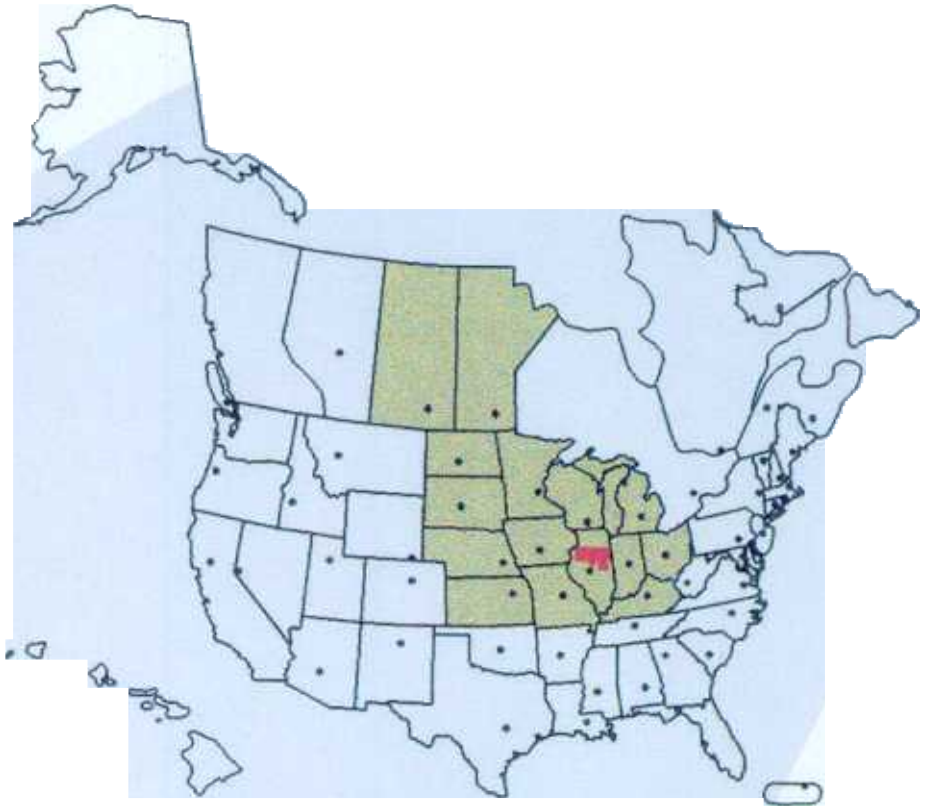
LTPP Seasonal Monitoring Program

Site Installation Report for SPS Section 390901 (39B) Delaware, Ohio

DTFH61-01-C-00085



November 15, 2001

LTPP

Submitted by
ERES CONSULTANTS
A Division of Applied Research Associates, Inc

LTPP Seasonal Monitoring Program

Site Installation Report for
SPS Section 390901 (39B)
Delaware, Ohio

FHWA Contract No. DTFH61-01-C-00085 **November 2001**

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Site Installation Report for SPS Section 390901 (39B) Delaware, Ohio

FHWA CONTRACT No. DTFH61-01-C-00085

Prepared by

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Prepared for

Federal Highway Administration
LTPP Division, HRDI-13
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

November 2001

Technical Report Documentation Page

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LTPP Seasonal Monitoring Program **Site Installation Report for SPS Section 390901(39B)** **Delaware, Ohio**	**November 15, 2001**
	6. Performing Organization Code
7. Author(s) **Haiming Huang**	
9. Performing Organization Name and Address **ERES Consultants** **A Division of Applied Research Associates, Inc.** **505 West University Avenue** **Champaign, Illinois 61820-3915**	10. Work Unit No.
	11. Contract or Grant No. **DTFH61-01-C-00085**
12. Sponsoring Agency Name and Address **Federal Highway Administration** **LTPP Division, HRDI-13** **Turner-Fairbanks Highway Research Center** **6300 Georgetown Pike** **McLean, Virginia 22101-2296**	13. Type of Report and Period Covered **Final Report** **July 1995 – June 1996**
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15. Supplementary Notes

FHWA LTPP Technical Representative - Jack Springer, HRDI-13

16. Abstract

This report contains instrumentation installation details and data collection summaries for SPS test section 390901, which is part of the core Seasonal Monitoring Program (SMP). This flexible asphalt concrete pavement section is located on the southbound outside lane of U.S. 23, approximately 5 miles north of Delaware, Ohio. This is an SPS-9 section in the "wet-freeze" climatic zone, meeting the requirements of SMP cell number 4.

The SMP instrument installation was carried out in accordance with the LTPP SMP installation guidelines with few deviations. The equipment installed included MRC thermistor probes, TDR probes, CRREL resistivity probes, and piezometer.

The construction of the pavement sections started in the spring of 1995. The SMP instrument was installed in August 1995 and the surface layer was placed in October 1995. The Ohio Department of Transportation started regular data collection on June 14, 1996, and the North Central Regional Support Contractor reported herein started regular data collection on May 14, 1998.

17. Keyword	18. Distribution Statement
Long Term Pavement Performance, LTPP, Seasonal Monitoring Program, SMP, Pavement Instrumentation, Time Domain Reflectometry, TDR, Piezometer, Resistance, Frost, Thaw, Temperature, Thermistor, Water Table, Falling Weight Deflectometer, FWD	**No restrictions. This document is available to the public from the sponsoring agency.**

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Unclassified	**Unclassified**		

Table of Content

LTPP Seasonal Monitoring Program
Site Installation Report for SPS Section 390901 (39B)
Delaware, Ohio

I. Introduction

The Strategic Highway Research Program (SHRP) initiated a series of General Pavement Studies (GPS) and Specific Pavement Studies (SPS) to evaluate several key performance parameters of highway pavement. As part of the national effort, the Ohio Department of Transportation (ODOT) constructed a series of pavement test sections on U.S. 23 in Delaware County. Four SPS experiments are included, SPS-1, SPS-2, SPS-8, and SPS-9. The test sections were instrumented by ODOT and six contracted universities in the state of Ohio. The instrumentation plan is more comprehensive but includes all instrumentation proposed under the Long Term Pavement Performance (LTPP).

Under the request of the Federal Highway Administration (FHWA) LTPP Division, the North Central Regional Support Contractor (NCRSC) put together installation reports for two Seasonal Monitoring Program (SMP) sites based on available information gathered from ODOT and participating universities. This report contains information specific to instrument installation and monitoring data collection for the LTPP SPS section 390901, which is part of the core SMP under the FHWA LTPP Division.

A. Test Site Location

SPS section 390901 is located on southbound outside lane of U.S. 23, approximately 5 miles north of Delaware, Ohio. The beginning of the section is at station 278+50. The detailed site location is shown in the maps included in appendix A. The information includes the following:

- SMP location map
- Detailed section location map

B. Test Section Information

The pavement in the test section is a flexible asphalt pavement and consists of the following pavement layers:

- 100 mm (4 in) asphalt concrete (AC)
- 300 mm (12 in) asphalt treated base (ATB)
- 100 mm (4 in) permeable asphalt treated base (PATB)
- 150 mm (6 in) Dense Graded Aggregate Base (DGAB)

Actual layer thickness and additional background information about the section are also shown in appendix A. The information includes the following:

- Actual layer thickness and material type
- Base and subgrade moisture data

Construction of the subgrade was completed on July 25, 1995. The instrument was installed in August 1995 and construction of the AC surface layer was completed on October 9, 1995.

The geographic location and existing pavement structure place this section in cell 4 of the SMP experiment, which is defined by the following parameters:

- Flexible thin (<5 in.) asphalt concrete surface
- Fine-grained subgrade
- Freezing environment
- Wet environment

II. Instrumentation Installation

A. Pre-Installation Activities

The pre-installation activities include selections of sensors, installation procedures, and location of instrumentation. Two workshops held in Columbus, Ohio, in 1993 brought together experts in instrumentation from the FHWA, universities, several state Departments of Transportation, and the U.S. Army Corps of Engineers. During these workshops, experiences obtained from Mn/Road, North Carolina Test pavement, I-80 in Iowa, Denver Airport, U.S. 33 and S.R. 2 in Ohio, and the Alberta Research Council were shared and discussed. These discussions provided information and background for planning this project.

Sensors for environmental factors at SMP sites were selected in consultation with FHWA personnel charged with coordination of the LTPP program for SHRP. The following sensors were selected for the installation of SMP instrument at this section:

- MRC thermistor probes to monitor pavement layer temperature
- TDR probes to monitor volumetric water content
- CRREL resistivity probes to monitor frost depth
- Piezometer to monitor ground water table

Instrumentation checks/calibrations were performed before the installation. The results from instrumentation checks/calibration are included in appendix B using the following forms:

- 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

Other pre-installation monitoring activities, such as FWD testing and manual distress surveys, were not conducted because of the new pavement construction at this site.

