	84.3	9248	14.16	11.50	9.68	7.39	5.60	3.47	1.91
*	2	84.1	9216	14.12	11.55	9.73	7.39	5.64	3.51	2.00
*	2	84.3	9240	14.12	11.55	9.68	7.39	5.64	3.47	1.95
*	3	109.9	12048	18.10	14.95	12.64	9.75	7.51	4.72	2.60
*	3	110.1	12080	18.22	14.95	12.64	9.84	7.47	4.77	2.56

File: C:\FWD\DATA\831801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	3	110.3	12088	18.22	15.04	12.72	9.88	7.56	4.77	2.60
*	3	110.1	12080	18.22	14.99	12.68	9.84	7.51	4.77	2.60
*	4	146.7	16088	23.17	19.17	16.24	12.75	9.82	6.24V	3.38
*	4	142.9	15672	23.04V	19.13V	16.28V	12.83V	9.82	6.37V	3.43
*	4	148.3	16264	23.25	19.22V	16.32V	12.88V	9.87	6.37	3.47
*	4	143.0	15680	22.92	19.05	16.24	12.79	9.78	6.28	3.43

Stn: -25 Lane:F3 Temp: J/C: Air: 55 PvT: 56 10:42

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12072	19.31	15.90	13.37	10.17	7.78	4.81	2.65
	C	110.9	12152	18.94	15.60	13.11	10.05	7.69	4.77	2.65
	C	110.6	12128	18.77	15.60	13.11	10.00	7.73	4.81	2.69
*	1	55.5	6088	9.47	7.76	6.47	4.85	3.60	2.25	1.26
*	1	55.2	6048	9.43	7.80	6.47	4.77	3.64	2.17	1.26
*	1	55.4	6064	9.51	7.80	6.51	4.90	3.69	2.30	1.34
*	1	55.7	6096	9.43	7.71	6.43	4.85	3.60	2.25	1.21
*	2	84.2	9224	14.20	11.72	9.81	7.43	5.60	3.47	1.91
*	2	84.6	9272	14.33	11.85	9.94	7.51	5.69	3.55	2.00
*	2	84.6	9260	14.29	11.85	9.90	7.51	5.69	3.51	1.91
*	2	84.3	9256	14.29	11.89	9.98	7.51	5.73	3.51	2.00
*	3	110.7	12144	18.48	15.43	12.98	9.96	7.65	4.77	2.65
*	3	111.0	12168	18.52	15.43	12.98	9.92	7.65	4.77	2.60
*	3	111.0	12168	18.52	15.43	12.98	9.96	7.69	4.77	2.65
*	3	111.0	12168	18.52	15.43	12.98	9.96	7.65	4.77	2.60
*	4	142.0V	15576V	23.29V	19.56V	16.54V	12.79	9.96V	6.24	3.47
*	4	149.3V	16360V	23.59V	19.78V	16.75V	13.00V	10.09V	6.37	3.51
*	4	142.8	15656	23.38V	19.65V	16.62V	12.92V	10.00V	6.28	3.47
*	4	147.7	16192	23.59	19.69V	16.71	13.04	9.96V	6.41	3.51

Stn: -20 Lane:F3 Temp: J/C: Air: 55 PvT: 56 10:44

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	19.65	16.03	13.50	10.22	7.73	4.81	2.56
	C	110.3	12088	19.31	15.73	13.24	10.05	7.65	4.81	2.52
	C	110.1	12072	19.23	15.68	13.20	10.00	7.65	4.77	2.52
*	1	55.4	6064	9.65	7.97	6.60	4.94	3.69	2.30	1.26
*	1	55.1	6040	9.72	7.89	6.56	4.85	3.60	2.25	1.21
*	1	55.4	6072	9.72	7.84	6.51	4.85	3.60	2.25	1.21
*	1	55.2	6056	9.76	7.93	6.60	4.90	3.69	2.30	1.30
*	2	83.6	9168	14.66	11.94	10.03	7.51	5.69	3.60	1.95
*	2	84.1	9216	14.66	11.98	10.03	7.60	5.73	3.60	1.95
*	2	83.8	9184	14.66	12.02	10.07	7.60	5.73	3.60	2.00
*	2	83.8	9192	14.58	11.94	10.03	7.56	5.73	3.60	1.95
*	3	110.3	12096	18.89	15.55	13.07	10.00	7.65	4.77	2.56
*	3	110.4	12104	19.02	15.55	13.11	10.05	7.69	4.81	2.60
*	3	110.4	12104	18.98	15.55	13.11	10.05	7.69	4.81	2.56
*	3	110.1	12080	19.02	15.60	13.20	10.05	7.69	4.85	2.65
*	4	142.8	15648	23.88	19.78	16.75	12.96	10.00	6.33	3.47
*	4	142.8	15648	23.96	19.82	16.79	13.04	10.09	6.33	3.47
*	4	142.6	15648	23.84	19.78	16.79	13.04	10.05	6.33	3.43
*	4	144.3	15824	24.01	19.95	16.92	13.17	10.18	6.41	3.51

Stn: -15 Lane:F3 Temp: J/C: Air: 56 PvT: 55 10:47

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	19.61	15.94	13.54	10.34	7.82	4.85	2.60
	C	110.1	12072	19.27	15.64	13.28	10.13	7.69	4.81	2.60
	C	110.1	12080	19.15	15.64	13.28	10.17	7.73	4.85	2.60
*	1	55.1	6032	9.68	7.80	6.60	4.94	3.69	2.34	1.30
*	1	55.2	6056	9.72	7.84	6.64	4.98	3.69	2.34	1.34
*	1	55.2	6056	9.72	7.84	6.56	4.94	3.69	2.34	1.30
*	1	55.2	6056	9.64	7.76	6.51	4.90	3.64	2.25	1.26
*	2	83.9	9200	14.54	11.81	9.98	7.56	5.69	3.55	1.95
*	2	83.9	9200	14.54	11.89	10.03	7.64	5.78	3.60	1.95
*	2	83.9	9208	14.58	11.85	10.03	7.60	5.73	3.55	1.91
*	2	83.9	9192	14.58	11.89	10.07	7.68	5.82	3.64	2.00
*	3	110.4	12112	18.89	15.51	13.24	10.09	7.69	4.85	2.60
*	3	110.1	12080	18.98	15.55	13.24	10.17	7.78	4.85	2.65
*	3	110.4	12112	18.98	15.55	13.24	10.17	7.78	4.85	2.65
*	3	110.3	12096	18.98	15.55	13.28	10.17	7.78	4.90	2.69
*	4	142.2	15592	23.92	19.73	16.97	13.13	10.13	6.37	3.47
*	4	142.2	15592	23.92	19.82	16.97	13.21	10.13	6.37	3.43
*	4	142.0	15568	23.88	19.82	16.97	13.21	10.13	6.37	3.43

File: C:\FWD\DATA\831801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	4	142.0	15584	23.96	19.82	17.01	13.25	10.22	6.37	3.43

Stn: -10 Lane:F3 Temp: J/C: Air: 57 PvT: 57 10:49

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	19.61	16.12	13.50	10.22	7.78	4.81	2.56
	C	110.0	12064	19.23	15.81	13.24	10.00	7.73	4.77	2.60
	C	110.3	12088	19.19	15.81	13.24	10.00	7.73	4.81	2.65
*	1	54.5	5976	9.55	7.84	6.47	4.81	3.64	2.21	1.26
*	1	54.6	5984	9.55	7.80	6.47	4.85	3.60	2.25	1.26
*	1	54.5	5968	9.59	7.80	6.47	4.85	3.60	2.25	1.26
*	1	54.8	6016	9.64	7.89	6.47	4.90	3.69	2.30	1.34
*	2	83.0	9104	14.54	11.85	9.90	7.47	5.69	3.51	2.00V
*	2	83.2	9128	14.29	11.68	9.68V	7.18V	5.42V	3.25V	1.65V
*	2	83.6	9160	14.58	11.98	10.03	7.51	5.78	3.55	2.00
*	2	83.6	9160	14.54	11.94	9.98	7.51	5.69	3.51	1.95
*	3	110.1	12072	18.77	15.55	13.07	9.96	7.65	4.77	2.56
*	3	110.3	12096	18.89	15.64	13.11	10.09	7.65	4.81	2.60
*	3	110.1	12080	18.85	15.55	13.07	10.05	7.65	4.77	2.60
*	3	110.1	12072	18.81	15.60	13.11	10.05	7.69	4.81	2.60
*	4	142.3	15608	23.80	19.78	16.67	13.00	10.00	6.33	3.43
*	4	142.6	15640	23.80	19.86	16.79	13.13	10.09	6.41	3.51
*	4	142.2	15584	23.75	19.82	16.75	13.13	10.05	6.37	3.47
*	4	142.2	15592	23.75	19.86	16.75	13.13	10.05	6.46	3.47

Stn: -5 Lane:F3 Temp: J/C: Air: 57 PvT: 57 10:52

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.6	12016	18.98	16.03	13.24	10.13	7.69	4.81	2.65
	C	110.1	12080	18.64	15.81	13.11	10.09	7.60	4.81	2.69
	C	110.1	12072	18.56	15.77	13.07	10.05	7.65	4.81	2.69
*	1	54.6	5984	9.38	7.84	6.43	4.81	3.60	2.25	1.34
*	1	54.5	5968	9.30	7.80	6.43	4.81	3.60	2.25	1.30
*	1	54.5	5976	9.30	7.80	6.38	4.81	3.56	2.21	1.26
*	1	54.5	5976	9.22	7.76	6.34	4.77	3.56	2.21	1.26
*	2	83.3	9136	14.08	11.89	9.81	7.51	5.64	3.51	2.04
*	2	83.9	9200	14.12	11.89	9.81	7.47	5.60	3.51	2.00
*	2	83.6	9168	14.12	11.89	9.85	7.47	5.64	3.55	2.04
*	2	83.5	9160	14.12	11.89	9.81	7.51	5.64	3.55	2.04
*	3	110.0	12064	18.35	15.55	12.90	9.92	7.56	4.77	2.69
*	3	110.6	12128	18.48	15.64	13.02	10.00	7.56	4.81	2.69
*	3	111.0	12168	18.52	15.73	13.02	10.00	7.65	4.81	2.69
*	3	110.6	12120	18.48	15.64	12.94	9.96	7.60	4.77	2.65
*	4	142.5	15624	23.38	19.91	16.67	12.96	9.96	6.33	3.51
*	4	142.6	15640	23.29	19.95	16.71	13.00	9.96	6.37	3.51
*	4	143.0	15680	23.42	20.04	16.79	13.04	10.00	6.41	3.56
*	4	142.5	15616	23.34	19.95	16.71	13.00	9.96	6.33	3.51

Stn: 0 Lane:F3 Temp: J/C: Air: 57 PvT: 57 10:54

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	112.5	12336	18.10	14.82	12.51	9.54	7.33	4.77	2.65
	C	112.5	12336	17.64	14.35	12.21	9.33	7.16	4.77	2.65
	C	112.9	12384	17.64	14.39	12.21	9.33	7.20	4.77	2.65
*	1	55.8	6120	8.80	7.07	6.00	4.52	3.38	2.30	1.34
*	1	56.1	6152	8.84	7.11	5.96	4.47	3.38	2.25	1.30
*	1	56.2	6168	8.80	7.02	6.00	4.52	3.38	2.30	1.30
*	1	56.2	6160	8.80	7.11	6.00	4.52	3.42	2.30	1.34
*	2	85.4	9360	13.32	10.77	9.13	6.97	5.33	3.51	2.00
*	2	85.7	9384	13.41	10.90	9.21	7.01	5.38	3.51	2.04
*	2	85.8	9400	13.45	10.86	9.25	7.01	5.38	3.55	2.08
*	2	85.4	9368	13.32	10.82	9.13	6.92	5.29	3.47	2.00
*	3	112.5	12336	17.34	14.22	12.08	9.24	7.16	4.72	2.65
*	3	112.8	12368	17.47	14.26	12.12	9.29	7.20	4.72	2.69
*	3	113.0	12392	17.47	14.26	12.17	9.33	7.20	4.77	2.65
*	3	112.8	12360	17.43	14.26	12.17	9.37	7.25	4.77	2.69
*	4	143.8	15768	22.16	18.31	15.51	12.03	9.47	6.15V	3.47
*	4	144.3	15832	22.25	18.27	15.68	12.24	9.47	6.37	3.56
*	4	144.1	15800	22.25	18.10	15.72	12.24	9.42	6.41	3.56
*	4	144.3	15824	22.25	18.05	15.68	12.24	9.42	6.37	3.51

Stn: 25 Lane:F3 Temp: J/C: Air: 56 PvT: 60 10:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12024	18.68	15.34	12.64	9.58	7.25	4.68	2.60

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	C	109.7	12032	18.31	14.95	12.38	9.41	7.07	4.55	2.56
	C	109.6	12016	18.27	14.95	12.47	9.54	7.25	4.59	2.60
*	1	54.8	6016	9.17	7.45	6.13	4.56	3.42	2.21	1.30
*	1	54.8	6016	9.17	7.41	6.08	4.56	3.38	2.17	1.21
*	1	54.8	6016	9.17	7.45	6.13	4.60	3.47	2.21	1.26
*	1	54.9	6024	9.17	7.45	6.17	4.64	3.51	2.21	1.30
*	2	83.2	9128	13.91	11.25	9.38	7.13	5.42	3.38	1.95
*	2	83.5	9144	13.83	11.25	9.34	7.09	5.33	3.34	1.91
*	2	83.5	9152	13.87	11.29	9.34	7.09	5.33	3.38	1.91
*	2	83.5	9152	13.91	11.33	9.34	7.05	5.33	3.42	1.95
*	3	109.7	12032	18.01	14.82	12.34	9.46	7.16	4.59	2.60
*	3	110.3	12088	18.01	14.82	12.30	9.37	7.11	4.59	2.60
*	3	110.1	12072	18.06	14.82	12.38	9.50	7.20	4.59	2.56
*	3	110.4	12104	18.14	14.91	12.42	9.54	7.25	4.68	2.60
*	4	142.3	15600	22.96	18.96	15.85	12.28	9.47	6.07	3.38
*	4	142.5	15616	22.96	18.96	15.90	12.33	9.51	6.07	3.38
*	4	142.3	15600	23.08	19.05	15.94	12.33	9.51	6.15	3.38
*	4	142.0	15576	22.96	19.05	15.94	12.37	9.56	6.15	3.43

Stn: 50 Lane:F3 Temp: J/C: Air: 56 PvT: 60 10:59

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11968	21.32	17.15	14.14	10.38	7.69	4.77	2.69
	C	109.4	12000	20.91	16.76	13.88	10.30	7.65	4.81	2.73
	C	110.0	12064	20.78	16.72	13.88	10.26	7.65	4.77	2.69
*	1	54.2	5944	10.60	8.36	6.86	4.90	3.64	2.25	1.30
*	1	54.6	5984	10.60	8.45	6.86	4.90	3.64	2.30	1.34
*	1	54.6	5984	10.60	8.45	6.86	4.90	3.64	2.30	1.30
*	1	54.9	6024	10.56	8.36	6.81	4.85	3.60	2.21	1.26
*	2	82.5	9032	15.79	12.54	10.33	7.51	5.56	3.47	1.95
*	2	83.5	9144	15.92	12.75	10.41	7.60	5.60	3.51	1.95
*	2	83.2	9120	15.92	12.80	10.45	7.60	5.64	3.51	1.95
*	2	83.5	9144	15.92	12.84	10.50	7.64	5.73	3.55	2.00
*	3	109.6	12024	20.44	16.59	13.71	10.13	7.65	4.81	2.65
*	3	110.1	12080	20.53	16.68	13.75	10.13	7.65	4.77	2.65
*	3	110.1	12072	20.57	16.80	13.80	10.17	7.69	4.85	2.65
*	3	109.7	12032	20.44	16.59	13.71	10.13	7.65	4.77	2.60
*	4	141.4	15512	25.85	21.03	17.52	13.09V	10.00	6.28	3.43
*	4	142.2	15584	25.89	21.11	17.65	13.38	10.05	6.37	3.51
*	4	141.9	15568	25.89	21.07	17.69	13.47	10.05	6.33	3.56
*	4	141.7	15536	25.89	20.98	17.65	13.51	10.00	6.33	3.56

Stn: 75 Lane:F3 Temp: J/C: Air: 57 PvT: 60 11:02

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12080	24.84	19.22	15.51	11.14	8.13	4.85	2.60
	C	110.1	12080	24.26	18.79	15.25	11.02	8.05	4.85	2.60
	C	110.6	12120	24.22	18.83	15.25	11.06	8.09	4.94	2.69
*	1	54.2	5944	12.57	9.48	7.50	5.28	3.78	2.34	1.30
*	1	54.1	5928	12.44	9.35	7.41	5.15	3.69	2.25	1.26
*	1	54.3	5960	12.53	9.44	7.50	5.28	3.78	2.34	1.30
*	1	54.2	5952	12.48	9.44	7.50	5.28	3.78	2.34	1.30
*	2	83.0	9104	18.43	14.13	11.35	8.10	5.87	3.51	1.91
*	2	83.5	9144	18.60	14.26	11.48	8.19	5.91	3.51	1.91
*	2	83.3	9136	18.56	14.26	11.48	8.19	5.91	3.55	1.91
*	2	83.5	9152	18.64	14.31	11.48	8.23	5.96	3.55	1.95
*	3	110.6	12128	23.84	18.57	15.08	10.93	8.00	4.85	2.56
*	3	110.7	12144	23.96	18.57	15.12	10.98	8.05	4.85	2.56
*	3	110.3	12096	23.88	18.57	15.12	10.98	8.05	4.85	2.60
*	3	110.7	12136	23.92	18.66	15.17	11.02	8.09	4.90	2.60
*	4	140.9	15448	29.95	23.57	19.32	14.23	10.53	6.41	3.43
*	4	141.4	15512	30.16	23.74	19.45	14.35	10.67	6.54	3.51
*	4	141.4	15512	30.12	23.74	19.49	14.39	10.67	6.50	3.47
*	4	141.7	15544	30.16	23.78	19.49	14.39	10.67	6.50	3.51

Stn: 100 Lane:F3 Temp: J/C: Air: 57 PvT: 60 11:04

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.3	12096	21.58	17.15	14.14	10.34	7.69	4.77	2.60
	C	111.0	12168	21.16	16.80	13.84	10.17	7.60	4.72	2.60
	C	111.3	12200	21.07	16.76	13.80	10.22	7.60	4.72	2.60
*	1	54.9	6024	10.68	8.36	6.73	4.85	3.56	2.21	1.30
*	1	55.2	6056	10.68	8.36	6.81	4.90	3.60	2.25	1.34
*	1	55.1	6040	10.68	8.36	6.77	4.90	3.56	2.21	1.26

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*	1	54.8	6016	10.64	8.36	6.77	4.90	3.60	2.30	1.34
*	2	83.6	9168	15.96	12.62	10.33	7.56	5.51	3.42	1.95
*	2	84.2	9224	16.05	12.71	10.41	7.60	5.60	3.47	1.95
*	2	83.9	9200	16.05	12.80	10.41	7.60	5.60	3.47	1.95
*	2	84.1	9216	16.00	12.67	10.37	7.56	5.60	3.47	1.95
*	3	110.7	12136	20.65	16.59	13.71	10.13	7.60	4.72	2.60
*	3	111.2	12192	20.82	16.68	13.84	10.17	7.69	4.77	2.65
*	3	111.2	12192	20.74	16.63	13.80	10.17	7.65	4.77	2.65
*	3	111.7	12248	20.82	16.72	13.80	10.22	7.65	4.77	2.60
*	4	142.3	15608	26.31	21.20	17.65	13.25	10.00	6.28	3.43
*	4	142.3	15608	26.44	21.33	17.78	13.34	10.13	6.37	3.51
*	4	142.3	15600	26.39	21.29	17.74	13.30	10.09	6.33	3.43
*	4	142.5	15624	26.44	21.33	17.78	13.38	10.13	6.37	3.56

Stn: 125 Lane:F3 Temp: J/C: Air: 57 PvT: 60 11:07

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.1	11960	21.91	17.75	14.70	11.02	8.22	5.07	2.69
	C	109.3	11976	21.49	17.41	14.48	10.76	8.18	5.03	2.78
	C	109.7	12024	21.41	17.36	14.40	10.72	8.13	5.03	2.73
*	1	54.5	5968	10.64	8.57	6.96	5.11	3.78	2.38	1.26V
*	1	54.6	5992	10.73	8.66	7.11	5.23	3.91	2.47	1.43
*	1	54.6	5992	10.89	8.88V	7.33V	5.36V	4.09V	2.64V	1.56V
*	1	54.3	5968	10.60	8.53	6.98	5.07	3.78	2.34V	1.26V
*	2	83.3	9136	16.13	13.01	10.75	7.89	5.96	3.64	2.00
*	2	83.5	9152	16.26	13.10	10.84	8.02	6.00	3.77	2.04
*	2	83.3	9136	16.26	13.14	10.88	8.02	6.04	3.77	2.08
*	2	83.5	9144	16.26	13.14	10.88	8.02	6.04	3.77	2.08
*	3	109.6	12024	20.99	17.11	14.27	10.68	8.09	5.03	2.69
*	3	109.7	12024	21.07	17.19	14.35	10.68	8.13	5.07	2.69
*	3	109.6	12024	21.11	17.19	14.35	10.76	8.13	5.11	2.73
*	3	109.9	12040	21.07	17.19	14.31	10.72	8.13	5.11	2.73
*	4	141.3	15504	26.69	21.89	18.34	13.97	10.67	6.80	3.60
*	4	141.7	15544	26.77	21.98	18.38	13.93	10.71	6.76	3.60
*	4	141.6	15520	26.85	22.02	18.47	14.01	10.76	6.84	3.69
*	4	141.3	15488	26.77	21.93	18.38	13.97	10.76	6.80	3.69

Stn: 150 Lane:F3 Temp: J/C: Air: 57 PvT: 60 11:10

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	21.70	17.71	14.74	11.27	8.45	5.29	2.69
	C	109.4	11992	21.16	17.36	14.44	11.06	8.36	5.24	2.73
	C	109.6	12016	21.11	17.28	14.40	11.02	8.36	5.16	2.78
*	1	54.3	5960	10.64	8.57	7.03	5.28	3.96	2.43	1.34
*	1	54.5	5976	10.64	8.62	7.07	5.28	3.96	2.47	1.34
*	1	54.8	6000	10.60	8.57	7.07	5.28	3.96	2.43	1.30
*	1	54.6	5984	10.60	8.57	7.03	5.23	3.91	2.38	1.26
*	2	83.2	9112	15.96	13.01	10.75	8.19	6.13	3.77	2.04
*	2	83.0	9104	15.92	12.97	10.80	8.19	6.13	3.81	2.00
*	2	83.3	9136	16.05	13.06	10.88	8.27	6.22	3.81	2.04
*	2	83.5	9152	16.00	13.06	10.88	8.27	6.22	3.86	2.04
*	3	109.7	12024	20.70	17.06	14.22	10.89	8.22	5.20	2.65
*	3	110.1	12072	20.86	17.11	14.27	10.98	8.31	5.16	2.69
*	3	109.7	12032	20.86	17.19	14.35	11.02	8.36	5.24	2.73
*	3	109.7	12024	20.82	17.15	14.31	11.02	8.31	5.29	2.69
*	4	141.3	15496	26.23	21.72	18.21	14.16	10.80	6.84	3.51
*	4	141.6	15520	26.31	21.80	18.29	14.23	10.85	6.84	3.56
*	4	141.4	15512	26.31	21.85	18.34	14.31	10.89	7.15V	3.51
*	4	141.7	15544	26.31	21.85	18.38	14.31	10.89	7.10	3.64

Stn: 175 Lane:F3 Temp: J/C: Air: 58 PvT: 60 11:12

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11888	24.93	19.56	15.94	11.74	8.58	5.20	2.69
	C	109.0	11960	24.38	19.13	15.60	11.52	8.45	5.07	2.69
	C	109.0	11944	24.17	19.00	15.55	11.57	8.45	5.11	2.65
*	1	54.5	5968	12.53	9.57	7.67	5.53	4.00	2.43	1.26
*	1	54.3	5952	12.40	9.48	7.63	5.53	3.96	2.43	1.26
*	1	54.2	5936	12.48	9.52	7.67	5.53	4.00	2.43	1.26
*	1	53.8	5896	12.36	9.44	7.63	5.53	4.00	2.43	1.26
*	2	82.2	9008	18.52	14.43	11.74	8.61	6.27	3.81	2.08
*	2	83.0	9096	18.60	14.61	11.83	8.70	6.36	3.86	2.08
*	2	82.8	9072	18.52	14.52	11.74	8.61	6.27	3.81	1.95
*	2	82.9	9088	18.56	14.52	11.78	8.65	6.31	3.86	2.00

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*	3	109.1	11960	23.84	18.87	15.47	11.48	8.49	5.20	2.73
*	3	109.1	11968	23.88	18.92	15.47	11.44	8.49	5.11	2.69
*	3	109.0	11952	23.88	18.87	15.47	11.48	8.45	5.07	2.69
*	3	109.0	11952	23.84	18.87	15.47	11.48	8.49	5.11	2.65
*	4	140.7	15432	30.12	23.96	19.75	14.86	11.07	6.80	3.56
*	4	140.9	15440	30.12	24.04	19.84	14.99	11.20	6.84	3.56
*	4	141.0	15464	30.08	24.13	19.88	15.03	11.20	6.89	3.60
*	4	140.6	15408	30.04	23.96	19.79	15.03	11.16	6.93	3.56

Stn: 200 Lane:F3 Temp: J/C: Air: 58 PvT: 62 11:15

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12048	21.95	17.80	14.70	10.85	8.05	4.81	2.60
	C	110.1	12080	21.49	17.45	14.44	10.68	7.91	4.85	2.65
	C	110.1	12072	21.37	17.36	14.40	10.64	7.87	4.81	2.60
*	1	55.8	6128	10.89	8.75	7.15	5.15	3.73	2.25	1.26
*	1	54.6	5984	10.85	8.75	7.20	5.15	3.73	2.34	1.30
*	1	54.3	5960	10.77	8.70	7.11	5.11	3.69	2.25	1.21
*	1	54.9	6024	10.85	8.70	7.15	5.15	3.69	2.25	1.21
*	2	83.2	9128	16.26	13.10	10.84	7.94	5.78	3.51	1.91
*	2	83.6	9168	16.34	13.27	10.97	8.02	5.91	3.60	2.00
*	2	83.6	9176	16.38	13.31	10.97	8.06	5.91	3.60	2.00
*	2	83.5	9152	16.30	13.23	10.93	7.98	5.91	3.60	1.95
*	3	110.1	12072	21.03	17.28	14.31	10.64	7.96	4.81	2.65
*	3	110.4	12120	21.20	17.32	14.40	10.68	7.96	4.85	2.65
*	3	110.3	12088	21.16	17.28	14.31	10.64	7.91	4.77	2.60
*	3	110.3	12088	21.16	17.28	14.31	10.64	7.91	4.81	2.60
*	4	141.7	15536	26.60	21.76	18.21	13.68	10.27	6.28	3.43
*	4	141.6	15528	26.60	21.89	18.29	13.76	10.31	6.37	3.43
*	4	141.6	15528	26.73	21.98	18.38	13.80	10.36	6.41	3.47
*	4	141.6	15528	26.64	21.89	18.34	13.76	10.31	6.41	3.43

Stn: 225 Lane:F3 Temp: J/C: Air: 58 PvT: 62 11:17

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11904	22.54	17.92	14.40	10.60	7.82	4.81	2.56
	C	108.8	11944	22.04	17.54	14.18	10.51	7.78	4.85	2.65
	C	109.0	11952	21.87	17.49	14.14	10.55	7.82	4.90	2.69
*	1	54.6	5984	11.27	8.83	7.03	5.11	3.69	2.30	1.34
*	1	54.6	5984	11.19	8.79	6.94	5.02	3.60	2.25	1.26
*	1	54.8	6000	11.19	8.75	6.94	4.98	3.60	2.21	1.21
*	1	54.5	5968	11.14	8.70	6.90	4.98	3.60	2.25	1.26
*	2	82.9	9080	16.63	13.19	10.58	7.77	5.69	3.51	1.95
*	2	83.0	9112	16.72	13.36	10.71	7.89	5.78	3.60	2.04
*	2	83.3	9136	16.72	13.27	10.63	7.81	5.73	3.51	1.95
*	2	83.2	9120	16.76	13.31	10.67	7.81	5.73	3.60	1.95
*	3	108.8	11944	21.45	17.24	13.97	10.47	7.78	4.85	2.65
*	3	109.0	11952	21.53	17.32	14.05	10.43	7.78	4.85	2.60
*	3	109.1	11960	21.62	17.41	14.10	10.47	7.82	4.85	2.65
*	3	109.0	11952	21.58	17.36	14.10	10.47	7.87	4.90	2.65
*	4	141.2	15480	27.15	21.98	17.99	13.55	10.22	6.41	3.47
*	4	141.2	15472	27.27	22.02	17.99	13.63	10.27	6.46	3.51
*	4	140.9	15448	27.19	21.98	17.99	13.59	10.22	6.41	3.43
*	4	140.7	15432	27.19	21.89	17.95	13.59	10.18	6.46	3.38

Stn: 250 Lane:F3 Temp: J/C: Air: 58 PvT: 61 11:20

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11936	21.79	17.24	14.18	10.30	7.78	4.81	2.65
	C	109.1	11960	21.41	16.80	13.88	10.17	7.69	4.90	2.65
	C	109.3	11976	21.28	16.80	13.88	10.22	7.65	4.94	2.69
*	1	54.8	6000	11.02	8.53	6.90	4.94	3.56	2.38	1.26
*	1	54.3	5968	11.02	8.53	6.90	4.94	3.60	2.30	1.26
*	1	54.8	6000	11.06	8.57	6.90	4.90	3.60	2.30	1.26
*	1	54.3	5960	11.06	8.57	6.94	4.94	3.64	2.34	1.34
*	2	82.6	9064	16.17	12.67	10.45	7.51	5.60	3.51	1.91
*	2	83.2	9120	16.30	12.84	10.54	7.60	5.69	3.60	2.00
*	2	83.3	9144	16.38	12.93	10.63	7.73	5.73	3.64	2.04
*	2	83.0	9112	16.30	12.88	10.54	7.64	5.73	3.60	2.00
*	3	109.6	12016	20.86	16.68	13.80	10.17	7.65	4.90	2.69
*	3	109.1	11968	20.86	16.68	13.80	10.17	7.65	4.90	2.65
*	3	109.7	12024	20.95	16.72	13.88	10.22	7.73	4.98	2.69
*	3	109.6	12016	21.03	16.76	13.88	10.22	7.73	4.90	2.69
*	4	141.3	15488	26.39	21.11	17.61	13.13	10.05	6.41	3.47

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Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 631801

*	4	141.3	15488	26.48	21.20	17.69	13.25	10.09	6.54	3.60
*	4	141.3	15488	26.39	21.16	17.69	13.25	10.13	6.50	3.56
*	4	141.3	15496	26.39	21.20	17.65	13.21	10.09	6.46	3.51

Stn: 275 Lane:F3 Temp: J/C: Air: 58 PvT: 63 11:23

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12072	20.53	16.63	13.71	10.22	7.78	4.77	2.56
	C	110.4	12112	20.11	16.29	13.45	10.09	7.65	4.77	2.56
	C	110.4	12104	20.03	16.24	13.50	10.09	7.69	4.81	2.56
*	1	54.9	6024	10.10	8.14	6.64	4.85	3.64	2.30	1.26
*	1	55.4	6072	10.14	8.14	6.68	4.94	3.69	2.34	1.30
*	1	55.2	6056	10.05	8.14	6.68	4.90	3.69	2.30	1.30
*	1	55.8	6112	10.10	8.14	6.68	4.90	3.69	2.30	1.30
*	2	83.3	9144	15.00	12.19	10.11	7.43	5.64	3.51	1.91
*	2	84.2	9232	15.12	12.28	10.15	7.51	5.69	3.51	1.91
*	2	84.1	9224	15.21	12.28	10.20	7.56	5.69	3.55	1.91
*	2	84.1	9216	15.17	12.32	10.15	7.51	5.69	3.51	1.91
*	3	110.6	12120	19.69	16.03	13.32	10.00	7.65	4.77	2.56
*	3	110.6	12128	19.82	16.16	13.45	10.13	7.73	4.90	2.65
*	3	110.9	12160	19.82	16.16	13.45	10.13	7.73	4.85	2.60
*	3	110.9	12152	19.82	16.12	13.45	10.09	7.69	4.85	2.60
*	4	141.7	15536	24.93	20.42	17.14	13.00	10.05	6.33	3.38
*	4	140.7	15424	24.97	20.51	17.18	13.04	10.09	6.33	3.34
*	4	142.0	15576	25.01	20.55	17.22	13.09	10.09	6.41	3.43
*	4	141.9	15552	24.93	20.51	17.27	13.09	10.13	6.41	3.43

Stn: 300 Lane:F3 Temp: J/C: Air: 59 PvT: 62 11:25

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.4	12000	19.69	16.16	13.58	10.38	7.87	4.90	2.52
	C	109.9	12048	19.31	15.81	13.32	10.22	7.78	4.85	2.56
	C	110.3	12096	19.27	15.86	13.37	10.22	7.82	4.90	2.56
*	1	54.5	5968	9.76	7.93	6.60	4.98	3.73	2.30	1.26
*	1	54.6	5992	9.68	7.93	6.60	4.98	3.73	2.30	1.21
*	1	54.6	6000	9.68	7.89	6.60	4.98	3.69	2.25	1.26
*	1	55.1	6040	9.68	7.89	6.56	4.94	3.69	2.25	1.21
*	2	83.5	9160	14.66	12.02	10.07	7.68	5.82	3.64	1.95
*	2	84.2	9232	14.75	12.11	10.20	7.77	5.82	3.64	1.95
*	2	83.5	9160	14.70	12.11	10.15	7.77	5.87	3.68	2.00
*	2	84.3	9248	14.66	12.06	10.15	7.73	5.82	3.64	1.91
*	3	110.0	12064	18.98	15.68	13.24	10.17	7.73	4.85	2.56
*	3	110.4	12112	19.10	15.81	13.32	10.26	7.82	4.94	2.65
*	3	110.3	12088	19.06	15.73	13.32	10.22	7.91	4.94	2.52
*	3	110.0	12056	19.02	15.73	13.32	10.22	7.87	4.94	2.60
*	4	141.6	15528	24.09	19.95	17.01	13.17	10.22	6.50	3.34
*	4	141.7	15536	24.17	20.12	17.09	13.30	10.31	6.59	3.47
*	4	141.3	15488	24.13	20.04	17.14	13.25	10.40	6.63	3.47
*	4	141.4	15512	24.05	19.95	17.05	13.21	10.31	6.54	3.38

Stn: 325 Lane:F3 Temp: J/C: Air: 59 PvT: 63 11:28

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11976	21.11	17.11	14.05	10.60	7.91	4.94	2.65
	C	109.4	11992	20.65	16.72	13.75	10.38	7.78	4.81	2.56
	C	109.4	11992	20.53	16.63	13.71	10.34	7.73	4.85	2.56
*	1	54.9	6024	10.64	8.53	6.90	5.07	3.69	2.30	1.26
*	1	55.2	6064	10.68	8.57	6.94	5.15	3.78	2.38	1.34
*	1	54.9	6016	10.56	8.49	6.90	5.07	3.69	2.30	1.26
*	1	54.9	6016	10.64	8.53	6.94	5.15	3.78	2.34	1.30
*	2	83.3	9128	15.71	12.67	10.37	7.81	5.73	3.60	1.91
*	2	83.9	9200	15.84	12.80	10.54	7.94	5.87	3.68	2.04
*	2	83.0	9112	15.79	12.80	10.50	7.94	5.87	3.68	2.04
*	2	83.5	9160	15.71	12.75	10.45	7.81	5.78	3.60	1.91
*	3	109.4	11992	20.11	16.46	13.58	10.30	7.73	4.85	2.56
*	3	110.1	12072	20.36	16.63	13.75	10.43	7.82	4.94	2.60
*	3	109.7	12032	20.28	16.55	13.71	10.34	7.78	4.85	2.56
*	3	109.7	12032	20.32	16.59	13.71	10.43	7.87	4.90	2.60
*	4	141.4	15520	25.35	20.85	17.39	13.38	10.13	6.41	3.38
*	4	141.7	15544	25.43	20.94	17.44	13.42	10.18	6.46	3.43
*	4	141.4	15512	25.47	20.90	17.44	13.47	10.18	6.46	3.43
*	4	141.4	15512	25.39	20.94	17.48	13.42	10.18	6.46	3.43

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Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
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Stn: 350 Lane:F3 Temp: J/C: Air: 59 PvT: 63 11:30

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.6	12128	23.08	20.08	13.50	9.84	7.16	4.42	2.39
	C	110.9	12160	22.54	19.52	13.41	9.79	7.16	4.51	2.52
	C	111.2	12192	22.37	19.43	13.32	9.71	7.16	4.46	2.47
*	1	55.8	6120	12.07	10.60	6.68	4.69	3.47	2.17	1.26
*	1	54.9	6024	11.86	10.38	6.56	4.64	3.38	2.12	1.21
*	1	55.1	6040	11.90	10.43	6.56	4.64	3.38	2.12	1.17
*	1	55.2	6056	11.90	10.38	6.60	4.64	3.42	2.12	1.17
*	2	83.6	9168	17.05	14.95	10.03	7.18	5.24	3.21	1.78
*	2	84.5	9256	17.18	15.12	10.15	7.26	5.33	3.29	1.78
*	2	84.5	9264	17.18	15.12	10.15	7.22	5.33	3.29	1.82
*	2	84.5	9256	17.09	15.08	10.07	7.26	5.29	3.29	1.78
*	3	110.6	12120	21.91	19.09	13.24	9.62	7.11	4.42	2.39
*	3	110.9	12152	22.08	19.17	13.32	9.67	7.20	4.42	2.43
*	3	110.9	12160	22.04	19.22	13.32	9.71	7.11	4.46	2.43
*	3	111.0	12176	22.12	19.22	13.37	9.71	7.20	4.46	2.43
*	4	141.4	15504	27.52	23.87	16.97	12.54	9.33	5.81	3.17
*	4	141.4	15512	27.57	24.00	17.09	12.58	9.38	5.89	3.21
*	4	141.6	15528	27.65	24.00	17.14	12.62	9.42	5.94	3.25
*	4	141.6	15520	27.57	24.04	17.18	12.66	9.47	5.94	3.25

'L-TRANS.CR. BETWEEN D2 AND D3

Stn: 375 Lane:F3 Temp: J/C: Air: 58 PvT: 63 11:33

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.0	11944	20.53	15.34	12.51	9.24	6.89	4.16	2.26
	C	109.6	12008	20.19	14.99	12.34	9.12	6.80	4.25	2.30
	C	109.7	12024	20.19	15.04	12.38	9.20	6.85	4.29	2.34
*	1	54.3	5952	10.77	7.67	6.21	4.47	3.24	2.04	1.13
*	1	54.3	5960	10.73	7.63	6.17	4.47	3.24	2.04	1.13
*	1	54.2	5936	10.68	7.67	6.17	4.47	3.20	2.04	1.13
*	1	54.6	6000	10.73	7.67	6.21	4.52	3.24	2.04	1.17
*	2	82.9	9088	15.54	11.42	9.34	6.92	5.07	3.12	1.73
*	2	83.3	9136	15.58	11.50	9.38	6.92	5.16	3.16	1.78
*	2	83.0	9104	15.54	11.42	9.34	6.92	5.02	3.16	1.69
*	2	83.3	9144	15.58	11.50	9.43	7.09	5.11	3.16	1.69
*	3	109.6	12016	19.73	14.87	12.42	9.58	6.80	4.29	2.34
*	3	109.6	12024	19.90	14.91	12.42	9.54	6.80	4.25	2.30
*	3	109.4	11992	19.86	14.87	12.38	9.50	6.76	4.29	2.30
*	3	109.3	11976	19.86	14.82	12.30	9.41	6.71	4.25	2.30
*	4	140.7	15432	24.59	18.83	15.81	12.37V	8.80	5.63	2.99
*	4	141.2	15480	24.55	18.83	15.68	11.99	8.85	5.59	2.99
*	4	140.4	15400	24.47	18.87	15.60	12.07	8.80	5.59	2.95
*	4	140.4	15400	24.47	18.70	15.55	11.82V	8.80	5.50	2.99

Stn: 400 Lane:F3 Temp: J/C: Air: 58 PvT: 63 11:36

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.9	12040	18.35	14.78	12.12	9.03	6.76	4.07	2.21
	C	110.1	12072	17.97	14.43	12.04	9.08	6.67	4.25	2.26
	C	110.1	12080	17.89	14.39	12.00	9.08	6.67	4.20	2.21
*	1	55.2	6056	9.26	7.41	6.08	4.52	3.24	2.12	1.17V
*	1	54.6	6000	9.22	7.37	6.08	4.47	3.20	2.12	1.08
*	1	55.1	6032	9.09	7.28	6.04	4.47	3.16	2.04	1.04
*	1	54.9	6016	9.09	7.28	6.08	4.52	3.11	2.12	1.04
*	2	83.3	9136	13.62	10.99	9.08	6.75	4.98	3.12	1.65
*	2	84.1	9224	13.70	11.03	9.17	6.84	4.98	3.12	1.60
*	2	84.3	9246	13.70	11.03	9.17	6.80	4.98	3.12	1.60
*	2	84.1	9224	13.62	11.03	9.17	6.88	4.98	3.16	1.65
*	3	110.3	12088	17.55	14.18	11.87	8.95	6.62	4.16	2.17
*	3	110.1	12080	17.60	14.26	11.78	8.86	6.71	4.07V	2.21
*	3	110.0	12064	17.60	14.22	11.95	9.03	6.62	4.20	2.17
*	3	110.0	12064	17.64	14.22	12.00	9.08	6.67	4.29	2.21
*	4	141.9	15560	22.08	17.92	15.21	11.65	8.62	5.55	2.86
*	4	142.5	15624	22.16	18.05	15.42	11.82	8.71	5.72	2.95
*	4	142.2	15584	22.20	18.01	15.38	11.82	8.67	5.72	2.91
*	4	142.0	15568	22.16	18.01	15.38	11.78	8.71	5.63	2.91

Stn: 425 Lane:F3 Temp: J/C: Air: 57 PvT: 63 11:38

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.3	11984	19.19	15.34	12.47	8.95	6.49	3.86	2.17

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Subsection: 831801

	C	110.0	12056	18.77	14.95	12.12	8.91	6.44	3.99	2.17
	C	109.9	12048	18.68	14.91	12.12	8.82	6.44	3.94	2.13
*	1	55.1	6032	9.68	7.63	6.08	4.31	3.07	1.86	1.08
*	1	54.6	6000	9.59	7.58	6.08	4.22	3.02	1.78	1.08
*	1	54.6	6000	9.55	7.58	6.08	4.26	3.07	1.82	1.08
*	1	54.8	6008	9.55	7.54	6.04	4.18	2.98	1.78	1.04
*	2	83.0	9104	14.33	11.42	9.25	6.50	4.71	2.77	1.60
*	2	83.9	9200	14.33	11.42	9.25	6.59	4.80	2.82	1.60
*	2	83.3	9144	14.24	11.38	9.21	6.59	4.76	2.82	1.56
*	2	83.6	9168	14.33	11.50	9.34	6.63	4.80	2.86	1.65
*	3	110.1	12072	18.27	14.74	11.95	8.78	6.40	3.90	2.08
*	3	110.0	12056	18.48	14.82	12.08	8.86	6.49	3.99	2.17
*	3	109.9	12048	18.43	14.78	12.04	8.95	6.49	4.03	2.17
*	3	110.3	12096	18.43	14.82	12.12	8.82	6.44	3.94	2.13
*	4	142.2	15584	23.17	18.70	15.38	11.48	8.49	5.29	2.86
*	4	141.4	15512	23.17	18.70	15.38	11.48	8.49	5.20	2.78
*	4	142.0	15576	23.17	18.79	15.47	11.52	8.53	5.24	2.86
*	4	142.3	15608	23.17	18.83	15.51	11.48	8.49	5.20	2.86

Stn: 450 Lane:F3 Temp: J/C: Air: 58 PvT: 62 11:41

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.7	12040	19.73	15.47	12.51	8.95	6.44	3.81	2.13
	C	109.7	12040	19.36	15.12	12.30	8.86	6.44	3.81	2.13
	C	109.9	12048	19.15	15.04	12.25	8.82	6.36	3.77	2.13
*	1	54.8	6008	10.10	7.80	6.26	4.35	3.11	1.82	1.08
*	1	55.1	6040	10.05	7.80	6.21	4.35	3.11	1.82	1.08
*	1	54.6	5992	9.97	7.76	6.08	4.35	3.11	1.78	1.08
*	1	54.5	5976	9.93	7.67	6.13	4.31	3.07	1.78	1.00
*	2	83.8	9184	14.79	11.55	9.30	6.63	4.80	2.82	1.60
*	2	83.9	9200	14.66	11.42	9.21	6.46	4.58V	2.60V	1.30V
*	2	83.9	9200	14.87	11.63	9.38	6.71	4.89	2.90V	1.65V
*	2	84.3	9240	14.83	11.59	9.38	6.67	4.80	2.82	1.56
*	3	109.7	12040	18.81	14.87	12.17	8.74	6.36	3.77	2.08
*	3	110.1	12080	18.98	14.99	12.21	8.86	6.44	3.86	2.13
*	3	110.3	12088	18.94	14.95	12.17	8.78	6.40	3.81	2.08
*	3	109.9	12048	18.94	14.95	12.25	8.86	6.44	3.86	2.17
*	4	142.0	15576	23.71	18.87	15.51	11.36	8.40	5.03	2.78
*	4	142.5	15616	23.71	18.87	15.55	11.40	8.40	5.03	2.78
*	4	141.9	15552	23.67	18.92	15.47	11.44	8.45	5.03	2.82
*	4	141.9	15552	23.67	18.79	15.51	11.36	8.36	5.03	2.78

Stn: 475 Lane:F3 Temp: J/C: Air: 59 PvT: 62 11:43

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	107.2	11760	21.58	15.64	12.21	8.40	6.04	3.64	2.00
	C	108.4	11880	21.11	15.47	12.17	8.40	6.04	3.73	2.04
	C	107.8	11824	20.99	15.43	12.12	8.40	6.04	3.68	2.04
*	1	54.1	5920	11.69	8.10	6.13	4.05	2.84	1.73	1.00
*	1	54.3	5952	11.56	8.10	6.13	4.05	2.84	1.73	1.00
*	1	53.9	5912	11.52	8.14	6.17	4.09	2.89	1.78	1.04
*	1	53.8	5896	11.56	8.10	6.13	4.05	2.84	1.73	1.00
*	2	82.3	9016	16.51	11.94	9.25	6.29	4.44	2.69	1.47
*	2	82.2	9008	16.59	11.98	9.30	6.29	4.49	2.69	1.52
*	2	82.5	9040	16.63	12.02	9.38	6.33	4.49	2.73	1.52
*	2	82.3	9032	16.63	12.02	9.34	6.33	4.49	2.73	1.52
*	3	108.1	11856	20.65	15.25	12.00	8.32	6.04	3.68	2.08
*	3	108.6	11904	20.82	15.34	12.08	8.40	6.09	3.73	2.08
*	3	108.7	11912	20.86	15.43	12.17	8.44	6.04	3.68	2.00
*	3	108.7	11912	20.86	15.38	12.08	8.36	6.04	3.64	1.95
*	4	141.0	15464	25.77	19.22	15.30	10.76	7.82	4.77	2.56
*	4	141.2	15480	25.72	19.30	15.38	10.76	7.91	4.81	2.56
*	4	141.2	15480	25.77	19.43	15.55	10.98	7.91	4.85	2.52
*	4	140.9	15440	25.77	19.35	15.47	10.89	7.87	4.85	2.56

Stn: 500 Lane:F3 Temp: J/C: Air: 59 PvT: 63 11:46

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	111.3	12200	18.01	14.35	11.83	8.78	5.73	3.77	2.13
	C	111.9	12264	17.60	14.00	11.57	8.61	5.69	3.73	2.13
	C	112.0	12280	17.64	14.00	11.65	8.65	5.78	3.81	2.13
*	1	55.7	6096	8.92	7.11	5.87	4.22	2.71	1.82	1.00
*	1	54.9	6024	8.92	7.11	5.83	4.26	2.76	1.82	1.13V
*	1	55.7	6104	8.80	7.02	5.78	4.18	2.67	1.73	1.00

File: C:\FWD\DATA\831801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	1	55.2	6056	8.76	7.02	5.74	4.18	2.67	1.73	1.00
*	2	84.1	9216	13.32	10.51	8.70	6.37	4.18	2.73	1.47
*	2	84.8	9304	13.49	10.69	8.63	6.50	4.22	2.77	1.56
*	2	84.8	9304	13.41	10.64	8.78	6.46	4.18	2.77	1.52
*	2	84.8	9288	13.45	10.69	8.87	6.50	4.27	2.82	1.60
*	3	112.0	12280	17.26	13.79	11.44	8.57	5.69	3.73	2.04
*	3	111.7	12248	17.30	13.83	11.48	8.57	5.73	3.77	2.08
*	3	112.0	12280	17.34	13.92	11.57	8.65	5.73	3.77	2.13
*	3	112.5	12320	17.47	13.92	11.57	8.65	5.78	3.81	2.17
*	4	143.6	15744	21.87	17.54	14.74	11.06	7.60	4.94	2.69
*	4	143.6	15736	21.99	17.58	14.70	11.10	7.56	4.94	2.73
*	4	143.5	15736	21.99	17.62	14.78	11.14	7.60	5.03	2.82
*	4	143.5	15728	21.99	17.67	14.78	11.19	7.65	4.98	2.82

'L-TRANS.CR. ~~BETWEEN~~ D2 ~~AND B3~~
UNDER

Stn: 505 Lane:F3 Temp: J/C: Air: 59 PvT: 62 11:50

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	109.6	12008	17.72	14.13	11.74	8.82	6.53	4.03	2.17
	C	110.0	12056	17.26	13.79	11.44	8.74	6.40	3.99	2.17
	C	110.1	12080	17.26	13.79	11.40	8.70	6.40	3.94	2.13
*	1	55.4	6072	8.97	7.11	5.83	4.31	3.16	1.95	1.13
*	1	55.5	6080	8.88	7.07	5.78	4.22	3.11	1.91	1.04
*	1	55.1	6048	8.84	7.02	5.74	4.22	3.07	1.91	1.08
*	1	55.5	6088	8.80	6.98	5.74	4.26	3.11	1.91	1.08
*	2	83.8	9176	13.03	10.43	8.65	6.42	4.76	2.90	1.60
*	2	84.1	9216	13.15	10.56	8.78	6.54	4.80	2.99	1.65
*	2	84.5	9256	13.20	10.56	8.74	6.59	4.89	2.99	1.60
*	2	83.3	9144	13.07	10.47	8.70	6.59	4.84	2.99	1.65
*	3	110.6	12128	17.01	13.62	11.31	8.65	6.40	3.99	2.13
*	3	110.6	12120	17.05	13.66	11.35	8.65	6.40	3.99	2.13
*	3	110.7	12136	17.05	13.66	11.40	8.65	6.40	3.99	2.13
*	3	110.7	12136	17.01	13.66	11.35	8.70	6.44	3.99	2.17
*	4	142.2	15592	21.45	17.32	14.52	11.14	8.36	5.24	2.86
*	4	142.6	15632	21.53	17.32	14.52	11.31	8.40	5.29	2.91
*	4	142.6	15640	21.41	17.32	14.48	11.19	8.36	5.24	2.78
*	4	142.5	15616	21.41	17.28	14.52	11.23	8.40	5.24	2.78

Stn: 510 Lane:F3 Temp: J/C: Air: 60 PvT: 62 11:52

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	110.1	12072	17.26	14.00	11.57	8.82	6.53	3.99	2.13
	C	110.1	12080	16.88	13.70	11.35	8.65	6.49	3.99	2.13
	C	110.4	12112	16.80	13.57	11.31	8.53	6.40	3.90	2.08
*	1	55.1	6040	8.67	6.94	5.74	4.26	3.16	1.91	1.13
*	1	54.6	5992	8.55	6.89	5.66	4.22	3.11	1.86	1.08
*	1	55.2	6056	8.50	6.81	5.61	4.18	3.02	1.82	1.00
*	1	54.5	5976	8.46	6.89	5.61	4.22	3.07	1.86	1.00
*	2	83.5	9160	12.82	10.34	8.61	6.46	4.80	2.90	1.60
*	2	83.8	9184	12.86	10.38	8.65	6.50	4.84	2.95	1.65
*	2	84.1	9216	12.86	10.38	8.57	6.46	4.80	2.90	1.52
*	2	84.2	9232	12.82	10.38	8.65	6.46	4.84	2.90	1.52
*	3	110.1	12072	16.51	13.36	11.18	8.48	6.36	3.86	2.08
*	3	110.4	12112	16.67	13.53	11.31	8.61	6.44	3.94	2.13
*	3	111.0	12176	16.67	13.53	11.31	8.61	6.44	3.94	2.13
*	3	110.6	12120	16.72	13.62	11.35	8.65	6.49	3.99	2.13
*	4	141.7	15536	20.99	17.11	14.35	10.98	8.36	5.16	2.73
*	4	142.0	15576	20.95	17.15	14.40	11.10	8.40	5.16	2.78
*	4	141.4	15520	20.91	17.11	14.40	11.06	8.36	5.16	2.73
*	4	141.7	15536	20.95	17.15	14.44	11.10	8.40	5.20	2.78

Stn: 515 Lane:F3 Temp: J/C: Air: 60 PvT: 61 11:55

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11904	16.72	13.57	11.31	8.32	6.36	3.81	2.04
	C	108.6	11896	16.34	13.23	11.05	8.23	6.18	3.81	2.13
	C	109.3	11976	16.30	13.19	11.05	8.23	6.18	3.77	2.08
*	1	54.5	5976	8.25	6.68	5.48	4.01	2.98	1.73	1.00
*	1	53.9	5912	8.17	6.64	5.48	4.01	2.93	1.78	1.04
*	1	54.3	5960	8.25	6.64	5.48	4.05	2.93	1.78	1.08
*	1	54.3	5960	8.21	6.64	5.48	4.01	2.93	1.78	1.00
*	2	82.2	9008	12.40	10.04	8.31	6.16	4.58	2.77	1.56
*	2	83.5	9144	12.44	10.17	8.48	6.29	4.67	2.82	1.56

File: C:\FWD\DATA\831801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	2	83.3	9128	12.36	10.08	8.40	6.25	4.58	2.77	1.52
*	2	83.5	9144	12.40	10.08	8.44	6.29	4.62	2.82	1.56
*	3	108.8	11936	16.05	13.10	10.93	8.19	6.18	3.81	2.04
*	3	108.8	11936	16.05	13.10	10.97	8.19	6.18	3.81	2.00
*	3	109.3	11984	16.05	13.14	10.97	8.15	6.22	3.77	1.95
*	3	109.1	11968	16.00	13.10	10.93	8.19	6.22	3.77	2.00
*	4	142.0	15568	20.24	16.59	13.97	10.55	8.05	4.90	2.56
*	4	141.4	15504	20.28	16.63	14.01	10.64	8.00	4.94	2.65
*	4	142.0	15568	20.28	16.68	14.05	10.72	8.09	5.03	2.73
*	4	141.6	15528	20.32	16.63	14.01	10.68	8.05	4.94	2.69

Stn: 520 Lane:F3 Temp: J/C: Air: 61 PvT: 61 11:57

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.1	11856	16.13	12.88	10.63	8.06	6.04	3.68	2.04
	C	108.6	11912	15.84	12.71	10.45	8.02	6.00	3.73	2.00
	C	108.8	11928	15.79	12.67	10.45	7.98	5.96	3.68	1.95
*	1	54.6	5984	8.13	6.42	5.23	3.88	2.89	1.73	1.00
*	1	54.6	5984	8.21	6.46	5.31	3.97	2.93	1.82	1.08
*	1	54.1	5936	8.09	6.38	5.23	3.93	2.89	1.78	1.04
*	1	54.3	5960	8.09	6.33	5.18	3.84	2.84	1.73	1.00
*	2	83.0	9104	12.15	9.61	7.93	5.99	4.49	2.77	1.56
*	2	83.8	9184	12.19	9.74	8.01	6.08	4.53	2.77	1.60
*	2	83.5	9160	12.15	9.78	8.01	6.12	4.49	2.82	1.47
*	2	83.8	9184	12.07	9.65	7.97	5.99	4.49	2.73	1.47
*	3	108.6	11896	15.46	12.50	10.33	7.89	5.91	3.64	2.00
*	3	109.1	11960	15.58	12.50	10.33	7.89	5.96	3.68	2.00
*	3	108.6	11912	15.58	12.58	10.41	7.98	6.00	3.77	2.04
*	3	108.6	11904	15.58	12.54	10.41	7.98	6.04	3.77	2.08
*	4	141.3	15496	19.65	15.86	13.20	10.13	7.69	4.77	2.56
*	4	141.4	15512	19.69	15.90	13.24	10.22	7.73	4.81	2.69
*	4	141.6	15520	19.73	15.99	13.28	10.30	7.82	4.85	2.73
*	4	141.4	15504	19.69	15.94	13.24	10.26	7.78	4.85	2.60

Stn: 525 Lane:F3 Temp: J/C: Air: 62 PvT: 61 12:00

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.8	11928	15.88	12.67	10.58	7.98	5.91	3.77	2.00
	C	109.9	12056	15.63	12.41	10.33	7.81	5.91	3.68	2.04
	C	110.1	12080	15.54	12.37	10.33	7.81	5.87	3.68	2.00
*	1	55.2	6056	8.13	6.38	5.27	3.93	2.89	1.82	1.04
*	1	54.9	6024	8.00	6.38	5.27	3.93	2.84	1.82	1.08
*	1	55.4	6072	7.96	6.33	5.18	3.84	2.80	1.78	1.00
*	1	55.2	6056	7.92	6.29	5.18	3.80	2.80	1.78	1.00
*	2	83.5	9160	11.86	9.48	7.88	5.95	4.36	2.77	1.52
*	2	84.1	9216	11.90	9.48	7.93	5.95	4.40	2.82	1.52
*	2	84.1	9224	11.90	9.48	7.93	5.95	4.40	2.82	1.52
*	2	83.8	9184	11.86	9.48	7.93	5.99	4.36	2.82	1.47
*	3	109.9	12056	15.33	12.24	10.28	7.81	5.78	3.73	2.04
*	3	110.1	12072	15.33	12.24	10.33	7.85	5.78	3.77	2.00
*	3	109.9	12048	15.42	12.28	10.33	7.85	5.87	3.77	2.00

File: C:\FWD\DATA\831801E3.FWD
Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
Subsection: 831801

*	3	109.9	12056	15.42	12.28	10.33	7.85	5.87	3.77	2.04
*	4	143.2	15704	19.27	15.51	13.11	10.09	7.51	4.85	2.52
*	4	142.3	15600	19.27	15.51	13.11	10.13	7.51	4.90	2.60
*	4	142.9	15664	19.31	15.55	13.20	10.22	7.51	4.94	2.56
*	4	142.8	15648	19.36	15.60	13.20	10.17	7.60	4.94	2.65

Stn: 535 Lane:F3 Temp: J/C: Air: 64 PvT: 64 12:08

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.6	11912	16.30	13.10	10.75	8.15	6.04	3.77	2.04
	C	109.6	12016	16.00	12.84	10.58	7.98	5.96	3.77	2.04
	C	109.6	12008	15.88	12.80	10.41	7.98	5.91	3.73	2.04
*	1	54.5	5968	8.17	6.46	5.27	3.84	2.80	1.69	0.95
*	1	55.4	6064	8.25	6.55	5.31	3.93	2.84	1.73	1.04
*	1	54.6	5984	8.13	6.38	5.31	3.88	2.84	1.73	1.00
*	1	55.7	6096	8.25	6.51	5.36	3.93	2.84	1.82	1.00
*	2	83.2	9112	12.11	9.74	7.93	5.95	4.40	2.73	1.52
*	2	83.3	9128	12.15	9.69	8.05	6.04	4.44	2.73	1.47
*	2	83.3	9144	12.11	9.65	7.97	5.95	4.40	2.73	1.43
*	2	83.2	9120	12.11	9.65	8.01	5.95	4.40	2.73	1.47
*	3	109.3	11976	15.58	12.54	10.37	7.89	5.91	3.68	2.00
*	3	109.7	12032	15.63	12.62	10.37	7.89	5.91	3.68	1.95
*	3	110.0	12056	15.67	12.71	10.45	7.98	5.96	3.77	2.04
*	3	110.1	12072	15.67	12.67	10.45	7.94	5.96	3.73	2.00
*	4	142.2	15592	19.69	15.86	13.32	10.22	7.69	4.90	2.60
*	4	142.6	15632	19.73	15.94	13.41	10.26	7.73	4.90	2.60
*	4	142.5	15624	19.73	15.90	13.37	10.26	7.73	4.90	2.60
*	4	142.6	15632	19.69	15.90	13.41	10.30	7.73	4.90	2.60

Stn: 540 Lane:F3 Temp: J/C: Air: 66 PvT: 64 12:11

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.3	11864	20.86	14.76	11.61	8.44	6.09	3.73	2.00
	C	109.1	11968	20.32	14.48	11.40	8.23	6.00	3.68	1.95
	C	108.8	11928	20.15	14.39	11.31	8.23	6.00	3.64	1.95
*	1	55.1	6032	10.77	7.63	5.91	4.18	2.93	1.73	0.95
*	1	54.5	5968	10.56	7.58	5.91	4.14	2.93	1.73	0.95
*	1	54.9	6024	10.68	7.67	5.96	4.18	2.98	1.78	1.04
*	1	54.8	6008	10.60	7.58	5.87	4.14	2.93	1.69	0.95
*	2	83.3	9144	15.54	11.16	8.74	6.25	4.49	2.69	1.47
*	2	83.5	9152	15.67	11.20	8.83	6.29	4.49	2.69	1.43
*	2	83.9	9200	15.67	11.20	8.83	6.29	4.53	2.69	1.43
*	2	83.8	9184	15.63	11.25	8.87	6.33	4.53	2.73	1.47
*	3	108.6	11904	19.69	14.26	11.27	8.23	6.00	3.68	2.00
*	3	109.3	11976	19.73	14.39	11.44	8.27	6.09	3.77	2.08
*	3	109.3	11976	19.69	14.39	11.40	8.27	6.04	3.73	2.00
*	3	109.6	12016	19.69	14.48	11.53	8.40	6.13	3.77	2.00
*	4	141.3	15488	24.63V	18.05	14.44	10.60	7.82	4.90	2.60
*	4	141.3	15488	24.68V	18.18	14.48	10.68	7.96	4.94	2.69
*	4	141.0	15456	24.80V	18.14	14.52	10.68	7.91	4.90	2.60
*	4	141.0	15464	46.96V	18.23	14.52	10.72	7.96	4.94	2.60

Previous Test Data Set DELETED !

Stn: 540 Lane:F3 Temp: J/C: Air: 67 PvT: 68 12:14

Sto	Hgt	psi	lbf	Df1	Df2	Df3	Df4	Df5	Df6	Df7
	C	108.4	11888	20.28	14.52	11.44	8.27	6.00	3.68	2.00
	C	108.8	11928	20.07	14.39	11.40	8.27	6.04	3.68	2.00
	C	108.7	11920	20.07	14.43	11.48	8.32	6.09	3.73	2.00
*	1	54.8	6008	10.64	7.63	5.96	4.18	2.98	1.73	0.95
*	1	54.8	6000	10.56	7.54	5.91	4.14	2.89	1.73	0.95
*	1	54.5	5976	10.56	7.63	6.00	4.22	2.98	1.78	1.04
*	1	55.1	6032	10.60	7.67	6.00	4.22	2.98	1.78	1.00
*	2	83.0	9096	15.33	11.16	8.78	6.29	4.53	2.73	1.52
*	2	83.8	9184	15.50	11.29	8.91	6.37	4.58	2.73	1.47
*	2	83.3	9136	15.38	11.25	8.87	6.33	4.58	2.77	1.52
*	2	83.2	9112	15.38	11.25	8.87	6.37	4.58	2.77	1.47
*	3	108.6	11936	19.61	14.31	11.40	8.23	6.04	3.68	2.04
*	3	109.3	11976	19.77	14.43	11.48	8.32	6.09	3.68	2.00
*	3	109.6	12016	19.86	14.48	11.53	8.36	6.09	3.73	2.00
*	3	109.0	11952	19.86	14.52	11.53	8.40	6.13	3.77	2.04
*	4	140.9	15448	24.30	18.10	14.48	10.64	7.87	4.90	2.60
*	4	141.3	15496	24.30	18.18	14.57	10.72	7.91	4.90	2.60

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Road: TC-1 WB LANES, 46 Km WEST OF BRANDON, MB
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*	4	141.3	15496	24.30	18.23	14.61	10.72	7.91	4.90	2.65
*	4	141.0	15464	24.30	18.27	14.65	10.81	7.96	4.98	2.69

Mileage:-.008 -> .102

Summary of Data for section 831801E
Analyzed by: ROBERT VAN SAMBEEK on 09-30-1993

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	1.6420	1.3031	1.0546	0.7708	0.5643	0.3521	0.1979
	2	1.6060	1.2877	1.0540	0.7809	0.5785	0.3588	0.1972
	3	1.5760	1.2735	1.0509	0.7900	0.5917	0.3700	0.2005
	4	1.5379	1.2522	1.0418	0.7943	0.5998	0.3790	0.2043

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.2064	0.1537	0.1054	0.0752	0.0613	0.0393	0.0201
	2	0.1921	0.1489	0.1087	0.0793	0.0642	0.0404	0.0228
	3	0.1816	0.1452	0.1102	0.0813	0.0667	0.0416	0.0221
	4	0.1801	0.1460	0.1131	0.0851	0.0699	0.0449	0.0242

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	12.57%	11.79%	9.99%	9.75%	10.87%	11.18%	10.14%
	2	11.96%	11.57%	10.31%	10.15%	11.11%	11.25%	11.55%
	3	11.52%	11.40%	10.49%	10.30%	11.27%	11.25%	11.00%
	4	11.71%	11.66%	10.85%	10.72%	11.66%	11.84%	11.83%

Flexible Pavement Deflection Statistics - 831801E

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	1.7633	1.3031	1.0546	0.7708	0.5643	0.3521	0.1979
	2	1.7245	1.2877	1.0540	0.7809	0.5785	0.3588	0.1972
	3	1.6919	1.2735	1.0509	0.7900	0.5917	0.3700	0.2005
	4	1.6509	1.2522	1.0418	0.7943	0.5998	0.3790	0.2043

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.2281	0.1537	0.1054	0.0752	0.0613	0.0393	0.0201
	2	0.2142	0.1489	0.1087	0.0793	0.0642	0.0404	0.0228
	3	0.2032	0.1452	0.1102	0.0813	0.0667	0.0416	0.0221
	4	0.2017	0.1460	0.1131	0.0851	0.0699	0.0449	0.0242

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	12.94%	11.79%	9.99%	9.75%	10.87%	11.18%	10.14%
	2	12.42%	11.57%	10.31%	10.15%	11.11%	11.25%	11.55%
	3	12.01%	11.40%	10.49%	10.30%	11.27%	11.25%	11.00%
	4	12.22%	11.66%	10.85%	10.72%	11.66%	11.84%	11.83%

Outlier Statistics - 831801E

Station	Height	Sensor	Number of Std. Dev.
75	1	1	2.28
75	2	1	2.24
75	3	1	2.20
75	4	1	2.25
175	1	1	2.20
175	1	3	2.22
175	1	4	2.13
175	2	1	2.27
175	2	2	2.11
175	2	3	2.25
175	2	4	2.17
175	3	1	2.28
175	3	2	2.11
175	3	3	2.20
175	3	4	2.08
175	4	1	2.25
175	4	2	2.08
175	4	3	2.14
175	4	4	2.07
350	1	2	2.74
350	2	2	2.31
350	3	2	2.10
350	4	2	2.01

Pavement Construction Information - 831801E

Material Code	Material Name	Layer Thickness
700	Asphaltic Concrete	4.4
304	Crushed Gravel	5.6
302	Uncrushed Gravel	13.2

Depth to rigid foundation: 100.0 ft.

FLEXIBLE Pavement Thickness Data - 831801E
(comparison of each calculation to the expected value)

Minimum expected SN value: 2.97
Maximum expected SN value: 5.23

Height	Station	Effective SN

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

FLEXIBLE Pavement Thickness Statistics - 831801E

Drop height 1

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	19577	4.75
	-35	19234	4.70
	-30	19218	4.75
	-25	19421	4.70
	-20	19536	4.65
	-15	18897	4.65
	-10	18983	4.65
	-5	18816	4.75
	0	18917	4.95
	25	19253	4.85
	50	18704	4.45
	75	18701	4.10
	100	18716	4.45
	125	17708	4.50
	150	17454	4.50
	175	16697	4.20
	200	19203	4.40
	225	19152	4.35
	250	18851	4.40
	275	19081	4.60
	300	19013	4.70
	325	18975	4.50
	350	20356	4.25
	375	21073	4.40
	400	21016	4.75
	425	22526	4.60
	450	22703	4.50
	475	23441	4.15
	500	23506	4.80
	505	22497	4.80
	510	22897	4.90
	515	23131	4.95
	520	23182	4.95
	525	23279	5.05
	530	23494	5.05
	535	24119	4.95
	540	24314	4.35
Subsection 1 Overall Mean:		20423	4.62
Standard Deviation:		2155	0.25
Coeff Of Variation:		10.55%	5.47%

FLEXIBLE Pavement Thickness Statistics - 831801E

Drop height 2

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	18703	4.80
	-35	19008	4.75
	-30	19260	4.75
	-25	19207	4.75
	-20	18746	4.70
	-15	18783	4.70
	-10	19167	4.70
	-5	18371	4.80
	0	18767	4.95
	25	19215	4.85
	50	18852	4.50
	75	17946	4.20
	100	19144	4.50
	125	17708	4.50
	150	16798	4.55
	175	16162	4.25
	200	18245	4.50
	225	18767	4.40
	250	18631	4.50
	275	19075	4.65
	300	18294	4.75
	325	18389	4.60
	350	20693	4.35
	375	21195	4.50
	400	21533	4.80
	425	22883	4.65
	450	23832	4.55
	475	23906	4.30
	500	24086	4.80
	505	22661	4.85
	510	23079	4.90
	515	23491	4.95
	520	23978	5.00
	525	23600	5.10
	530	23917	5.10
	535	24397	5.00
	540	24239	4.45
Subsection 1 Overall Mean:		20398	4.67
Standard Deviation:		2501	0.23
Coeff Of Variation:		12.26%	4.94%

FLEXIBLE Pavement Thickness Statistics - 831801E

Drop height 3

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	18658	4.85
	-35	18489	4.80
	-30	18640	4.85
	-25	18724	4.80
	-20	18335	4.75
	-15	18212	4.75
	-10	18395	4.75
	-5	18398	4.80
	0	18809	5.00
	25	18927	4.90
	50	18445	4.55
	75	17167	4.30
	100	18817	4.55
	125	16873	4.55
	150	16124	4.65
	175	15699	4.35
	200	17681	4.55
	225	17730	4.50
	250	17938	4.55
	275	18334	4.70
	300	17609	4.80
	325	17665	4.65
	350	20067	4.40
	375	20595	4.60
	400	21152	4.85
	425	22261	4.70
	450	22852	4.65
	475	23463	4.40
	500	23341	4.85
	505	22236	4.95
	510	22535	4.95
	515	23054	5.00
	520	23435	5.05
	525	23277	5.10
	530	23427	5.15
	535	23658	5.10
	540	23535	4.50
Subsection 1 Overall Mean:		19853	4.74
Standard Deviation:		2491	0.22
Coeff Of Variation:		12.55%	4.66%

FLEXIBLE Pavement Thickness Statistics - 831801E

Drop height 4

Subsection	Station	Subgrade Modulus	Effective SN
No test pit data found, therefore no results exist...			
1	-40	18382	4.90
	-35	18259	4.90
	-30	18525	4.95
	-25	18519	4.90
	-20	18161	4.80
	-15	17769	4.85
	-10	17946	4.85
	-5	18074	4.90
	0	18252	5.00
	25	18684	4.95
	50	18023	4.65
	75	16568	4.35
	100	18103	4.60
	125	16428	4.60
	150	15744	4.70
	175	15253	4.40
	200	17337	4.60
	225	17364	4.55
	250	17587	4.65
	275	17697	4.75
	300	16995	4.90
	325	17479	4.75
	350	19315	4.45
	375	20276	4.70
	400	20202	4.95
	425	21775	4.80
	450	22396	4.70
	475	23440	4.50
	500	22804	4.90
	505	21762	5.00
	510	21993	5.05
	515	22937	5.10
	520	23447	5.15
	525	23351	5.20
	530	23305	5.20
	535	23290	5.15
	540	22989	4.65
Subsection 1 Overall Mean:		19471	4.81
Standard Deviation:		2542	0.22
Coeff Of Variation:		13.06%	4.63%

Manitoba

Memorandum

Date: November 12, 1991

To: John Hosang, P. Eng.
Barry Rowley, P. Eng.
Ross Adamson, P. Eng.
Ross Scrase, P. Eng.
Fred Young, P. Eng.
Subject: Dave Reid

From: R. A. Van Cauwenberghe, P. Eng.
Senior Engineer: Pavements,
Geotechnical and Research
1181 Portage Avenue (Annex)
Telephone: 945-0560

STRATEGIC HIGHWAY RESEARCH PROGRAM (SHRP)
SEASONAL VARIATION TESTING

The North Central regional contractor for SHRP, Braun Intertec Pavement, is planning to conduct Falling Weight Deflection (FWD) testing at the GPS-1 test site on PTH 1, West of Brandon. Braun plans to conduct all-day FWD testing, on an irregular basis, during the winter of 1991, and intensive FWD testing in the spring of 1992.

As discussed with Braun, and with agreement from the Department, testing will be allowed only under the following safety related conditions:

1. Dry Surface - The pavement surface should be dry and ice-free at, and within the vicinity of the test section.

2. Good Visibility - The determination of good visibility shall be acceptable to District personnel.

3. Daylight Hours - Testing is restricted to daylight hours only. Inclusive in this time is the set-up and/or removal of traffic control devices.

4. Traffic Control - The District will provide and supervise the control of traffic.

Braun has tentatively scheduled the first FWD testing session for Wednesday, November 13 8:00 a.m. - 3:30 p.m. The above criteria will govern whether testing will proceed as planned.

LK/bb

cc: Erland Lukanen, P. Eng.
Braun Intertec Pavement

Manitoba

Highways and Transportation

MATERIALS & RESEARCH BRANCH
12th Floor - 215 Garry St.
Winnipeg, Manitoba R3C 3Z1

Telephone: (204) 945-8982 Facsimile: (204) 945-2229

COVER SHEET: If there are any problems with this transmittal, please call 945-8982.

DATE: July 8, 1993

TO: NAME: Bob VanSambeek

OFFICE: Braun Intertec

FAX NUMBER: (612) 776-7201

FROM: NAME: Dennis Watson

TELEPHONE: (204) 945-8982

FAX NUMBER: (204) 945-2229

NO. OF PAGES: (including this one) 1

MESSAGE/REPLY: Our Department does not have the capacity to core 300mm diameter holes. We do have a drill rig capable of turning a 300mm auger, but do not possess one of our own.

We may be able to contract out the coring and/or drilling to a local outfit. Let us know what we'll need.

See you in 2 weeks

DW

1993

Manitoba

Memorandum

Date . August 23, 1993

To . LIST . Gene & Bob

From . Dennis Watson
. Research Engineer
. Materials & Research
. 12th Floor - 215 Garry Street

Telephone . 945-8982

Subject . **RE: Seasonal Monitoring Instrumentation Installation Meeting**

Two of our Manitoba Test Sites have been selected by the U.S. Federal Highway Administration's Long Term Pavement Performance project to be monitored seasonally. The purpose of this monitoring is to evaluate the seasonal variations in pavement structural strength. The measurement of the factors affecting this strength, namely frost depth, rainfall, water table, and temperature, involve the installation of the appropriate monitoring instruments. The Manitoba sites involved are PTH 75 at Glenlea and PTH 1W at Oak Lake which are both scheduled for installation of the monitoring instrumentation in mid-October, 1993.

A meeting to organize the activities has been arranged for Friday, August 27 at 10:00 a.m. in the Boardroom on the 15th Floor, 215 Garry Street, Winnipeg.

Please have one of your staff attend in the event that you cannot.

Please contact me at 945-8982 if you require any further information.

Dennis Watson

DW/bb

LIST:

Fred Young, P. Eng., Materials and Research
Bob Kurylko, P. Eng., Traffic
Dave Reid, Virden - FAX
Russ Farrell, Selkirk - FAX
Lawrence Papuga (for Rene Gervais), Bridges and Structures
Dr. Eugene L. Skok Jr.
Braun Intertec Pavement Inc., St. Paul, Mn. - FAX
R. Van Sambeek
Braun Intertec Pavement Inc., St. Paul, Mn. - FAX

Bob V.

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MANITOBA

MEETING AGENDA

August 27, 1993 from 10:00 AM to 12:00 Noon

Boardroom on the 15th floor

215 Garry Street, Winnipeg, Manitoba

Introduction

Test Sections

Sensor Description and Installation Procedures

(Break)

Installation and Monitoring Schedule

Safety

Manitoba Highways and Transportation Responsibilities

NCRCO and FHWA Staff Responsibilities

Closing Comments

? Modified Resistivity Probe to go 10' (Space 3" ? lower half ?

? Info Sign at SM sites for PR ?

? Replace PCC in trench ? - bond in place ?

- Statement from FHWA for local newspaper

FHWA-LTPP SEASONAL MONITORING PROGRAM IN MANITOBA

Introduction

Signup sheet

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.

- Factors defined in the core experiment monitored by FHWA-LTPP include
  - wet or dry climate – Border – +20 inches of rain - wet?
  - freeze or no freeze climate
  - pavement surface type (AC or PCC)
  - pavement surface thickness
  - Original Construction
- Factors not defined in the core experiment include – limit due to equipment requirements
  - pavement edge drains
  - recycled materials
  - CRCP
  - shallow water table (very shallow)
  - 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 – able to tie into the existing database w/ inventory and traffic data.

Overview of Sensor Installation and Monitoring Activities

- Two days for initial instrumentation installation and monitoring

- About $10,000 of equipment installed at each site – not including labor costs

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

- Relate environmental variations to changes in pavement performance

Monitoring Activities need to

  - 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 two times per year In addition to PASCO photo logging
  - frost heave/swelling soil monitored using elevation data collected five times in first year and two times per year after the first year

Test Sections

Section Location

- 64 sections in the Core Experiment monitored under FHWA-LTPP contract

- 16 sections in the North Central Region
  - two core sections in Manitoba
    - 831801, WB PTH 1, Near Oak Lake (West of Brandon)
    - 833802, NB PTH 75, Near Glenlea (South of Winnipeg)

- no supplemental sections identified in the North Central Region at this time

Allowable Maintenance

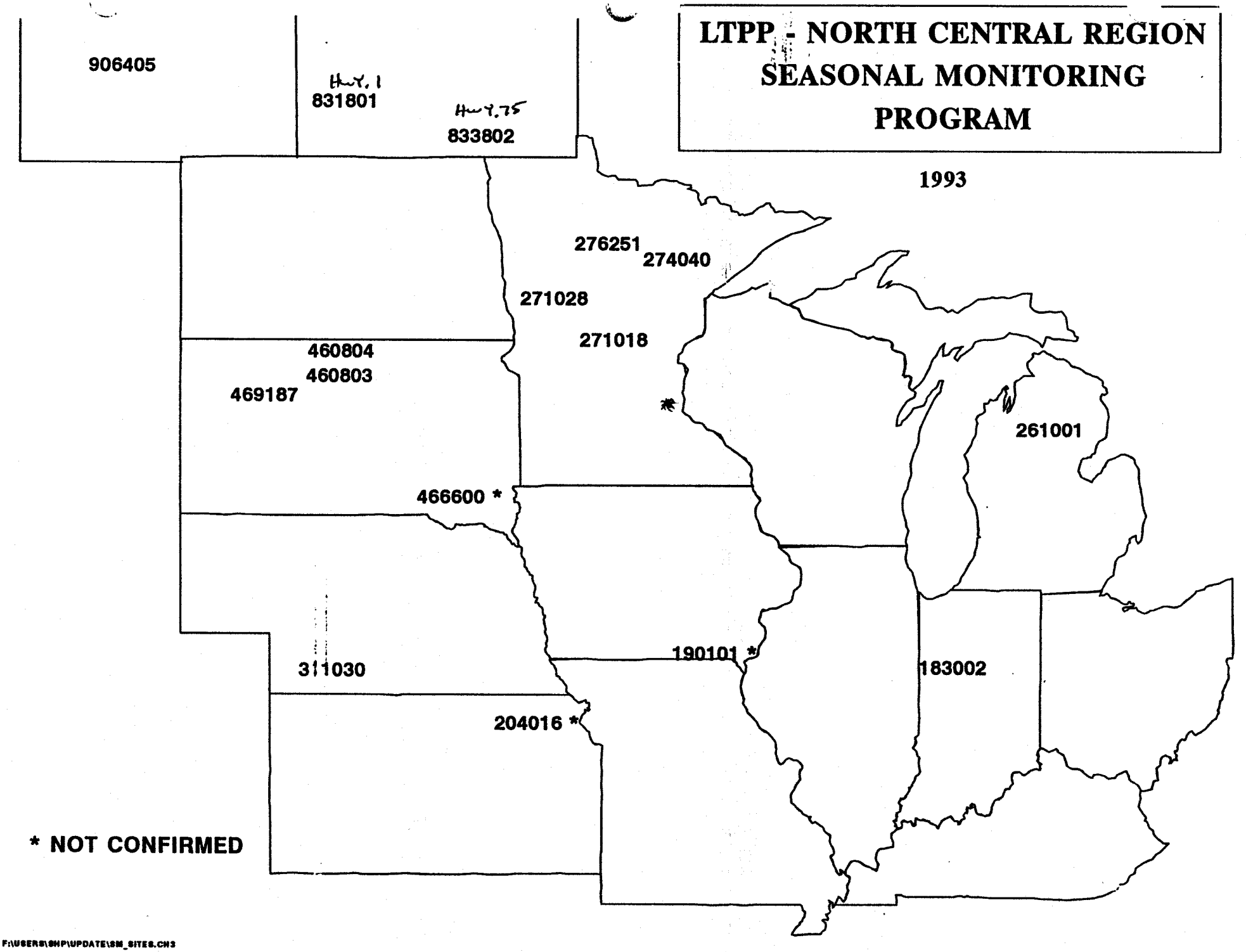
- routine maintenance
  - any scheduled?

- no structural rehab preferred for ten years

- safety is primary concern

833802 — need repairs outside section

LTPP - NORTH CENTRAL REGION SEASONAL MONITORING PROGRAM



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- Pilot in Delta, Colorado
- PCC site in Nephi, Utah
- AC section in Little Falls, MN

Sensor Description and Installation Procedure

TDR (Time Domain Reflectometry) Probes

- FHWA design and manufacture
  - three prong
  - $60.00 each

- measure dielectric of material between probes and relate to moisture content
  - air = 1.0
  - dry soil = 3 to 4 - Sat. Sand ~60? (Little Falls)
  - water = 80

- calibration
  - laboratory in air and water
  - field moisture test on material placed on probes
  - retain soil samples for additional laboratory calibration @ various moisture contents

- 10 probes per installation
  - one mid-depth in the base < 12"
  - 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 exhibit large change resistance with change in temperature

- built in multiplexer on PC board for automated readings

- two part
  - stainless steel section ~13"
    - monitor temperature gradient through the pavement surface
      - one inch deep
      - mid depth in surface
      - one inch ~~from~~ above bottom of pavement
  - plexiglass section
    - monitor temperatures at 15 points along probe - 3" interval near top and 6" intervals into subgrade ↓ 80"

- laboratory calibration at three temperatures
  - ice bath
  - Room temp.
  - warm 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

– plot resistance vs depth profiles

– AC prevent movement of ions in the soil
– avoid polarization

Air Temperature

- Campbell Scientific
  - $150.00

- air probe and radiation shield

- mount on instrument pole ≈ 9' above ditch

Rain Gauge/Tipping Bucket

- Texas Electronics
  - $255.00

- 0.1 mm (0.004 inches) liquid precipitation per tip

- mount on instrument pole

– bird house?
– clean out each visit.
– Target?

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 on TDR probes.

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

- relate time for pulse to travel through probe to dielectric
- then relate ε to moisture content

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
    - filled with water proof grease

BREAK

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 ← 14th Contingency (setup for next site)
  - Oct. 12 & 13 - 831801, WB PTH 1, Near Oak Lake
  - Oct. 14 & 15 - 833802, NB PTH 75, Near Glenlea
  - Oct. 18 & 19 as contingency days for weather or equipment problems

FISHING TRIP 15+16 — HOLIDAY — ?

Long Term Monitoring

- one day every month except during spring every other week.
- every other year for 10 years 20 days worth of monitoring

Safety

Agency Requirements
- clothing → hardhats around drill rig. and steel toe boots
- → vests + orange hat
- Bring to attention any safety Concerns

Manitoba Highways and Transportation Responsibilities

Project Contacts for Maintenance Activities and Traffic Control
- will set up traffic control directly with districts if desired — direct. Contact for traffic control w/ sch. sent to Dennis

Public Relations
- coordinate with FHWA representative on-site regarding any news coverage — will look into!

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

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

Establish Bench Mark for Elevation Reference — anticipate problems w/ combo piezo/B.M.
- not affected by frost
- actual elevation not required — only use as local reference

Equipment
- pavement saw and operator
  - only required for first day during instrument installation
  - saw 16 inch square block out of the pavement surface (~PCC ~250# block)
    - located in the outer wheel path
    - will put block back in-place on AC section — PCC go either way!
  - equipment capable of cutting one inch deeper than estimated pavement thicknesses below
    - 831801 4.4 inches Asphalt (5.5" → 150mm)
    - 833802 9.8 inches Portland Cement Concrete (11" → 275mm)
  - saw four inch wide trench for conduit (100mm)
    - extend from outer wheel path to pavement edge (2½')
- drill rig and operator
  - only required for first day during instrument installation
  - able to drive in ditch or back up to location for instrument pole (27' off Lane)
  - bore one six-inch diameter hole for piezometer (150mm)
    - 14 foot depth (~4 meter)
    - located on shoulder
      - location may depend on cap used for piezometer

- bore one 12 inch diameter hole for instrumentation (300mm)
  - solid stem auger preferred
  - eight foot depth (2.5 meter)
  - located in outer wheel path
  - NCRCO has 12 inch diameter auger with 1-5/8 inch male hex drive (300mm / 40mm)
- bore one 12 inch diameter hole for equipment cabinet (300mm)
  - two feet deep
  - located about 26 feet outside the driving lane in the ditch — may dig by hand
- bore one six-inch diameter hole for the instrumentation pole (150mm)
  - 10 feet deep (3 meter)
  - located adjacent to the equipment cabinet in the ditch

w/ Saw Crew

- small portable generator? — Wet/dry vac.
  - not sure if needed — Looking into inverter for van

Materials

- cover assembly for piezometer — Dennis Lokinto
  - must function for ten years
  - able to open in the winter
  - minimum four inch inside diameter (100mm)
- 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 — Silica Sand
- pea gravel or trap rock for equipment cabinet
  - 500 pounds
  - 3/8 inch size preferred — matl. used for sealcoating / chip seals
- asphalt patch for conduit trench — Patch 4" x 2½' x 4"
  - estimate 500 pounds
- quick set concrete to repair PCC sections — quick set for everything.
  - only for 833802 by Glenlea
  - estimate three to four cubic feet — 4" x 30" x 10"
- water for mixing sackcrete and equipment clean-up
  - estimate 30 gallons

83 5A 93 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I07 Representative Dry Density	Agency Code [83] LTPP Section ID [1801]

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: ROBERT VAN SAMBEEK Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 29/DEC/95 (FOR 12-OCT-93 INSTALL)

BRAUN[SM]
INTERTEC 831801

TIPPING BUCKET RAIN GAGE AND AND AIR TEMPERATURE PROBE

THE HOLE WAS DRILLED WITH SOLID STEM AUGER. 12 INCHES IN DIAMETER.

IT WAS ADVANCED TO A DEPTH OF 9.2 FEET BELOW EXISTING GROUND SURFACE.