B. Installation Activities

After the construction of subgrade, subbase, and base, a 300 mm instrumentation hole was drilled at a specified location in August 1995. Seasonal instruments (MRC Thermistor, TDR, and DRREL Resistivity probes) were placed in the hole, and the hole was backfilled by the university team. Upon completion of the paving process, a 51-mm diameter core was drilled in the surface layer. Thermistor probes were epoxied to the cores, and then the core was reinserted and resealed.

An underground concrete cell was constructed to house the data acquisition equipment. It is located in the grass median, approximately 35 ft from the edge of the traffic lane where the instrumentation hole resides. Other seasonal instrumentation installed in 1995 includes a piezometer. No rain gauge and air temperature probe were installed at this section in 1995 installation.

Some deviations from the April 1994 *LTPP Seasonal Monitoring Program: Instrumentation and Data Collection Guidelines* were observed. The followings are the major deviations observed at this site:

- No air temperature probe and rain gauge were installed.
- The underground cell was constructed to house the data acquisition equipment, instead of using a roadside cabinet for this purpose.
- No instrumentation hole was drilled from the pavement surface because the probes were buried in the lower pavement layer before the surface layer placement.

The installation was completed by the Ohio DOT and Case Western Reserve University. Dr. Ludwig Figueroa form Case Western Reserve University can be contacted for further information regarding the installation. The other people involved with the installation are listed on "Data Sheet SMP–I01: list of Installed Instrumentation," which is included in appendix C, along with the following other SMP installation forms:

- 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-I06: TDR Moisture content

Appendix C also contains some photographs of instrumentation installation. It should be noted that these photographs are not particularly from the section 390901. However, they are from other sections at the same site and would be very similar to the installation done on the section 390901.

III. SMP Data Collection

A. Initial SMP Data Collection

Data readings were not taken until several months after the completed installation. ODOT started the seasonal data collection on June 14, 1996. NCRSC started the seasonal data collection in March 1998. The NCRSC collected its first set of FWD data at this section on May 14, 1998, along with SMP onsite and manual data. The manual data collected includes resistivity, elevation, and water table (see appendix D for the following):

- Data Sheet SMP-D10: SMP Field Activity Report
- Data Sheet SMP-C06: Resistivity Calibration Block Check
- Data Sheet SMP-D03: Contact Resistance Measurements
- Data Sheet SMP-D04: Four-Point Resistivity Measurements
- Data Sheet SMP-D05: Ground Water Table Measurements
- Data Sheet SMP-D08: Surface Elevation Measurements – AC Pavements

B. Routine SMP Data Collection

The NCRSC collected routing data at this SMP site from May 1998 to May 1999 on a monthly basis. Detailed data collection activities are summarized in the table in appendix D. In addition, the ODOT and participating universities collect SMP data regularly. For more detailed information on these data collection activities, contact Mr. Issam Khoury from Ohio University.

IV. Summary

The Ohio Department of Transportation constructed a series of pavement test sections on U.S. 23 in Delaware County. The test sections were instrumented by ODOT and six contracted universities in the state of Ohio.

This report contains information specific to the SMP instrument installation and monitoring data collection for the LTPP SPS section 390901, which is part of the core SMP program under the FHWA LTPP Division. The following equipment was installed at the site:

- MRC thermistor probes to monitor pavement layer temperature
- TDR probes to monitor volumetric water content
- CRREL resistivity probes to monitor frost depth
- Piezometer to monitor ground water table

The SMP instrument installation was carried out in accordance with the LTPP SMP installation guidelines with few deviations. The followings are the major deviations observed at this site:

- No air temperature probe and rain gauge were installed.

- The underground cell was constructed to house the data acquisition equipment, instead of using a roadside cabinet for this purpose.
- No instrumentation hole was drilled from the pavement surface because the probes were buried in the lower pavement layer before the surface layer placement.

The construction of the pavement sections started in the spring of 1995. The SMP instrument was installed in August 1995 and the surface layer was placed in October 1995. ODOT started regular data collection on June 14, 1996. North Central Regional Support Contractor started regular data collection on May14, 1998.

References

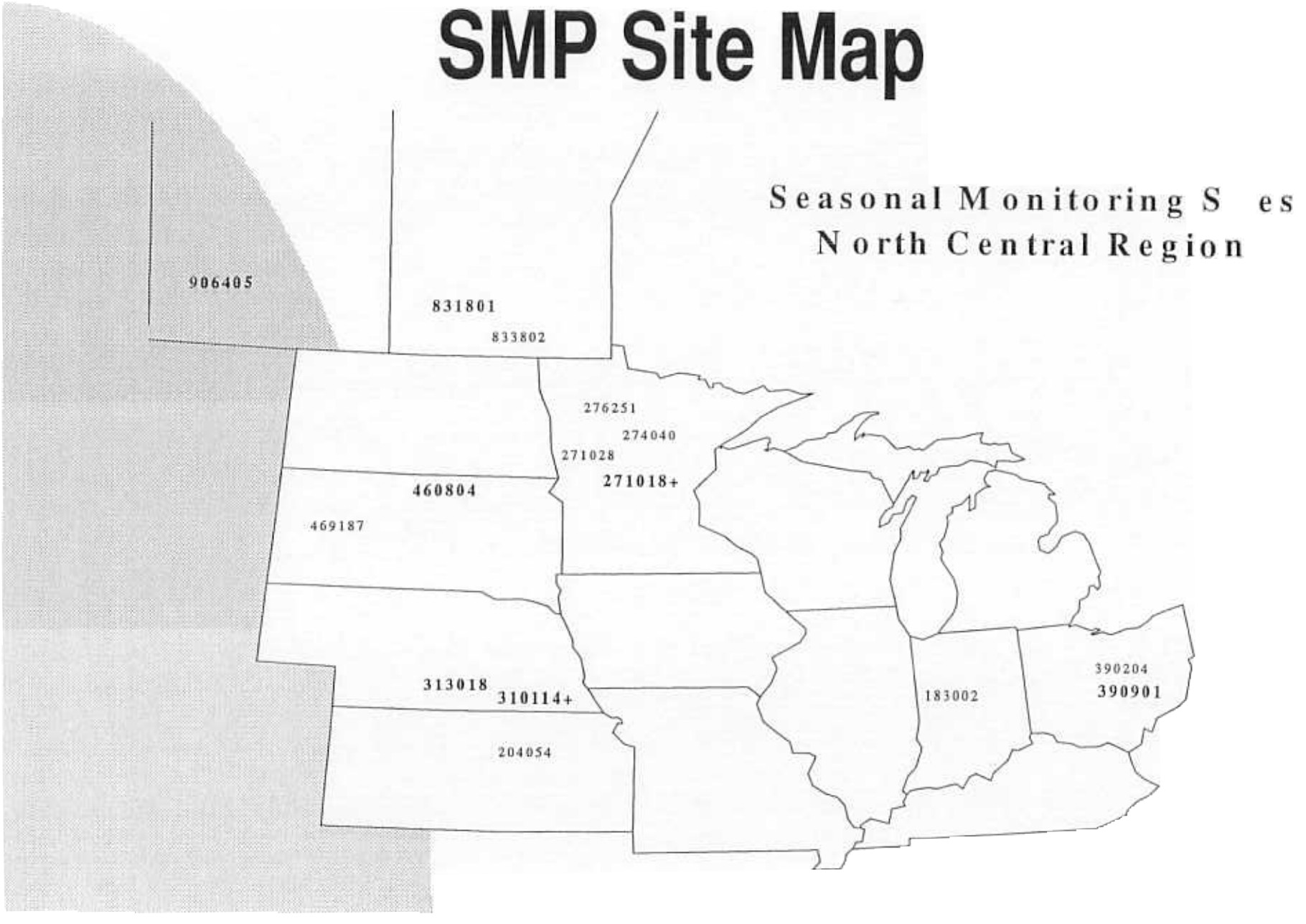
1. Center for Geotechnical and Environmental Research, Civil Engineering Department, Ohio University. *Instrumentation Plan for the Ohio SPS Test Pavement (DEL-23-17.48),* Draft final report for Ohio Department of Transportation and Federal Highway Administration. July 1994.

2. Turner-Fairbank Highway Research Center, Federal Highway Administration. *LTPP Seasonal Monitoring Program: Instrumentation Installation and Data Collection Guidelines.* April 1994.