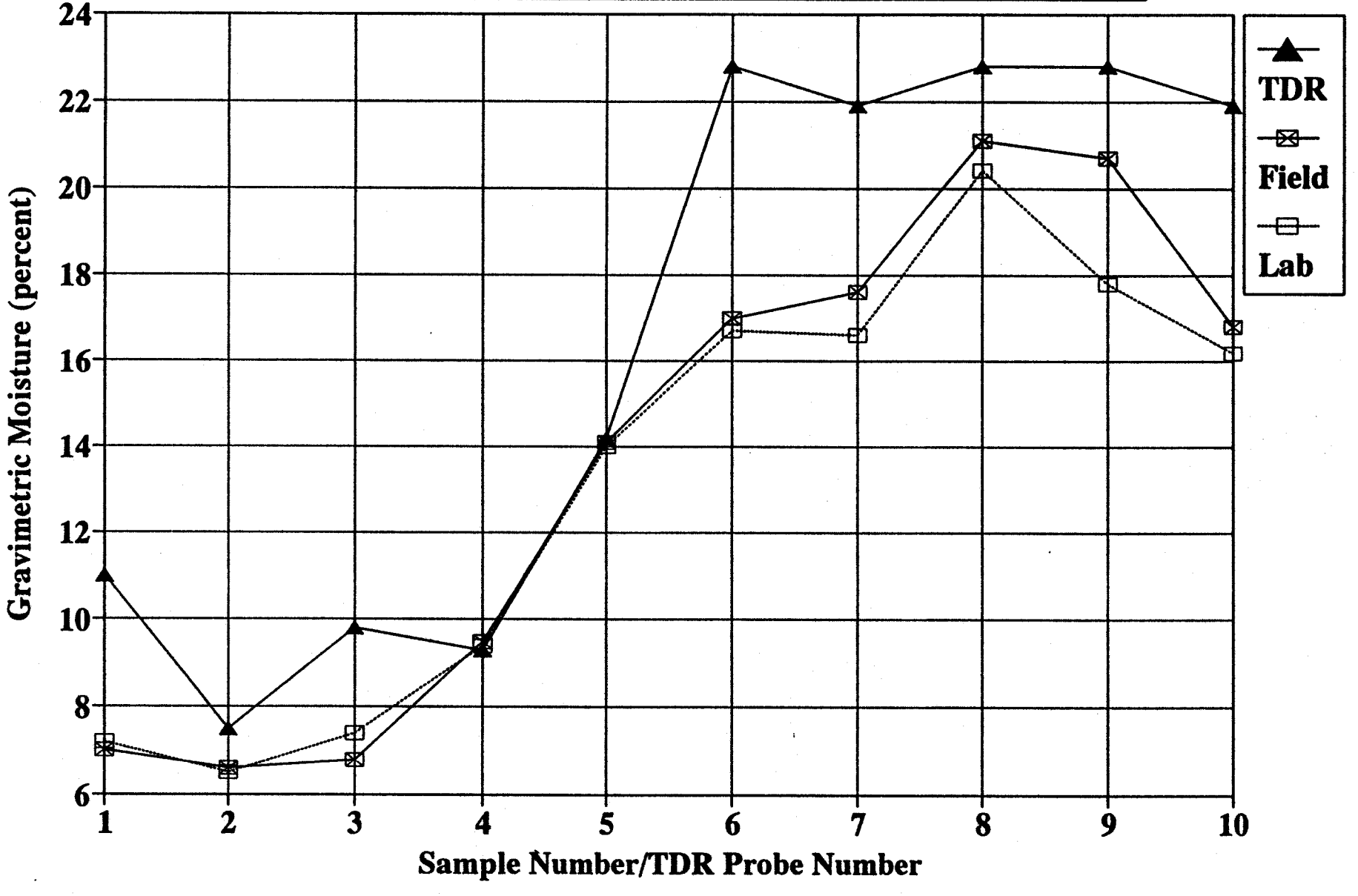
IT WAS PLACED ABOUT 4 INCHES TO 6 INCHES BEHIND THE EQUIPMENT CABINET.

THE BOTTOM SECTION OF 2" PIPE WITH THE FLOOR FLANGE WAS 10 FEET 4 INCHES LONG TIP TO TIP.

4 BAGS OF SAKRETE -

THE SAKRETE AND SOIL WAS COMPACTED WHEN IT WAS PLACED

GPS SECTION 831801 - Oak Lake, Manitoba



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 831801

SIGNATURE OF OWNER OR AGENT *(Print or Type and Sign)*: 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: R Lentz	SIGNATURE OF CUSTOMS OFFICER: R Lentz

CERTIFICATE ON RETURN

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

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

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

PAPERWORK 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 for 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 articles 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 Instrumentation Site 831801 Oaklake, Manitoba

<u>Salvageable Equipment</u>

Telephone cabinet manufactured by Reliance

CR 10 data logger manufactured by Campbell Scientific, Inc. (SN. 16524)

PS12 power supply manufactured by Campbell Scientific, Inc. (SN. 5655)

Electronic rain gauge manufactured by Texas Electronics, Inc (SN. 12052-693)

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

<u>Materials installed in the ground (non recoverable)</u>

Resistivity probe (SN. 83AR)

MRC thermistor probe (SN. 83AT)

Ten time-domain reflectometry (TDR) probes (SN. 83A01 to 83A10)

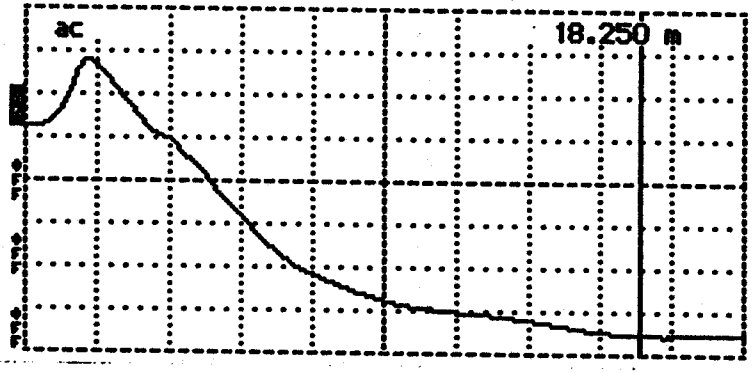
Eight foot copper grounding rod

14 foot galvanized pipe with eight foot grease sleeve

32 foot flexible conduit

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

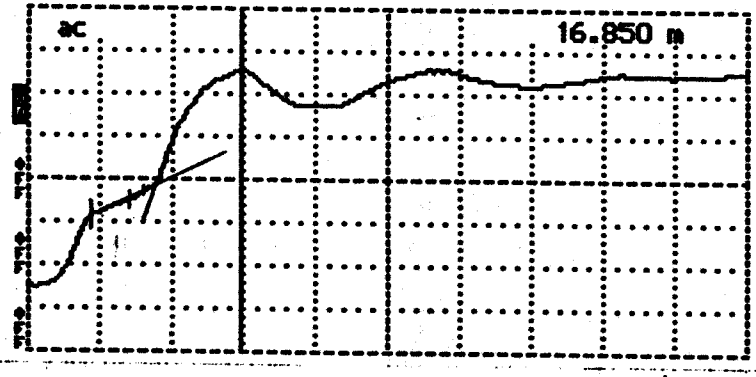
Cursor ..... 18.250 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 83/801 - 83A08
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.850 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

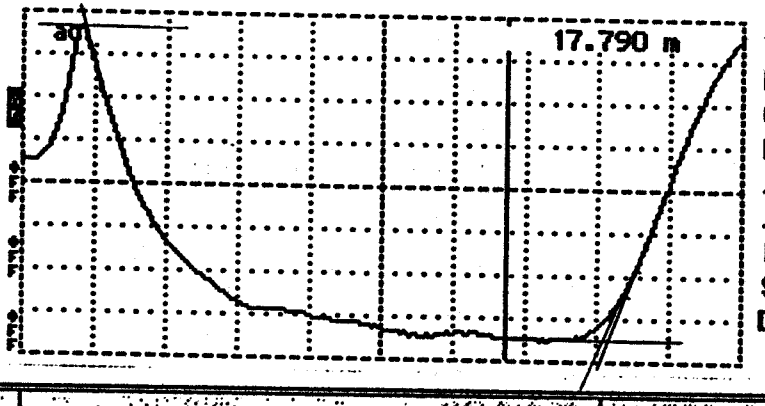


Tektronix 1502B TDR
Date 10-7-93
Cable 83/801 - 83A08
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.23	1.31

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.790 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 831801- 83A08
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: 83A08 TDR Probe Length, L: .(1). m Length of Coax Cable: (1). m

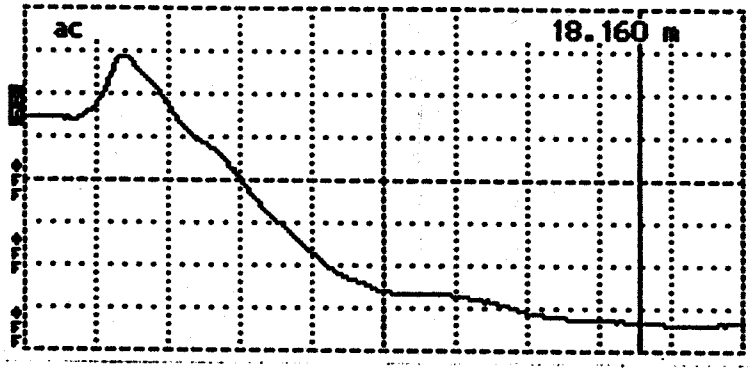
Comments: (1) Not measured in 1993, used 0.203 m for "L"

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 [83] LTPP Section ID [1801]

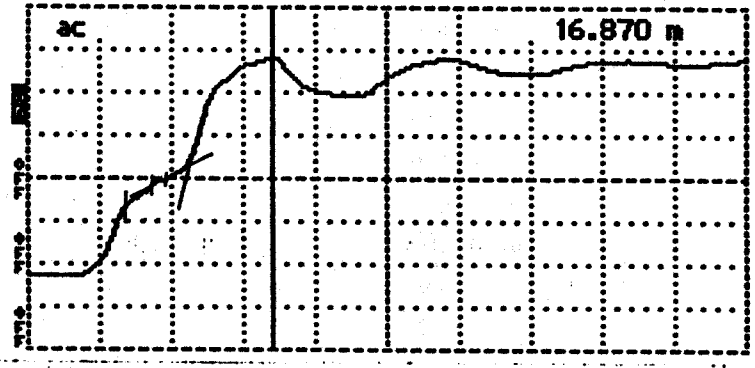
Cursor ..... 18.160 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A09
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.870 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

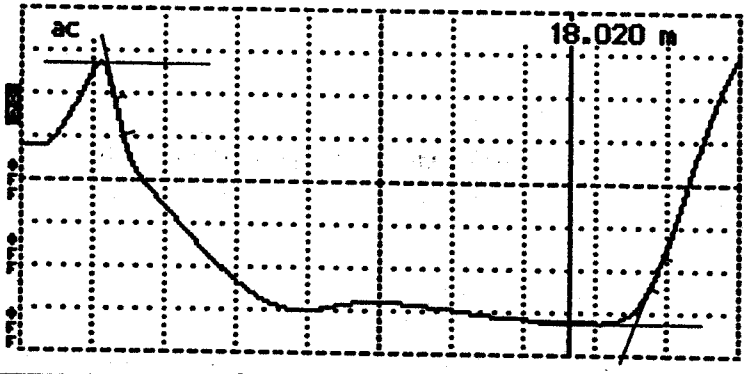


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A09
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.21	1.09

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 18.020 m
Distance/Div..... .25 m/div
Vertical Scale.... 77.0 mP/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 83[801-83A09
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.84	83.82

[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: 83A09 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

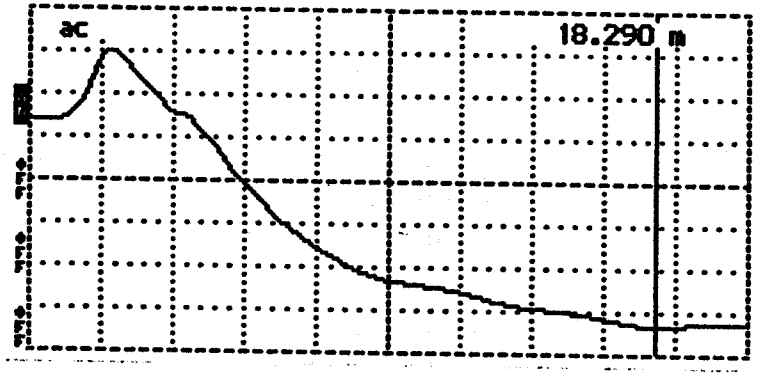
Comments: (1) Not measured in 1993, used 0.203 M for "L".

Prepared by: JAH Employer: Braun Intertec Corporation

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

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

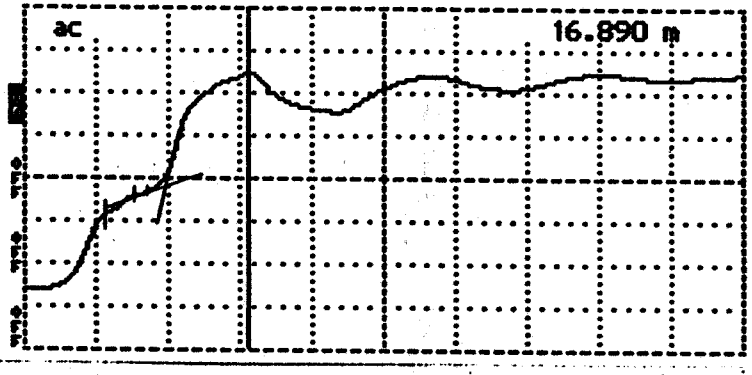
Cursor ..... 18.290 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-~~83~~83A10
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"Shorted at Start"	NA	NA

Cursor ..... 16.890 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

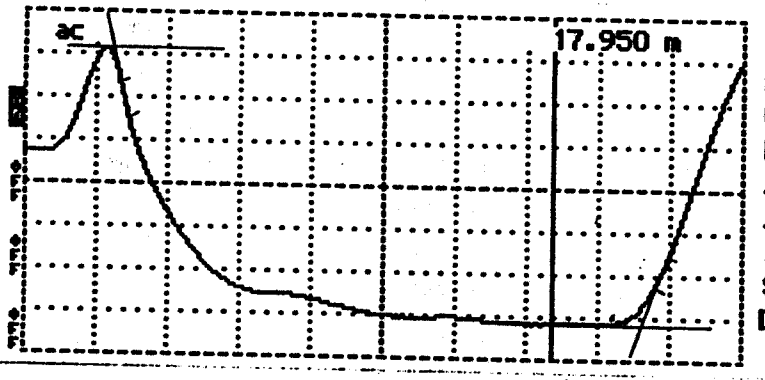


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-~~83~~83A10
Notes AIR
Input Trace
Stored Trace
Difference Trace

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 [83] LTPP Section ID [1801]

Cursor ..... 17.950 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 831801 ~~83A10~~
Notes H2O

Input Trace _____
Stored Trace _____
Difference Trace _____

TDR Trace[1]	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.84	83.82

[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: 83A10 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

Entered: RJV

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [83] LTPP Section ID [1801]

Thermistor Probe Assigned Serial Number : [83A T]

Air Temperature Probe Assigned Serial Number: [83A A T]

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	0.3	39.6	IN SS
2	0.152	0.1	39.6	PART OF
3	0.305	0.1	39.9	PROBE
4	.027	2.3	41.5	
5	.104	0.4	42.3	
6	.177	0.6	42.1	
7	.254	0.7	42.1	
8	.331	2.4	42.1	
9	.484	1.1	41.9	
10	.637	1.0	41.1	
11	.788	0.8	41.2	
12	.941	1.4	41.0	
13	1.095	1.2	41.4	
14	1.245	2.5	40.9	
15	1.395	1.5	41.1	
16	1.550	1.5	41.0	
17	1.704	2.2	41.6	
18	1.850	1.4	40.9	
End	(1)	n/a	n/a	
Air Probe	n/a	(1)	(1)	

Comments: (1) NOT RECORDED IN 1993

Prepared by: RJV/JAH from 1993 Data Employer: Braun Intertec Corporation

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

Entered 9/10

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [83] LTPP Section ID [1801]

Electrical Resistivity Serial Number: 83A R

DB37 Connector Pin Number	Electrode Number	Distance from Top (m) Line 1	Distance from Top (m) Line 2	Distance from Top (m)	Continuity ✓	Spacing (m)	Comments
36	1			0.030			* DATA TAKEN FROM
35	2			0.078		0.049	FORM USED IN
34	3			0.128		.051	1993 WHICH
33	4			0.178		.050	HAD 'SPACING'
32	5			0.228		.052	VERSUS DISTANCE
31	6			0.275		.051	FROM TOP OF
30	7			0.330		.051	PROBE.
29	8			0.381		.053	
28	9			0.433		.051	
27	10			0.483		.051	
26	11			0.534		.053	
25	12			0.585		.051	
24	13			0.635		.050	
23	14			0.686		.053	
22	15			0.736		.051	
21	16			0.788		.051	
20	17			0.838		.052	
19	18			0.889		.051	
18	19			0.938		.052	
17	20			0.991		.051	
16	21			1.040		.051	
15	22			1.091		.051	
14	23			1.143		.051	
13	24			1.193		.051	
12	25			1.243		.051	
11	26			1.293		.051	
10	27			1.346		.051	
9	28			1.390		.051	
8	29			1.446		.052	
7	30			1.496		.050	
6	31			1.546		.052	
5	32			1.596		.052	
4	33			1.644		.049	
3	34			1.700		.053	
2	35			1.749		.051	
1	36			1.801		.052	
	Bottom			1.929	n/a	n/a	

Comments: DATA FROM 1993 INFORMATION

Prepared by: RJV/JAH Employer: Braun Intertec Corporation

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

Pavement Repairs

- patch conduit trench on AC shoulders with asphalt patch 2½" Both sections Agg. shoulder

- assist with block replacement on AC section

- assist with rapid set concrete patch for instrumentation hole and conduit trench on PCC pavement

Miscellaneous Activities

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

→ for area w/ instr. cabinet only

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

- traffic control setup + leave - will have two people on site at least ½ of the visit w/ telephone

Closing Comments

- Any questions or concerns, please call.

Snow Mobile Concerns

stripe pole?

yellow & black

Delineator or 2" pole?

BRAUNSM
INTERTEC

Description: MANITOBA SEASONAL PLANNING MEETING

Project No: DBNX92700 R5

Date: 8/27/93 By: RY

NAME	DIST / DIV.	PHONE NUMBER
BERT VAN SAMBEEK	BRAUN INTERTEC / SHRP	612-776-7522
ENNIS WATSON	MATERIALS	204 945-8982
ANT GARDINER	VIROGIN MANITOBA/WRS	745-1895
TONY NG	MAT'LS & RESEARCH	204 945-8982
TAN HILDERMAN	MAT'LS	204 945-8982
DON FINDLAY	Highways Region 2. Supt.	204 745-2086
DAVE REID	Highways Region 3	204 748-2414
ARALD LARSEN	HIGHWAYS TRAFFIC ENGINEERING	204 945-3781
Jay Van Camwenberghe	Materials & Research	204 945-8982
Russ Jarrell	Region / Maintenance Manager.	204 785-5248

Manitoba

Memorandum

Date . September 22, 1993

To . LIST

From . Dennis Watson
. Pavement Research Engineer
. Materials & Research
. 12th Floor - 215 Garry Street

Telephone . 945-8982

Subject . **Installation of Seasonal Monitoring Instruments**

This memo is intended to serve as a follow-up to our meeting of August 27 at which a number of responsibilities were assigned.

The schedule remains unchanged with October 12 & 13 at Oak Lake and October 14 & 15 for Glenlea scheduled for installation and verifications. Traffic control personnel will be required for all four days with the installation personnel required on October 12 and 14 only.

A helix-type monument has been selected for use as an elevation benchmark and will be installed by Gerald Chartier's drill truck. The Regions responsible will be requested to establish an accurate elevation from a geodetic benchmark.

Don Findlay (Region 2 Superintendent) will provide a pavement saw, operator and an electric generator for use on both of the sites.

Bill Halwachs (Region 2 Superintendent) will make Gerald Chartier's drill truck available for both sites. Mr. Chartier will arrange for an adaptor for connecting the helix monument to the drill shaft for installation of the elevation benchmark. Mr. Chartier's truck is capable of drilling all of the holes required on both sites as well as installing the helix monuments.

Roger Sutyla (Region Superintendent) and Richard Murphy (Region 3 Superintendent) have been asked to provide 200 kg of filter sand, 250 kg of pea gravel, 1 pail of cold mix asphalt, and 100 litres of water per site. These Superintendents are also requested to ensure that the grass be mowed 50 m on each end of the test sites and halfway down the slope to facilitate easier installation of the instruments. Reflective hazard markers are also required for installation on the instrument pole.

The utility companies, namely Manitoba Telephone System and Centra Gas, have been contacted and have assured me that the drilling will not interfere with their facilities.

I will bring the 12 bags of sackcrete, quick set concrete, piezometer cover, and bentonite pellets to the sites.

If there are any questions on these matters, please feel free to contact me at anytime.

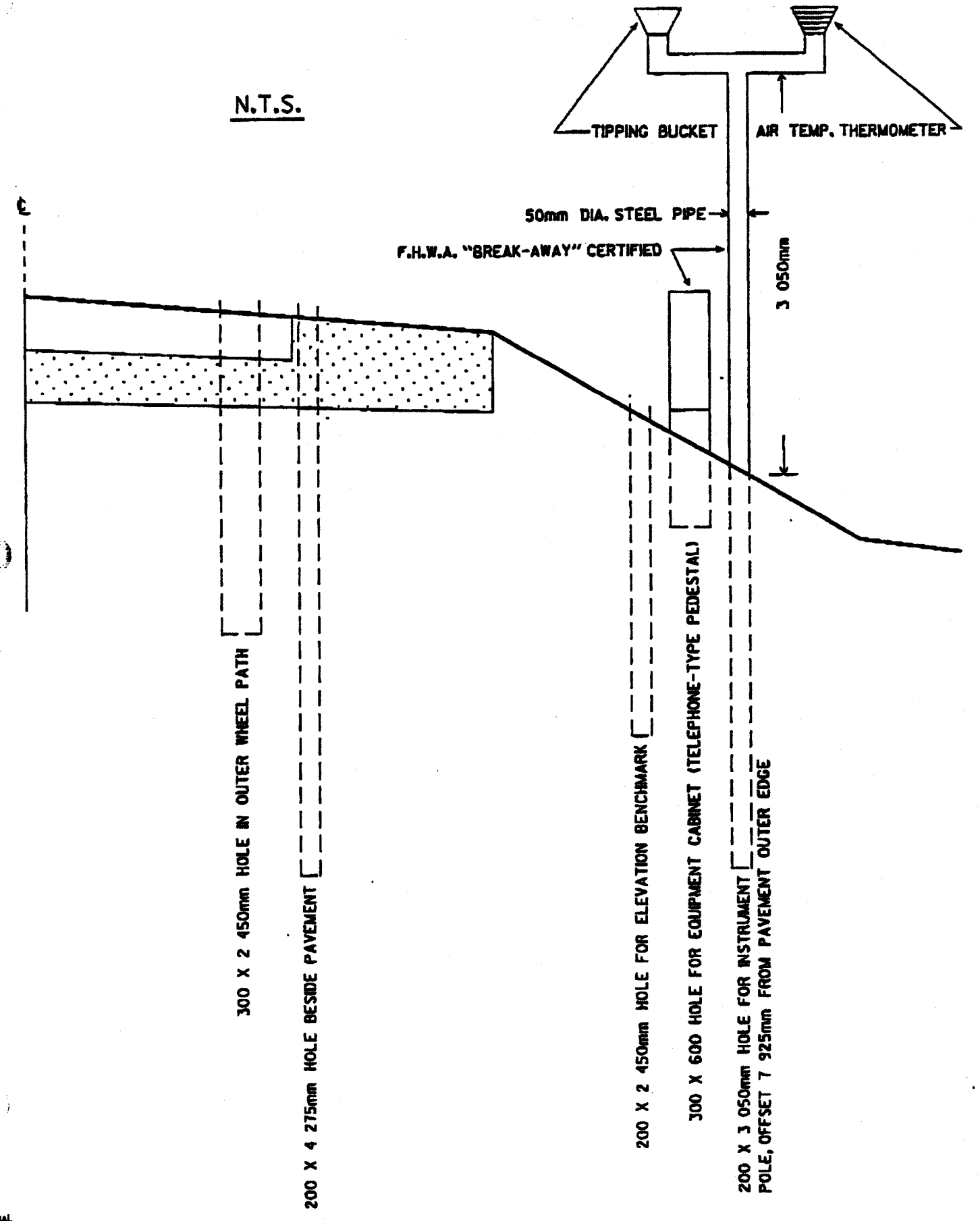
Dennis Watson
Attached - Site Layout
DW/bb

Distribution List:
Bob Van Sambeek, Project Engineer, Braun Intertec, St. Paul, Mn.(FAX)
Russ Farrell, Maintenance Manager, Selkirk Highways Office
Richard Murphy, Maintenance Superintendent, Virden Highways Office
Roger Sutyla, Maintenance Superintendent, Steinbach Highways Office
Don Findlay, Maintenance Superintendent, Carman Highways Office
Gerald Chartier, Drill Truck Operator, Wilkes Yard

.H.W.A. - L.T.P.P. SEASONAL PROGRAM IN MANITOBA

SITE LAYOUT

N.T.S.



Manitoba

Highways and Transportation
Materials and Research

MATERIALS & RESEARCH BRANCH
12th Floor - 215 Garry Street
Winnipeg, Manitoba R3C 3Z1
Telephone: (204) 945-8982 Facsimile: (204) 945-2229

FACSIMILE TRANSMISSION SHEET

Please call 945-8982 if there is any problem with this transmittal.

DATE:	Nov 1, 1993	No. OF PAGES (including this one)	1
TO:	Bob Van Sambeek	FROM:	D. Watson
PHONE:	( )	PHONE:	(204) 945-8982
FAX:	(612) 776-7201	FAX:	(204) 945-2229

SUBJECT: Seasonal Sites Traffic Control Booking #'s

MESSAGE:

Glenlea site, Roger Sutyla, (204) 326-4434

Oak Lake, Richard Murray, (204) 748-2227

Bob: Please relay to Gene that Ray wants to plan the seminar for sometime in February. I will call Gene once I get more info.
TW

P.S. I booked traffic control for Oak Lake on Nov 12, 8:00 and Glenlea on Nov 15, at 8:00.
TW

831801

BRAUN INTERTEC

Description: SMP

Project No: DBNX9C700 B5

Date: 6/3/94 By: RV

6/3/94 (CALL FROM DENNIS WATSON)

OAK LAKE – PIEZOMETER ELEV. 426.577 M

GLENLEA – " " 235.422 M

FEB. 3, 1993

OAKLAKE – 426.573 (MOVE 4mm)?

GLENLEA – 235.409 (11/15/93 ELEV. SHEET)

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.

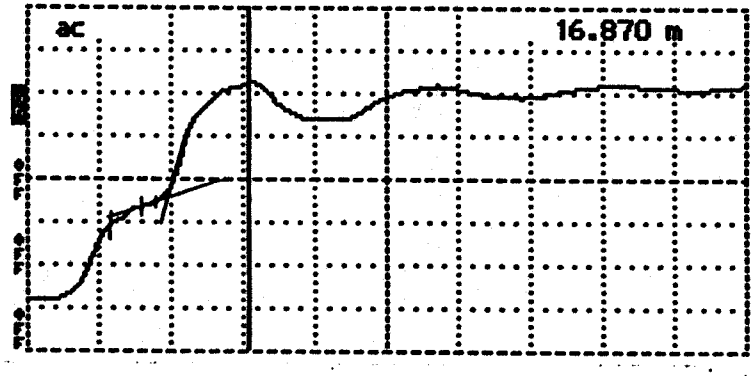
LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 18.300 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 831801-B3A01
Notes SHORTON
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.870 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

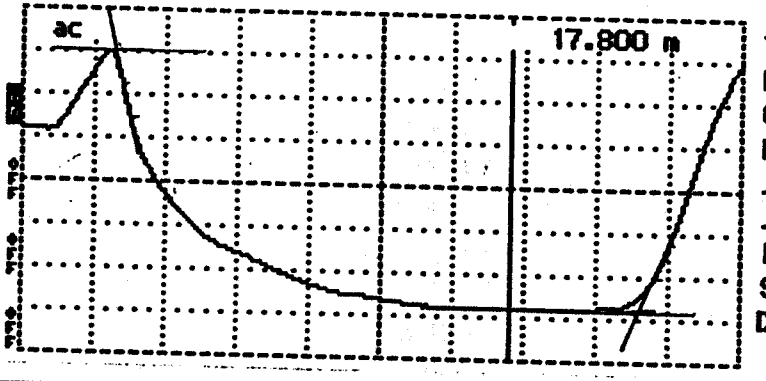


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-B3A01
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.19	0.89

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.800 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 10-7-95
Cable 831801-3 83A01
Notes A2c
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: 83A01 TDR Probe Length, L: .(1)__ m Length of Coax Cable: (1).__ m

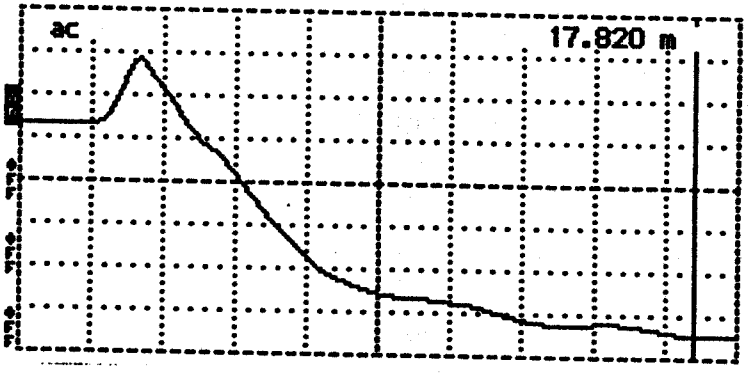
Comments: (1) Not measured in 1993, used 0203m for "L"

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 [83] LTPP Section ID [1801]

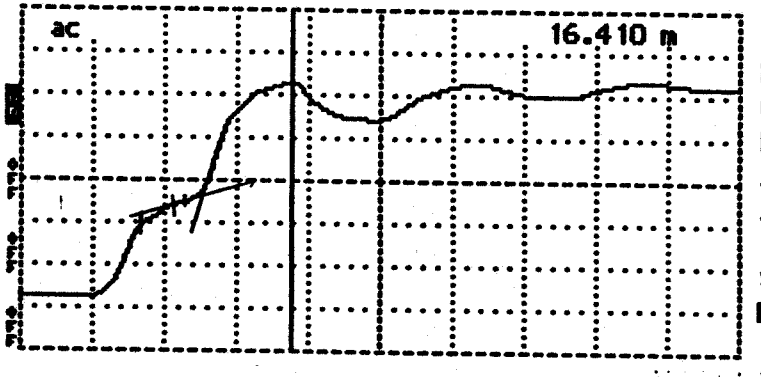
Cursor ..... 17.820 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 83/801 - 83A02
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

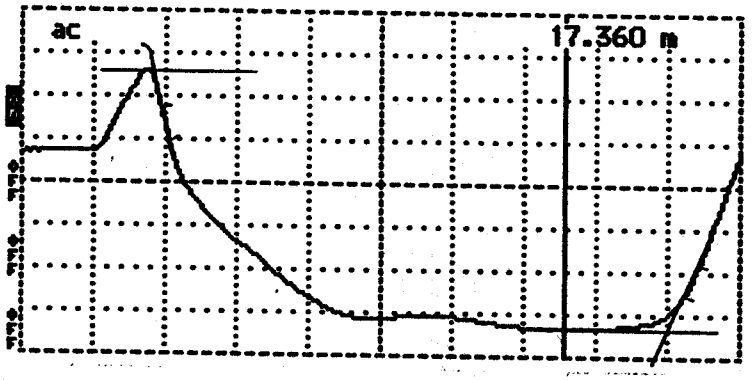


Tektronix 1502B TDR
Date 10-7-93
Cable 83/801 - 83A02
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	0.21	1.09

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.360 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 10-7-95
Cable 93/801 - 83A02
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.79	79.33

[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: 83A02 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

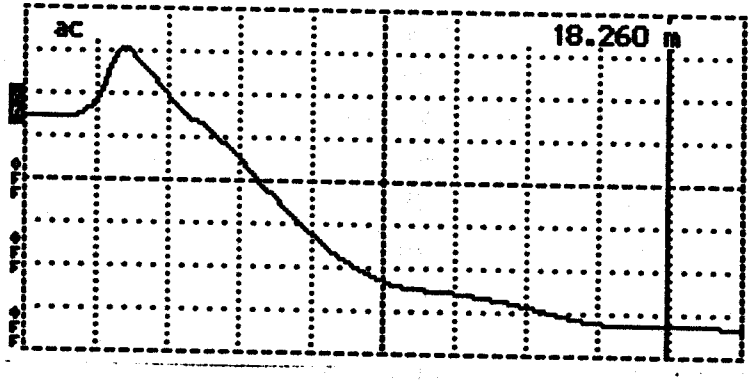
Comments: (1) Not measured in 1993, used 0.203 M for "L"

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 [83] LTPP Section ID [1801]

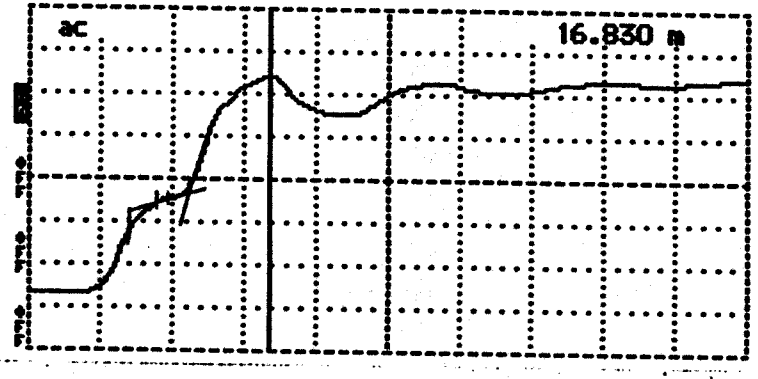
Cursor ..... 18.260 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801 - 83A03
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.830 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

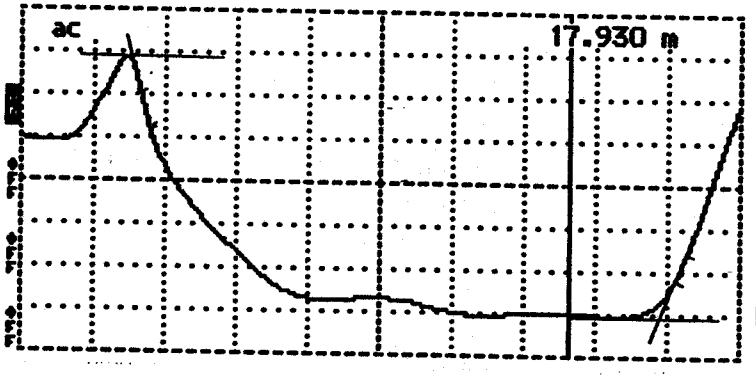


Tektronix 1502B TDR
Date 10-7-93
Cable 831801 - 83A03
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	1.21	1.09

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.930 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 16-7-93
Cable 831801-& 83A03
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: 83A03 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

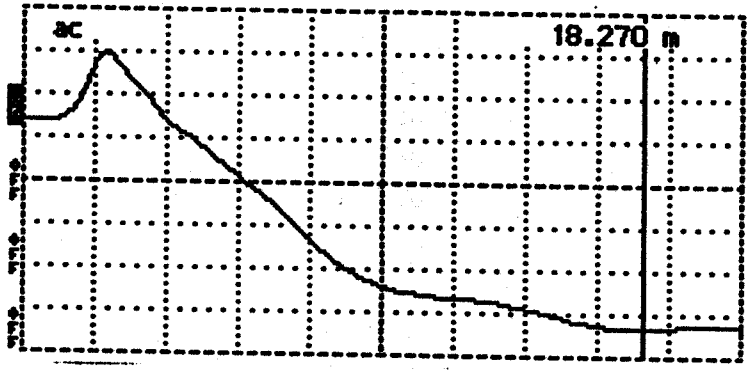
Comments: (1) Not measured in 1993, used 0.203 m for "L"

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 [83] LTPP Section ID [1801]

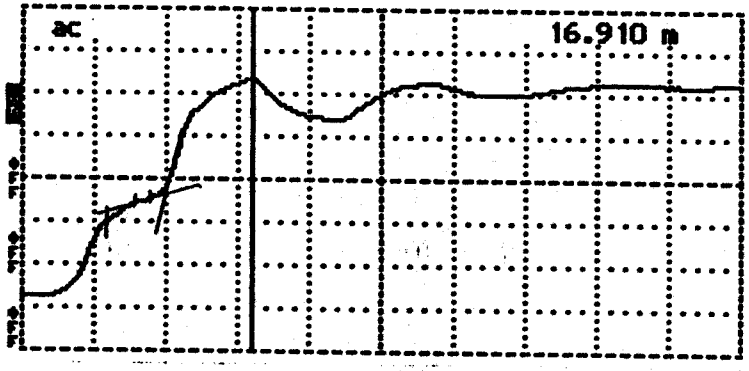
Cursor ..... 18.270 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-893A04
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.910 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

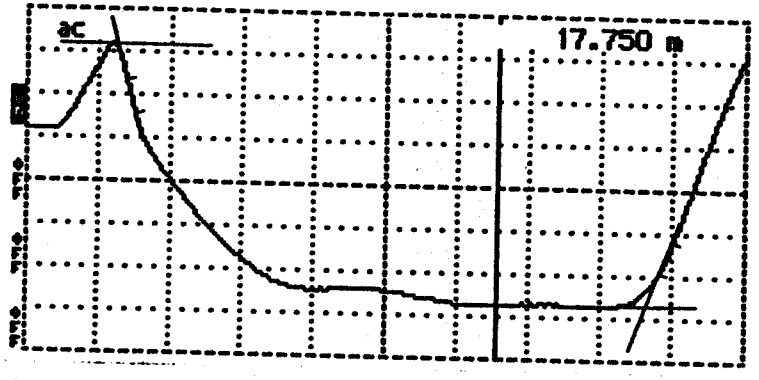


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-893A04
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant
"In Air"	1.25	1.55

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.750 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 83801-83A04
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)[1]	Dielectric Constant[2]
"In Water"	1.84	83.82

[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: 83A04 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

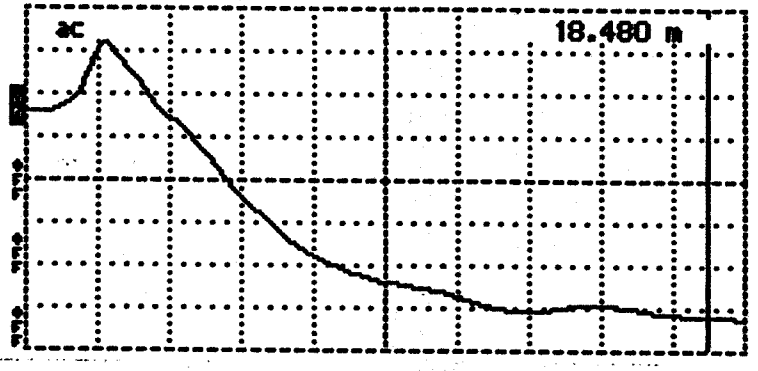
Comments: (1) Not measured in 1993, used 0.203 m for "L"

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 [83] LTPP Section ID [1801]

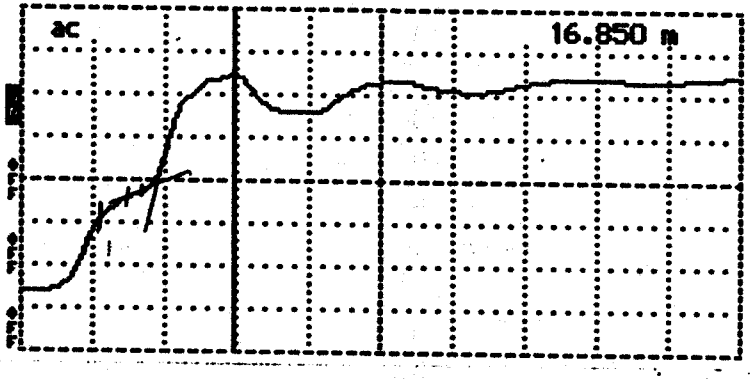
Cursor ..... 18.480 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A05
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.850 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
Vp 0.99
Noise Filter..... 8 avg
Power..... ac

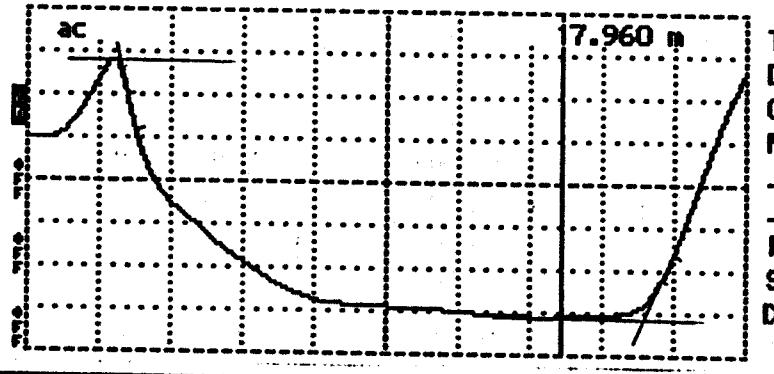


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A05
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	1.20	0.99

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.960 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 83/801 - 83A05
Notes
Hzc
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: 83A05 TDR Probe Length, L: .(1) m Length of Coax Cable: (1). m

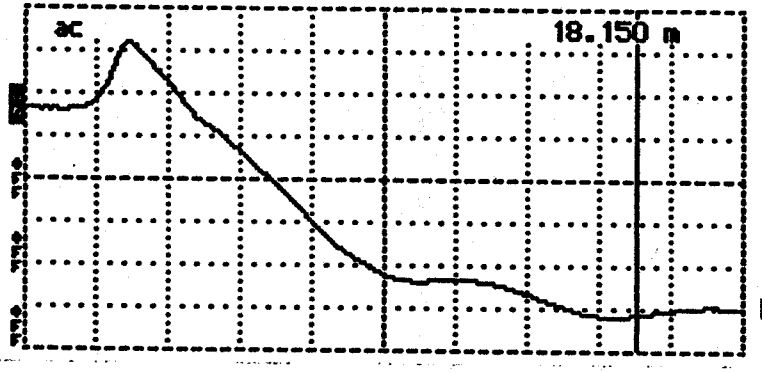
Comments: (1) Not measured in 1993, used 0.203 m for "L"

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 [83] LTPP Section ID [1901]

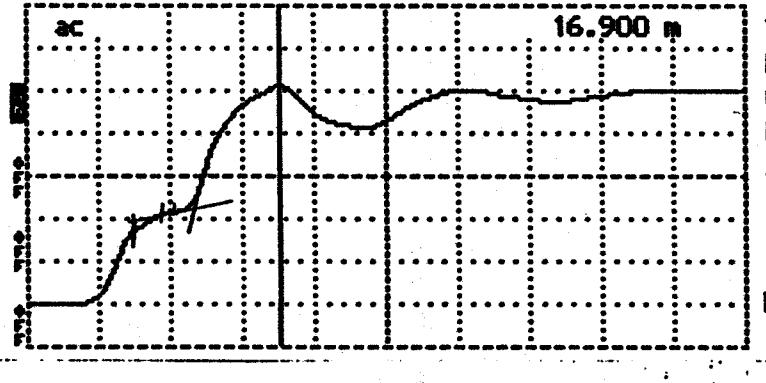
Cursor ..... 18.150 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-B3A06
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.900 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mV/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

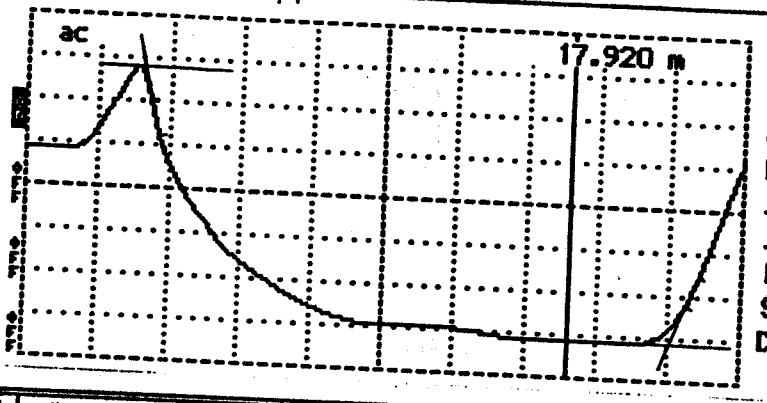


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-B3A06
Notes AIR
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	1.21	1.09

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

Cursor ..... 17.920 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 831801 - B3A06
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace [1] [2]	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.94	93.82

[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: 83A06 TDR Probe Length, L: .(1) m Length of Coax Cable: (1) m

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

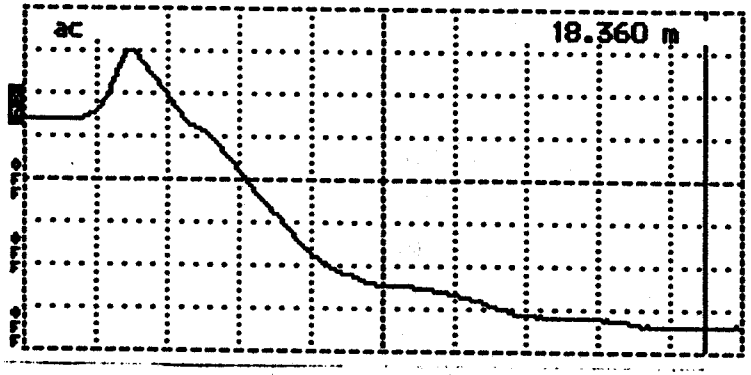
Prepared by: JAH

Employer: Braun Intertec Corporation

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

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [83] LTPP Section ID [1801]

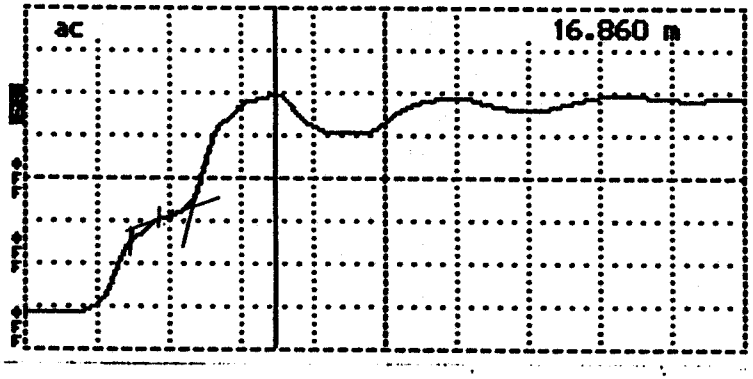
Cursor ..... 18.360 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac



Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A07
Notes SHORTED
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 16.860 m
Distance/Div..... .25 m/div
Vertical Scale.... 177 mρ/div
VP 0.99
Noise Filter..... 8 avg
Power..... ac

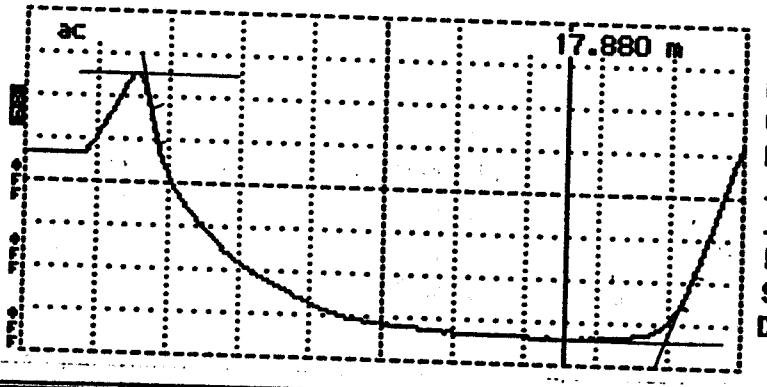


Tektronix 1502B TDR
Date 10-7-93
Cable 831801-83A07
Notes AIR
Input Trace
Stored Trace
Difference Trace

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 [83] LTPP Section ID [1801]

Cursor ..... 17.880 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 831801-83A07
Notes H2O
Input Trace
Stored Trace
Difference Trace

TDR Trace[1]	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.84	83.82

[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).

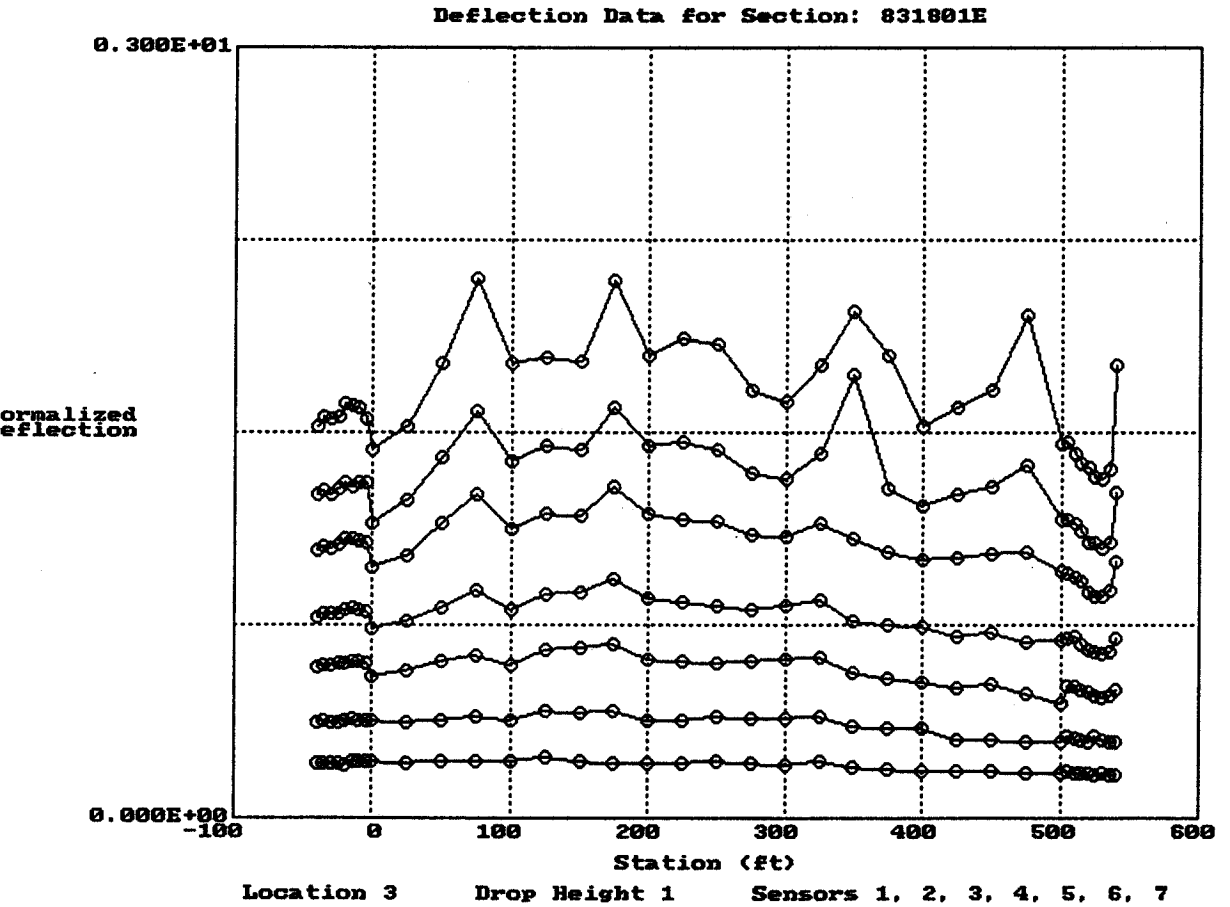
TDR Probe Serial Number: 83A07 TDR Probe Length, L: (1) ____ m Length of Coax Cable: (1) ____ m

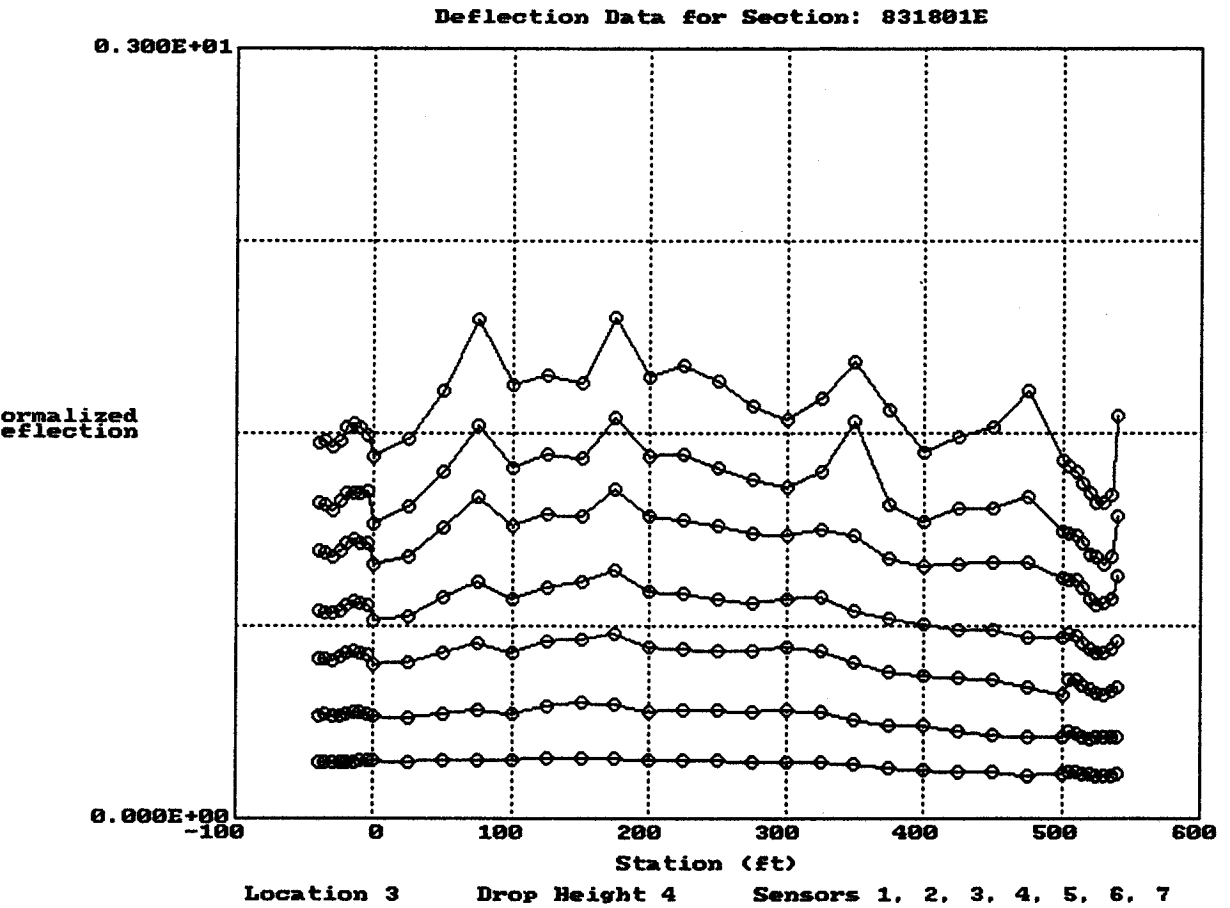
Comments: (1) Not measured in 1993, used 0.203 M for "L".

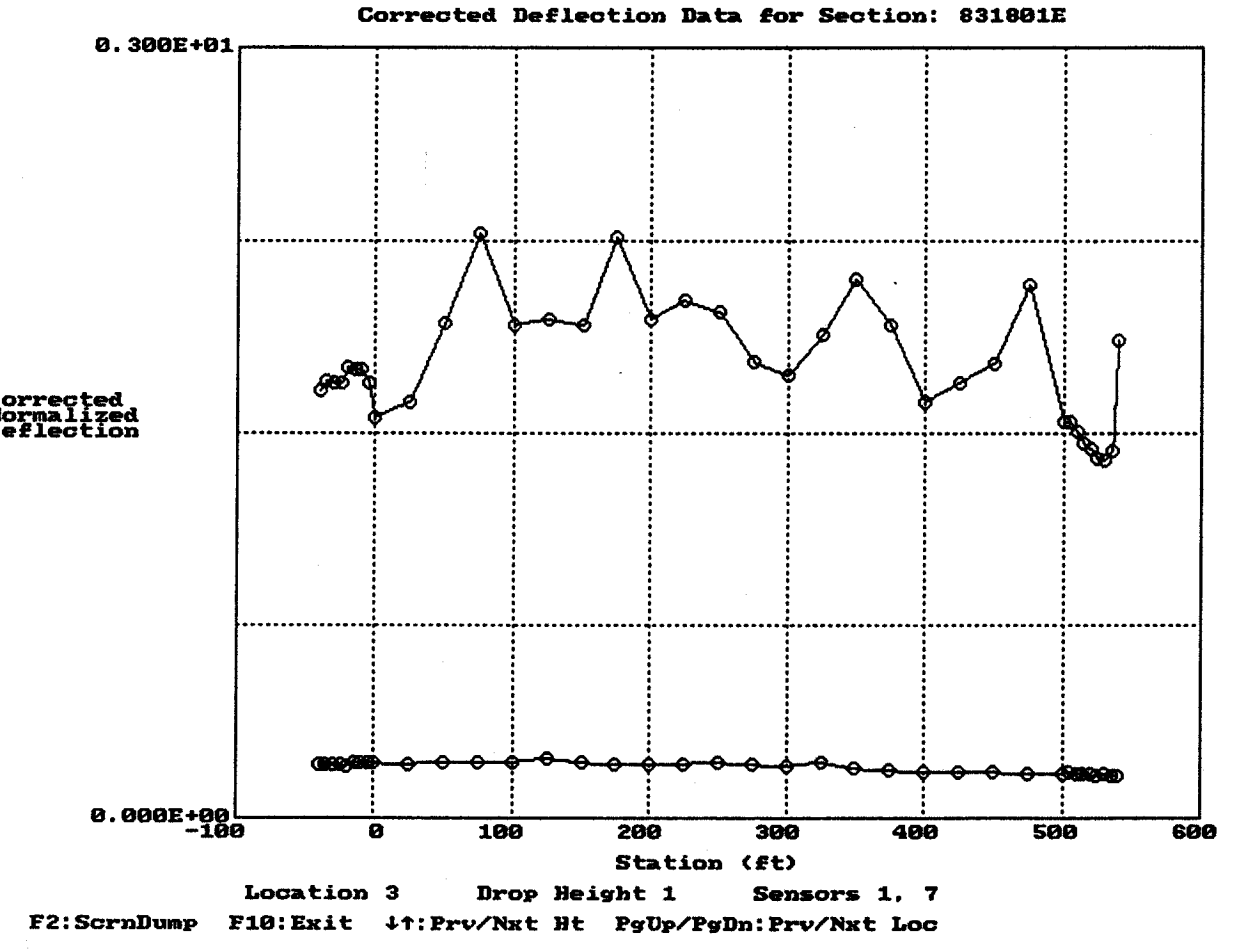
Prepared by: JAH Employer: Braun Intertec Corporation

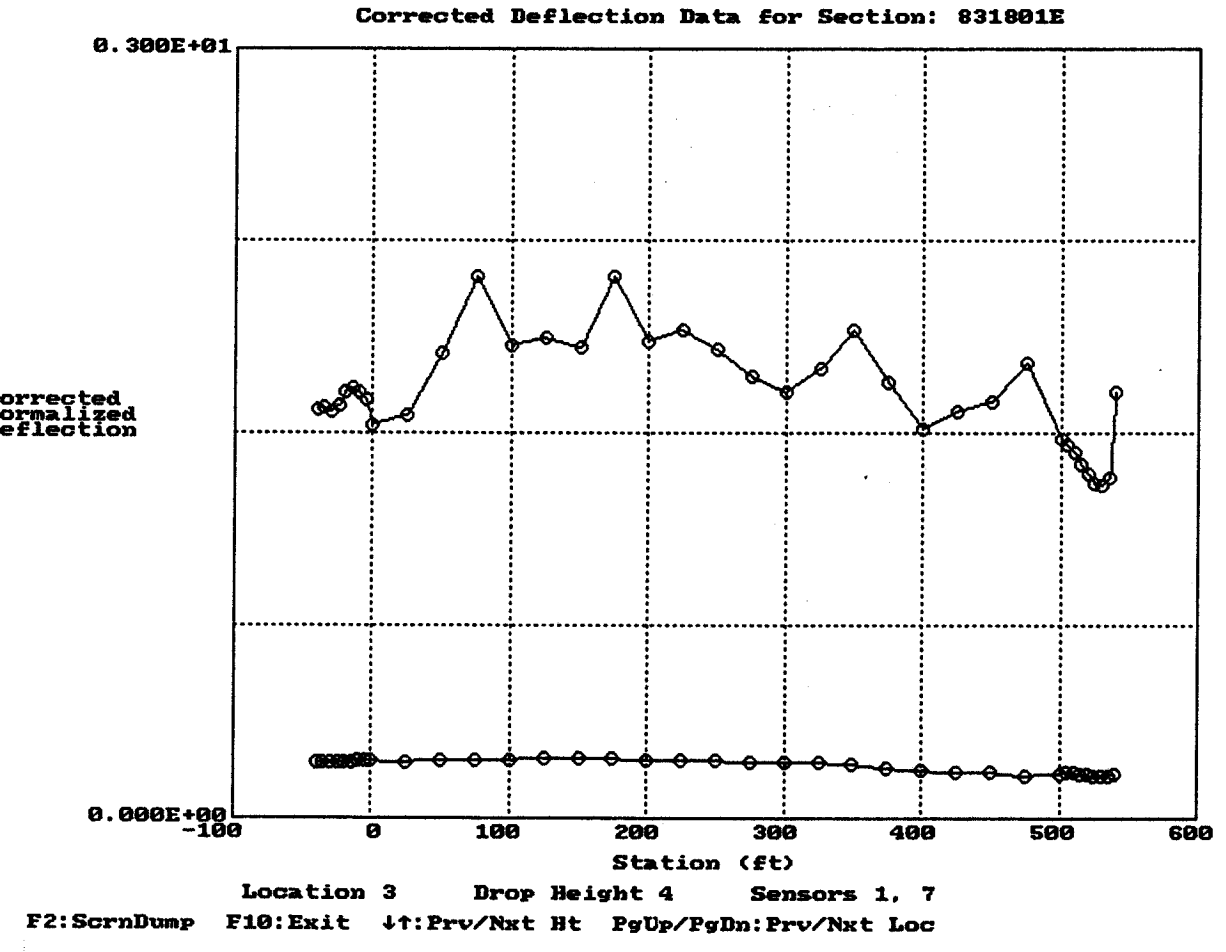
Date (dd/mmm/yy): 16/NOV/95 (installed 1993)

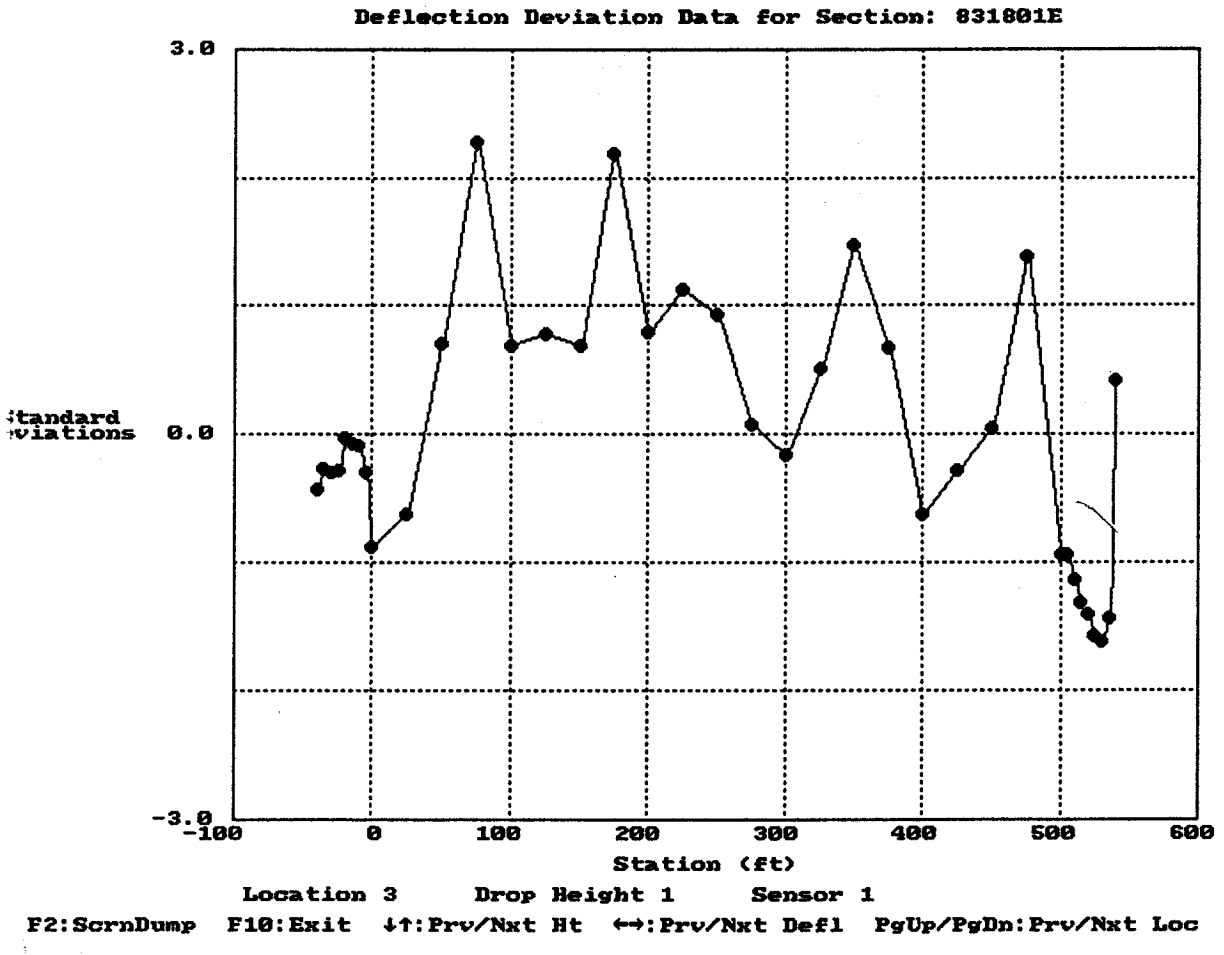
Data Sheet SMP-C01: TDR Probe Check (Continued)

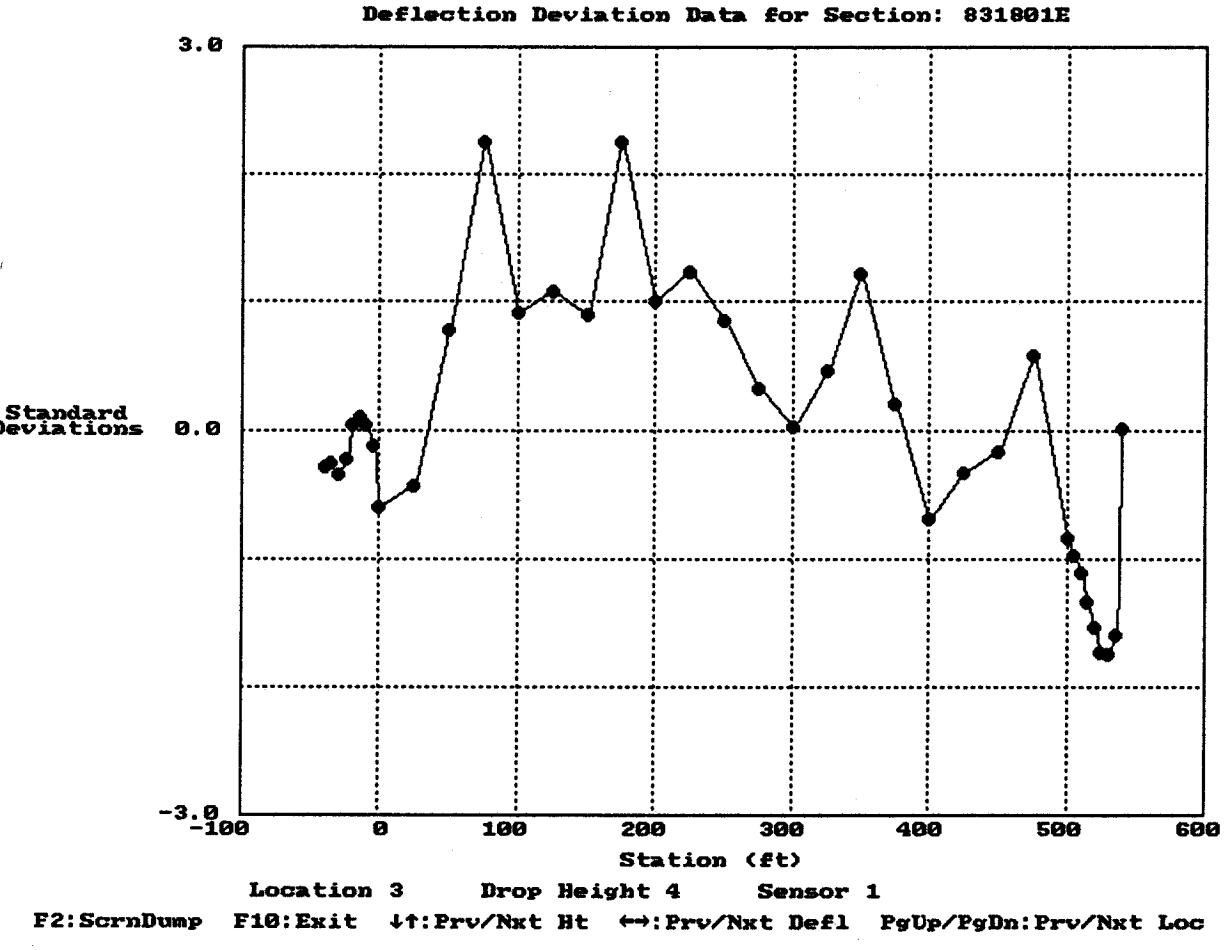

Deflection Data for Section: 831801E
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3
Drop Height 1
Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump
F10:Exit
↓↑:Prv/Nxt Ht
PgUp/PgDn:Prv/Nxt Loc

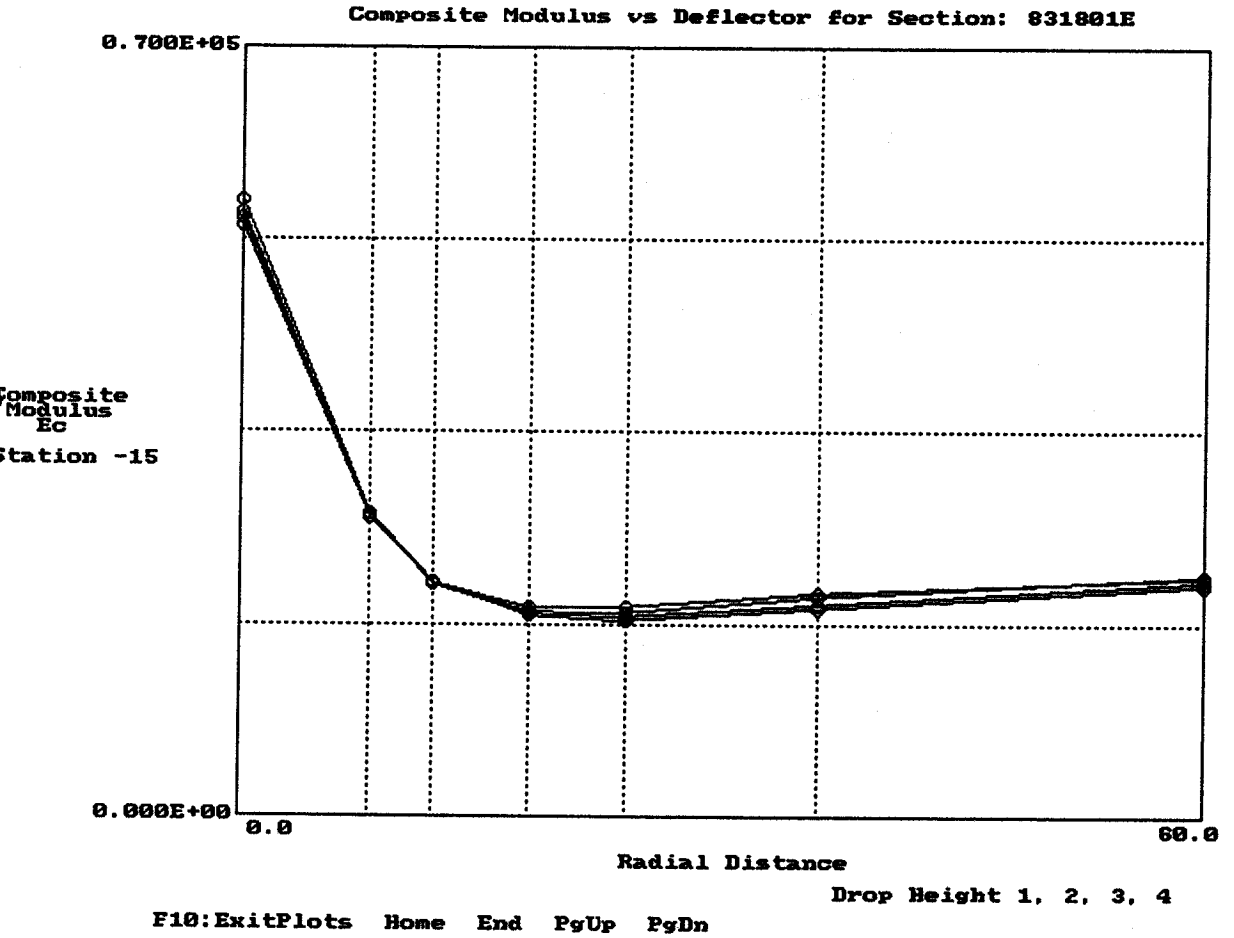

Deflection Data for Section: 831801E
0.300E+01
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Corrected Deflection Data for Section: 831801E
0.300E+01
orrected
ormalized
eflection
0.000E+00
-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

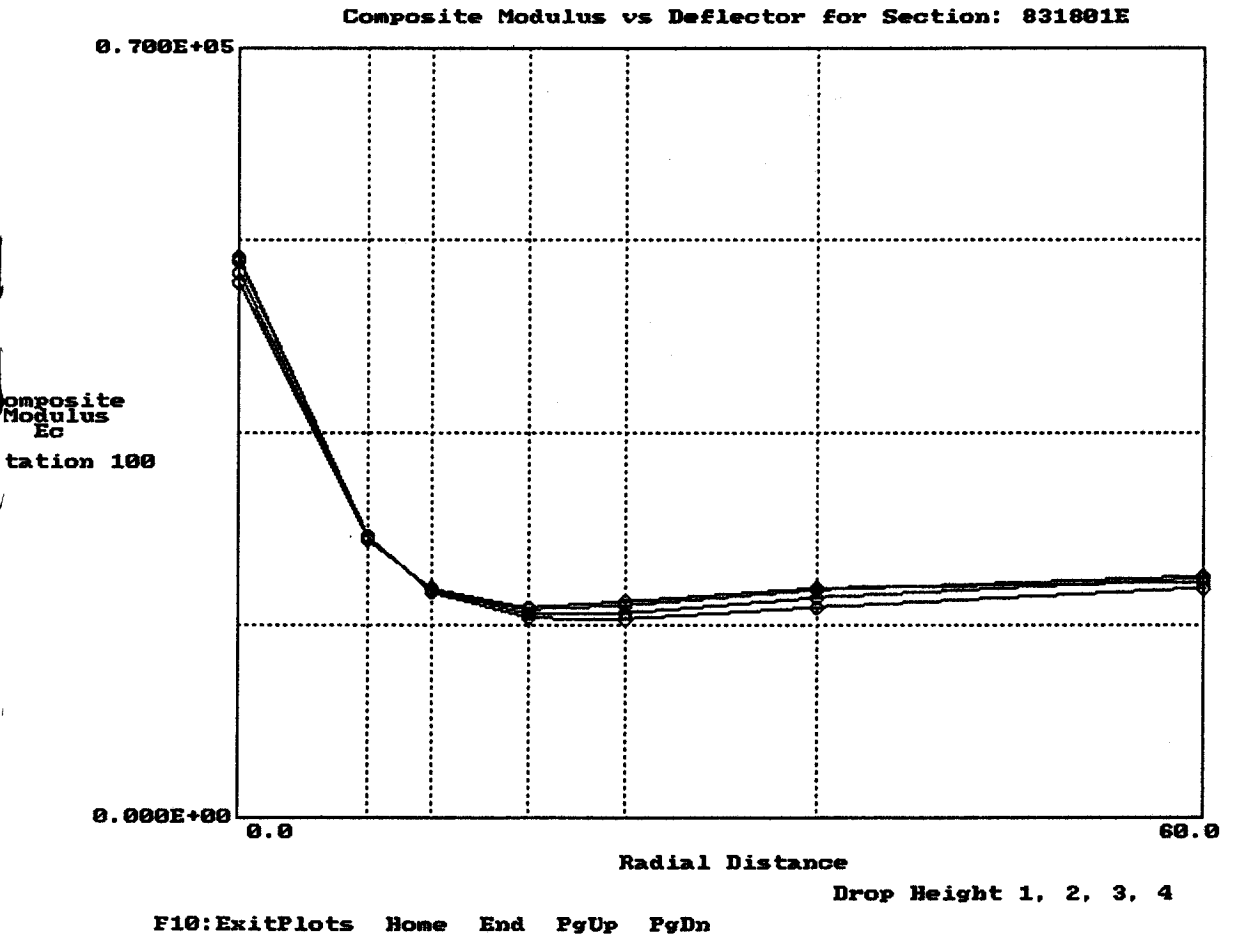

Corrected Deflection Data for Section: 831801E
0.300E+01
orrected
ormalized
eflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
Location 3 Drop Height 4 Sensors 1, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc


Deflection Deviation Data for Section: 831801E
3.0
0.0
-3.0
tandard
viations
-100
0
100
200
300
400
500
600
Station (ft)
Location 3
Drop Height 1
Sensor 1
F2:ScrnDump
F10:Exit
↓↑:Prv/Nxt Ht
↔:Prv/Nxt Defl
PgUp/PgDn:Prv/Nxt Loc


Deflection Deviation Data for Section: 831801E
3.0
Standard Deviations
0.0
-3.0
-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

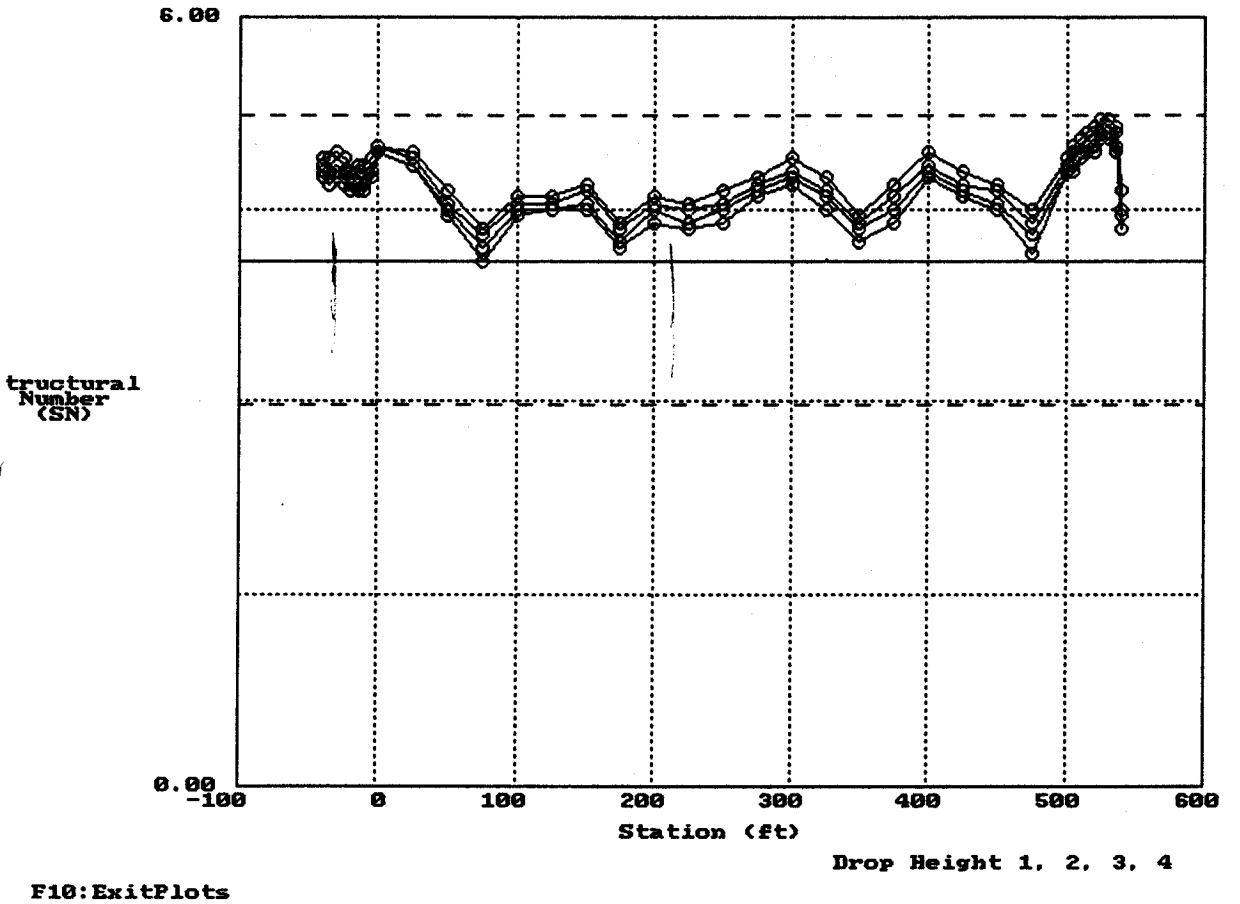


F10:ExitPlots Home End PgUp PgDn

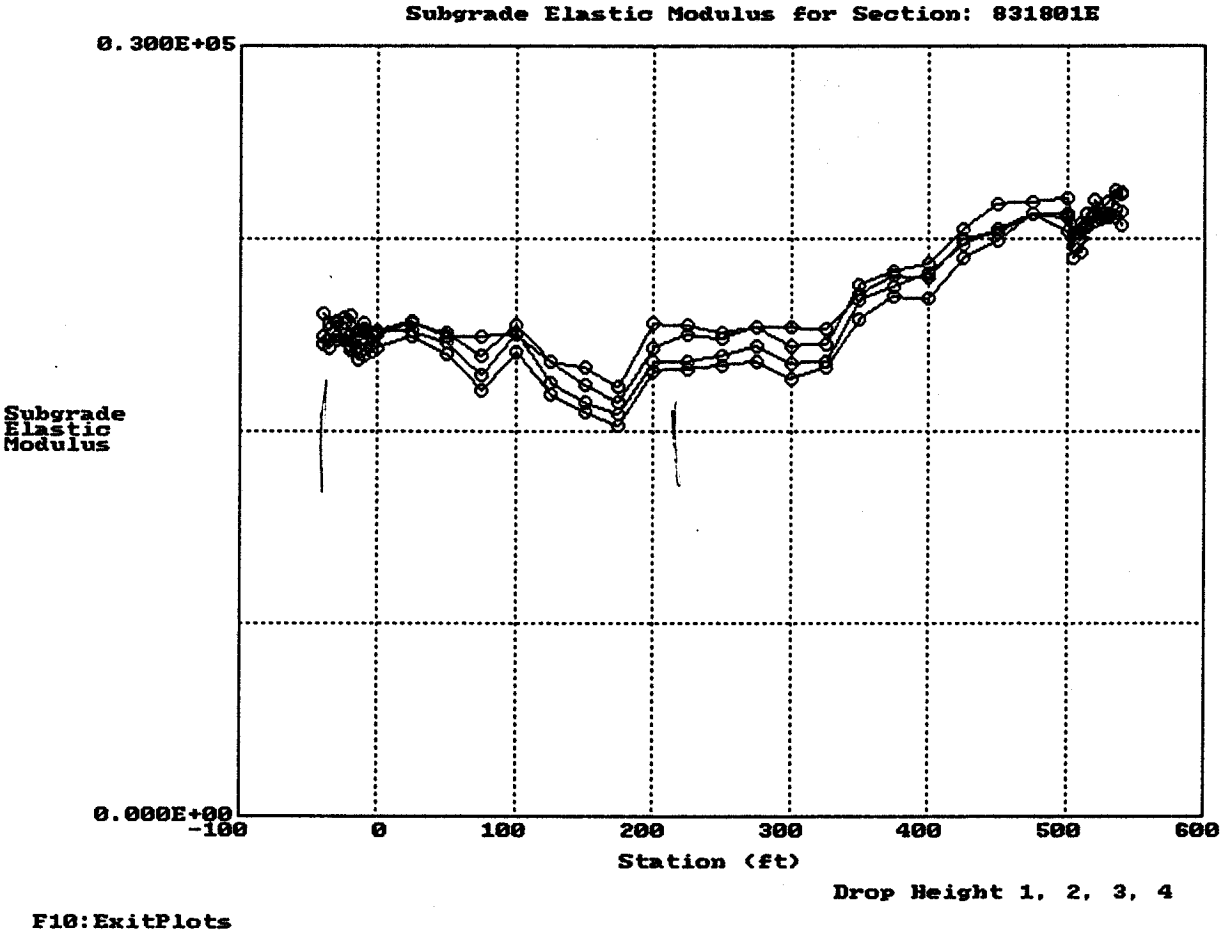


F10:ExitPlots Home End PgUp PgDn

Equivalent Structural Number for Section: 831801E



F10:ExitPlots



F10:ExitPlots

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; and
- Pre-installation meeting agenda, list of participants, and notes.

87180 (

Manitoba

Highways and Transportation

Materials & Research
1181 Portage Avenue (Annex)
Winnipeg, Manitoba
R3G 0T3

November 20, 1990

Erland Lukanen
1404 Concordia Avenue
St. Paul, Minnesota
U.S.A. 55104

Subject: Seasonal Deflection Testing

We are pleased that plans are underway to conduct seasonal testing. Our agency is anxious to participate and therefore are willing to provide the necessary traffic control to conduct 16 days of deflection testing per year on our GPS 1 and GPS 2 sections.

Our frost depth estimate is assumed to be within 1 foot. Will it be necessary to eventually install frost depth measuring instrumentation and, if so, what type of instrumentation?

R. A. Van Cauwenberghe, P. Eng.
Senior Engineer: Pavements,
Geotechnical & Research

RAVC/rp

Attachment

cc: F. D. Young

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	(FT)	
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	7.5	
MB.	836454	Y	11.0	F	N	N	7.5	BIT. STAB. BASE
SK.	906405	N	3.0	C	N	N		

831801

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. F.D. Young
Dir. Matls. & Res.
Manitoba Highways & Transp.
1181 Portage Ave. (Annex)
Winnipeg, Manitoba R3G 0T3
Canada

Fred

Dear ~~Mr. Young~~;

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 Manitoba monitoring is based on the above factors:

831801 on TC-001 westbound, west of Brandon

We hope that Manitoba 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: Ray Van Cauwenberghe, LTPP Contact
E.L. Skok
R.J. Van Sambeek

831801

3-91
Slush
Bypass

Manitoba

Highways and
Transportation
Materials & Research
1181 Portage Avenue (Annex)
Winnipeg, Manitoba
R3G 0T3

July 9, 1991

Richard C. Ingberg
Regional Engineer, S.H.R.P.
1404 Concordia Ave.,
St. Paul, Minnesota, 55104

Dear Dick:

I hope this finds you well and enjoying summer. I look forward to our meeting with you and Gene on July 31st, 1991.

Concerning your letter June 26, 1991, regarding seasonal monitoring of SHRP-GPS Sections, this is to advise that we will be pleased to participate.

Hopefully we will be able to provide sufficient staff for instrumentation installation when the time comes.

Kinds regards,

FDY/rp

Fred D. Young, P. Eng
Director of Materials & Research

cc: R.A.V.C.
J. Hosang

831801

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

COMMENTS FROM FWD FILE FOR TESTING IN THE OWP
350 L-TRANS.CR.BETWEEN D2 AND D3
500 L-TRANS.CR.UNDER D2

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: %1036 total combinations within the section
23 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: 148 total combinations within the section
All results are within the range of expected values.