Appendix A Test Section Background Information

1. SMP location map
2. Detailed section location map
3. Layer thickness and material type
4. Base and subgrade moisture data

SMP Site Map


Seasonal Monitoring S es
North Central Region
906405
831801
833802
276251
274040
271028
271018+
460804
469187
313018
310114+
204054
183002
390204
390901

Ohio Department of TRANSPORTATION

District Map

District 1
1885 North McCullough St.
Lima, Ohio 45801-0040
419-222-9055
fax: 419-222-0438

District 2
317 East Poe Rd.
Bowling Green, Ohio
43402
419-353-8131
fax: 419-353-1468

Distict 3
906 North Clark St.
Ashland, Ohio
44805-1989
800-276-4188
fax: 419-281-0874

District 4
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Ravenna, Ohio 44266
330-297-0801
fax: 330-297-1769

District 5
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Jacksontown, Ohio
43030-0306
740-323-4400
fax: 740-323-3715

District 6
400 East William St.
Delaware, Ohio 43015
800-372-7714
fax: 740-369-7437

District 7
1001 St. Mary's Ave.
SR 29 PO Box 969
Sidney, Ohio 45365-0969
937-492-1141
fax: 937-497-9734

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Lebanon, Ohio 45036-9518
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fax: 513-932-7651

Central Office
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614-466-7170
fax: 614-644-8662
ODOT Web Site: http://www.dot.state.oh.us

District 9
650 Eastern Ave.
Chillicothe, Ohio 45601
740-773-2691
fax: 740-775-4889

District 10
Box 658 Muskingum Drive
Marietta, Ohio 45750
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fax: 740-373-7317

District 11
2201 Reiser Ave.
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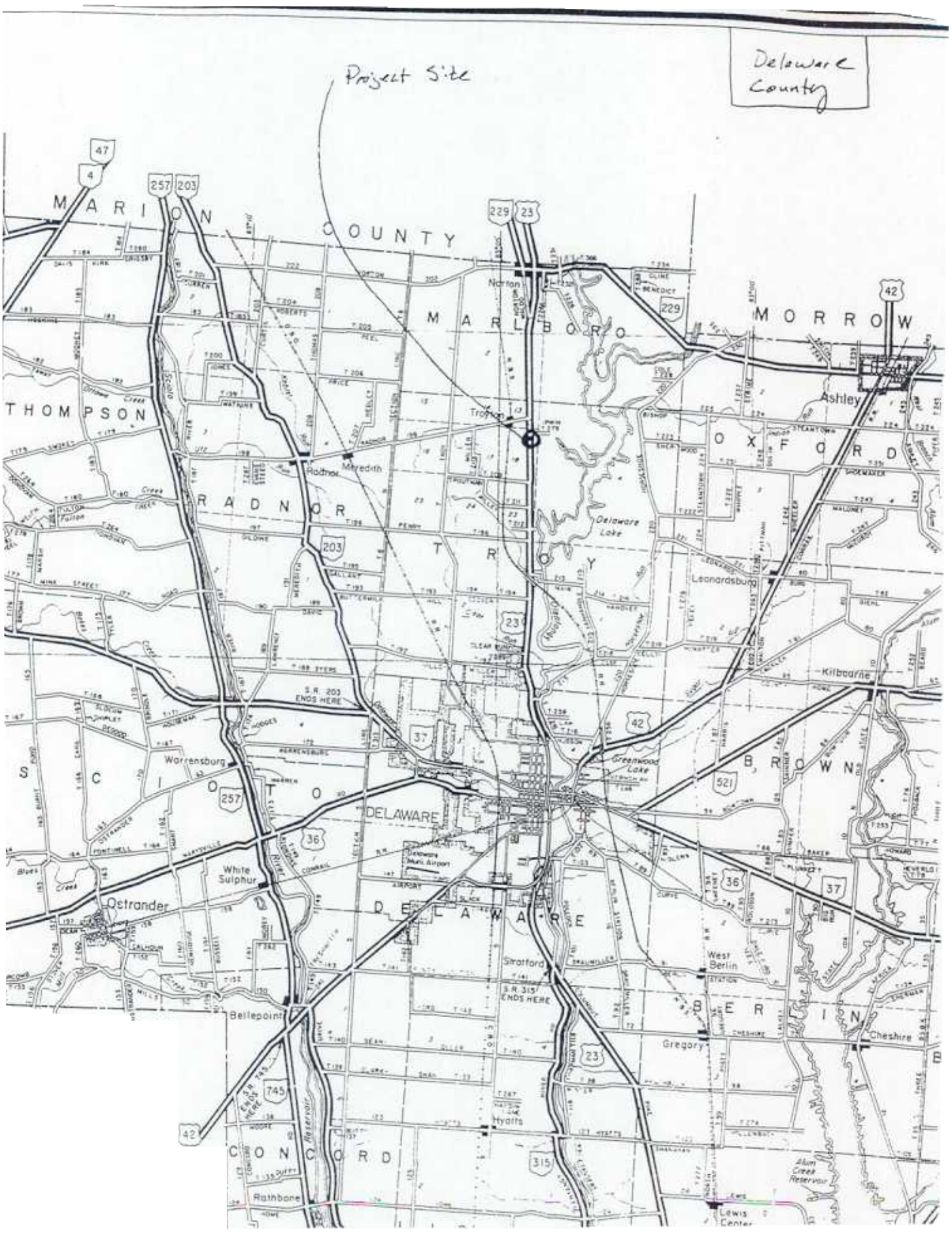
44663-3333
330-339-6633
fax: 330-308-3942

District 12
5500 Transportation Blvd.
Garfield Heights, OH
44125-5396
216-581-2100
fax: 216-587-1730

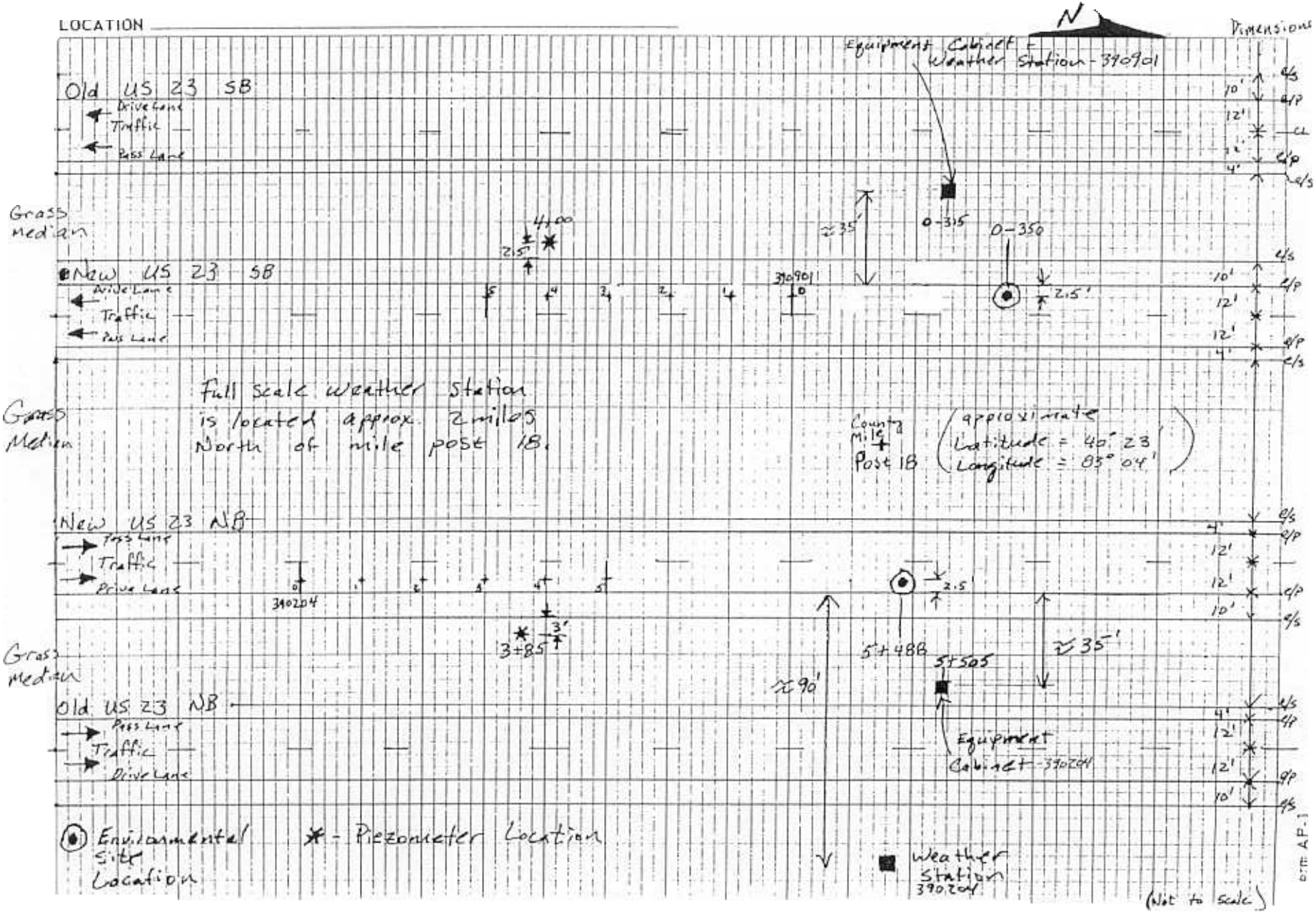

Project Site
Delaware County
MARION COUNTY
MARLBORO
MORROW
THOMPSON
RADNOR
TROY
OXFORD
BROWN
BERLIN
CONCORD
DELAWARE
Norton
Ashley
Meredith
Radnor
Delaware Lake
Leanardsburg
Kilbourne
Greenwood Lake
Warrensburg
Scioto
White Sulphur
Ostrander
Delaware Municipal Airport
Stratford
West Berlin
Bellepoint
Gregory
Cheshire
Hyatts
Rathbone
Alum Creek Reservoir
Lewis Center
S.R. 203 ENDS HERE
S.R. 315 ENDS HERE
47
4
257
203
229
23
42
37
36
521
745
315