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

Entered: 990

83 SA 93 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [83] LTPP Section ID [1801]

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	0-20	0-20	-0.76	-0.76
Observation Piezometer	1+00	1+00	-0.30	-0.61
Equipment Cabinet	0-20	0-20	-7.60	-7.47
Weather Station	0-20	0-20	-7.62	-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	
	Metal Bottom	0.089	0.083	
	PVC Top	0.165	0.165	
Resistivity Probe		0.165	0.165	

PIEZ. 0.2420 M below AC Surface @ Sta. 1+00 on 13-OCT-93.

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.184	0.200	All depths ±0.005m as converted from measurement done in inches in 1993.
2	0.337	0.340	
3	0.489	0.495	
4	0.641	0.650	
5	0.794	0.810	
6	0.946	0.960	
7	1.099	1.110	
8	1.251	1.250	
9	1.556	1.555	
10	1.861	1.855	

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: Jason Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/Dec/95 (For 12Oct93 install)

83SA93A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [83] LTPP Section ID [1801]

Operator: PENNER Equipment Used: DERRICK DIGGER

Location: Station: 1+00 Offset: −0.61 m (from lane edge)

Bore Hole Diameter: 203. mm Auger Type: Solid Stem

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
0.5	±0.914	SILTY SAND BROWN (FILL)	214
1.0			
1.5			
2.0		SILTY SAND BROWN	214
2.5			
3.0	±3.353		
3.5			
4.0		SILTY CLAY BROWN	131
4.5	±4.572		
5.0			

[1] Format: ___.___ m; [2] Format: ___

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

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

BRAUN SM
INTERTEC

831801 10-12-93

PIEZOMETER / BENCH MARK.

SEE SOILS LOG FOR SOIL INFORMATION

PLACED IN GRAVEL SHOULDER

USED A DERRIC-DIGGER THE PROVINCE USES THIS EQUIPMENT TO INSTALL SIGN POSTS.

THEY USED A 8" ± AUGER TO DRILL THE HOLE.

TIP TO TIP WAS 14' 3" LONG.

BOTTOM WAS TAMPED BEFORE PIEZOMETER WAS PUT INTO BORE HOLE.

BOTTOM OF HOLE WAS 15' BELOW THE SURFACE OF SHOULDER.

1 100# BAG OF FILTER SAND WAS PLACED IN AROUND SLOTTED PART OF PIPE FROM 9.5 FOOT DEPTH TO 15 FOOT DEPTH.

BENTONITE WAS PLACED FROM THE 8 FOOT DEPTH TO 9.5 FOOT DEPTH.

SOILS REMOVED FROM THE BORE HOLE DURING THE DRILLING WERE USED AS BACK FILL. ABOVE THE TOP OF THE BENTONITE AT ABOUT 8 FEET TO ABOUT 2 FEET BELOW GROUND LEVEL.

BRAUN[SM]
INTERTEC

831801

THE BOTTOM OF THE 4½" OD STEEL SLEEVE WAS ABOUT 2¼ FEET BELOW GROUND LEVEL.

THE 4½" OD STEEL SLEEVE WAS USED AS A PROTECTIVE PIPE FOR THE PIEZOMETER/BENCH MARK. THE STEEL SLEEVE WAS ABOUT 2 FEET IN LENGTH. IT HAD A 5" OD STEEL CAP ABOUT 2 INCHES HIGH.

THE STEEL SLEEVE WAS BACKFILLED WITH CONCRETE (SAKRETE) TO ABOUT 3 INCHES FROM THE TOP. LUGS WERE WELDED TO THE - SIDE OF THE STEEL SLEEVE TO HELP ANCHOR IT IN THE CONCRETE.

FILTER SAND WAS USED TO FILL THE AREA INSIDE OF STEEL SLEEVE AND THE PIEZOMETER/BENCH MARK. FILTER SAND WAS PLACED TO ABOUT 2 TO 3 INCHES BELOW THE TOP OF THE PIEZOMETER/ BENCH MARK PIPE.

83 5A 93 A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [83] LTPP Section ID [1801]

Operator: PENNER Equipment Used: DERRICK DIGGER

Location: Station: 0-20 Offset: 0.76 m (from lane edge)

Bore Hole Diameter: 304. mm

Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10	0.121	AC	730
0.20	0.229	CRUSHED GRAVEL - BROWN	304
0.30		GRAVEL UNCRUSHED - BROWN	302
0.40			
0.50	0.533		
0.60		SILTY SAND FINE - BROWN	214
0.70	0.749		
0.80		CLAYEY SAND - BROWN	216
0.90			
1.00			
1.10			
1.20			
1.30	1.321		
1.40		SILTY CLAY - BROWN	131
1.50			
1.60			
1.70			
1.80			
1.90	1.905		
2.00			
2.10			
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 12-Oct-93 Installation)

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [83] LTPP Section ID [1801]

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	0.020	10	1	22.1	840.0	799.5	576.4	40.5	7.0
2	0.340	9	3	224.5	790.0	755.0	530.5	35.0	6.6
3	0.495	9	2	224.1	739.4	706.5	482.4	32.9	6.8
4	0.650	7	1	223.1	462.1	441.3	218.2	20.8	9.5
5	0.810	6	3	224.5	721.6	660.0	435.5	61.6	14.1
6	0.960	5	2	224.1	834.1	745.4	521.3	88.7	17.0
7	1.110	4	1	223.1	684.1	615.0	391.9	69.1	17.6
8	1.250	3	3	224.5	1012.0	875.0	650.5	137.0	21.1
9	1.560	2	2	224.1	763.5	671.0	446.9	92.5	20.7
10	1.850	1	1	223.1	792.4	710.0	486.9	82.4	16.9

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

Comments: _____

Prepared by: RJV/SAH From 1993 Data Sheets Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/NOV/95 (For 12-OCT-1993 INSTALLATION)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (A) LAB ~~Field~~ Gravimetric Moisture Content	Agency Code [83] LTPP Section ID [1801]

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	0.020								7.2
2	0.340								6.5
3	0.495								7.4
4	0.650								9.4
5	0.810								14.0
6	0.960								16.7
7	1.110								16.6
8	1.250								20.4
9	1.560								17.8
10	1.850								16.2

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

Comments: LAB MOISTURES DONE BY MANITOBA

Prepared by: RSV/JAH FROM 1993 DATA Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 21/NOV/95 (FOR 12-OCT-1993 INSTALLATION)

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 (B) Gravimetric Moisture Comparison	Agency Code [83] LTPP Section ID [1801]

TDR	SMP-I02 TDR Depth (m)	SMP-I04 Material Code	Lab Data Dry Density (pcf) (*)	TDR Installation Data		Gravimetric Moistures		Comments
				SMP-I06 La (m)	Calculated Gravimetric (percent)	SMP-I05 Field (percent)	SMP-I05A Lab (percent)	
1	0.195	304	130.1	0.70	11.0	7.0	7.2	
2	0.345	302	130.1	0.58	7.5	6.6	6.5	
3	0.495	302	130.1	0.66	9.8	6.8	7.4	
4	0.650	214	133.0	0.65	9.3	9.5	9.4	
5	0.815	216	133.0	0.82	14.2	14.1	14.0	
6	0.960	216	106.7	0.98	22.8	17.0	16.7	
7	1.110	216	106.7	0.95	21.9	17.6	16.6	
8	1.250	216	106.7	0.98	22.8	21.1	20.4	
9	1.555	131	106.7	0.98	22.8	20.7	17.8	Lab result not consistent with rest of data
10	1.855	131	106.7	0.95	21.9	16.9	16.2	

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 DATA FROM FORM 504 @ STA 0-46 AS FOLLOWS:
0.23M. → 130.1 pcf, 0.60M → 133.0 pcf, AND 0.91M → 106.7 pcf.
ALL DATA FOR 12-OCT-93 INSTALLATION.

Prepared by: RSV Employer: Braun Intertec Corporation Date (dd/mmm/yy): 29/DEC/95

$$\omega = \left(-330.72 + 4526.78\,La^2 - 2103.88\,La^4 + 402.25\,La^6\right)/\gamma_d$$; La (meters), γ_d (pcf), ω (%)

8 3 SA 93 A

LTPP Seasonal Monitoring Program Data Sheet SMP-I06 TDR Moisture Content	Agency Code [83] LTPP Section ID [1801]

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	0.020	(1)	0.70	12.13	
2	0.340		0.58	8.33	
3	0.495		0.66	10.78	
4	0.650		0.65	10.46	
5	0.810		0.82	16.64	
6	0.960		0.98	23.77	
7	1.110		0.95	22.34	
8	1.250		0.98	23.77	
9	1.560		0.98	23.77	
10	1.850		0.95	22.34	

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

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

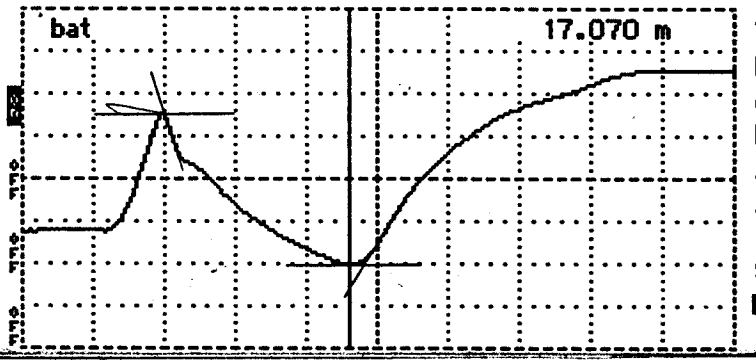
where ε = dielectric constant; L_a = apparent length of probe, m; L = actual length of probe units (= 0.203 m (8 in) for FHWA probes); V_p = phase velocity setting (= 0.99).

ATTACH TDR TRACES TO THIS DATA SHEET.

Comments: (1) NOT RECORDED IN 1993.

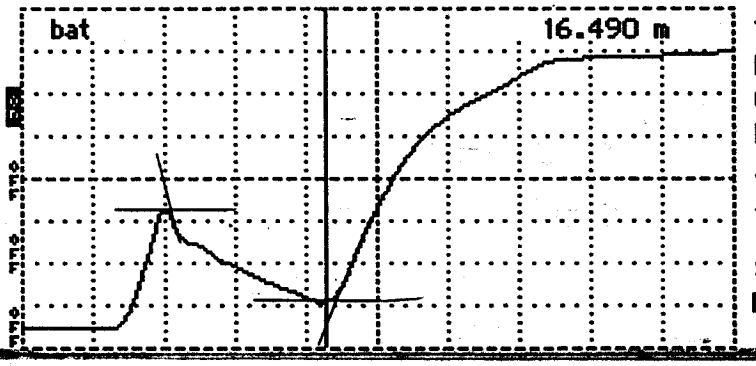
Prepared by: RSV FROM DATA COLLECTED 12-OCT-1993 INSTALLATION) Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 17/NOV/95 (INSTALLED 12-OCT-1993)



..... 17.070 m
Div..... .25 m/div
Scale.... 77.0 mΩ/div
..... 0.99
er..... 8 avg
..... bat

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #1
Notes (83A01)
Input Trace
Stored Trace
Difference Trace



..... 16.490 m
Div..... .25 m/div
Scale.... 77.0 mΩ/div
..... 0.99
er..... 8 avg
..... bat

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #2
Notes (83A02)
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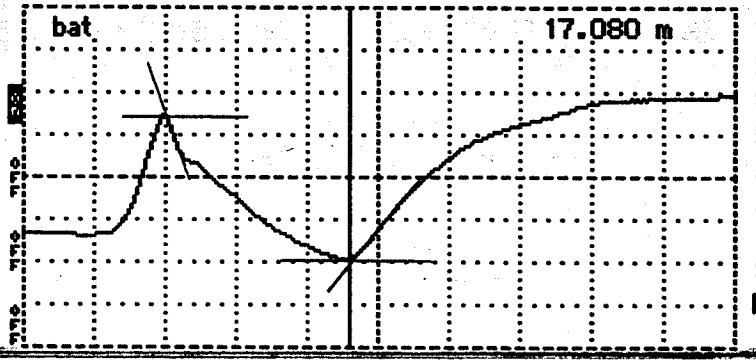
Stored Trace
Difference Trace



..... 17.080 m
Div..... .25 m/div
Scale.... 77.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #3
Notes (83A03)
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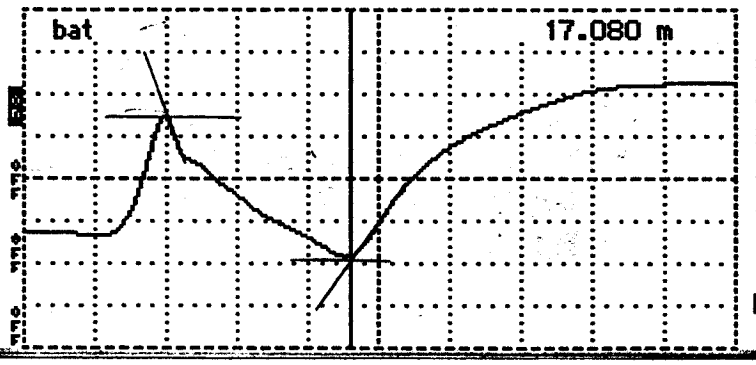
Difference Trace



..... 17.080 m
Div..... .25 m/div
Scale.... 77.0 mΩ/div
..... 0.99
er..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #4
Notes 83A04
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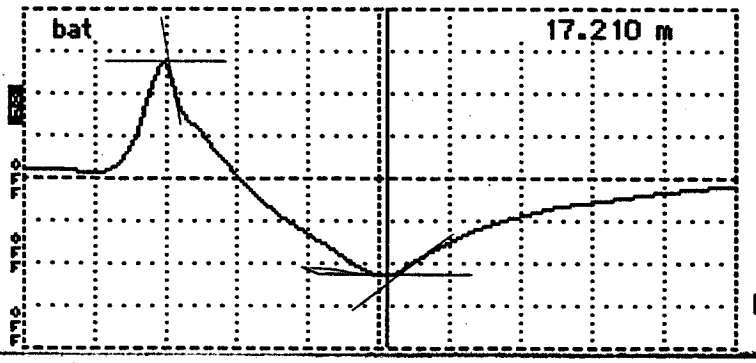
Stored Trace
Difference Trace



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Scale.... 77.0 mΩ/div
..... 0.99
er..... 8 avg
..... bat

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Date 10-12-93
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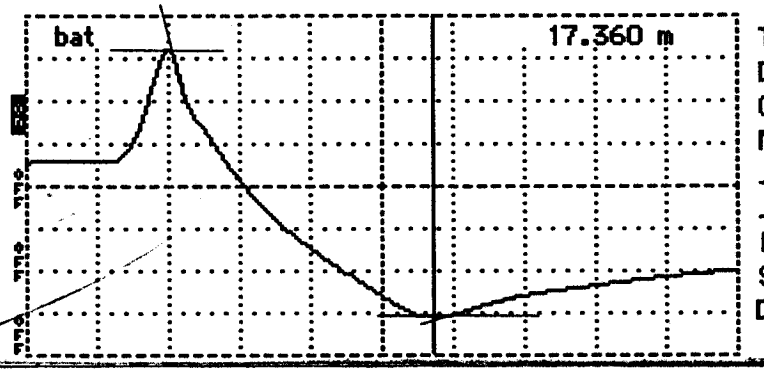
Notes 83A05
Input Trace
Stored Trace
Difference Trace



..... 17.360 m
Div..... .25 m/div
Scale.... 77.0 m/div
..... 0.99
r..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #6
Notes 83A06
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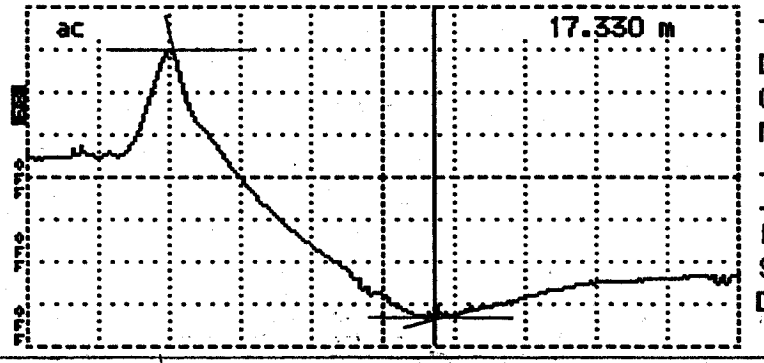
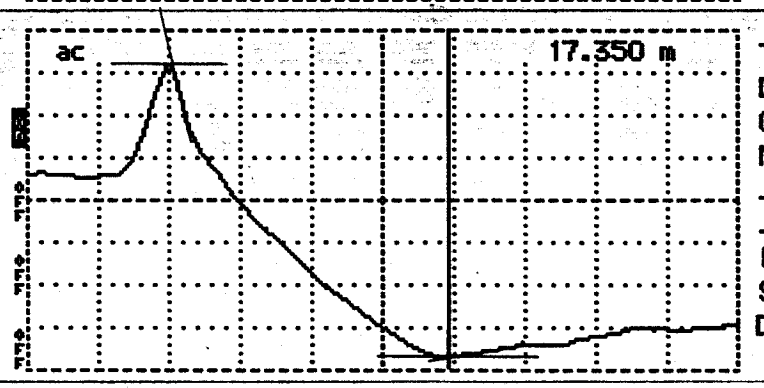
Stored Trace
Difference Trace



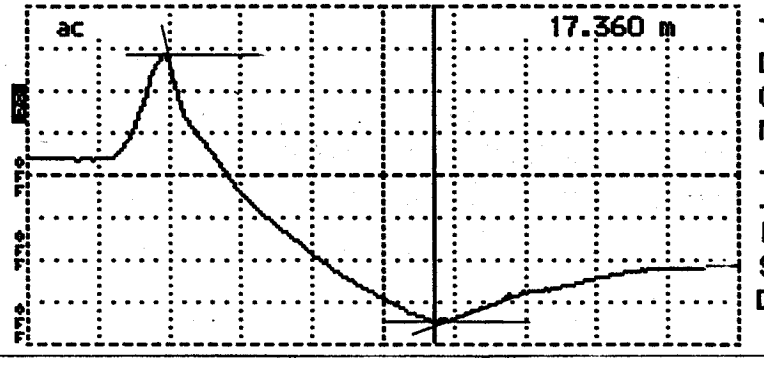
..... 17.330 m
Div..... .25 m/div
Scale.... 77.0 m/div
..... 0.99
r..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #7
Notes 83A07
Input Trace
Stored Trace
Difference Trace



..... 17.350 m
Div..... .25 m/div
Scale.... 77.0 m/div
..... 0.99
r..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #8
Notes 83A08
Input Trace
Stored Trace
Difference Trace



..... 17.360 m
Div..... .25 m/div
Scale.... 77.0 m/div
..... 0.99
r..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #9
Notes 83A09
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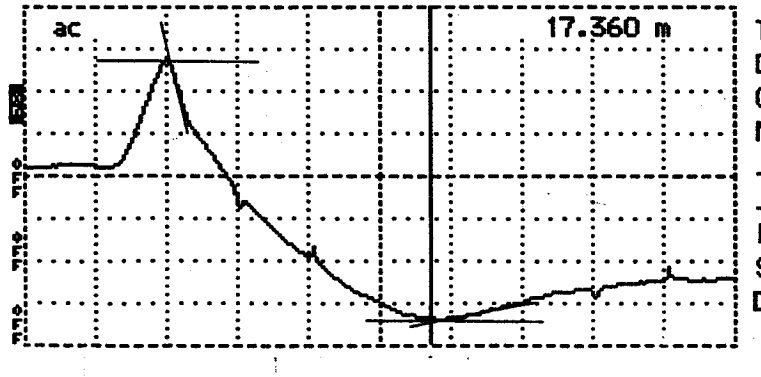
Stored Trace
Difference Trace



..... 17.360 m
Div..... .25 m/div
Scale.... 77.0 m/div
..... 0.99
r..... 8 avg
..... ac

Tektronix 1502B TDR
Date 10-12-93
Cable 831 1801 #10
Notes 83A10
Input Trace
Stored Trace
Difference Trace

LTPP Seasonal Monitoring Program Data Sheet SMP-C04 Function Generator, Multimeter, and Switch Box Checks	Agency Code [83] LTPP Section ID [1801]

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): 29/Dec/95

LTPP Seasonal Monitoring Program Data Sheet SMP-C05 Rain Gauge Calibration	Agency Code [83] LTPP Section ID [1801]

General Information:

Manufacturer: TEXAS ELECTRONICS INC

Model Number: TRP-525M

Serial Number: 12052

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	0640	0705	473.	95.	0.5
2	0738	0810	473.	97.	—.—
3	0813	0840	473.	98.	—.—

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

Comments: DATA FROM 1993 INFORMATION. RAW DATA ON FILE.

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.

83 SA 93A

Seasonal Monitoring Program Guidelines: Version 2.1a/March 1995

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [83] LTPP Section ID [1801]

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	83AT
Resistivity Probe	01	83AR
TDR Sensors	10	83A01 to 83A10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	01	16524
Battery Package	01	5655
Weather Station:		
Rain Gauge	01	12052
Air Temperature Probe	01	83AAT
Radiation Shield	01	———
Observation Piezometer/Bench Mark:	01	n/a

List of Participants:

Name of Participant	Agency/Employer
ROBERT VAN SAMBEEK	BRAUN INTERTEC CORP
RON URBACH	" " "
DANA MILLER	" " "
JOEL RECTOR	" " "
DENNIS WATSON	MANITOBA MATLS. AND RESER.
BONNIE ?	" " " "
? PENNER	MANITOBA - DRILL RIG

Prepared by: Jerome Dicks Employer: Braun Intertec Corporation

Date (dd/mmm/yy): 10/Dec/95 (for 120ct93 Install)

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:

$$N(T,\varepsilon_t) = ab^{T'}\left(\frac{1}{\varepsilon_t}\right)^c \tag{3}$$

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.

ACKNOWLEDGEMENTS

The data used in this paper originated from the SHRP/FHWA-LTPP Study. Permission granted by Monte Simmons for use of these data is gratefully acknowledged. The testing work described was performed by staff of the North Central Region Coordination Contractor, Braun Intertec Corporation. All staff performing tests are also acknowledged.

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.

REFERENCES

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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

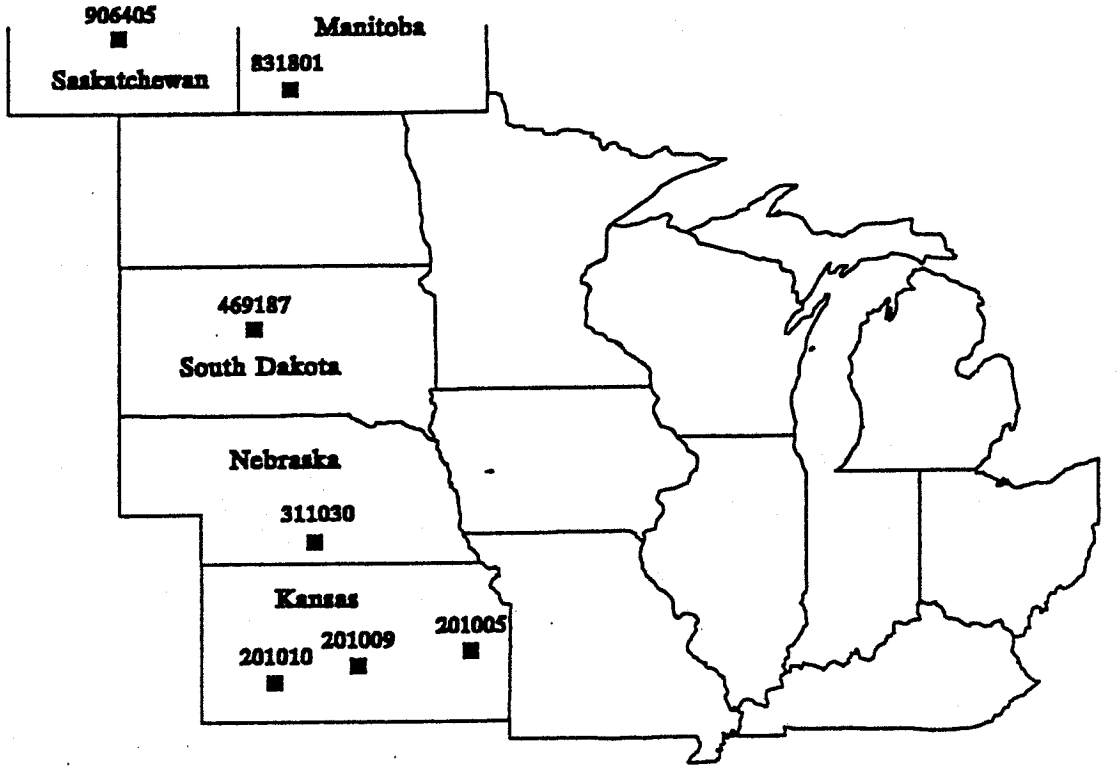


Figure 1 Testing Section Layout

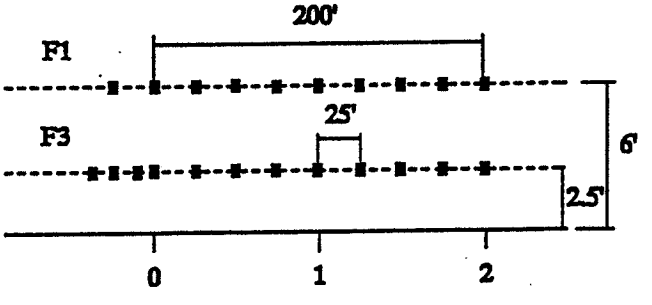


Figure 2 Testing Location Layout

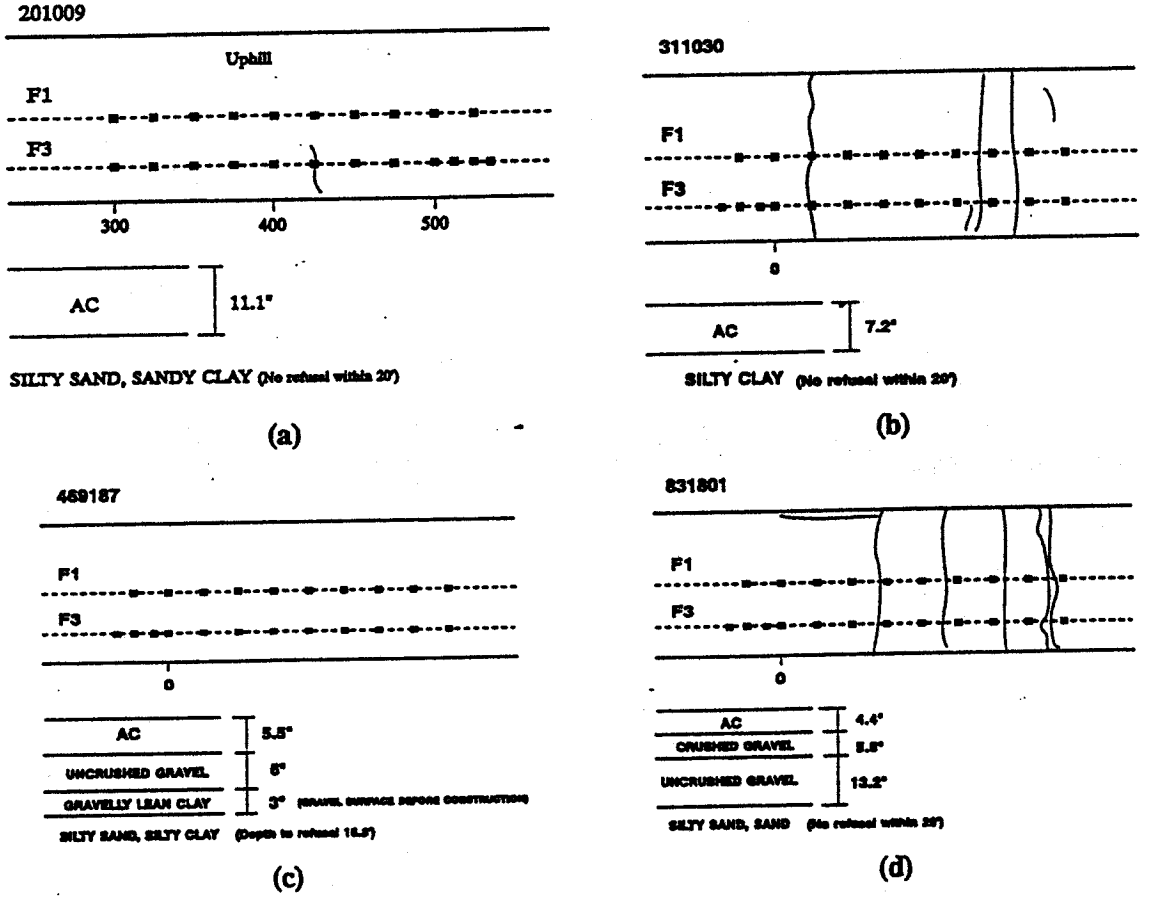


Figure 3 Survey Results and Layer Structures

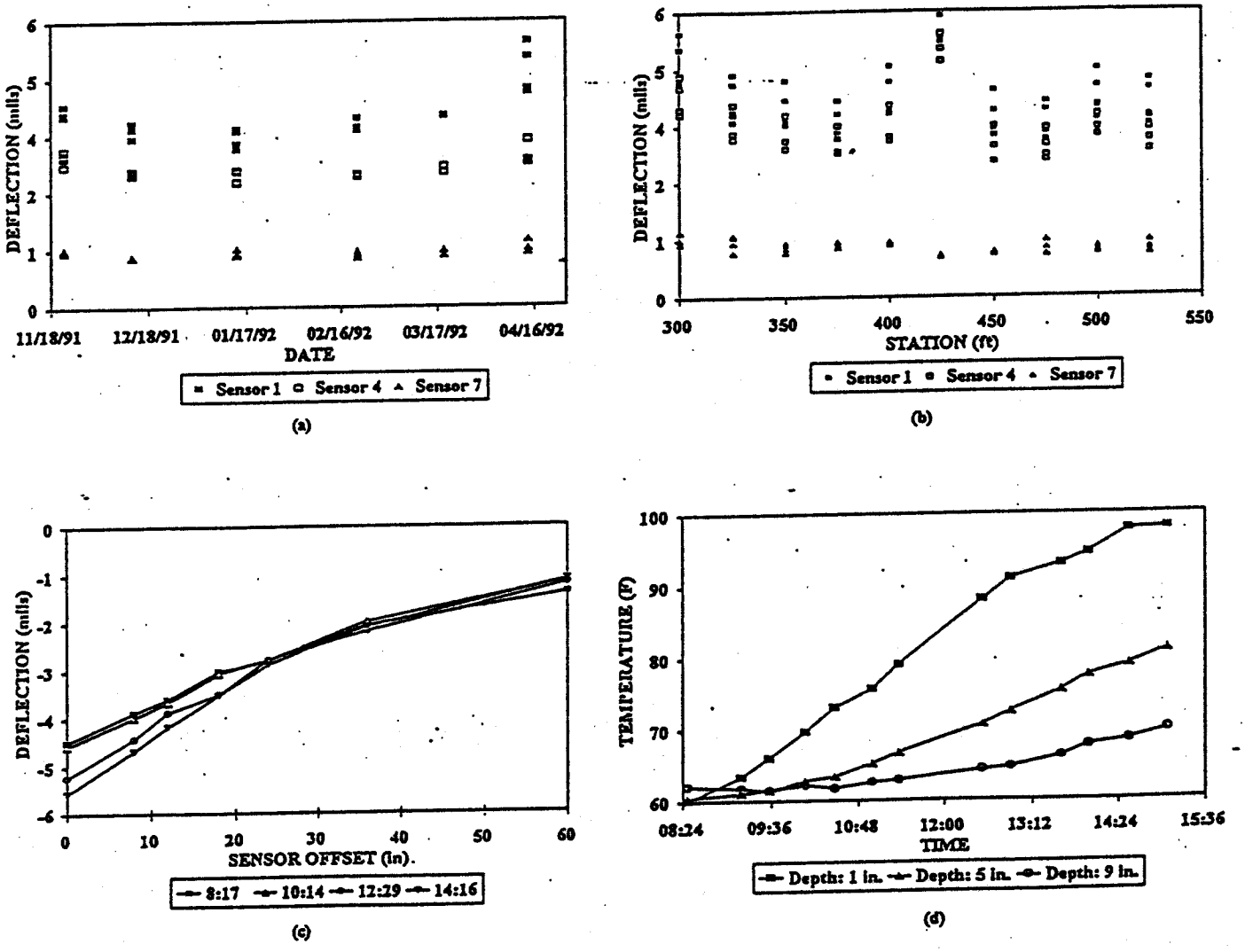


Figure 4. Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 201009 in Kansas: (a) deflections vs. testing date at Station 300; (b) deflections across test section on April 4, 1992; (c) deflection basins; (d) pavement temperature vs. time.

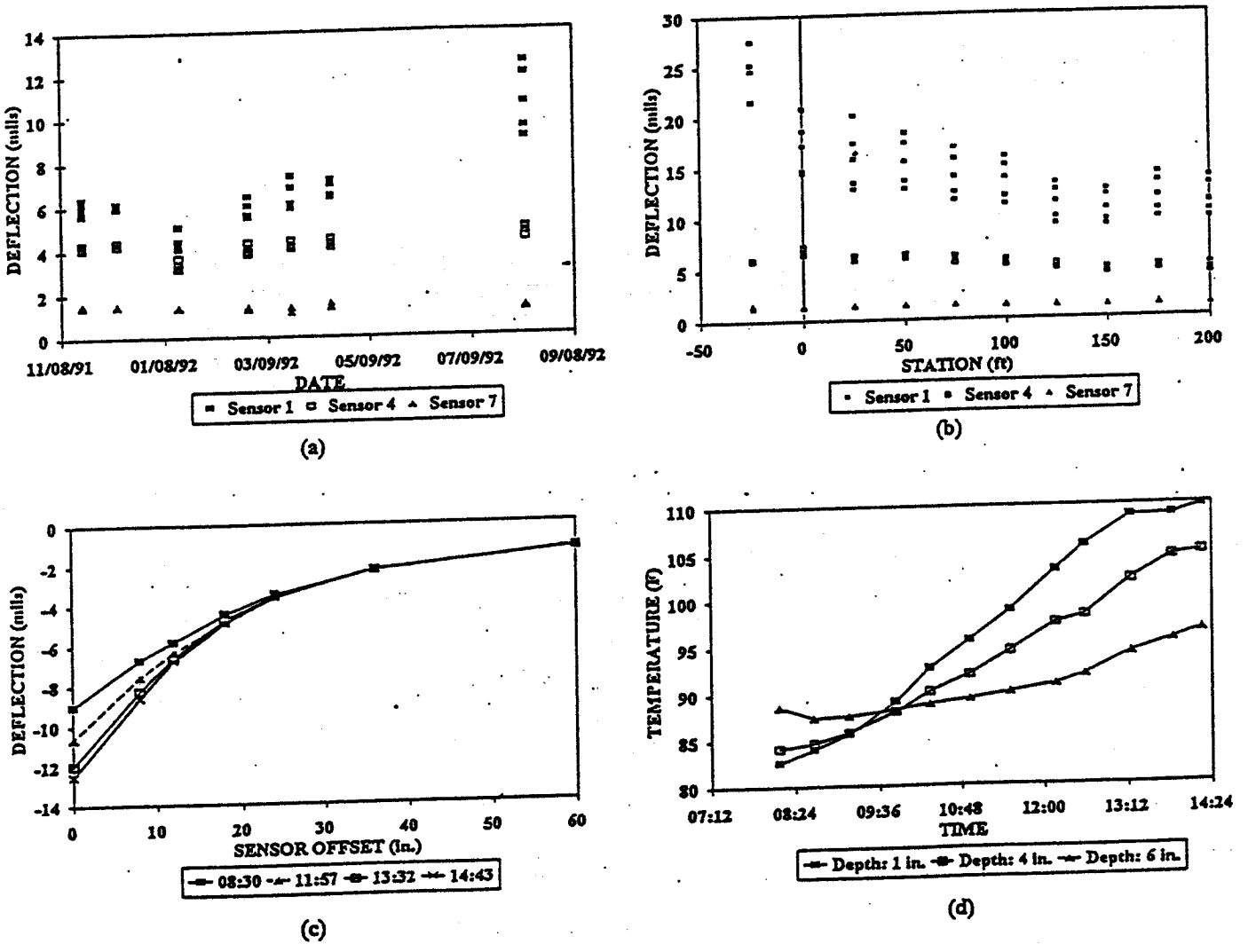


Figure 5 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 311030 in Nebraska: (a) deflections vs. testing date at Station 150; (b) deflections across test section on August 10, 1992; (c) deflection basins; (d) pavement temperature vs. time.

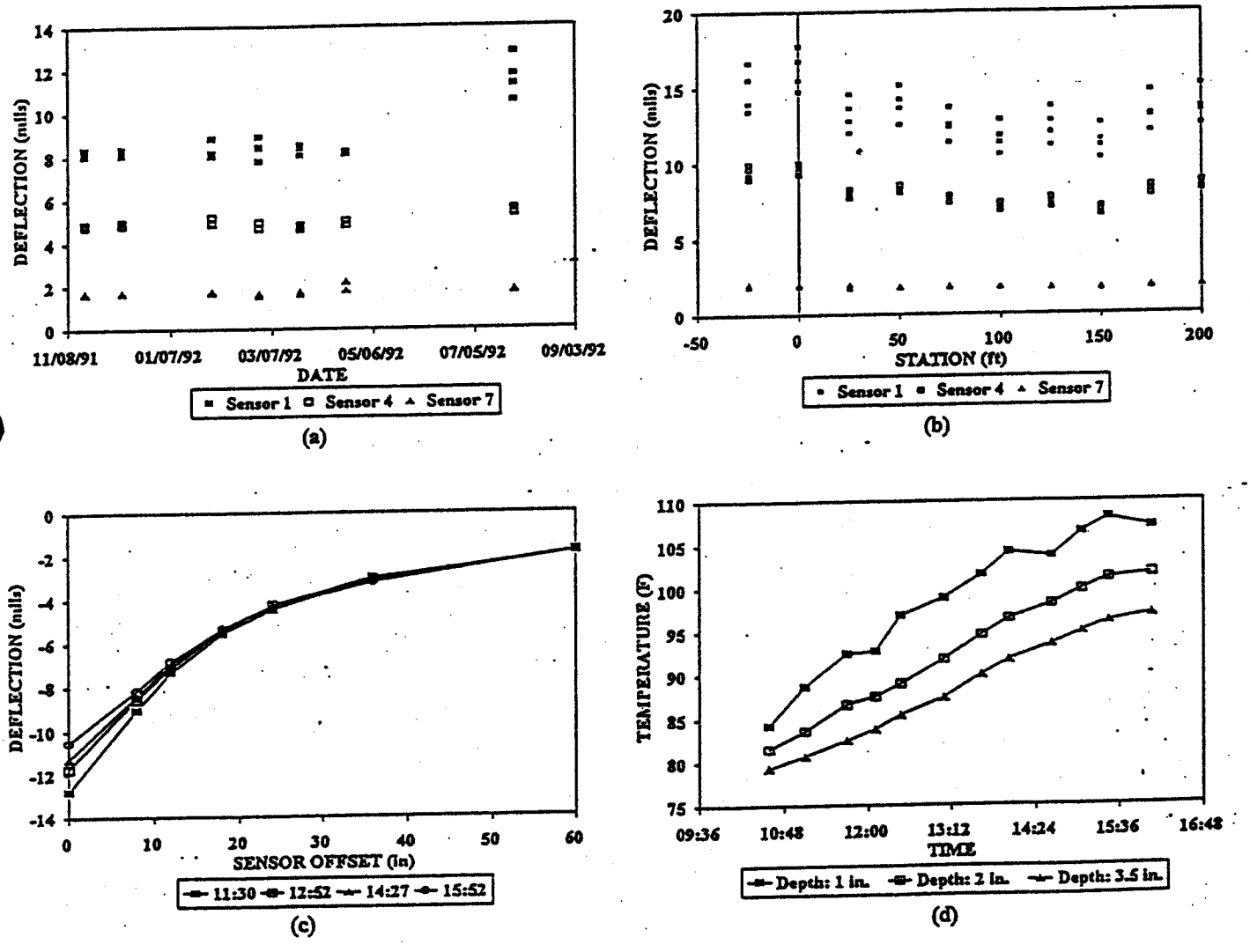


Figure 6 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 469187 in South Dakota: (a) deflections vs. testing date at Station 100; (b) deflections across test section on July 28, 1992; (c) deflection basins; (d) pavement temperature vs. time.

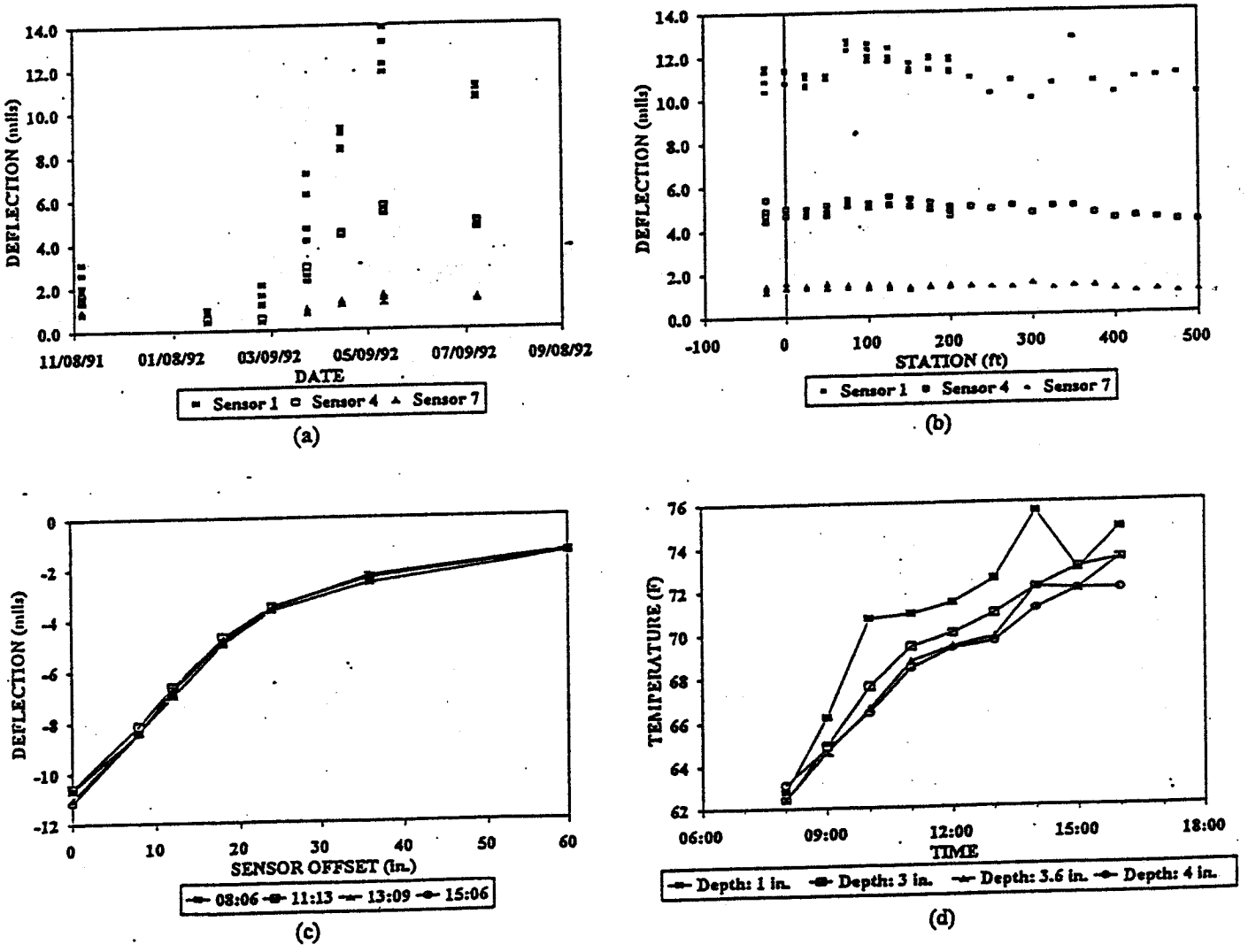


Figure 7 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 831801 in Manitoba: (a) deflections vs. testing date at Station 25; (b) deflections across test section on July 16, 1992; (c) deflection basins; (d) pavement temperature vs. time.

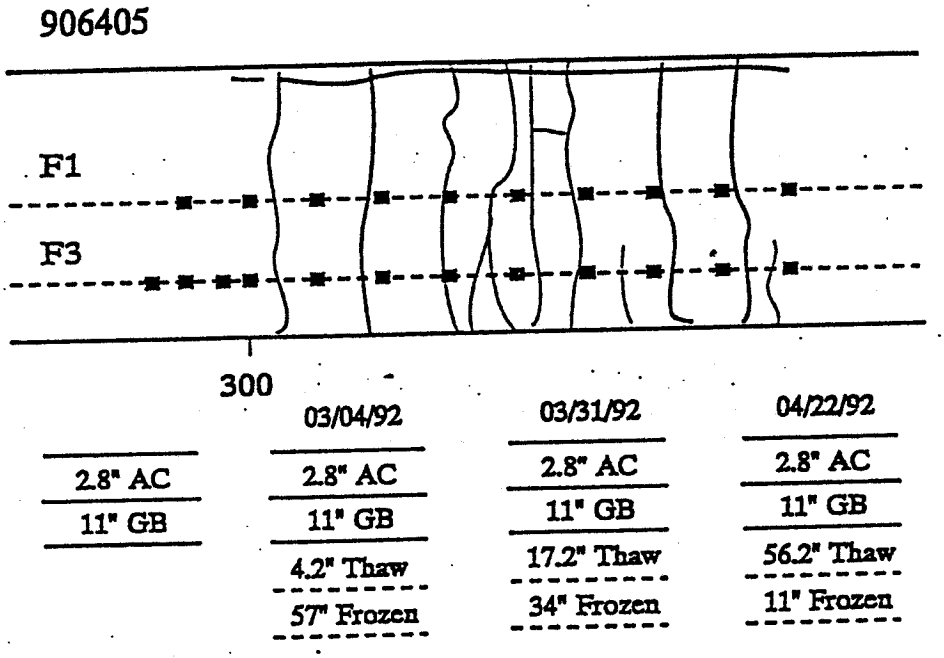


Figure 8 Survey Results and Layer Structures

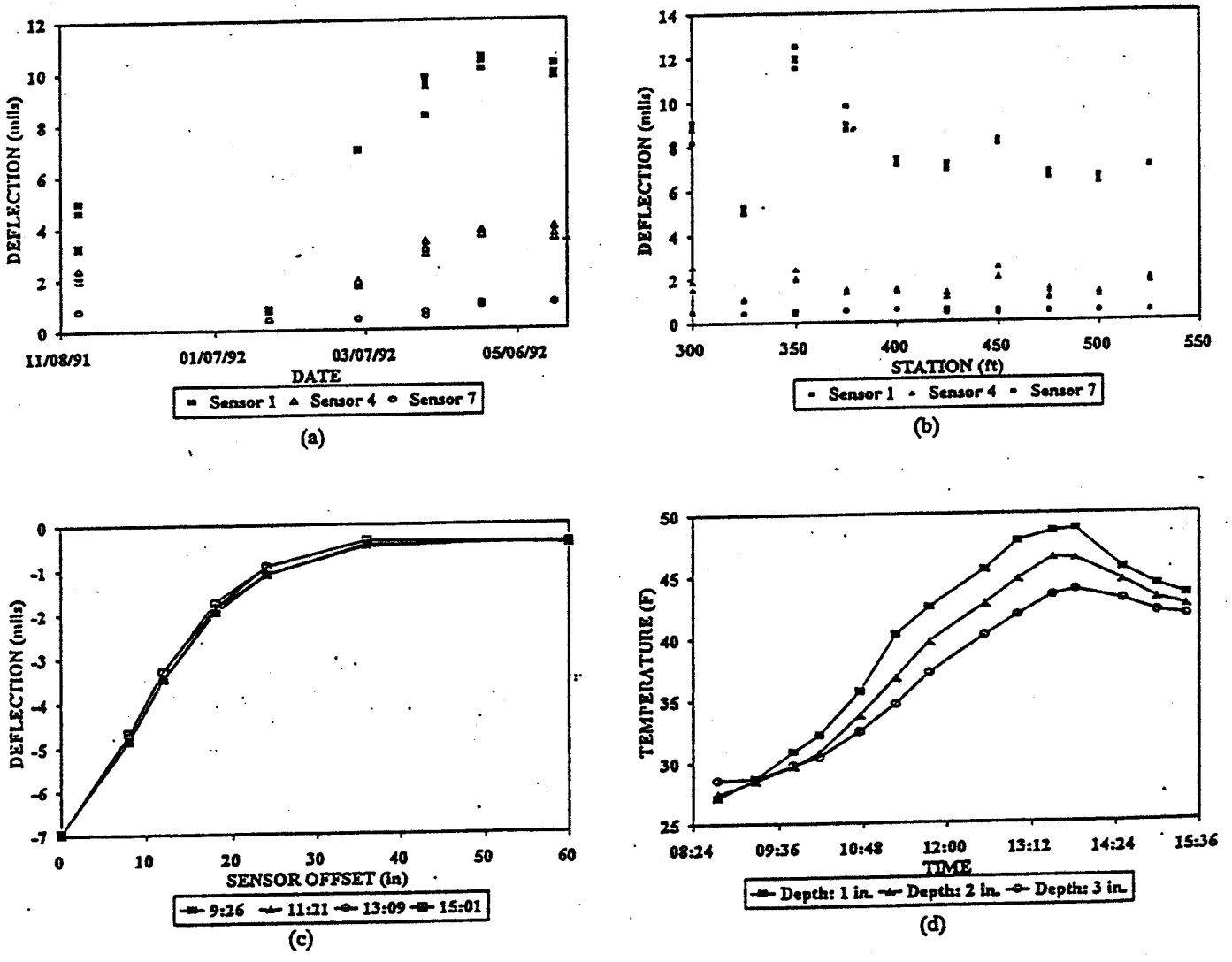


Figure 9 Measured midlane deflections and pavement temperatures (6,000 lbs load), GPS Test Section 906405 in Saskatchewan: (a) deflections vs. testing date at Station 525; (b) deflections across test section on March 4, 1992; (c) deflection basins; (d) pavement temperature vs. time.

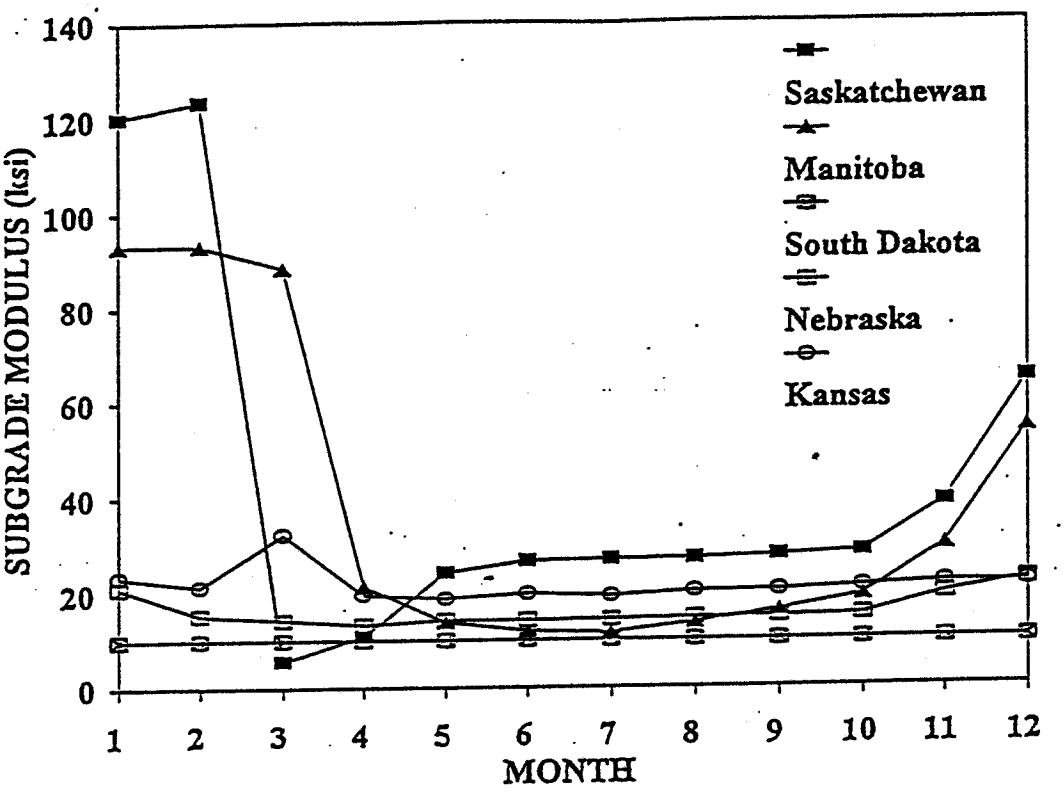


Figure 10 Monthly variation of subgrade moduli

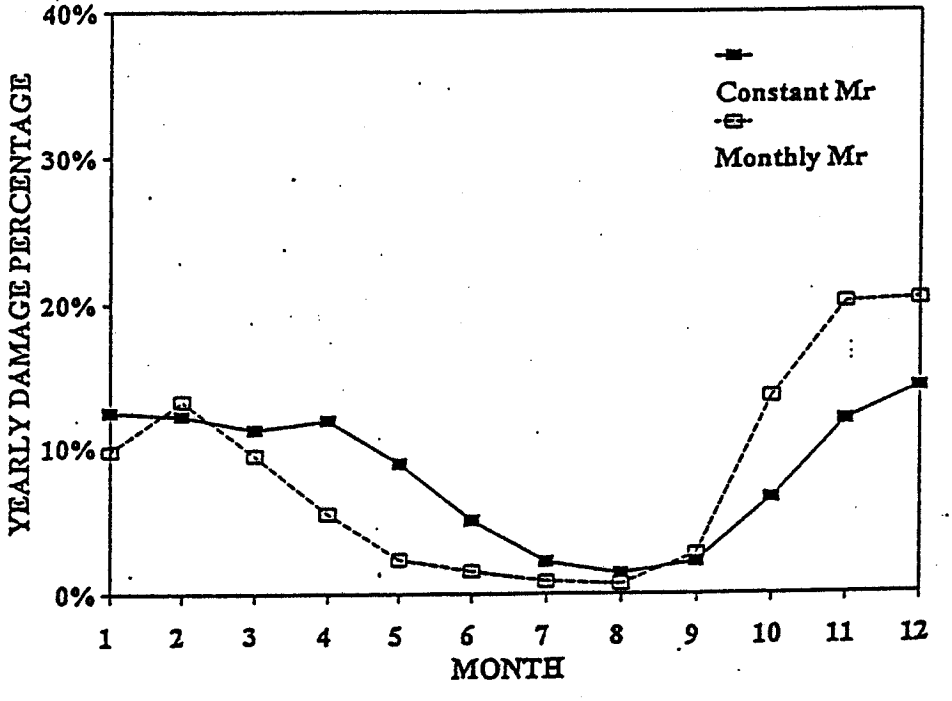


Figure 11 Yearly damage percentage in each month (GPS Section 311030 in Nebraska)

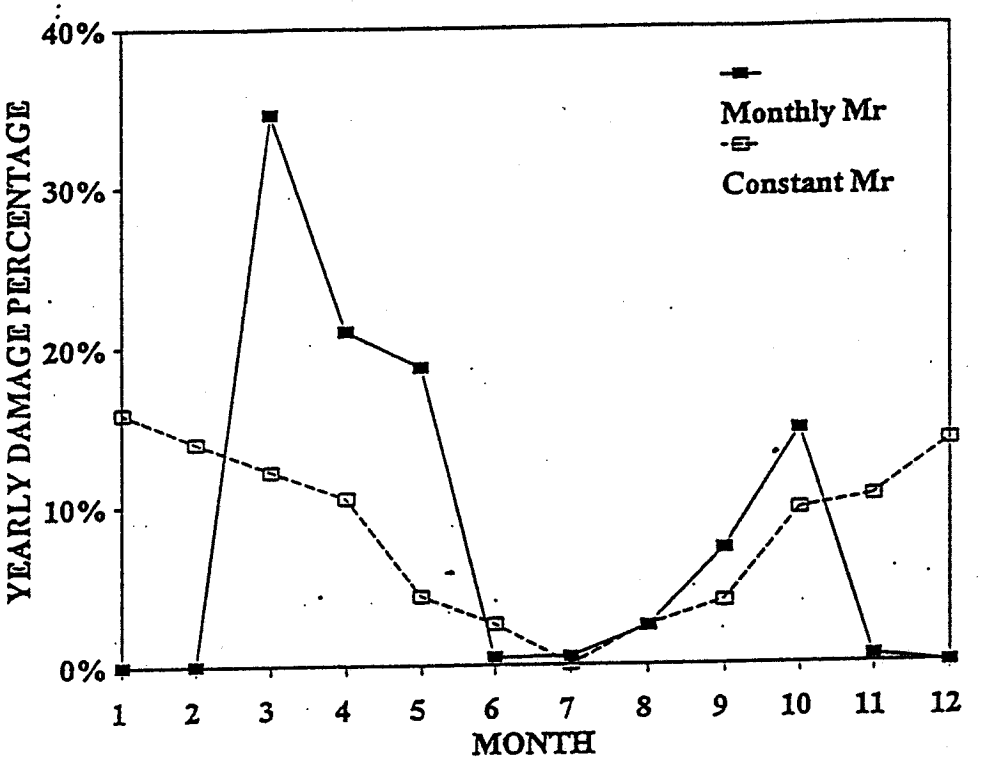
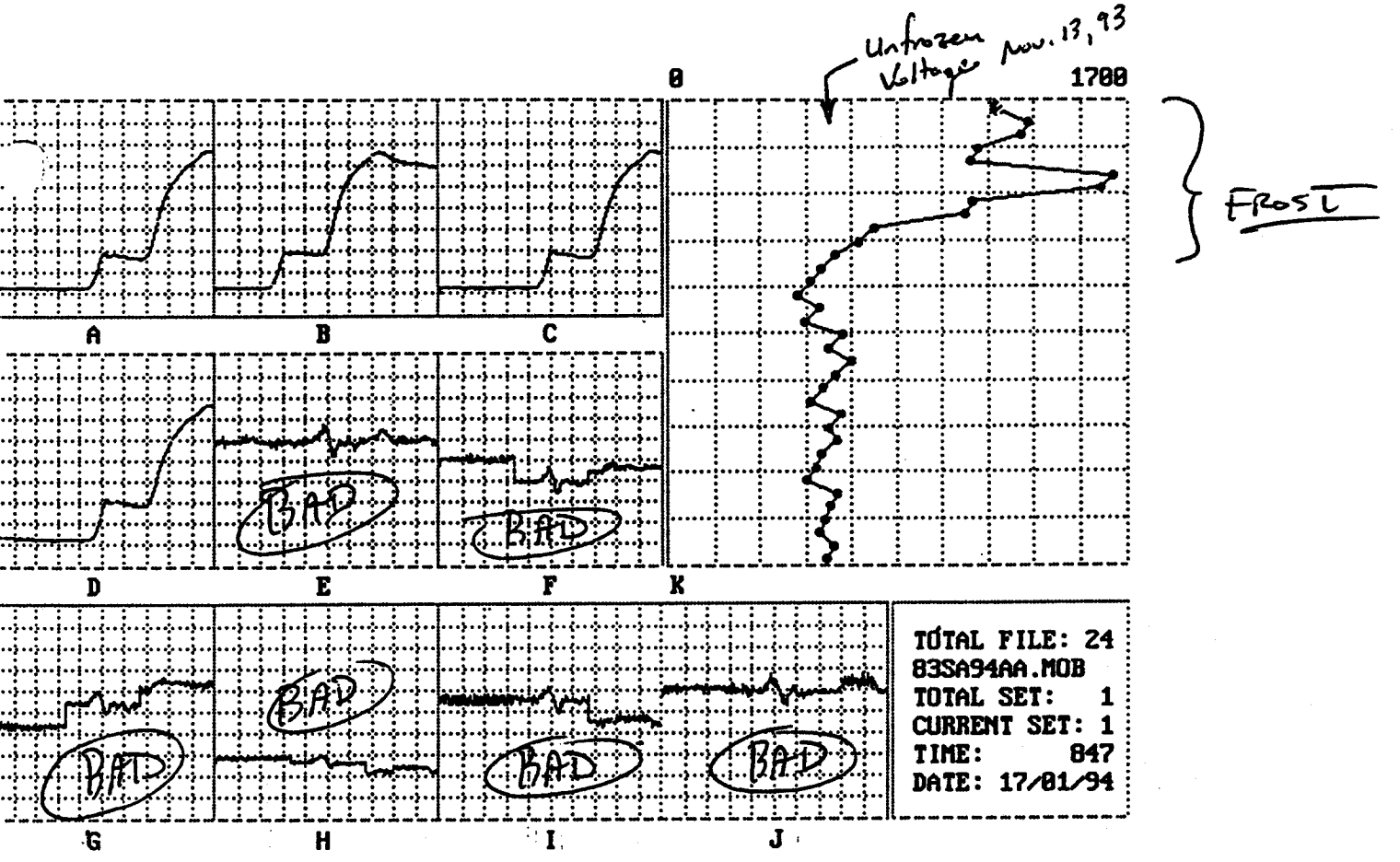


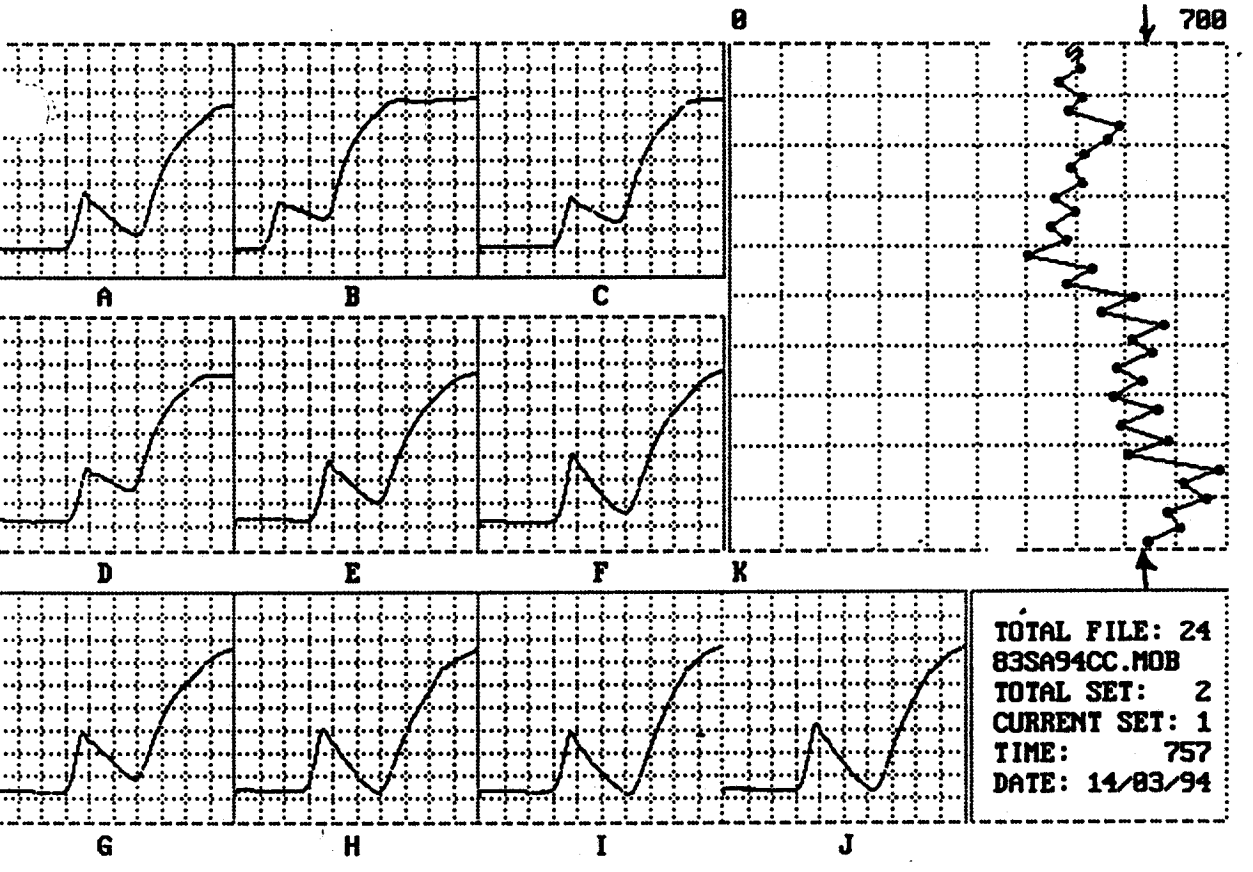
Figure 12 Yearly damage percentage in each month (GPS Section 906405 in Saskatchewan)



Extremely cold air temperatures @ the site.

$-38°C$

Cable reader not work well in the cold.

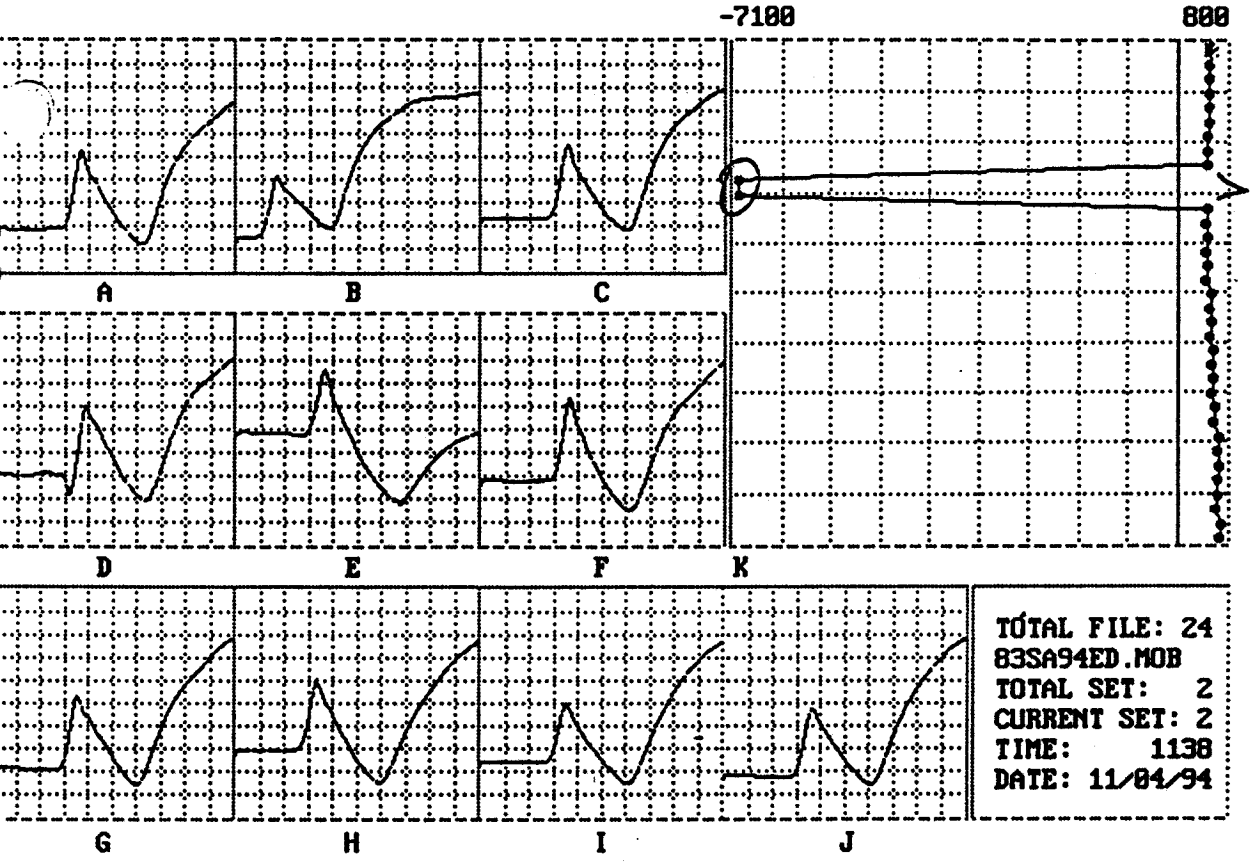


ANY FROST ? }?

er=Curve to select (↵); PgU/PgD=Prior/Next set; Ctrl+PgU/PgD=Prior/Next File

FROST BELOW END OF RESISTIVITY PROBE ?

TDR SHAPE STILL SHOW FROST ?



CRREL PROBLEM WITH 10/11. ASSIGN -6999 to -1

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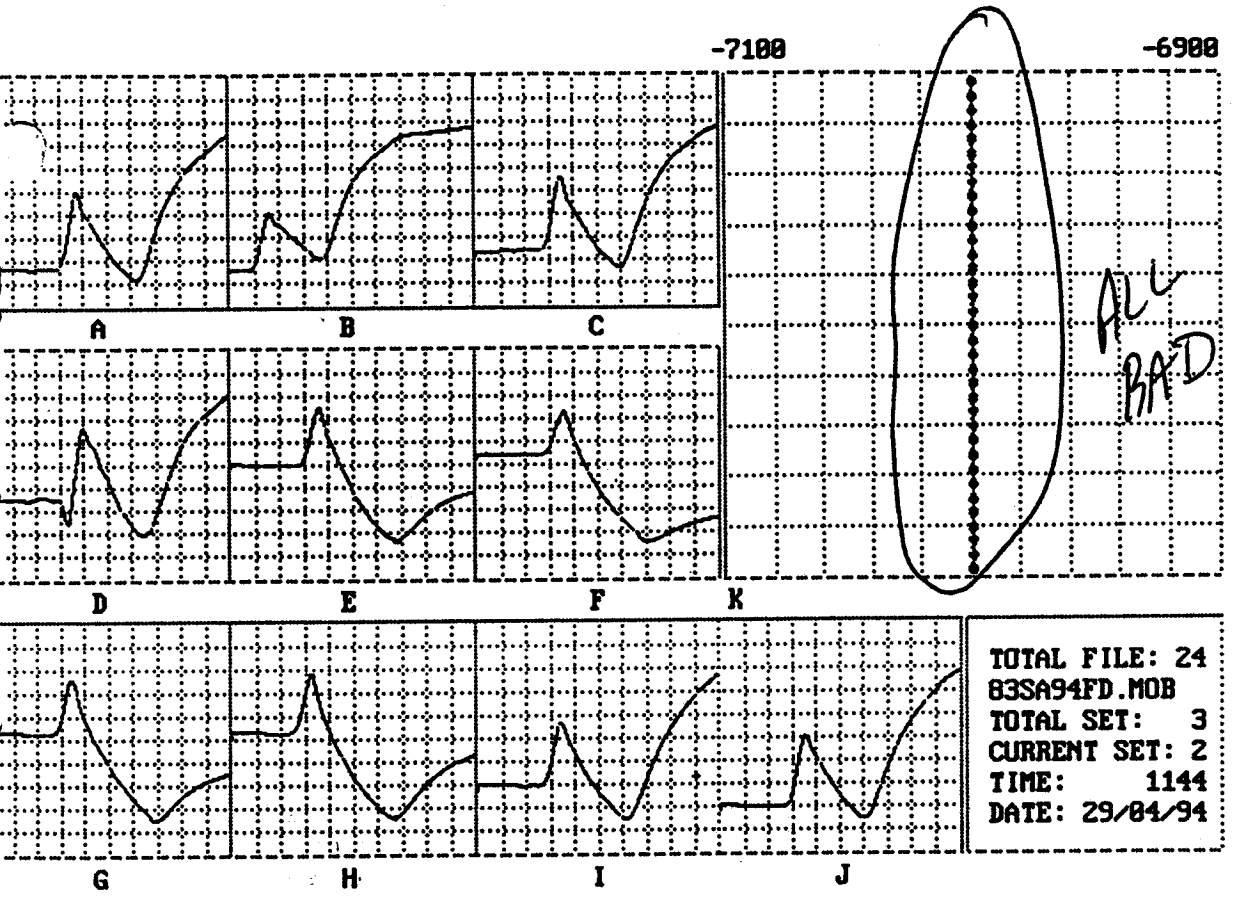

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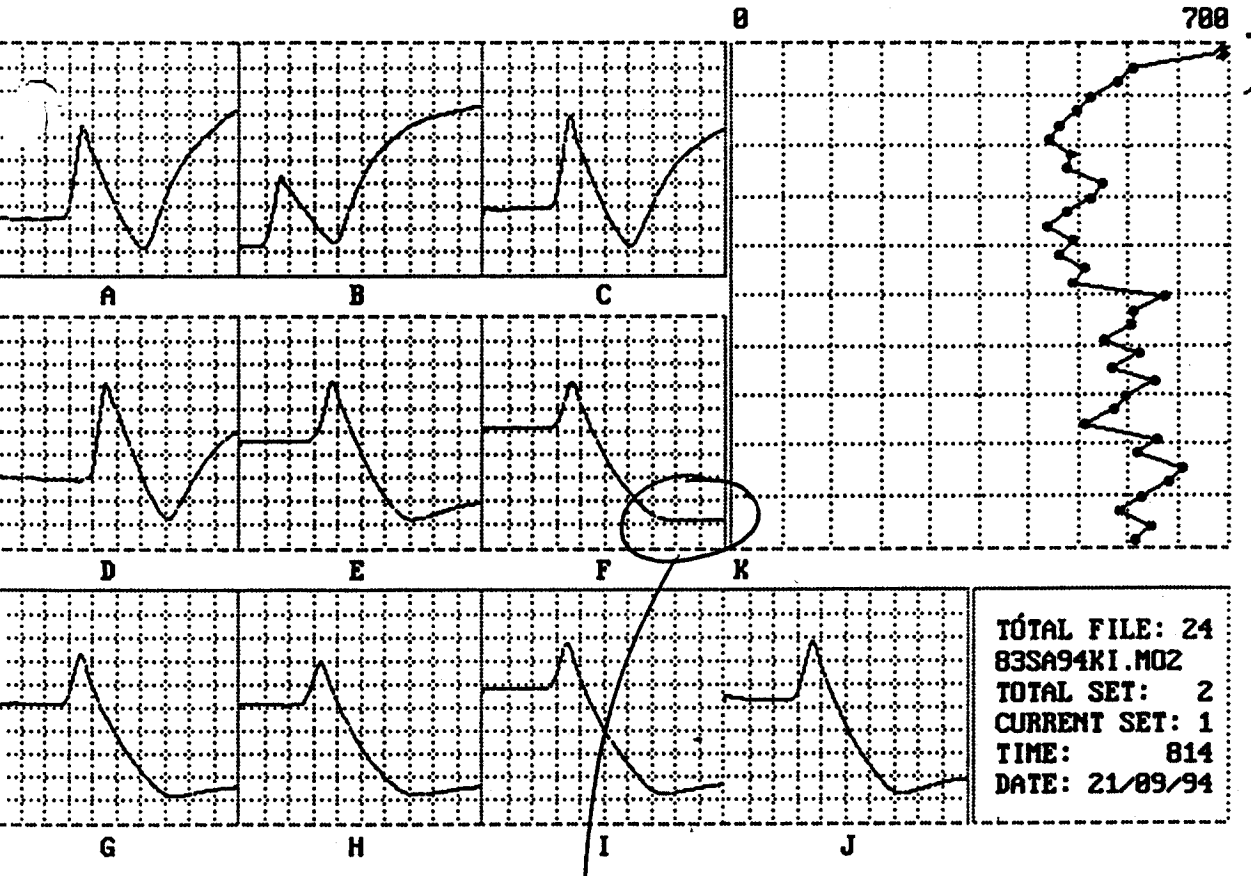

HIGH ?

FROST
21-SEP-94
?

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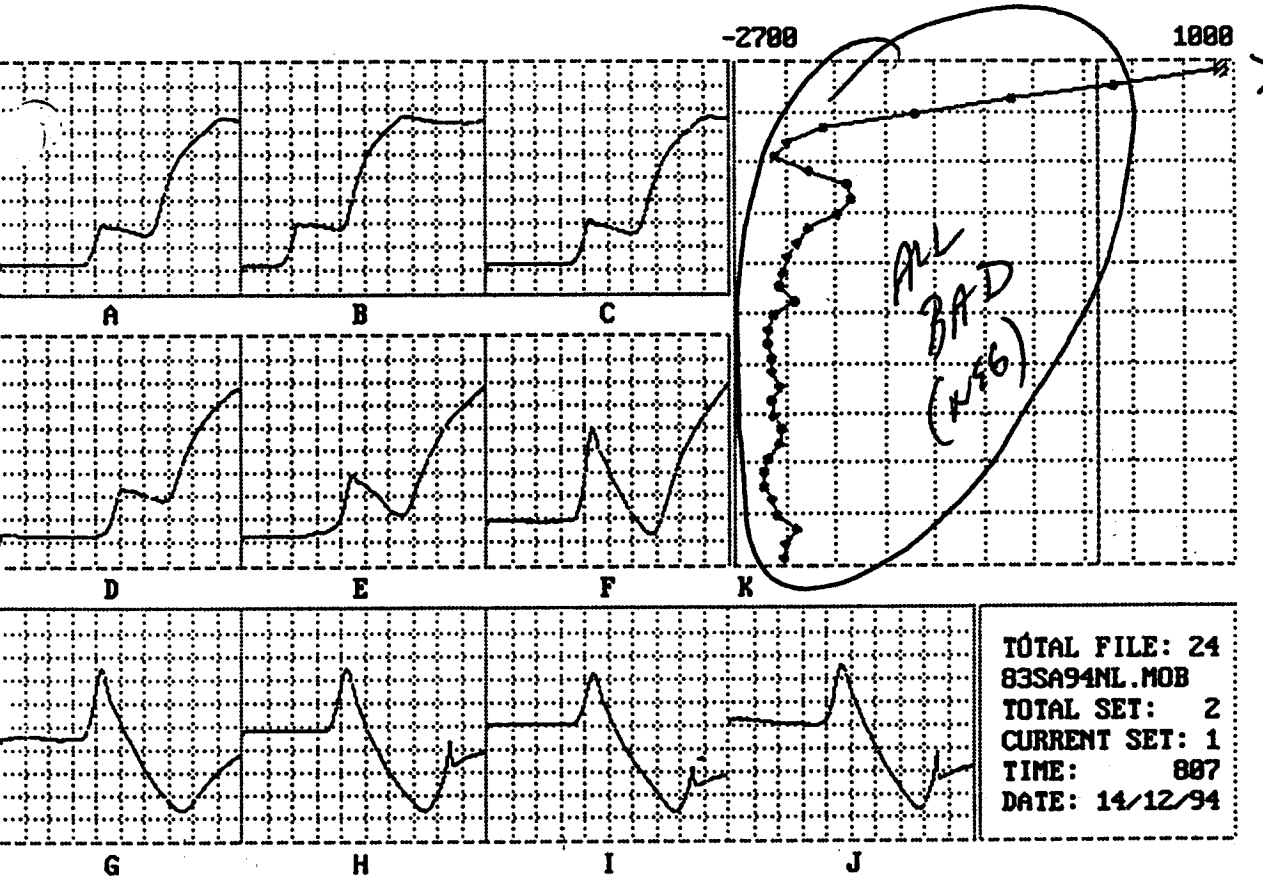
FLAT TRACE

- FHWA/TAC ADVISE GOOD/BAD DATA.



FHWA/TAC
ADVISE
GOOD/BAD

ALL BAD (#6)

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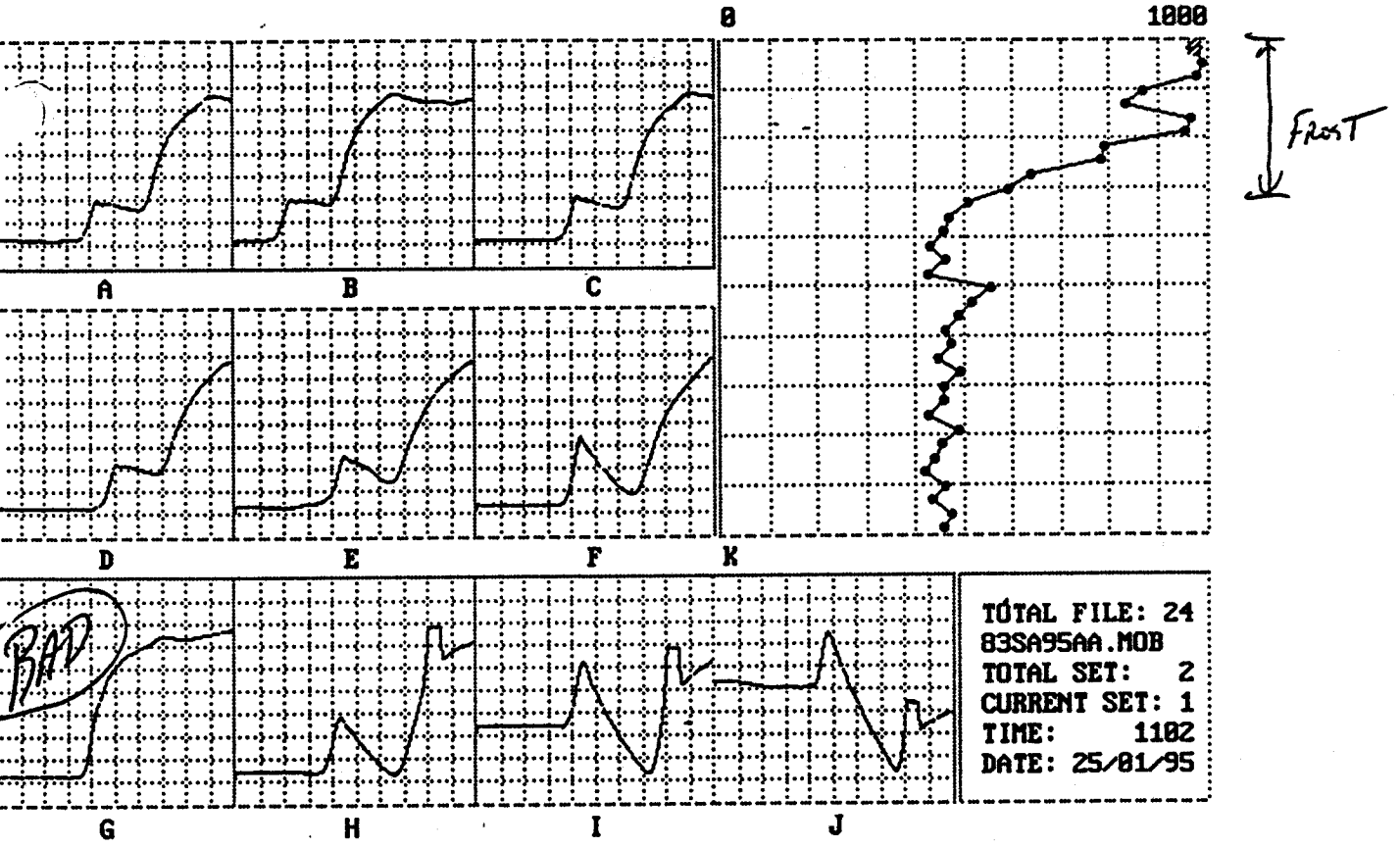

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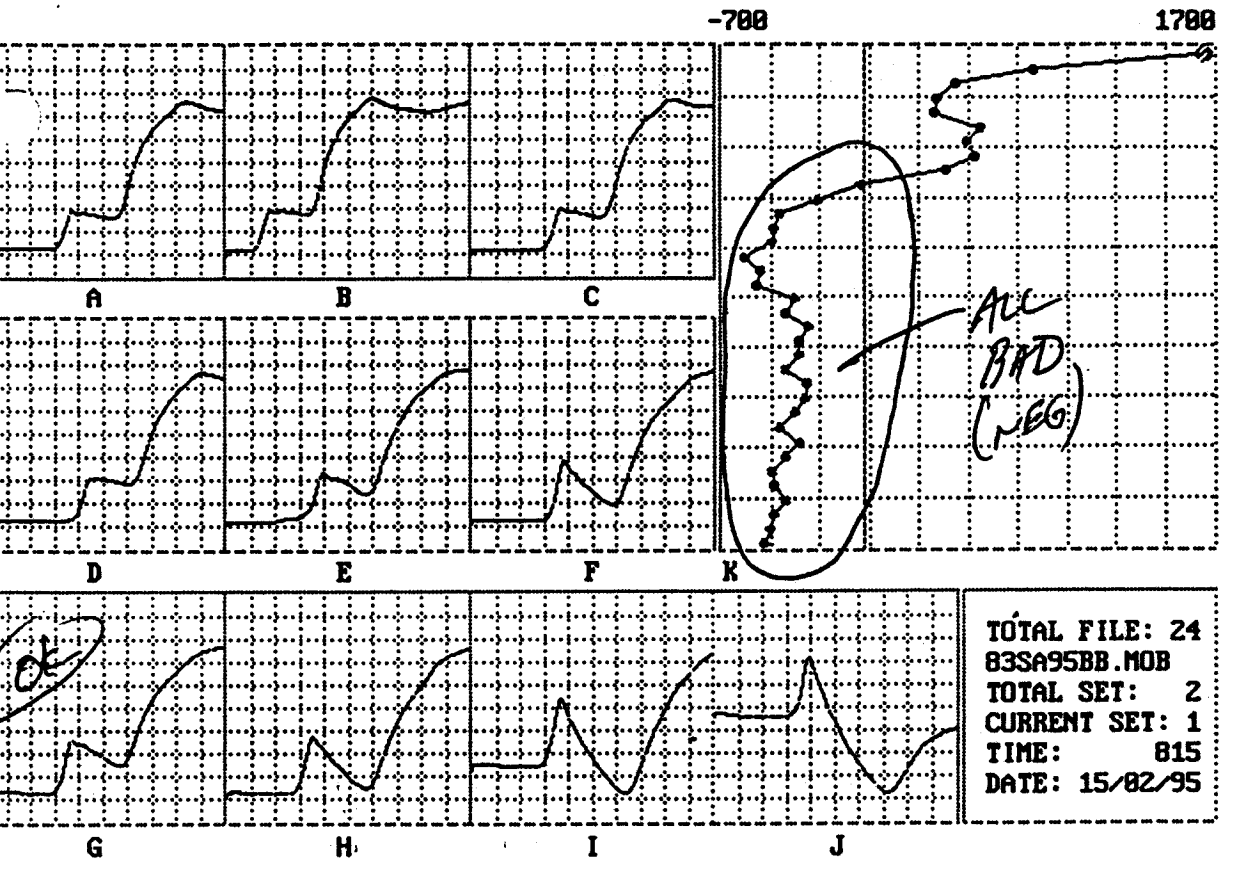
PROBE #7 (6) FAILURE

SEE 835A95BB DATA - WORKING AGAIN



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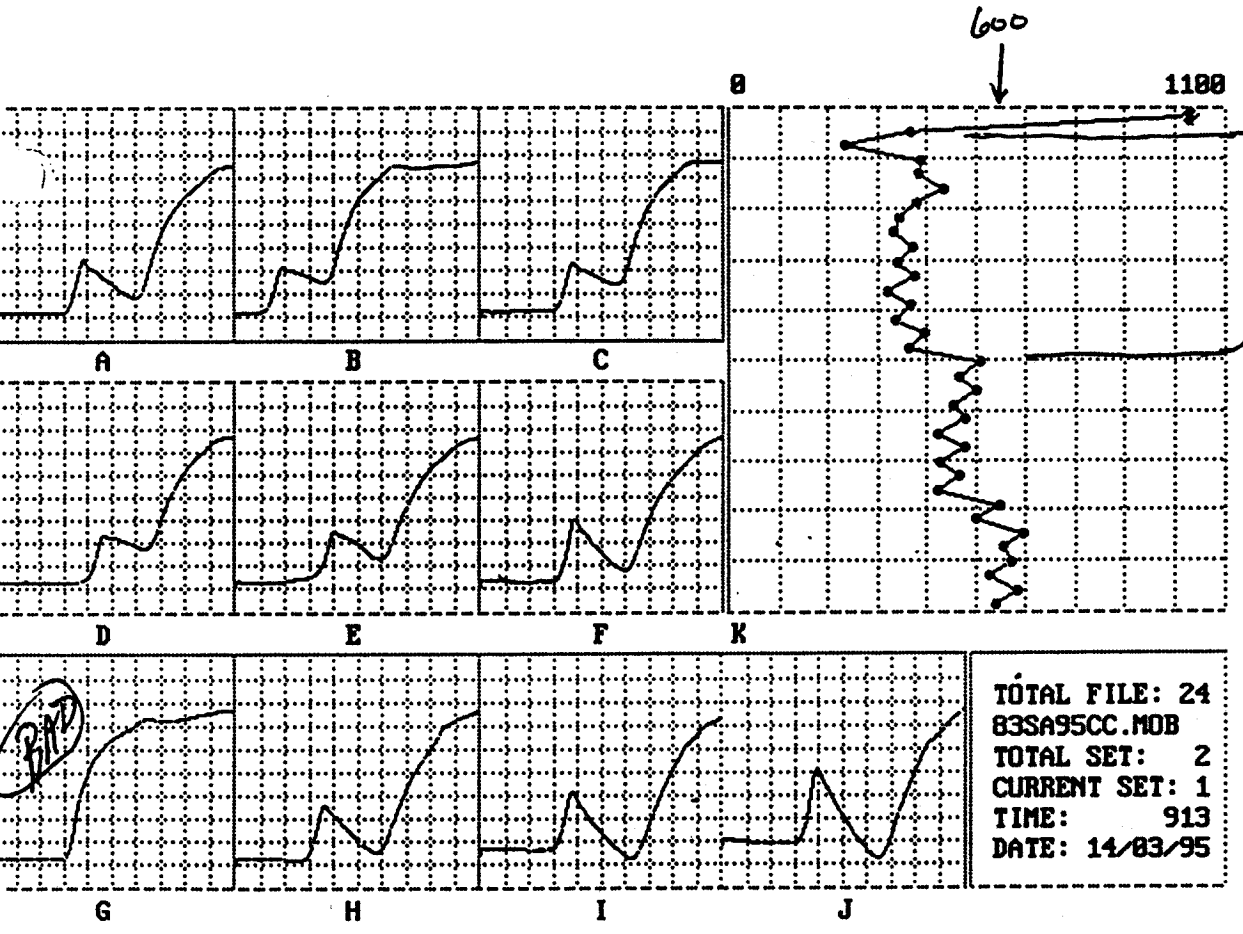
PROBE #8 WORKING AGAIN.