SHP Site Information

SU EM

DEL-23

LOCATION



LAYER ELEVATION AND THICKNESS - SPS-9

shot = surveyed
plan = plan elevations

Example

Station 278+50 - 283+50
State 39
SPS # 09
Test Section 01

Project Sta. (NRP 8+4)	Offset from o/l (inch)	ELEVATIONS (9 ft.) Subgrade shot	Subgrade plan	6"DGAB sub-subbase shot	6"DGAB sub-subbase plan	4"PATB subbase shot	4"PATB subbase plan	12"ATB base shot	12"ATB base plan	2.25" AC binder shot	2.25" AC binder plan	1.75" AC surface shot	1.75" AC surface plan	LAYER THICKNESS (in.) 6" DGAB subbase	4" PATB subbase	12" ATB base	2.25" AC binder	1.75" AC surface	4" AC binder+ surface
283+75	0	52.38	52.39	52.89	52.88	53.18	53.22	54.19	54.18	54.37	54.38	54.52	54.52	6.12	3.48	12.12	2.16	1.80	3.96
	36	52.34	52.34	52.87	52.84	53.16	53.20	54.16	54.16	54.33	54.35	54.48	54.48	6.36	3.48	12.00	2.04	1.80	3.84
	72	52.30	52.29	52.80	52.80	53.12	53.13	54.11	54.12	54.29	54.30	54.43	54.44	6.00	3.84	11.88	2.16	1.68	3.84
0-25	108	52.25	52.25	52.77	52.75	53.10	53.10	54.09	54.10	54.26	54.28	54.39	54.41	6.24	3.96	11.88	2.04	1.56	3.60
	144	52.21	52.20	52.72	52.71	53.03	53.05	54.05	54.03	54.21	54.24	54.35	54.36	6.12	3.72	12.24	1.92	1.68	3.60
	0	52.39	52.41	52.91	52.89	53.21	53.24	54.22	54.21	54.40	54.41	54.53	54.55	6.24	3.60	12.12	2.16	1.56	3.72
283+50	36	52.35	52.36	52.88	52.85	53.17	53.21	54.18	54.17	54.36	54.37	54.49	54.51	6.36	3.48	12.12	2.16	1.56	3.72
	72	52.32	52.31	52.83	52.82	53.12	53.16	54.15	54.12	54.32	54.34	54.46	54.47	6.12	3.48	12.36	2.04	1.68	3.72
0+00	108	52.27	52.27	52.79	52.77	53.11	53.12	54.11	54.11	54.27	54.30	54.42	54.42	6.24	3.84	12.00	1.92	1.80	3.72
	144	52.23	52.22	52.74	52.73	53.07	53.07	54.05	54.07	54.23	54.24	54.37	54.38	6.12	3.96	11.76	2.16	1.68	3.84
	0	52.48	52.47	52.96	52.98	53.27	53.29	54.29	54.27	54.47	54.48	54.60	54.62	5.76	3.72	12.24	2.16	1.56	3.72
283+00	36	52.43	52.42	52.93	52.93	53.24	53.26	54.26	54.24	54.42	54.45	54.57	54.57	6.00	3.72	12.24	1.92	1.80	3.72
	72	52.39	52.37	52.87	52.89	53.21	53.20	54.21	54.21	54.38	54.40	54.52	54.53	5.76	4.08	12.00	2.04	1.68	3.72
0+50	108	52.35	52.33	52.84	52.85	53.17	53.17	54.17	54.17	54.33	54.36	54.47	54.48	5.88	3.96	12.00	1.92	1.68	3.60
	144	52.30	52.28	52.79	52.80	53.11	53.12	54.10	54.11	54.27	54.29	54.43	54.42	5.88	3.84	11.88	2.04	1.92	3.96
	0	52.58	52.56	53.06	53.08	53.39	53.39	54.39	54.39	54.57	54.58	54.71	54.72	5.76	3.96	12.00	2.16	1.68	3.84
282+50	36	52.53	52.51	53.03	53.03	53.36	53.36	54.36	54.36	54.53	54.55	54.67	54.68	6.00	3.96	12.00	2.04	1.68	3.72
	72	52.49	52.46	52.96	52.99	53.31	53.29	54.30	54.31	54.49	54.49	54.62	54.64	5.64	4.20	11.88	2.28	1.56	3.84
1+00	108	52.40	52.42	52.92	52.90	53.26	53.25	54.26	54.26	54.43	54.45	54.56	54.58	6.24	4.08	12.00	2.04	1.56	3.60
	144	52.39	52.37	52.87	52.89	53.19	53.20	54.21	54.19	54.39	54.40	54.52	54.54	5.76	3.84	12.24	2.16	1.56	3.72
	0	52.70	52.68	53.20	53.20	53.50	53.53	54.50	54.50	54.68	54.69	54.81	54.83	6.00	3.60	12.00	2.16	1.56	3.72
282+00	36	52.66	52.63	53.18	53.16	53.49	53.51	54.47	54.49	54.64	54.66	54.77	54.79	6.24	3.72	11.76	2.04	1.56	3.60
	72	52.60	52.58	53.10	53.10	53.43	53.43	54.42	54.43	54.59	54.61	54.73	54.74	6.00	3.96	11.88	2.04	1.68	3.72
1+50	108	52.54	52.54	53.03	53.04	53.39	53.36	54.38	54.39	54.55	54.57	54.68	54.70	5.88	4.32	11.88	2.04	1.56	3.60
	144	52.49	52.49	52.98	52.99	53.30	53.31	54.33	54.30	54.49	54.52	54.63	54.64	5.88	3.84	12.36	1.92	1.68	3.60
	0	52.85	52.81	53.33	53.35	[illegible]	53.66	54.62	54.60	54.79	54.81	54.93	54.94	5.76	3.24	12.24	2.04	1.68	3.72
281+50	36	52.78	52.76	53.30	53.28	53.60	53.63	54.59	54.60	54.76	54.78	54.90	54.91	6.24	3.60	11.88	2.04	1.68	3.72
	72	52.73	52.71	53.24	53.23	53.55	53.57	54.54	54.55	54.71	54.73	54.85	54.86	6.12	3.72	11.88	2.04	1.68	3.72
2+00	108	52.68	52.67	53.18	53.18	53.52	53.51	54.51	54.52	54.68	54.70	54.81	54.83	6.00	4.08	11.88	2.04	1.56	3.60
	144	52.63	52.62	53.15	53.13	53.46	53.48	54.46	54.46	54.63	54.65	54.77	54.78	6.24	3.72	12.00	2.04	1.68	3.72
	0	52.93	52.94	53.45	53.43	53.76	53.78	54.74	54.76	54.91	54.93	55.05	55.06	6.24	3.72	11.76	2.04	1.68	3.72
281+00	36	52.89	52.89	53.41	53.39	[illegible]	53.74	54.69	54.68	54.86	54.88	55.01	55.01	6.24	3.24	12.12	2.04	1.80	3.84
	72	52.86	52.84	53.36	53.36	[illegible]	53.69	54.65	54.64	54.82	54.84	54.96	54.97	6.00	3.36	12.12	2.04	1.68	3.72
2+50	108	52.78	52.80	53.31	53.28	53.61	53.64	54.61	54.61	54.79	54.80	54.93	54.94	6.36	3.60	12.00	2.16	1.68	3.84
	144	52.73	52.75	53.26	53.23	53.55	53.59	54.58	54.55	54.75	54.77	54.89	54.90	6.36	3.48	12.36	2.04	1.68	3.72
	0	53.06	53.07	53.56	53.56	53.89	53.89	54.88	54.89	55.06	55.07	55.20	55.21	6.00	3.96	11.88	2.16	1.68	3.84
280+50	36	53.04	53.04	53.55	53.54	53.87	53.88	54.87	54.87	55.04	55.06	55.17	55.19	6.12	3.84	12.00	2.04	1.56	3.60
	72	53.01	53.01	53.53	53.51	53.84	53.86	54.85	54.84	55.02	55.04	55.15	55.17	6.24	3.72	12.12	2.04	1.56	3.60
3+00	108	52.98	52.97	53.50	53.48	53.81	53.83	54.83	54.81	55.00	55.02	55.13	55.15	6.24	3.72	12.24	2.04	1.56	3.60
	144	52.94	52.94	53.45	53.44	53.80	53.78	54.80	54.80	54.98	54.99	55.12	55.13	6.12	4.20	12.00	2.16	1.68	3.84
	0	53.24	53.20	[illegible]	53.74	54.03	54.02	55.05	55.03	55.22	55.24	55.35	55.37	5.40	4.08	12.24	2.04	1.56	3.60
280+00	36	53.23	53.20	53.71	53.73	54.04	54.04	55.05	55.04	55.22	55.24	55.35	55.37	5.76	3.96	12.12	2.04	1.56	3.60
	72	53.23	53.20	53.70	53.73	54.02	54.03	55.04	55.02	55.22	55.23	55.35	55.37	5.64	3.84	12.24	2.16	1.56	3.72
3+50	108	53.23	53.19	53.69	53.73	54.01	54.02	55.04	55.01	55.23	55.23	55.36	55.38	5.52	3.84	12.36	2.28	1.56	3.84
	144	53.21	53.19	53.69	53.71	53.99	54.02	[illegible]	54.99	55.25	55.24	[illegible]	55.40	5.76	3.60	12.72	2.40	1.44	3.84
	0	53.34	53.31	53.82	53.84	54.12	54.15	55.16	55.12	55.32	55.35	55.45	55.47	5.76	3.60	12.48	1.92	1.56	3.48
279+50	36	53.36	53.33	53.83	53.86	54.15	54.16	55.18	55.15	55.34	55.37	55.48	55.49	5.64	3.84	12.36	1.92	1.68	3.60
	72	53.37	53.36	[illegible]	53.87	54.15	54.15	55.19	55.15	55.36	55.38	55.50	55.51	5.40	3.96	12.48	2.04	1.68	3.72
4+00	108	53.42	53.38	[illegible]	53.92	54.17	54.19	55.21	55.17	55.39	55.40	55.54	55.54	5.28	3.72	12.48	2.16	1.80	3.96
	144	53.42	53.40	53.88	53.92	54.19	54.21	55.22	55.19	55.42	55.41	55.58	55.57	5.52	3.72	12.36	2.40	1.92	4.32
	0	53.37	53.35	53.86	53.87	54.18	54.19	55.20	55.18	55.37	55.39	55.51	55.52	5.88	3.84	12.24	2.04	1.68	3.72
279+00	36	53.42	53.40	[illegible]	53.92	54.23	54.20	55.24	55.23	55.41	55.43	55.55	55.56	5.40	4.32	12.12	2.04	1.68	3.72
	72	53.48	53.44	[illegible]	53.98	54.26	54.26	55.27	55.26	55.45	55.46	55.58	55.60	5.40	3.96	12.12	2.16	1.56	3.72
4+50	108	53.53	53.49	53.99	54.03	54.31	54.32	55.32	55.31	55.49	55.51	55.63	55.64	5.52	3.84	12.12	2.04	1.68	3.72
	144	53.55	53.53	54.04	54.05	54.33	54.37	55.35	55.33	55.53	55.54	55.67	55.68	5.88	3.48	12.24	2.16	1.68	3.84
	0	53.31	53.34	53.85	53.81	54.16	54.18	55.16	55.16	55.35	55.35	55.49	55.50	6.48	3.72	12.00	2.28	1.68	3.96
278+50	36	[illegible]	53.39	[illegible]	53.84	54.21	54.22	55.22	55.21	55.39	55.41	55.53	55.54	6.60	3.84	12.12	2.04	1.68	3.72
	72	53.40	53.43	53.94	53.90	54.26	54.27	55.26	55.26	55.43	55.45	55.58	55.58	6.48	3.84	12.00	2.04	1.80	3.84
5+00	108	53.48	53.48	54.00	53.98	54.34	54.33	55.31	55.34	55.48	55.50	55.63	55.63	6.24	4.08	11.64	2.04	1.80	3.84
	144	53.54	53.52	54.04	54.04	54.39	54.37	55.36	55.39	55.53	55.55	55.69	55.68	6.00	4.20	11.64	2.04	1.92	3.96
	0	53.28	53.31	[illegible]	53.78	[illegible]	54.17	55.13	55.11	55.30	55.32	55.44	55.45	6.72	3.24	12.24	2.04	1.68	3.72
278+25	36	53.32	53.36	[illegible]	53.82	[illegible]	54.23	55.17	55.18	55.34	55.36	55.49	55.49	6.96	3.36	11.88	2.04	1.80	3.84
	72	53.37	53.41	53.91	53.87	54.23	54.24	55.21	55.23	55.39	55.40	55.53	55.54	6.48	3.84	11.76	2.16	1.68	3.84
5+25	108	53.44	53.45	[illegible]	53.94	54.29	54.33	55.27	55.29	55.43	55.46	55.58	55.58	6.72	3.48	11.76	1.92	1.80	3.72
	144	53.49	53.50	[illegible]	53.99	54.35	54.37	55.31	55.35	55.48	55.50	55.63	55.63	6.60	3.72	11.52	2.04	1.80	3.84

(Note [illegible])

* note: tolerance in the subgrade refers to plan elevation
tolerance in other layers refers to plan thickness

	6" DGAB subbase	4" PATB subbase	12" ATB base	2.25" AC binder	1.75" AC surface	4" AC binder+ surface
Avg.	6.03	3.78	12.07	2.08	1.67	3.75
Standard Dev.	0.36	0.25	0.23	0.10	0.10	0.13
Max.	6.96	4.32	12.72	2.40	1.92	4.32
Min.	5.28	3.24	11.52	1.92	1.44	3.48

C - Aspalt Concrete
ATB - Asphalt Treated Base
PATB - Permeable Asphalt Treated Base
CTB - Permeable Cement Treated Base
GAB - Dense Graded Aggregate Base

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING — SHEET NUMBER 10 OF 24

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHRP REGION NC — STATE OH — STATE CODE 39

SPS EXPERIMENT NO 9 — SPS PROJECT CODE 09

ROUTE/HIGHWAY US 23 — Lane 1 — Direction S — TEST SECTION NO. 01

SAMPLE/TEST LOCATION: ☐ Before Section ☒ After Section ☒ Within Section — FIELD SET NO. 1

OPERATOR Brad Young — NUCLEAR DENSITY GAUGE I.D. Model 3440 Serial 23964 — TEST DATE 7-25-95

SAMPLING AREA NO: SA- S1 — LOCATION: STATION 1+00/2+50/4+00/5+50 OFFSET 6 feet from ℄/s

LOCATION NO: ____ — DATE OF LAST MAJOR CALIBRATION 10-14-94

Note: Use additional sheets if necessary

		T12 (1+00)	T11 (2+50)	T10 (4+00)		SA# 8 Bulk Sample location B3	T9 (5+50)
DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)		26	26	26			26
LAYER NUMBER		2	2	2		Bulk Sample #BE03 ME03	2
MATERIAL TYPE: (Unbound=G Other=T)		G	G	G			G
IN SITU DENSITY, pcf Dry Unit Wt (AASHTO T238-86)	1	125.6	131.3	123.2			117.1
	2	125.9	130.0	123.1			115.9
	3	125.1	129.3	121.6			120.1
	4	125.6	131.0	122.4			117.7
AVERAGE		125.6	130.4	122.6			117.7
Method (A,B,or C)		B	B	B			B
Rod Depth, inches		8	8	8			8
IN SITU MOISTURE CONTENT, % (AASHTO T239-86)	1	8.2	9.4	11.4			14.4
	2	8.0	9.2	11.6			14.2
	3	8.4	9.5	11.4			13.1
	4	8.2	9.4	11.6			14.3
AVERAGE		8.2	9.4	11.5			14.0

GENERAL REMARKS: Bulk sample of embankment (Soil tests)

CERTIFIED Brad Young — Field Crew Chief — Affiliation: ODOT R+D

VERIFIED AND APPROVED — SHRP Representative — Affiliation: ____

DATE 7-25-1995 — Month- Day- Year

LTPP-SPS MATERIAL SAMPLING AND FIELD TESTING

IN SITU DENSITY AND MOISTURE TESTS

SAMPLING DATA SHEET 8-1

SHEET NUMBER 12 OF 24

SHRP REGION NC STATE OH

SPS EXPERIMENT NO 9

ROUTE/HIGHWAY US 23 Lane 1 Direction S

SAMPLE/TEST LOCATION: ☒ Before Section ☐ After Section ☒ Within Section

STATE CODE	39
SPS PROJECT CODE	09
TEST SECTION NO.	01
FIELD SET NO.	1

OPERATOR B. Young NUCLEAR DENSITY GAUGE I.D. Model 3440 Serial 23964 TEST DATE 9-5-95