READINGS ARE LOW.

PROBLEM WITH CREEL DEVICE ?

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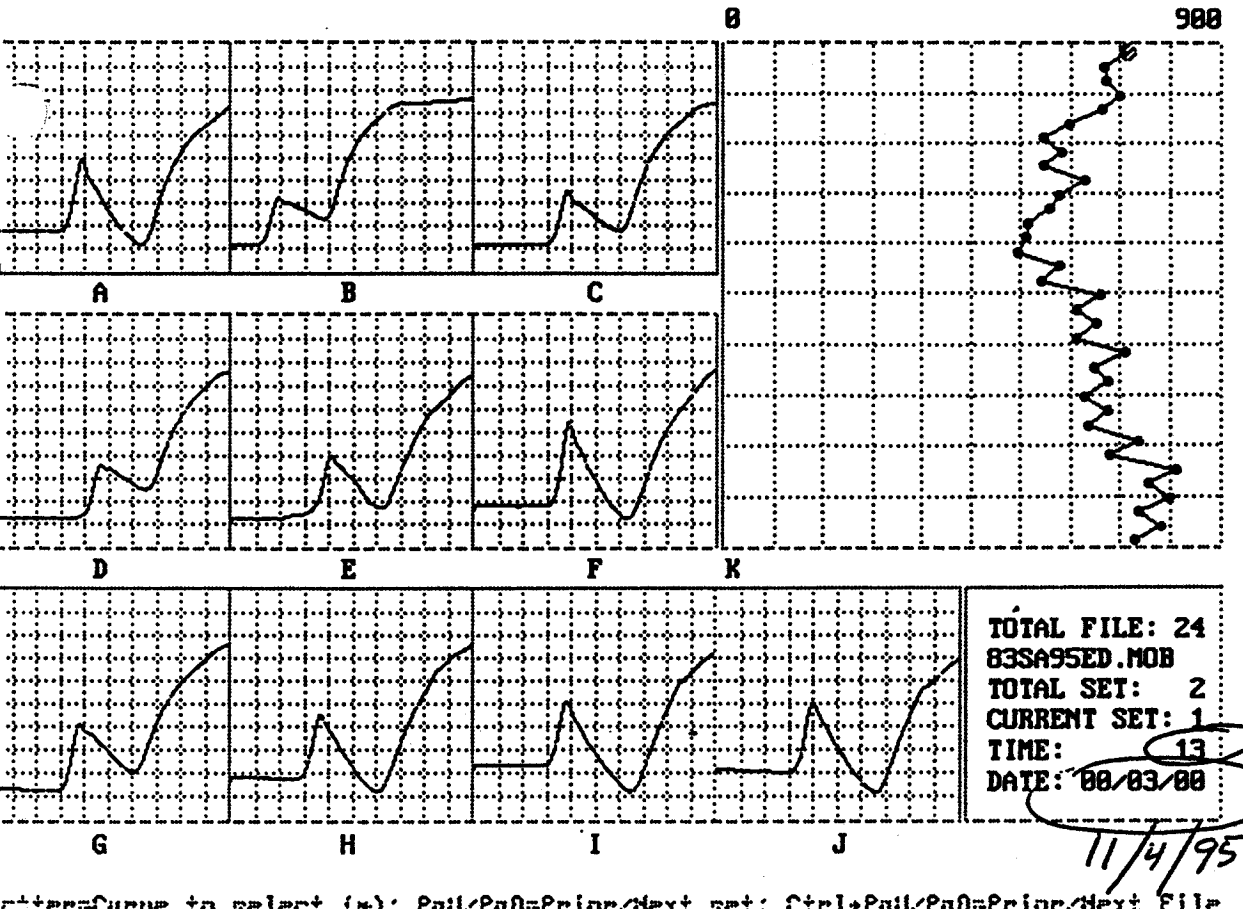
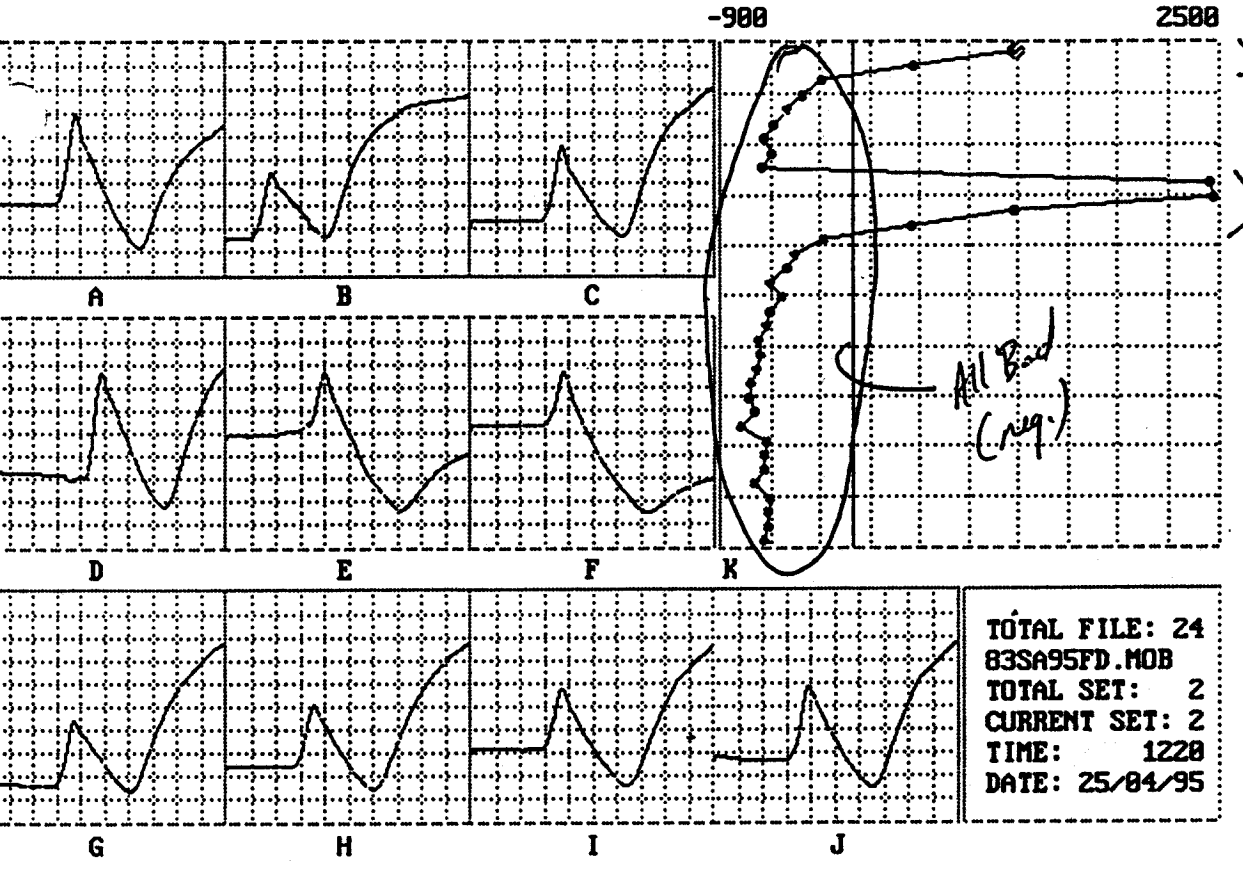
— PROBE 8 (6) FAIL AGAIN.

— CREEL READINGS ARE LOW.



- SEE SHEET D10.

PROBE 8 (G) WORKING AGAIN.



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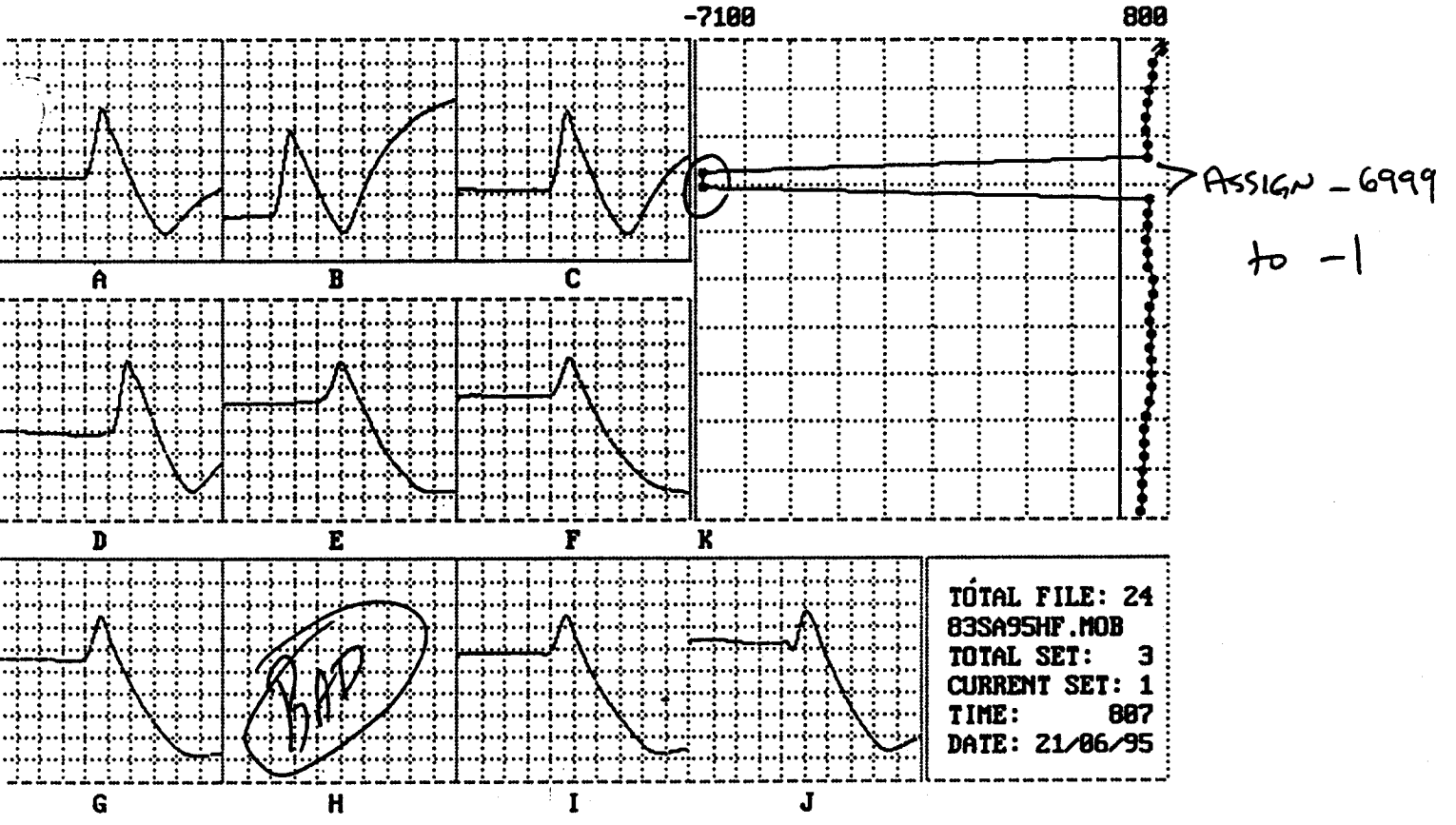
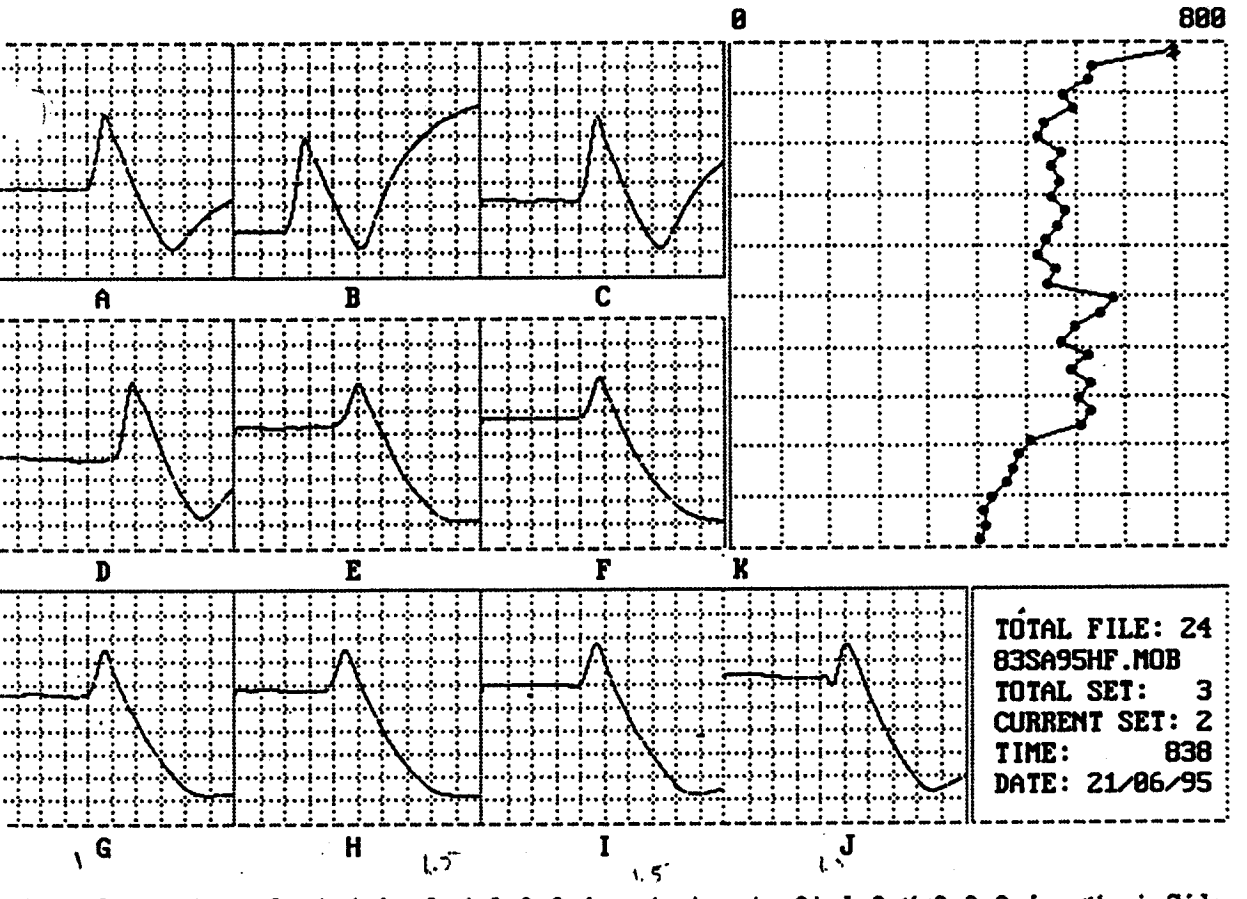
ODD FAILURE FOR CRREC DEVISE



ASSIGN -6999 to -1



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TRACES SHIFTED TO THE RIGHT. CHECK IF DEFAULT LENGTHS USED VERSUS MOBILE WITH ADJUSTED LENGTHS.

Appendix D-3: GPS Section 831801 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 SMP pilot.

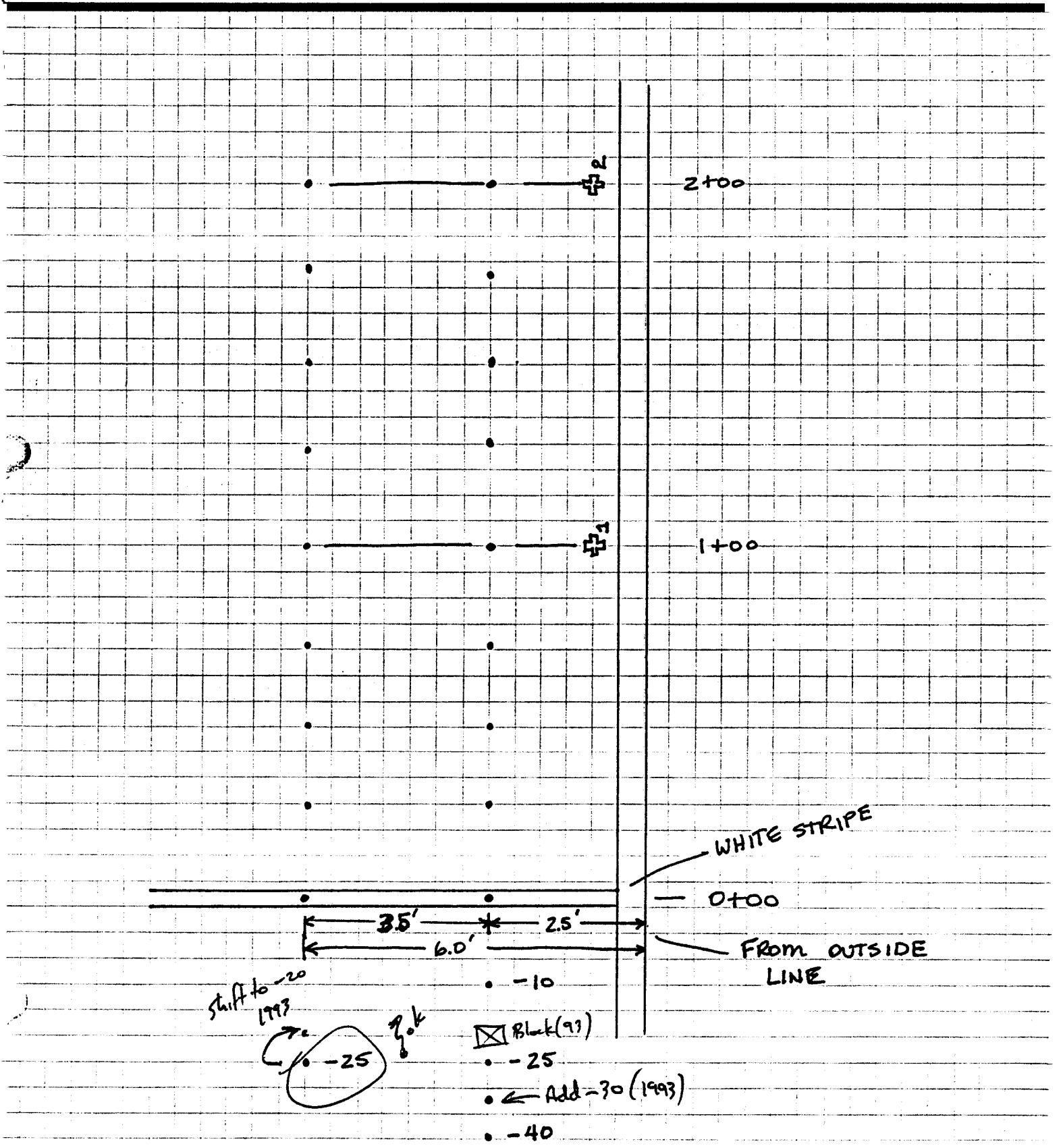
1991

BRAUN[SM]
INTERTEC

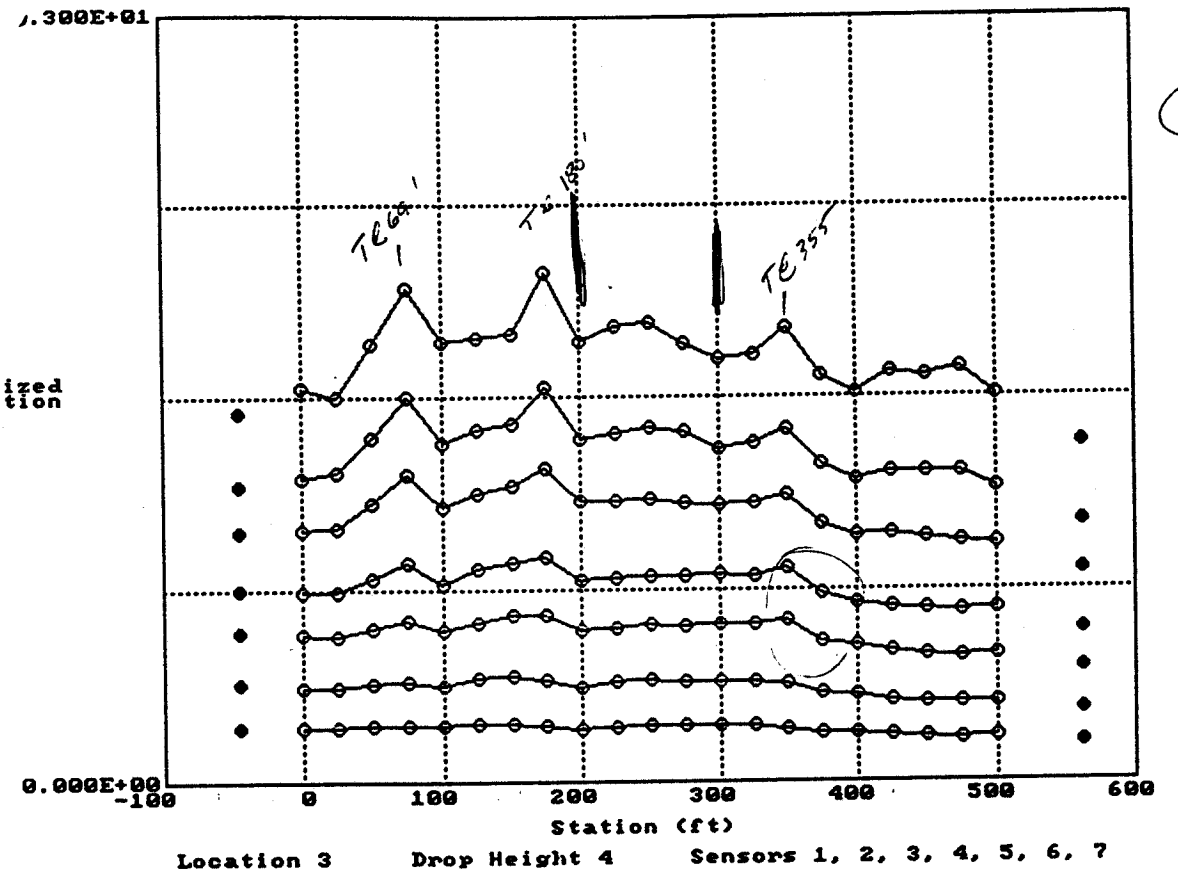
Description: 831801 MANITOBA
SEASONAL FWD LAYOUT

Project No:

Date: 1991 By:



1991 DATA



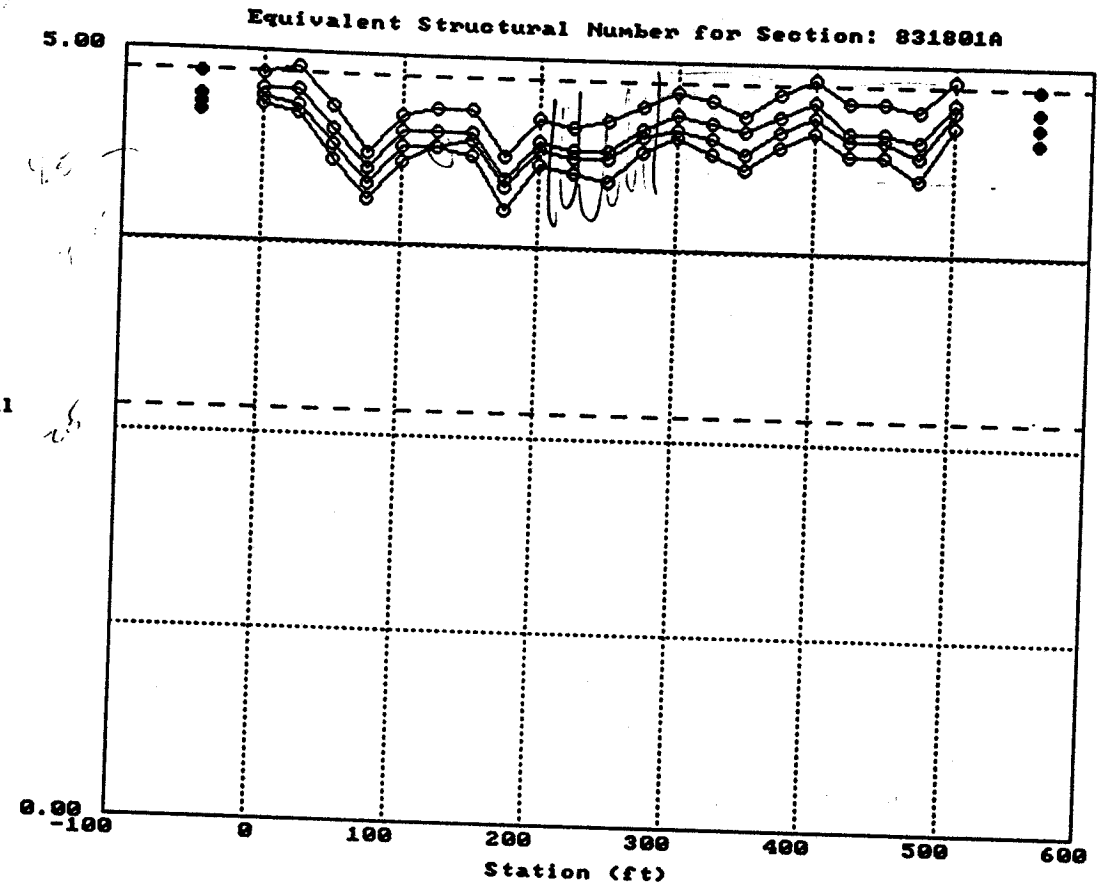
Location 3 Drop Height 4 Sensors 1, 2, 3, 4, 5, 6, 7

F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

0 - 200

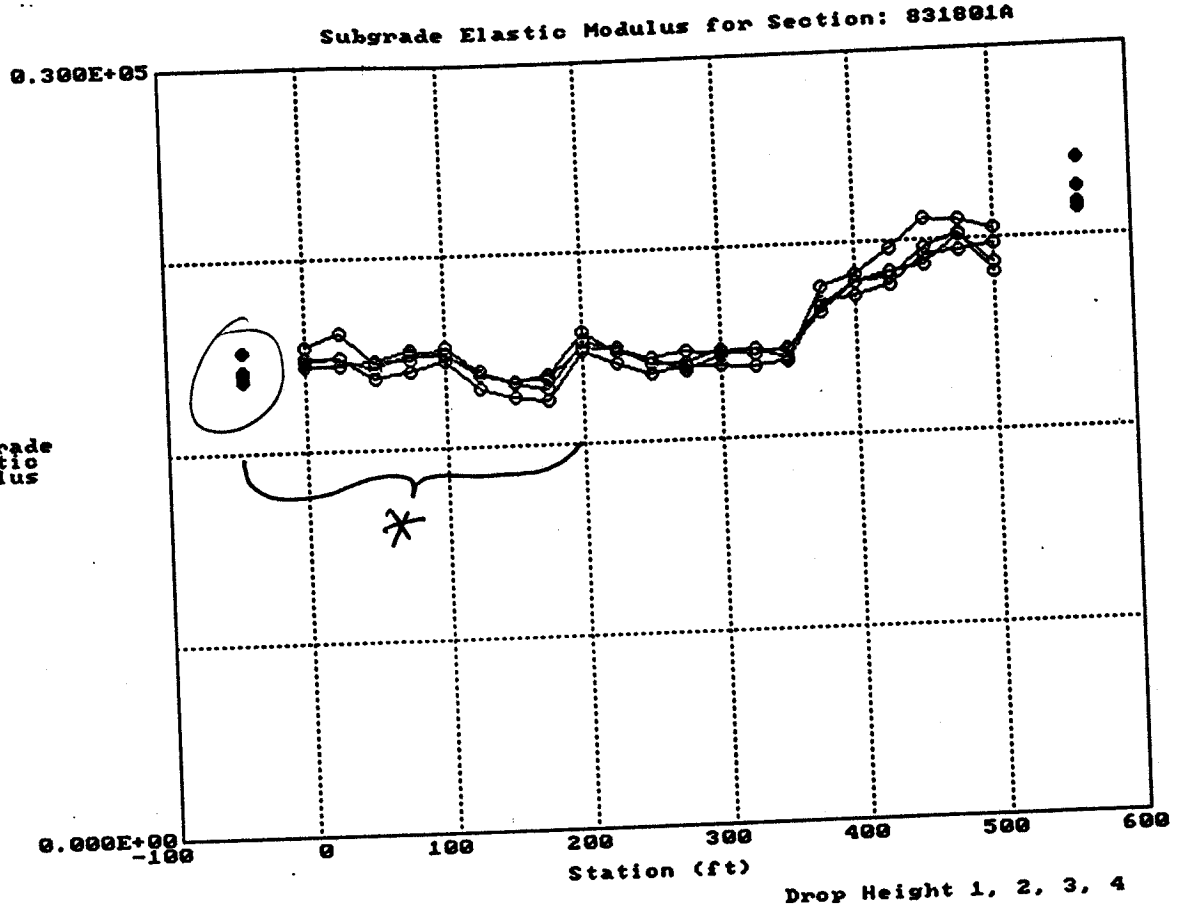
Cond. Ok

- DEFL.
- SN - 300 - 500
- Subgrade - 0 - 200 * especially for testpit area



F10:ExitPlots

Drop Height 1, 2, 3, 4



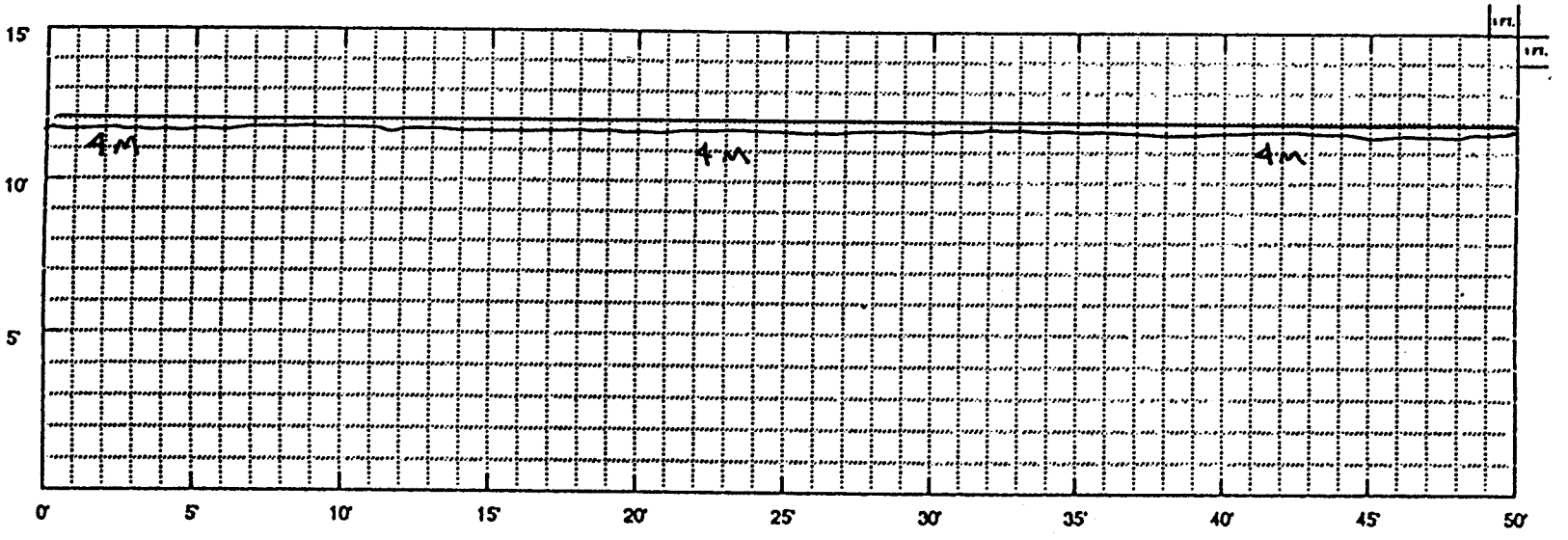
F10:ExitPlots

Date 5/9/91

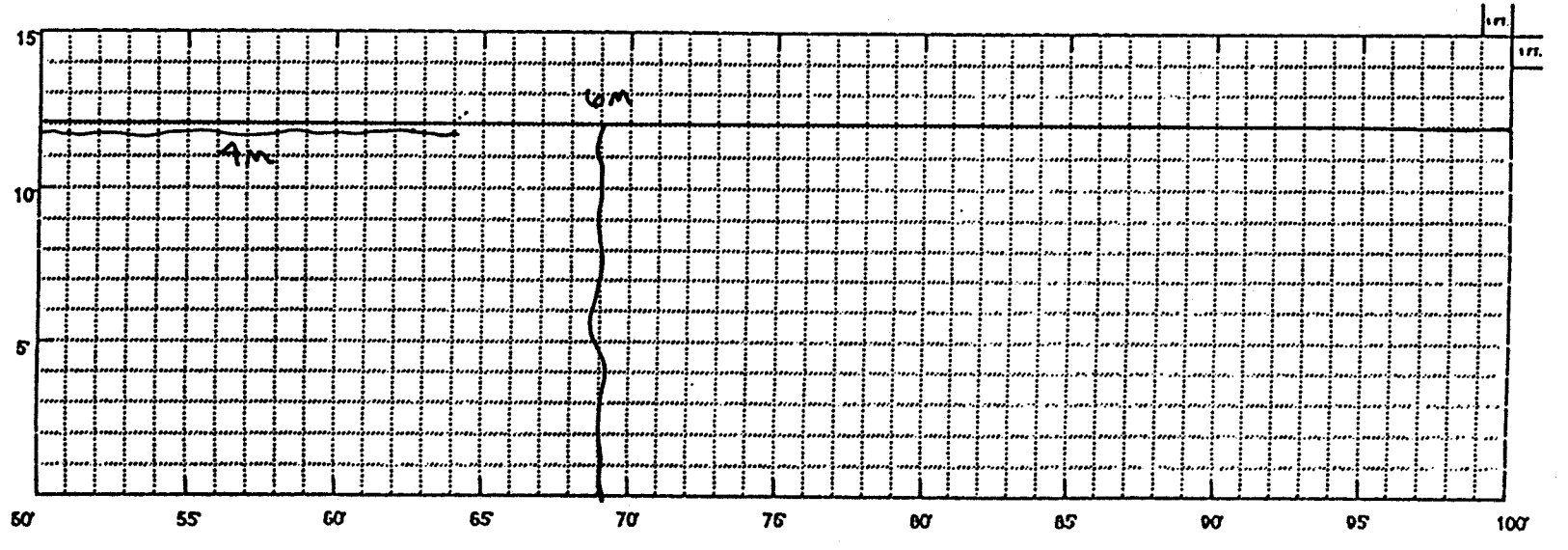
State Assigned ID ____

State Code 83

SHRP Section ID 1801



Comments: _____



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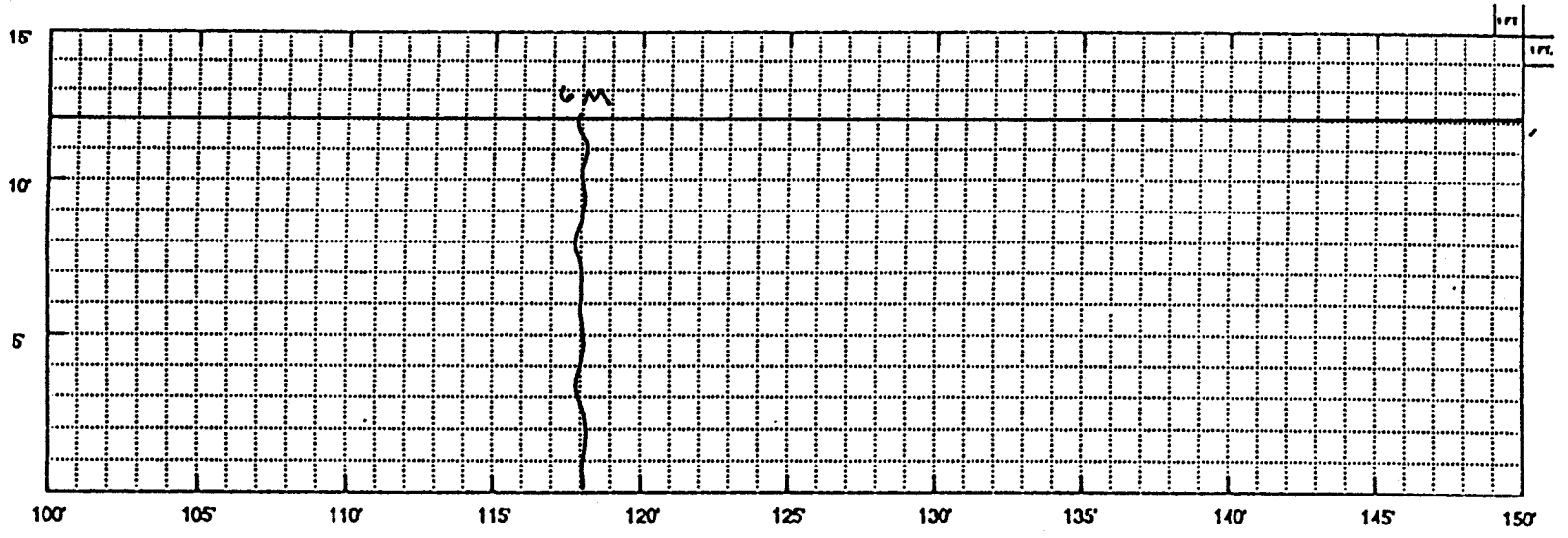
State Code 83

SHRP Section ID 1801



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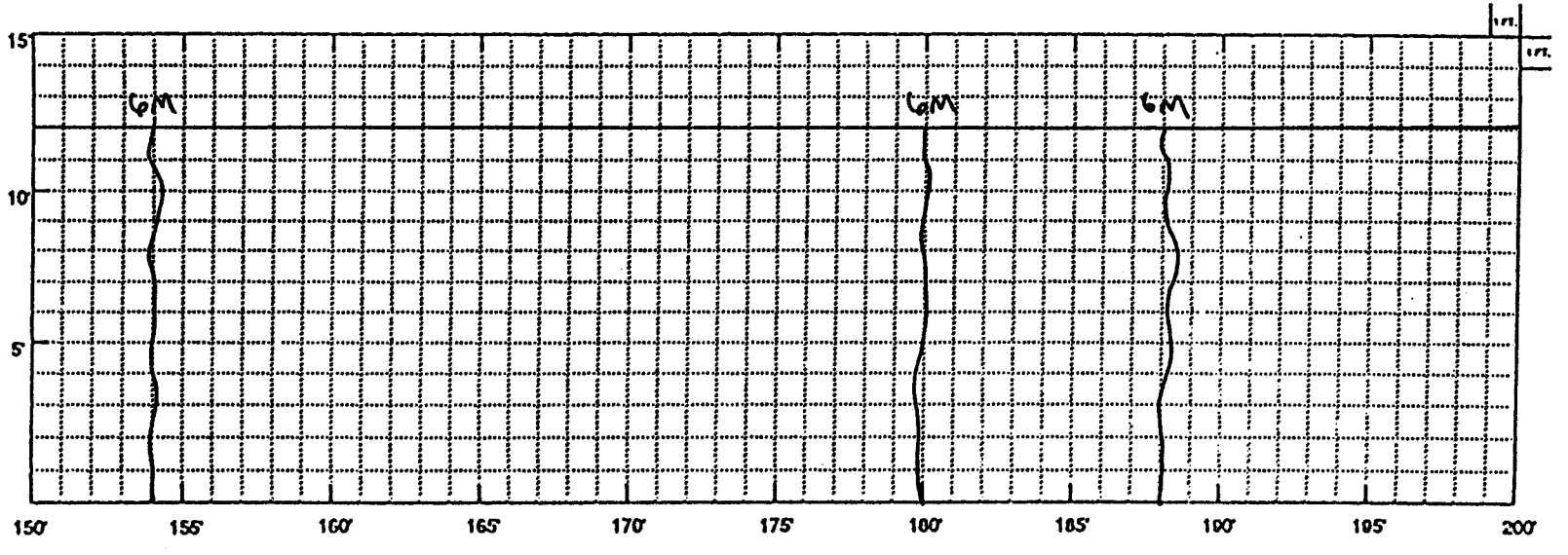

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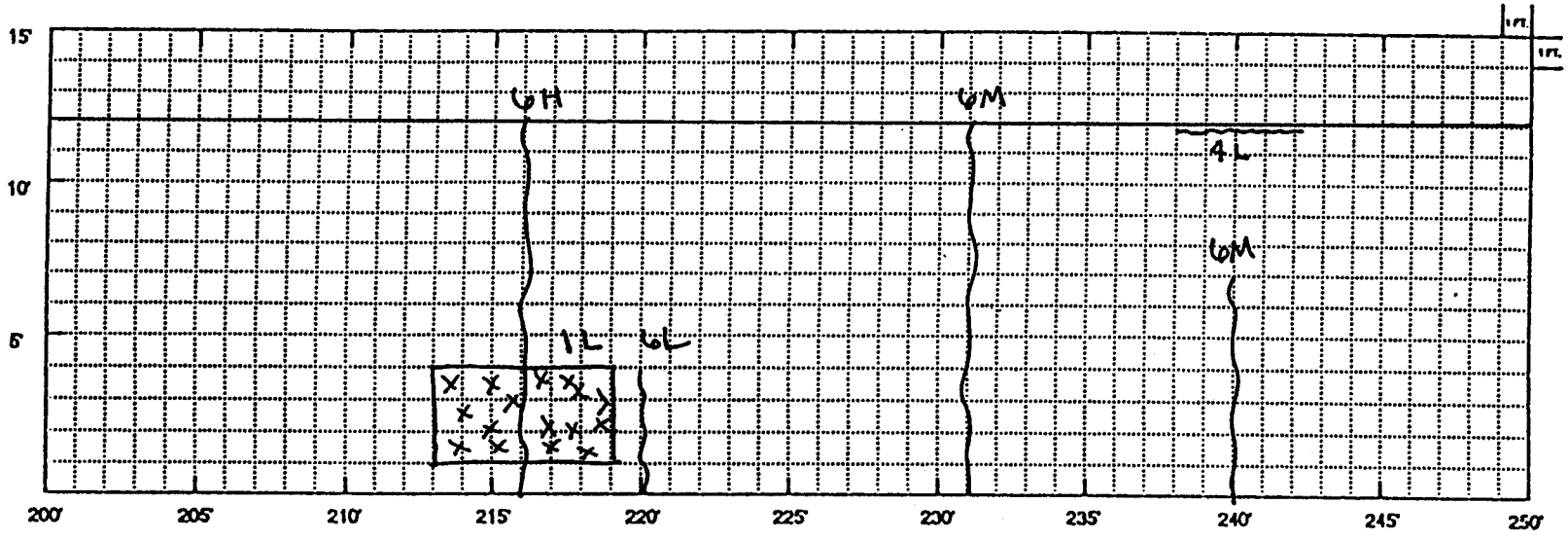