SAMPLING AREA NO: SA-S1 LOCATION: STATION 11+00 / 2+50 / 4+00 / 0-50 OFFSET 6 feet from ℄/s

LOCATION NO: DATE OF LAST MAJOR CALIBRATION 10-14-94

Note: Use additional sheets if necessary

DEPTH FROM SURFACE TO THE TOP OF THE LAYER, INCHES (From Plans)	T20 (1+00) 20"	T19 (2+50) 20"	T18 (4+00) 20"		SA#1 Bulk Sample Location BS Before section	T17 (0-50) 20"
LAYER NUMBER	3	3	3			3
MATERIAL TYPE: (Unbound=G Other=T)	G	G	G			G
IN SITU DENSITY, pcf Dry Unit Wt (AASHTO T238-86) 1	129.0	125.6	130.8			125.8
2	128.9	127.1	124.7			126.6
3	125.1	120.3	124.8			125.1
4	129.0	124.4	129.0			126.0
AVERAGE	128.0	122.9	127.3			125.9
Method (A,B,or C)	B	B	B			B
Rod Depth, inches	6	6	6			6
IN SITU MOISTURE CONTENT, % (AASHTO T239-86) 1	1.9	2.1	3.6			2.4
2	1.9	2.2	3.4			2.2
3	1.9	2.1	3.6			2.1
4	1.8	2.5	3.5			1.9
AVERAGE	1.9	2.2	3.5			2.2

GENERAL REMARKS: T17 + BS moved to before the section Dense Graded Agg. Base TESTED 304 BASE

CERTIFIED Brad Young
Field Crew Chief
Affiliation: ODOT R+D

VERIFIED AND APPROVED
SHRP Representative
Affiliation:

DATE 9-5-1995 Month- Day- Year

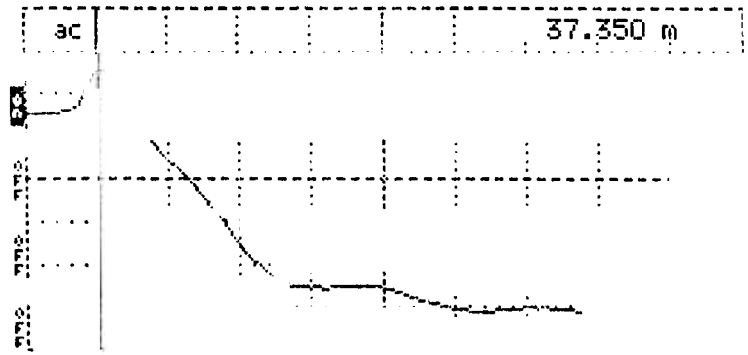
Proj. Station
T17 - 284+00
T18 - 279+50
T19 - 281+00
T20 - 282+50

Appendix B Pre-installation Equipment Checks/Calibration Information

1. Data Sheet SMP-C01: TDR Probe Check
2. Data Sheet SMP-C02: Thermistor and Air Temperature Probe Check
3. Data Sheet SMP-C03: Electrical Resistivity Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

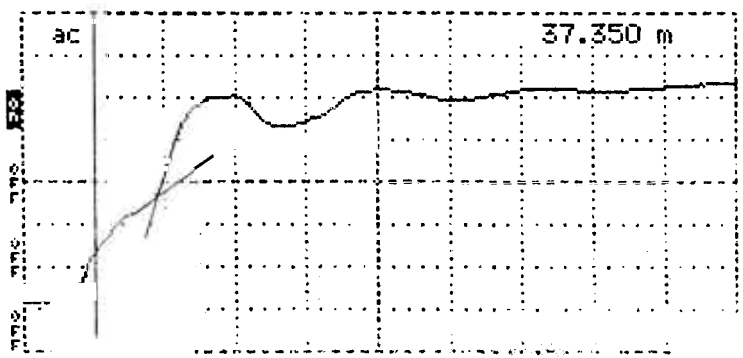
Cursor ..... 37.350 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mP/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A00BT-1
Notes SHORTED
CWRY
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.350 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mP/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac

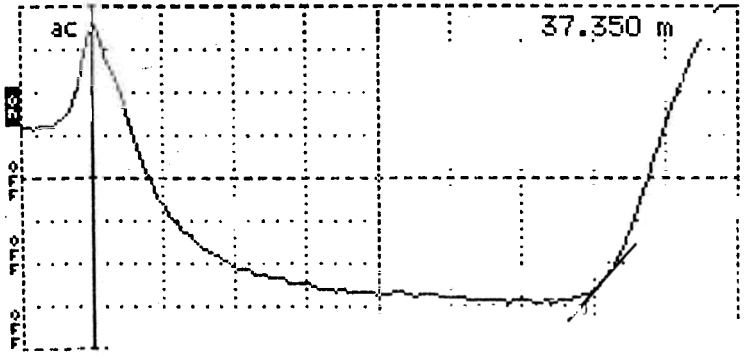


Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-00BT-1
Notes AIR
CWRY
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	0.20	1.02

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Cursor ..... 37.350 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-1
Notes WATER
CWRU

Input Trace .....
Stored Trace .....
Difference Trace .....

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	1.70	73.72

[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:

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

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: 39A01 TDR Probe Length, L: 0.203 m Length of Coax Cable: 0.5 m

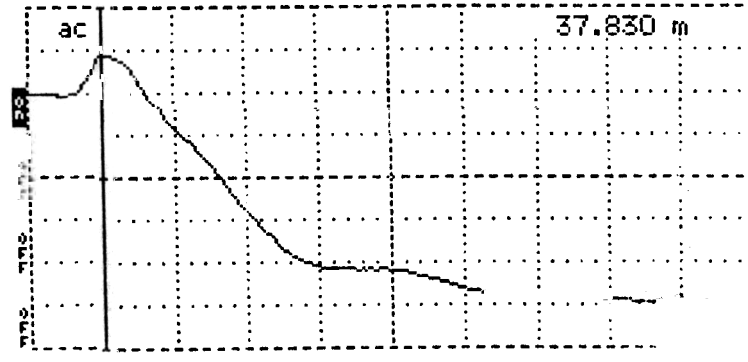
Comments: _____

Prepared by: P. Kusky Employer: CWRU

Date (dd/mm/yy): 04/11/95

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [37]
	LTPP Section ID [S P S 9]

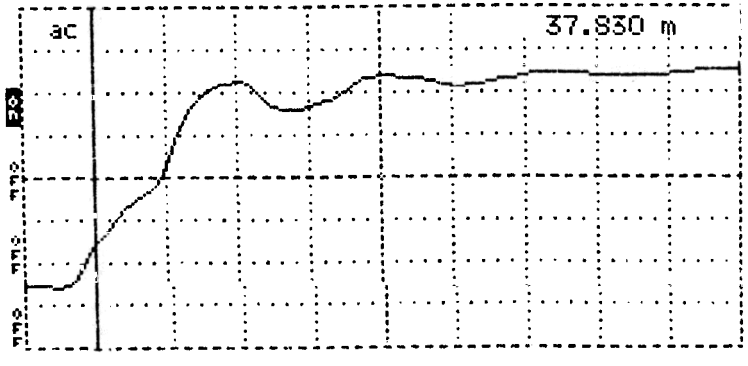
Cursor ..... 37.830 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-2
Notes SHORTED
CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.830 m
Distance/Div.. .. .25 m/div
Vertical Scale. .. 172 mρ/div
VP 0.99
Noise Filter... .. 1 avg
Power..... .. ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-2
Notes AIR
CWRU
Input Trace
Stored Trace
Difference Trace

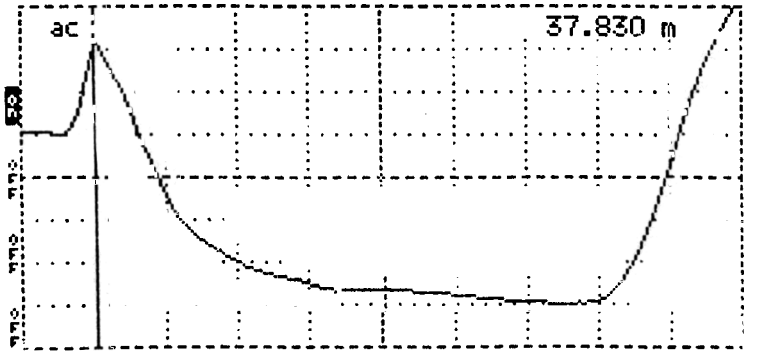
TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	__ __.__

Data Sheet SMP-C01: TDR Probe Check

[redacted] [redacted] 570901 # 2

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

Cursor ..... 37.830 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-2
Notes WATER
CURV
Input Trace
Stored Trace
Difference Trace

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

[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: __ __ __ __ __ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

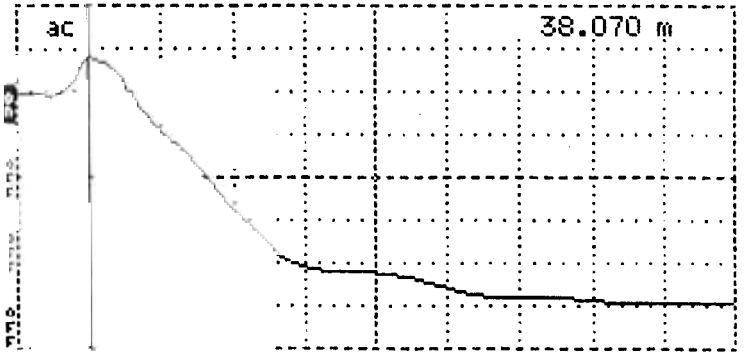
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ / __ __

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

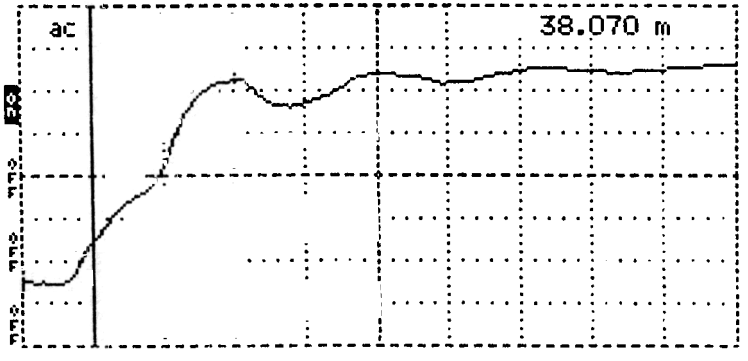
Cursor ..... 38.070 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-3
Notes SHORTED
CWRY
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 38.070 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



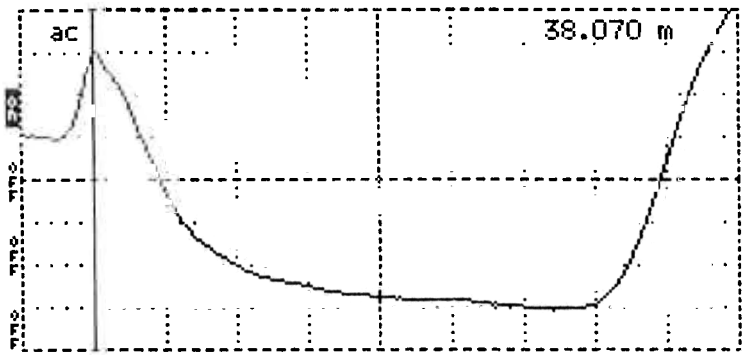
Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-ODOT-3
Notes AIR
CWRY
Input Trace
Stored Trace
Difference Trace

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

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S 0 S 9]

Cursor ..... 38.070 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-ODOT-3
Notes WATER
CURV
Input Trace
Stored Trace
Difference Trace

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

[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:

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

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: _____ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

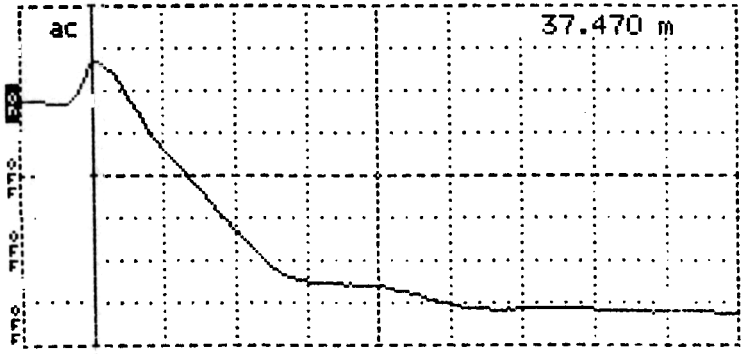
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __/__/__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

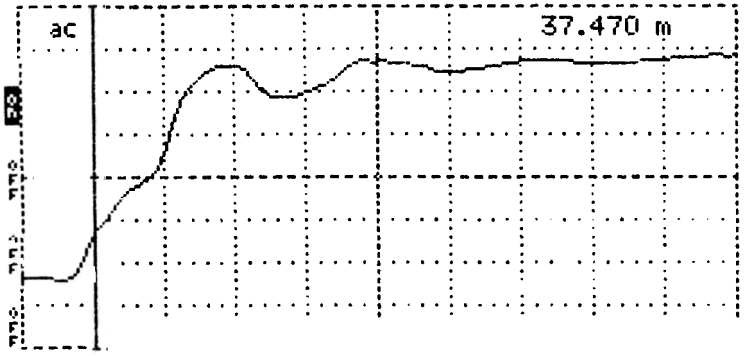
Cursor ..... 37.470 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-ODOT-4
Notes SHORTED
CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.470 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac

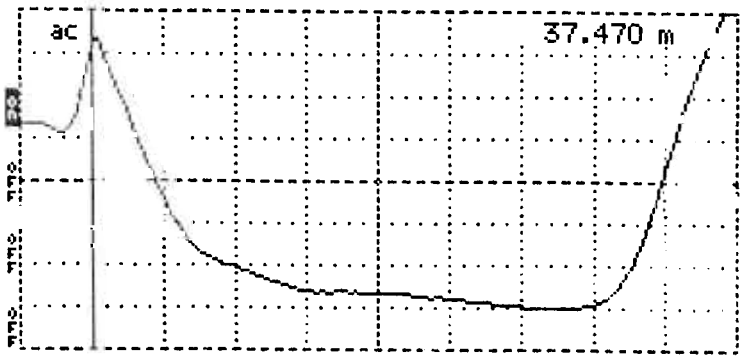


Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-ODOT-4
Notes AIR
CWRU
Input Trace
Stored Trace
Difference Trace

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

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Cursor ..... 37.470 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mV/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-000T-9
Notes WATER
CURV
Input Trace ____
Stored Trace ---
Difference Trace

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

[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: _ _ _ _ _ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

_____

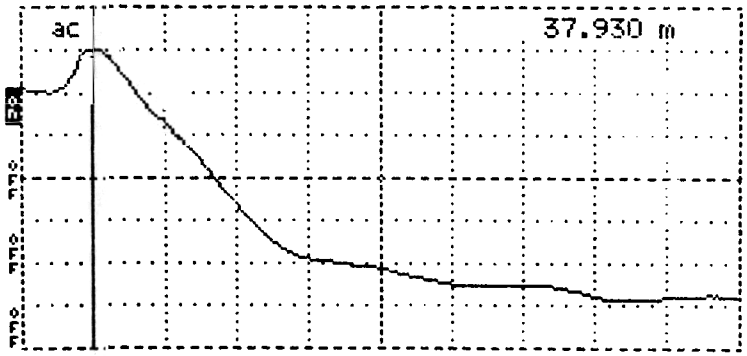
Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ / __ __

390901 #5

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

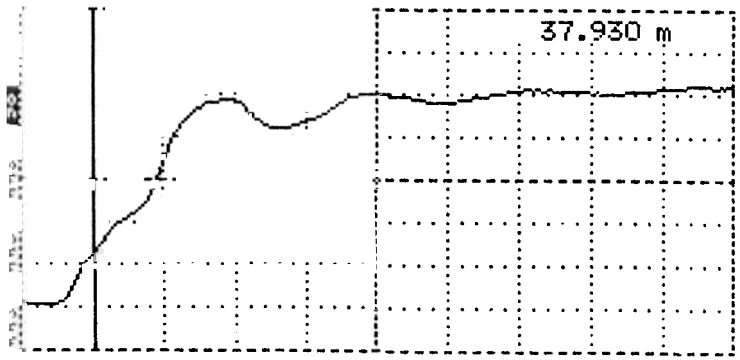
Cursor ..... 37.930 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-000A-5
Notes SHORTED
CWRU
Input Trace .
Stored Trace .....
Difference Trace .....

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

Cursor ..... 37.930 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac

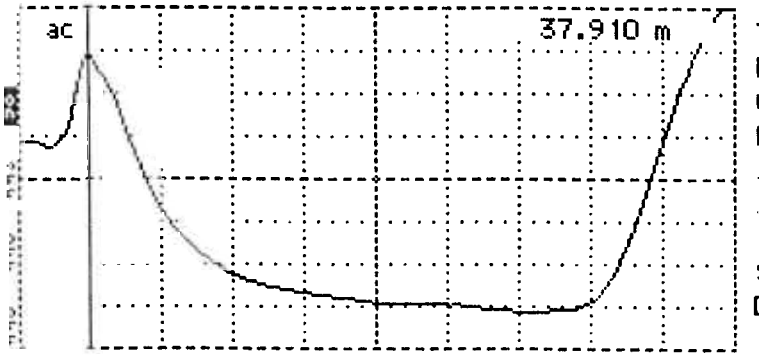


Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-000T-5
Notes AIR
CWRU
Input Trace .....
Stored Trace .....
Difference Trace .....