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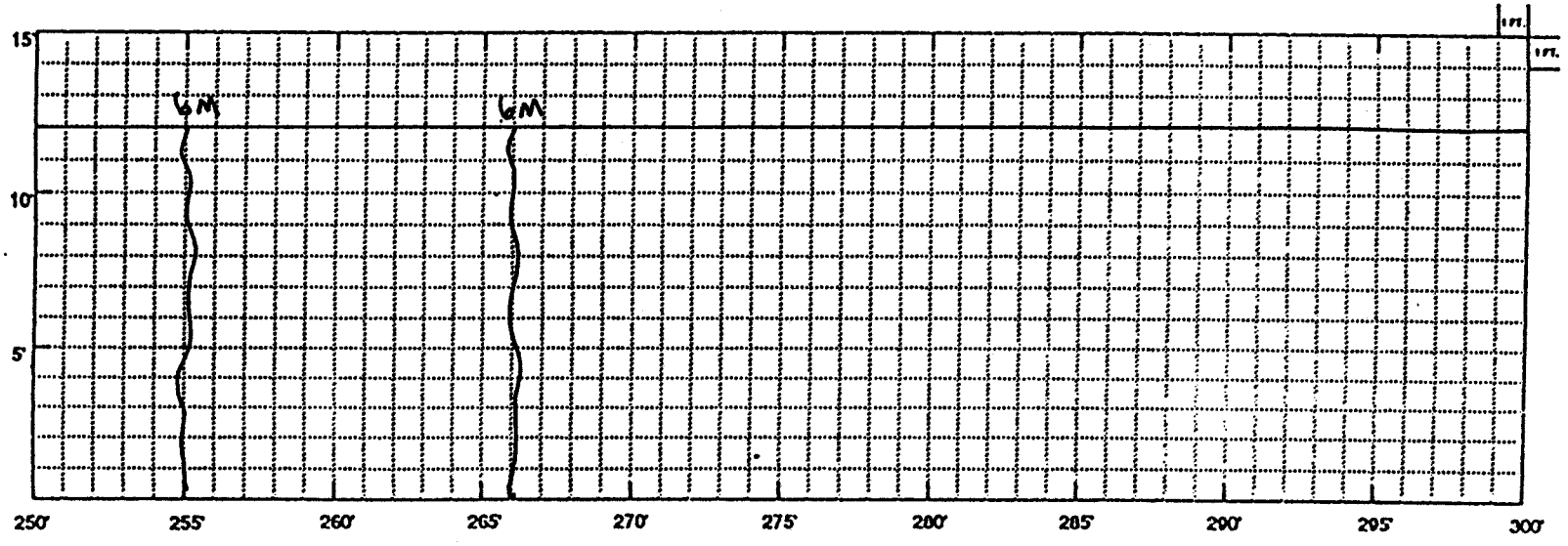

Comments: _____

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State Code 8 3

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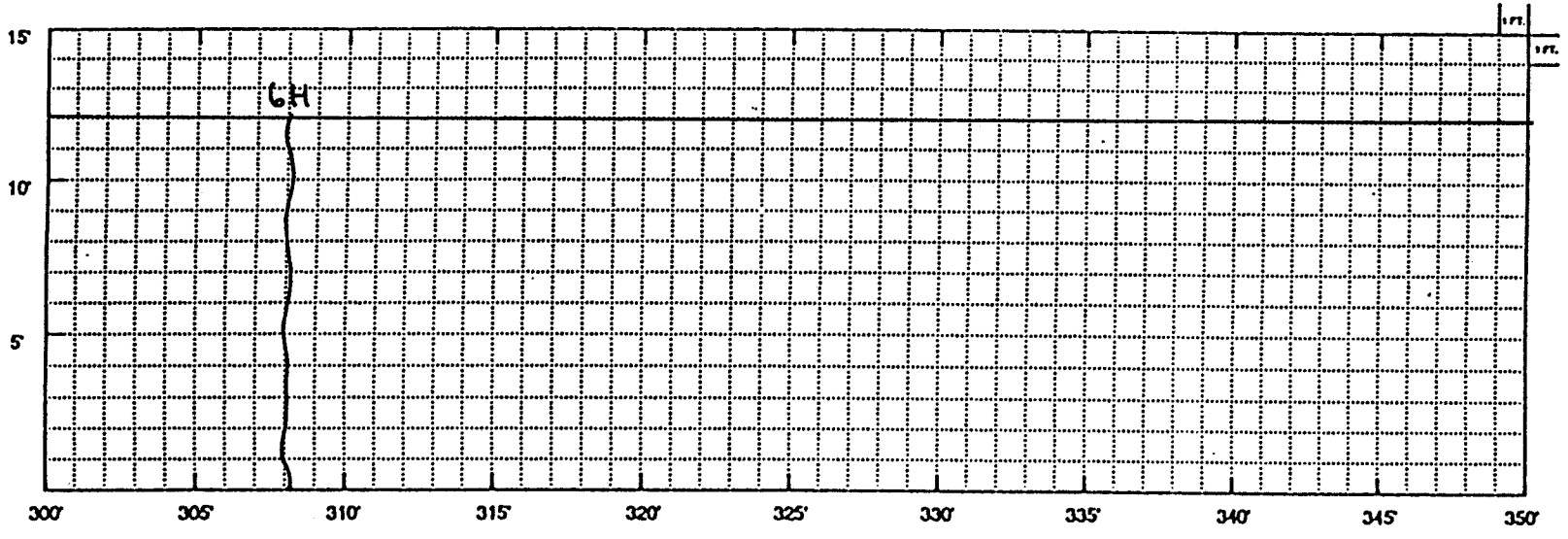

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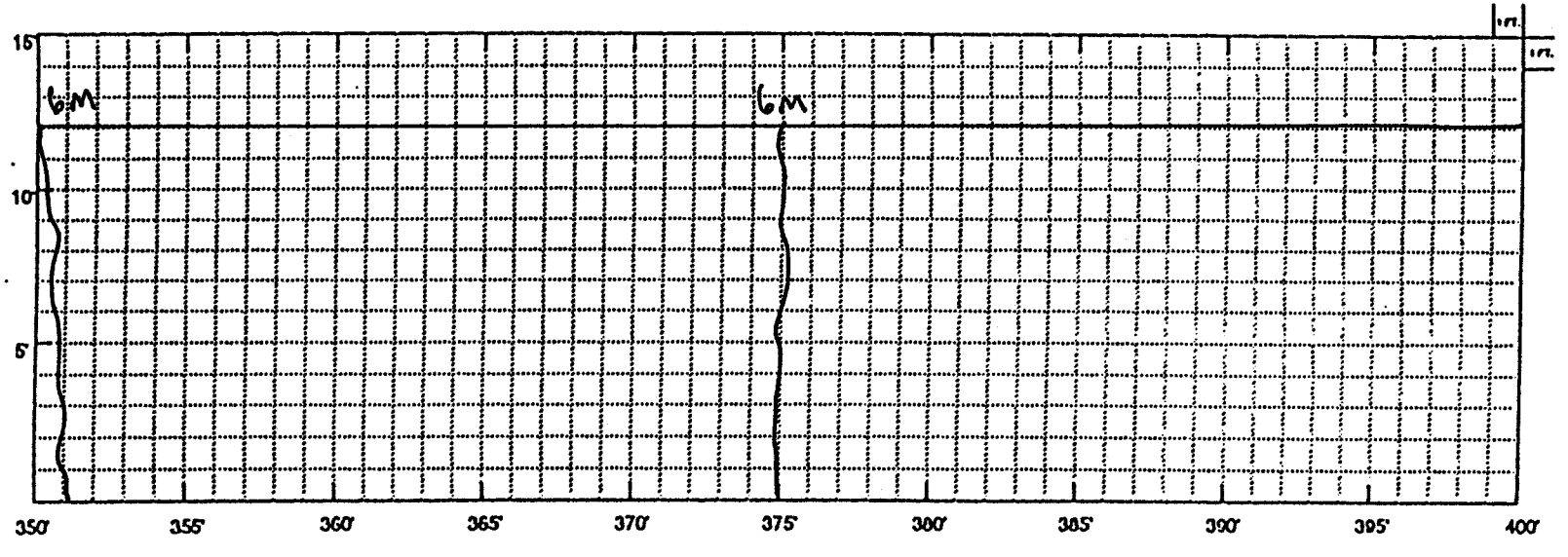

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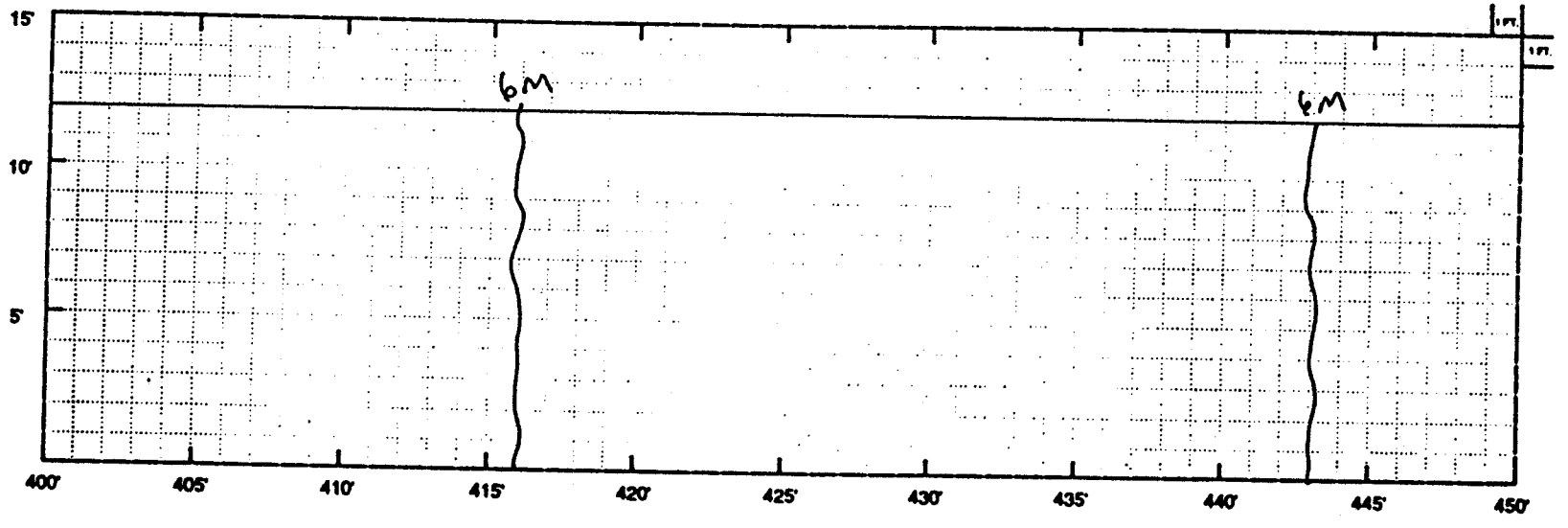

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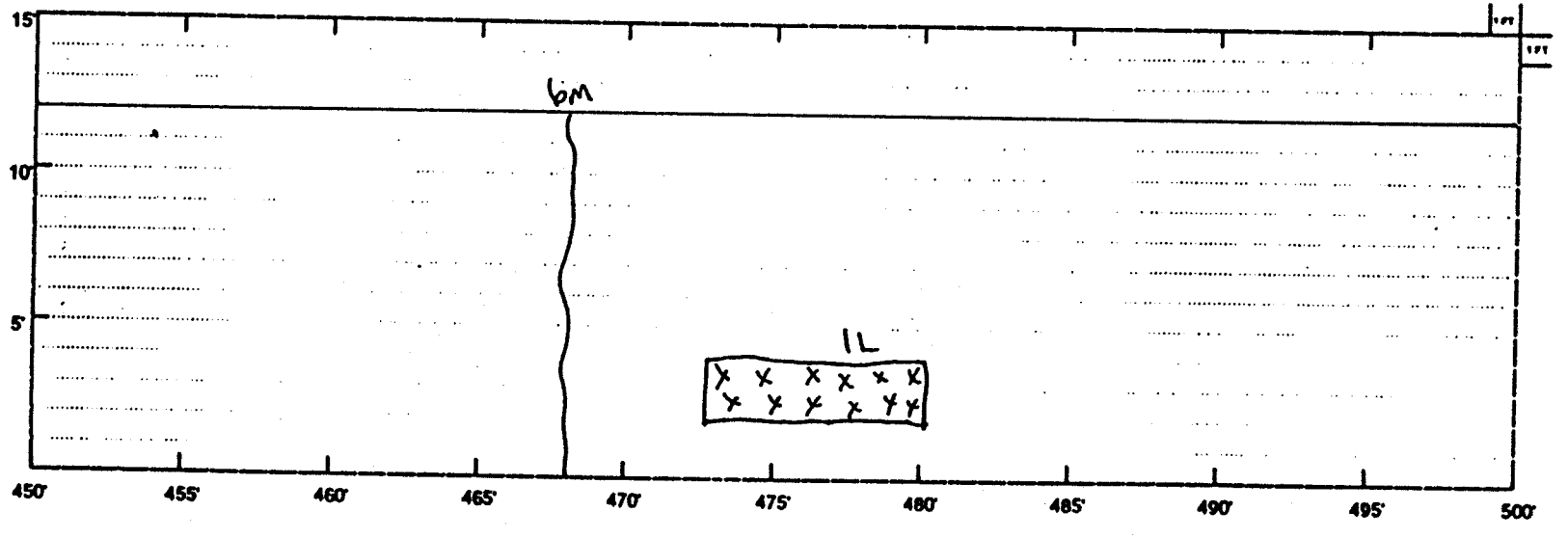
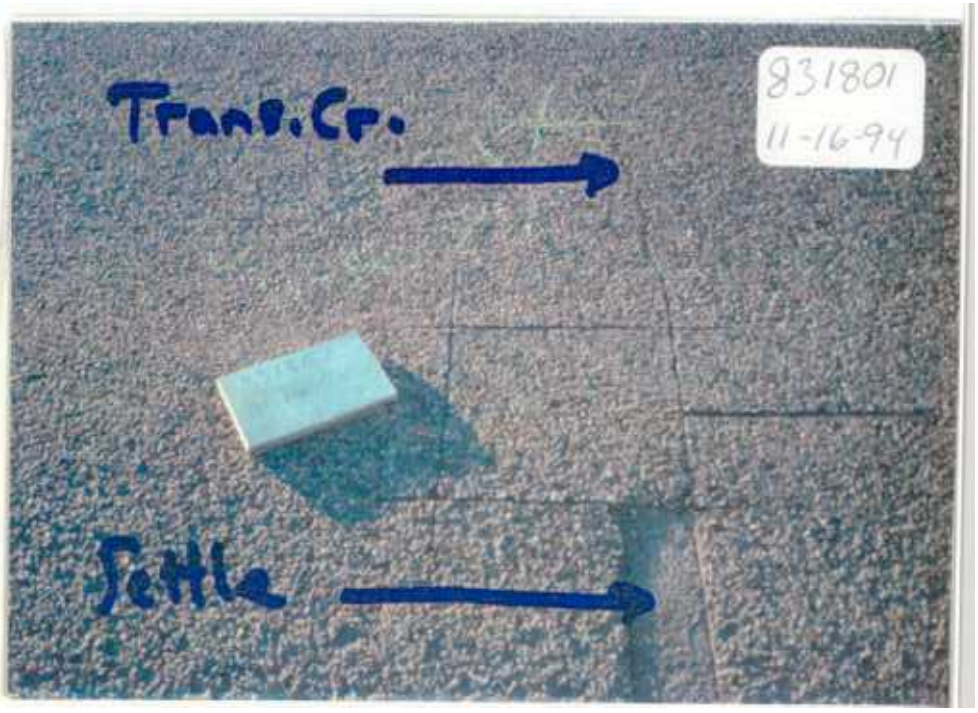
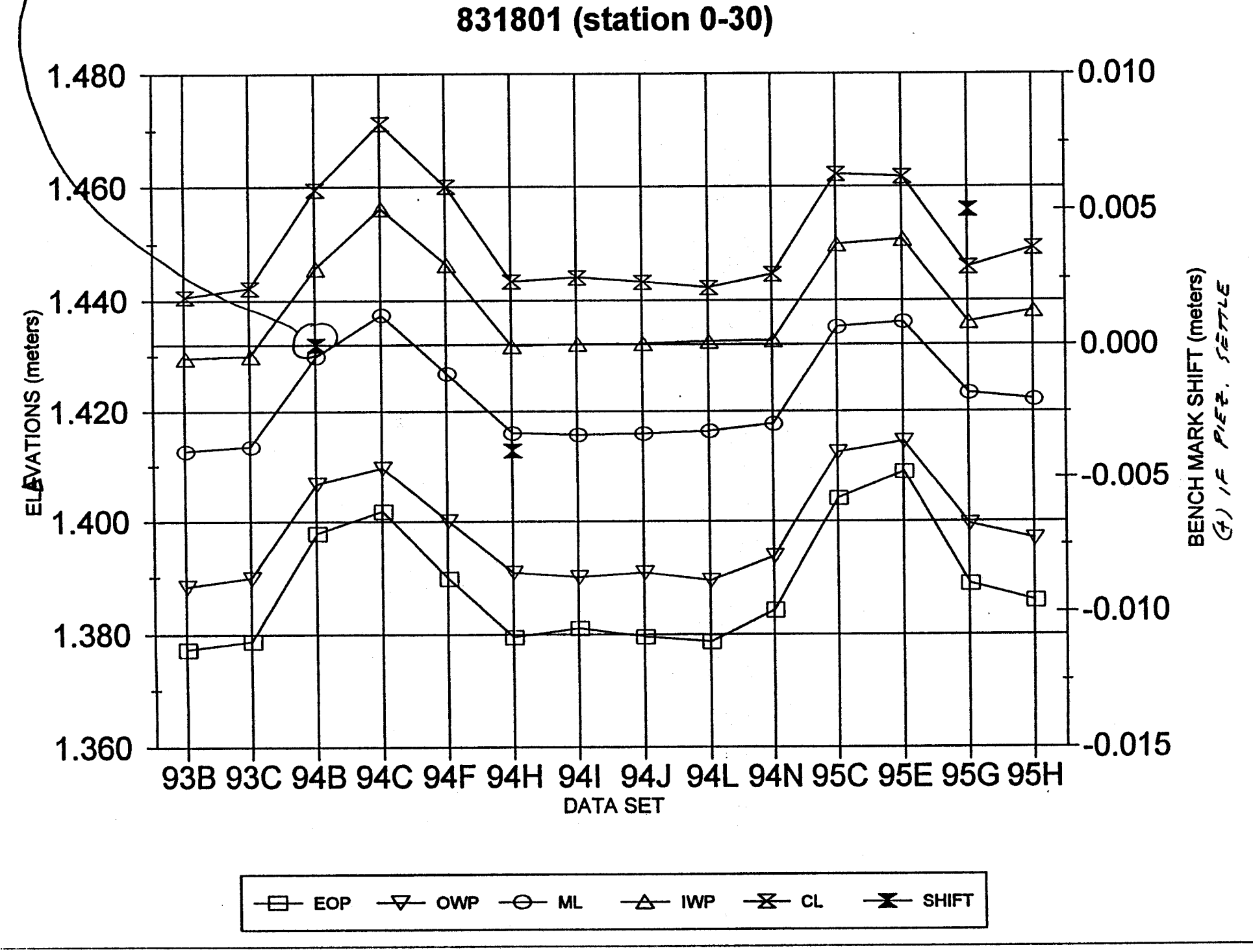


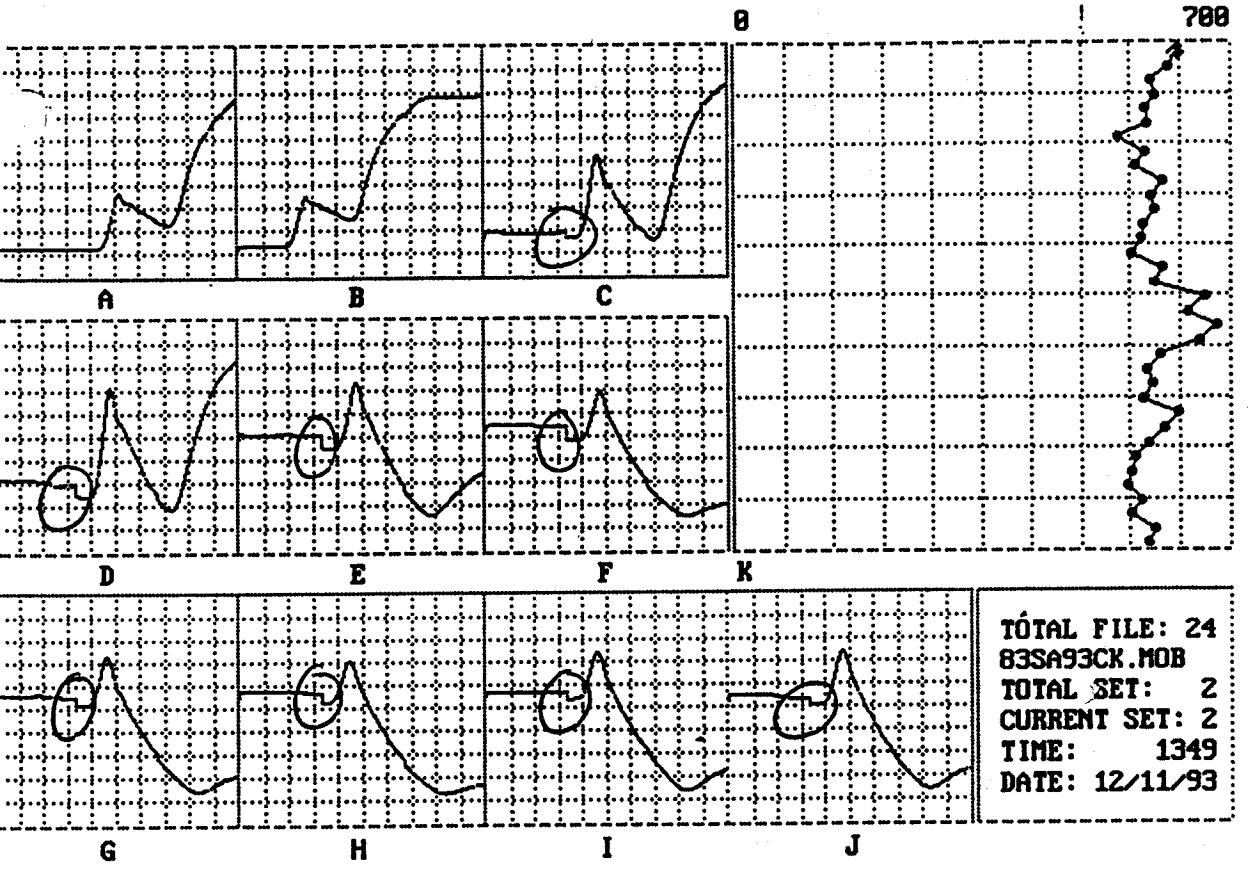
Comments: _____


831801
13-DEC-93


831801
11-16-94
Trans. Cp.
Kettle

N.: PIEZ. ELEV. FAST AFTER FROST FOR B.

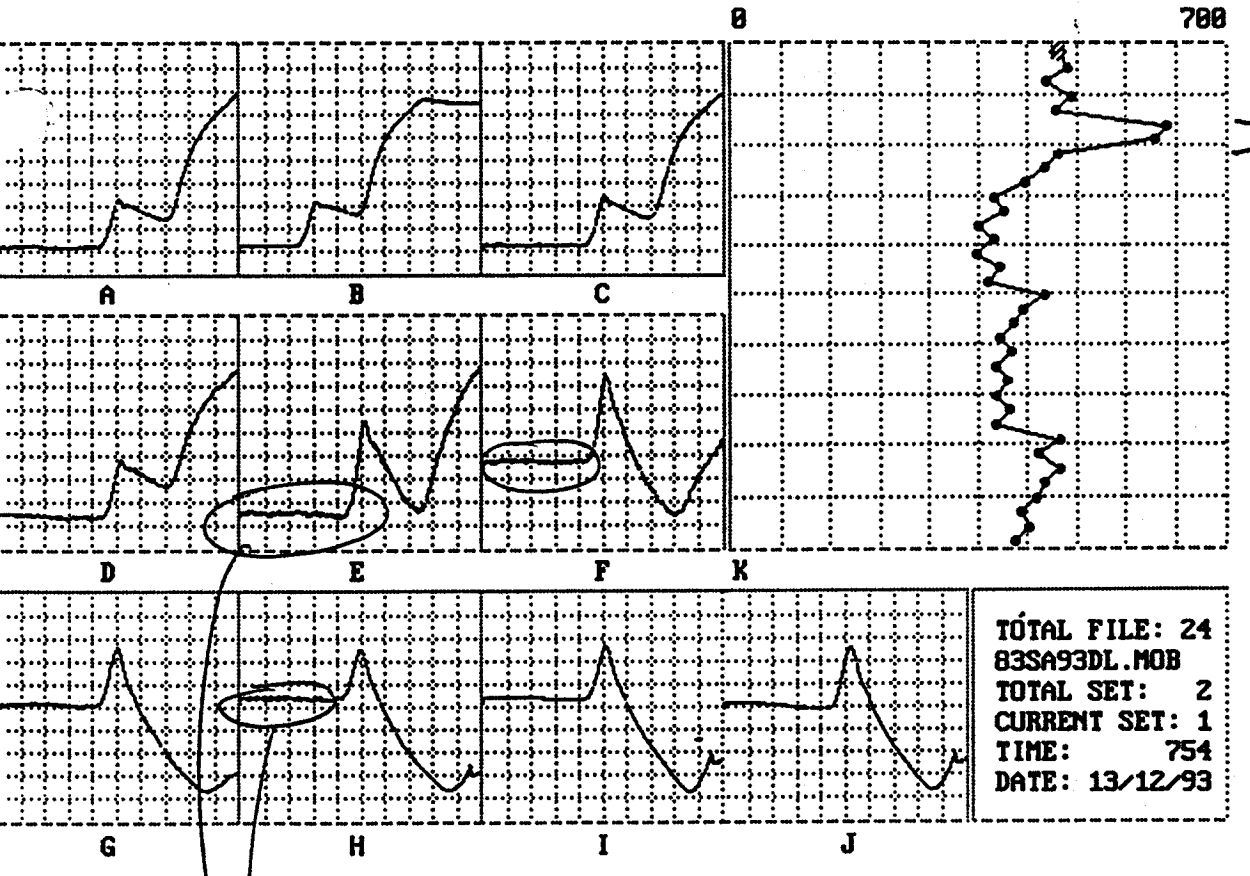




ESTIMATE ABOUT 600mV UNFROZEN

ter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

Circled shifts from cold temperature problem with cable reader. Data is still okay.


0
700
A
B
C
D
E
F
K
G
H
I
J
TOTAL FILE: 24
83SA93DL.MOB
TOTAL SET: 2
CURRENT SET: 1
TIME: 754
DATE: 13/12/93
Frost
- check data for warming trend 2nd week of December.
Noise observed when very cold air temperatures regarding cable reader
etter=Curve to select (*): PgU/PgD=Prior/Next set: Ctrl+PgU/PgD=Prior/Next File

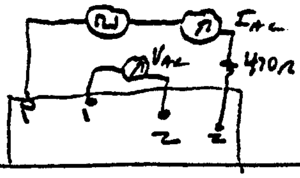
ASONAC 83180
Au Ave MB

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.

Entered: Y4R



ENTERED JAN 18 1995

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LTPP Seasonal Monitoring ~~Study~~ Data Sheet ~~R1~~ D03 Contact Resistance Measurements	* State Code [83] * Test Section Number [1801]

1. Date (Month - Day - Year) Nov [11 - 12 - 93]

2. Time Measurements Began (Military) [1150]

3. Comments AC POWER TO FUNCTION GENERATOR AND FHWA BOX

Test Position	Connections I_1 V_1	Connections I_2 V_2	Voltage (ACV) Range Setting	Voltage (ACV) Reading	Current (ACA) Range Setting	Current (ACA) Reading	Notes	R = E/I
1	1	2	V ac	7.96	mA ac milli	1062		7500
2	3	2		8.25		.976		8500
3	3	4		8.72		.770		11300
4	5	4		8.41		.822		10200
5	5	6		7.35		1.257		5800
6	7	6		6.76		1.550		4400
7	7	8		6.29		1.729		3600
8	9	8		5.41		2.139		2500
9	9	10		4.50		2.560		1800
10	11	10		3.17		3.330		1000
11	11	12		2.75		3.641		800
12	13	12		2.67		3.667		700
13	13	14		2.54		3.740		700
14	15	14		2.281	milli	3.911		600
15	15	16		1.863	mA ac	4.45		400
16	17	16		1.730		4.79		400
17	17	18		2.230		4.18		500
18	19	18		2.281		4.08		600
19	19	20		1.599		4.60		300
20	21	20		1.524		4.61		300
21	21	22		1.501		4.71		300
22	23	22		1.218		4.93		200
~~23~~	~~23~~	~~24~~		~~¥0.601~~		~~¥00.01~~	* Problem w/ CH. 24 on FHWA Box	
24	25	24		1.359		4.83		300
25	25	26		1.543		4.65		300
26	27	26		2.308		3.97		600
27	27	28		2.267		4.10		600
28	29	28		1.563		4.62		300
29	29	30		1.545		4.65		300
30	31	30		1.400		4.75		300
31	31	32		1.322		4.86		300
32	33	32		1.459		4.72		300
33	33	34		1.656		4.46		400
34	35	34		1.554		4.54		300
35	35	36		1.290		4.79		300
36	37	38						
37	38	39						
38	39	40						

Margin notes: positions 1–4 FROZ; positions 5–8 TRAN.

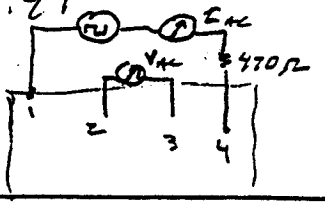
do not enter #23

~~Simplified comment~~ Problem with test position 23 on switch box.

Preparer Robert Van Sambeek Employer Braun Intertec

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

Entered: 4/N



835A93C

Seasonal Monitoring Program Guidelines: Version 1.1/June 1993

LTPP Seasonal Monitoring Study Data Sheet ~~R2~~ D04 Four-Point Resistivity Measurements	* State Code [83] * Test Section Number [1801]

1. Date (Month - Day - Year) NOV [14-12-93]
2. Time Measurements Began (Military) [1140]
3. Comments USING DC POWER TO FUNCTION GENERATOR AND FHWA 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	(mV)	330.0	milli	.857	
2	2	3	4	5		319.4		1120	
3	3	4	5	6		345.6		1146	
4	4	5	6	7		185.3		993	
5	5	6	7	8		221.3		1,405	
6	6	7	8	9		- 188.6		1,909	
7	7	8	9	10		- 135.0		2177	
8	8	9	10	11		181.3		2660	
9	9	10	11	12		89.0		2822	
10	10	11	12	13		158.3		3383	
11	11	12	13	14		104.3		3809	
12	12	13	14	15		94.6	milli	3.864	
13	13	14	15	16		105.7	(mA)	4.35	
14	14	15	16	17		84.9		4.26	
15	15	16	17	18		75.0		4.13	
16	16	17	18	19		73.7		4.63	
17	17	18	19	20		81.6		4.80	
18	18	19	20	21		62.8		4.24	
19	19	20	21	22		68.5		4.63	
20	20	21	22	23		72.0		5.04	
~~21~~	~~21~~	~~22~~	~~23~~	~~24~~		~~0.0~~		~~0.01~~	PROBLEM W/ CHANNEL 24 ON FHWA BOX
22	22	23	24	25		64.7		4.80	
23	23	24	25	26		68.0		4.78	
24	24	25	26	27		58.0		4.22	
25	25	26	27	28		71.0		4.70	
26	26	27	28	29		75.1		4.63	
27	27	28	29	30		68.4		4.16	
28	28	29	30	31		80.1		4.75	
29	29	30	31	32		81.7		4.68	
30	30	31	32	33		80.0		4.64	
31	31	32	33	34		~~78.5~~		4.67	
32	32	33	34	35		89.4		4.72	
33	33	34	35	36		81.8		4.80	

do not enter 21

Preparer [illegible] Employer [illegible]

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

Entered: 11/

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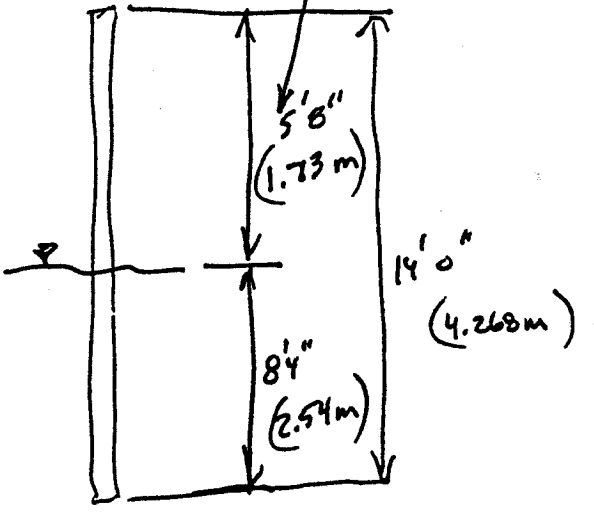
LTPP Seasonal Monitoring Study Form ~~W5~~ D05 Ground Water Table Measurement	State Code [83] Test Section Number [1801]

Number	Time	Well Depth ~~(ft)~~	Water Depth (ft)	Weather Conditions*	Comments
1	~~9:03~~	~~14'~~	~~8'4"~~	CLOUDY	
2	0903	4.268M	1.73m	CLOUDY	
3					
4			ENTER DEPTH TO H2O		
5					

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



Collected by: ARH Employer: BRAUN INTERTEC Date: Oct 10-13-93

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

Entered: 4/11

835A938

Assume Time ~1000 (Comment in Smpcheck)

LTPP Seasonal Monitoring Study Form E2 D08 Transverse Profile Measurements-AC	State Code (83) GPS Section No. 831801 Test Section Number (___) Sheet 1 of 2

STA	BS	HI	IFS	TFS	ELEV	REMARKS
Bm	1.1756	~~11.1756~~			~~10.0000~~	
BM	1.1756				~~10.0000~~	CHECK BACK

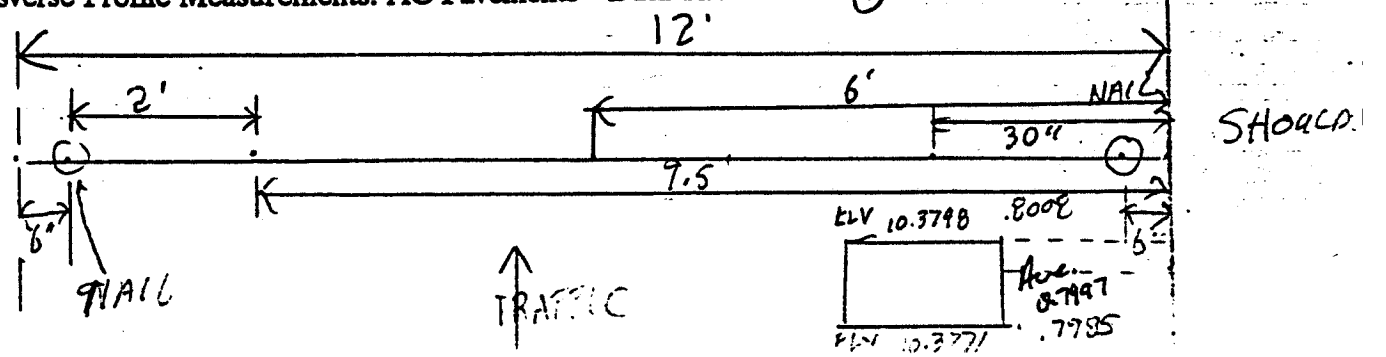
TYPE OF INSTRUMENT LEICA WILD NA 2000

STA	EOP	OWP	MID	IWP	CL	REMARKS
0+30	.7983	.7872	.7629	.7460	.7349	
ELEV	~~10.3773~~	~~10.3884~~	~~10.4127~~	~~10.4296~~	~~10.4407~~	
0+20	.8088	~~0.7997~~	.7735	.7584	.7459	
ELEV	~~10.3668~~		~~10.4021~~	~~10.4172~~	~~10.4297~~	
0+10	.8180	.8080	.7834	.7682	.7554	
ELEV	~~10.3676~~	~~10.3776~~	~~10.4022~~	~~10.4174~~	~~10.4302~~	
0+00	.8265	.8168	.7922	.7775	.7662	11.775
ELEV	~~10.3491~~	~~10.3588~~	~~10.3834~~	~~10.3981~~	~~10.4094~~	
0+25	.8533	.8433	.8176	.8026	.7903	
ELEV	~~10.3223~~	~~10.3323~~	~~10.3580~~	~~10.3730~~	~~10.3853~~	
0+50	.8829	.8731	.8490	.8344	.8221	
ELEV	~~10.2927~~	~~10.3025~~	~~10.3268~~	~~10.3412~~	~~10.3535~~	
0+75	.9104	.8973	.8724	.8615	.8493	
ELEV	~~10.2652~~	~~10.2783~~	~~10.3032~~	~~10.3141~~	~~10.3263~~	
1+00	.9336	.9175	.8918	.8795	.8707	
ELEV	~~10.2420~~	~~10.2581~~	~~10.2838~~	~~10.2967~~	~~10.3077~~	

RECHECK .9337

Prepared by: RRW/DM Employer: BRAUN INTERTEC Date: Oct 10-13-93

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



Entered 1441

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LTPP Seasonal Monitoring Study Form ~~E2~~ D08 Transverse Profile Measurements-AC			State Code (__) GPS Section No. 931801 Test Section Number (___) Sheet 2 of 2			
STA	BS	HI	IFS	TFS	ELEV	REMARKS
		11.1756				
TYPE OF INSTRUMENT LEICA WILD NA2000						
STA	EOP	OWP	MID	IWP	CL	REMARKS
1+25	.9567	.9470	.9211	.9040	.8938	
ELEV	~~10.2181~~	~~10.2333~~	~~10.2575~~	~~10.2711~~	~~10.2813~~	
1+50	.9694	.9599	.9350	.9237	.9143	
ELEV	~~10.2052~~	~~10.2157~~	~~10.2393~~	~~10.2511~~	~~10.2613~~	
1+75	.9822	.9732	.9429	.9322	.9224	
ELEV	~~10.1937~~	~~10.2022~~	~~10.2333~~	~~10.2411~~	~~10.2513~~	
2+00	.9678	.9617	.9389	.9225	.9122	
ELEV	~~10.2058~~	~~10.2119~~	~~10.2361~~	~~10.2531~~	~~10.2634~~	
+	--.----	--.----	--.----	--.----	--.----	
ELEV	--.----	--.----	--.----	--.----	--.----	
+	--.----	--.----	--.----	--.----	--.----	
ELEV	--.----	--.----	--.----	--.----	--.----	
+	--.----	--.----	--.----	--.----	--.----	
ELEV	--.----	--.----	--.----	--.----	--.----	
+	--.----	--.----	--.----	--.----	--.----	
ELEV	--.----	--.----	--.----	--.----	--.----	

Prepared by: BRU/DM Employer: _____ Date: Oct 10-13-93

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.

83SA - 831801, PTH-1 WB LANES, 46 KM WEST OF BRANDON, MB

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	
27-Aug-92																					X		
10-Jun-93																				X			
14-Jun-93																			X				
12-Oct-93	93A														X	1	1						INSTALLATION, MANUAL TDR DATA COLLECTION.
13-Oct-93	93B	X	X	X	X	X					X	X			X	3	3						NO RESISTIVITY SWITCH BOX.
12-Nov-93	93C	X	X	X	X	X			X	X	X	X			X	3	3						ADDED RELAY TO ONSITE PANEL, TWO ONSITE FILES.
18-Nov-93																					X		SCREEN GONE FROM TIPPING BUCKET, NOTICED 13DEC93.
13-Dec-93	93D	X	X	X	X	X					X				X	2	2						POLE PULLED DOWN, REPLACED UNION, RESET POLE. NO SWITCH BOX
17-Jan-94	94A	X	X	X	X	X										0	0						WEATHER CONDITIONS LIMITED TESTING.
14-Feb-94	94B	X	X	X	X	X			X	X	X	X			X	3	3		X				REPLACED SCREEN ON RAIN GAUGE.
18-Feb-94																					X		PROFILE DATA NOT RECIEVED BY RCO.
14-Mar-94	94C	X	X	X	X	X			X	X	X	X			X	3	3						
28-Mar-94	94D	X	X	X	X	X			X	X	X				X	3	3						MANY REPEAT FWD TESTS.
11-Apr-94	94E	X	X	X	X	X			X	X	X				X	3	3						
16-Apr-94																					X		PROFILE DATA NOT RECIEVED BY RCO.
29-Apr-94	94F	X	X	X	X	X			X	X	X	X			X	4	4						MANY REPEAT FWD TESTS.
13-May-94	94G	X	X	X	X	X			X	X	X				X	4	4						FWD D1 READINGS BAD.
17-Jun-94	94H	X	X	X	X	X			X	X	X	X			X	2	2						
18-Jul-94																					X		
25-Jul-94	94I	X	X	X	X	X			X	X	X	X			X	4	4						
18-Aug-94	94J	X	X	X	X	X			X	X	X	X			X	4	4		X				
21-Sep-94	94K	X	X	X	X	X			X	X	X				X	3	3						TWO RESISTIVITY SETS, CALIBRATION RESISTORS DO NOT CHECK.
19-Oct-94	94L	X	X	X	X	X			X	X	X	X			X	3	3						
12-Nov-94																					X		PROFILE DATA NOT RECIEVED BY RCO.
16-Nov-94	94M	X	X	X	X	X			X	X	X				X	3	3						
14-Dec-94	94N	X	X	X	X	X			X	X	X	X			X	3	3						BM ELEVATION DOES NOT CLOSE WITHIN SPEC., NO TIME TO RESHOOT.
23-Jan-95																					X		PROFILE DATA NOT RECIEVED BY RCO.
25-Jan-95	95A	X	X	X	X	X			X	X	X					0	0						WEATHER CONDITIONS LIMITED TESTING.

83SA - 831801, PTH-1 WB LANES, 46 KM WEST OF BRANDON, MB

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	
15-Feb-95	95B	X	X	X	X	X			X	X	X				X	1	1						WEATHER CONDITIONS LIMITED TESTING. ONSITE DOA.
14-Mar-95	95C	X	X	X	X	X			X	X	X	X			X	2	2						ONSITE DOA.
28-Mar-95	95D	X	X	X	X	X										0	0						WEATHER CONDITIONS LIMITED TESTING.
11-Apr-95	95E	X	X	X	X	X			X	X	X	X			X	2	2		X				
25-Apr-95	95F	X	X	X	X	X			X	X	X				X	3	3						
17-May-95	95G	X	X	X	X	X			X	X	X	X			X	3	3						
21-Jun-95	95H	X	X	X	X	X			X	X	X	X			X	1	2		X				WEATHER CONDITIONS LIMITED TESTING.

831801 - 83SA

Updated 31-Oct-95

LOCATION - PTH-1 WB Lanes, 27 Miles (46 Km) West of Brandon, MB
CONTACTS - Richard Murphy (204) 748-2227.
TEMP HOLES - Sta 0-03, Depths are about 0.8", 1.8", and 2.8" (AC thickness = 4.5").

DISTRESS COMMENTS:

Sta F1 - Tests at Sta 0-20 and at 25 foot intervals from Sta 0+00 to 2+00.

-20 LP ADJACENT TO INSTRUMENTATION HOLE AND L-TRANS.CR. UNDER D2
150 M-TRANS.CR. BETWEEN D6 AND D7
175 M-TRANS.CR. BETWEEN D6 AND D7

Sta F3 - Tests at Sta 0-30, 0-25, 0-10, and at 25 foot intervals from Sta 0+00 to Sta 2+00.

-25 D7 ON INSTRUMENTATION HOLE AND 1' BEHIND M-TRANS.CR.
-10 L-TRANS.CR. 6" IN FRONT OF D7
150 M-TRANS.CR. BETWEEN D6 AND D7
175 M-TRANS.CR. UNDER D7

PIEZOMETER - Sta 1+00, 2.0 feet from edge of paved shoulder, Depth = 4.303M.

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 at Sta 0-30, 0-20, 0-10, and every 25 feet from Sta 0+00 to Sta 2+00.

COMMENTS - In 1996, may want to install nails according to current guide lines.
- Traffic control - Devin (summer?), Bev (winter?), and John (regular).