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

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Cursor ..... 37.910 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 ADOT-5
Notes WATER
CWRY
Input Trace .
Stored Trace .....
Difference Trace .....

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

[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: _____ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

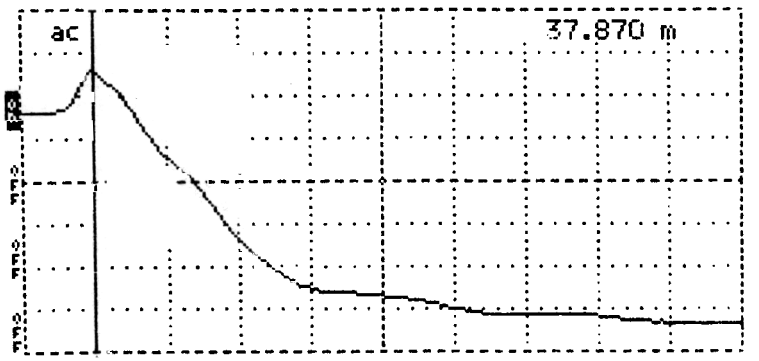
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ / __ /

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

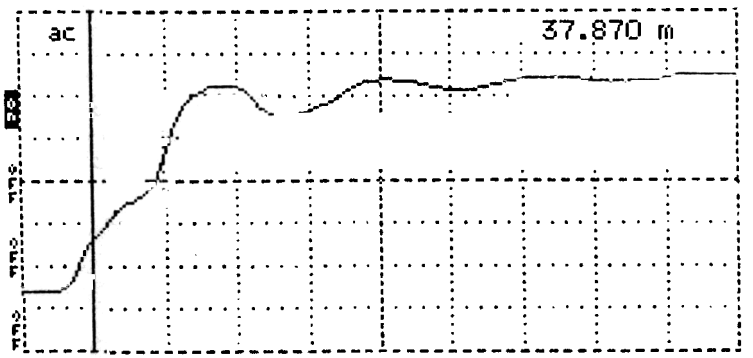
Cursor ..... 37.870 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-ODOT-6
Notes SHORTED CWRY
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.870 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



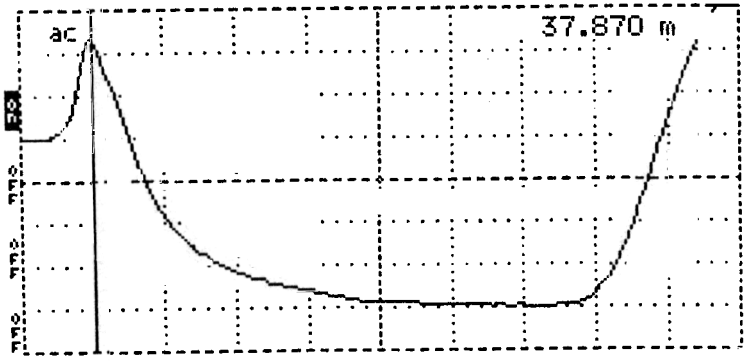
Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-ODOT-6
Notes AIR CWRY
Input Trace
Stored Trace
Difference Trace

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

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

Cursor ..... 37.870 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39 A-door-B
Notes 3M WATER CURED
Input Trace ____ ____
Stored Trace .....
Difference Trace .....

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

[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: _____ TDR Probe Length, L: __ m Length of Coax Cable: m

Comments: _____

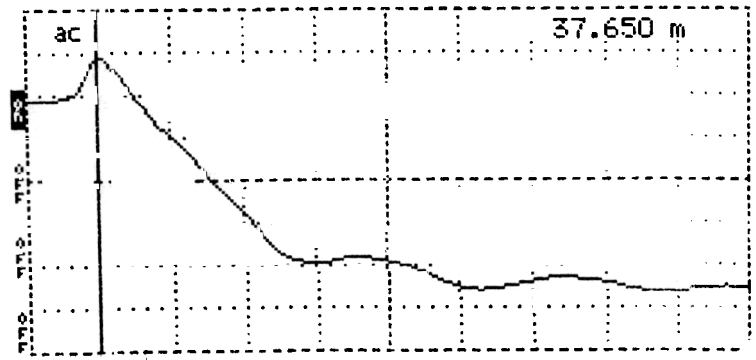
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __/__/__

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S 9 S 9]

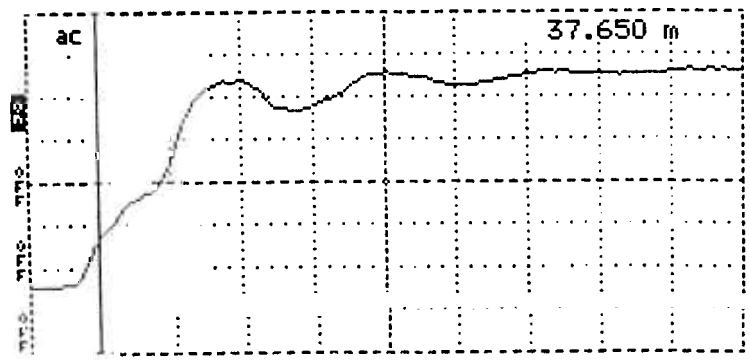
Cursor ..... 37.650 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-000T-7
Notes SHORTED CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.650 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



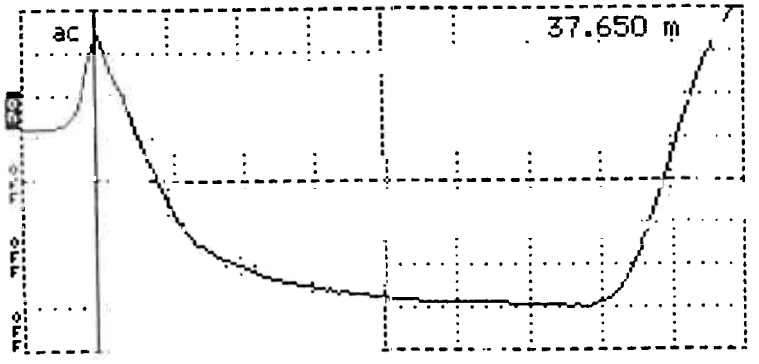
Tektronix 1502B TDR
Date 4/2/95
Cable 39 A-000T-7
Notes AIR CWRU
Input Trace
Stored Trace
Difference Trace

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

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

Cursor ..... 37.650 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39-A-0007-7
Notes WATER CURV
Input Trace
Stored Trace
Difference Trace

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

[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:

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

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: _ _ _ _ _ _ TDR Probe Length, L: _ _ _ m Length of Coax Cable: m

Comments: _____

_____

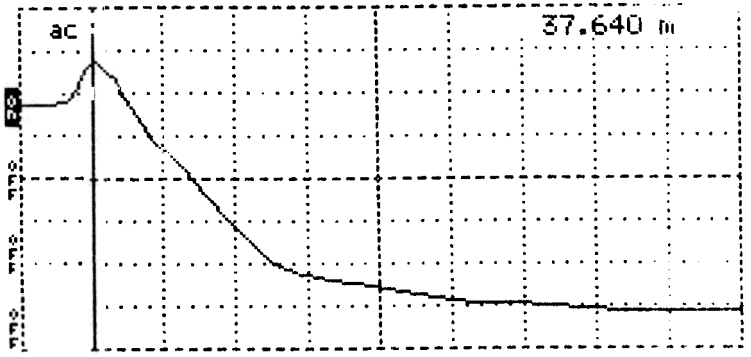
Prepared by: _____ Employer: _____

Date (dd/mm/yy): _ _ / _ _ / _ _

390901 #8

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

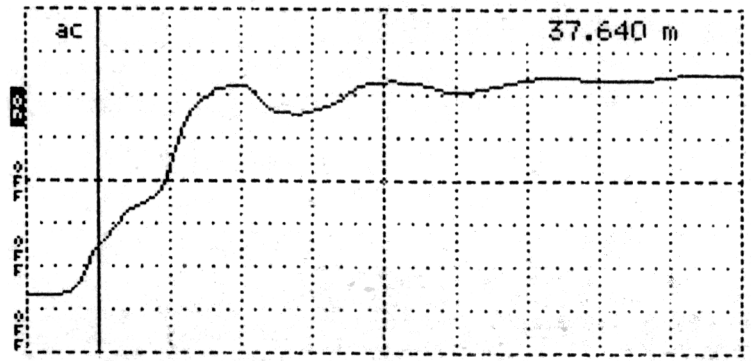
Cursor ..... 37.640 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-000T-8
Notes SHORTED
CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.640 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-000T-8
Notes AIR
CWRU
Input Trace
Stored Trace
Difference Trace

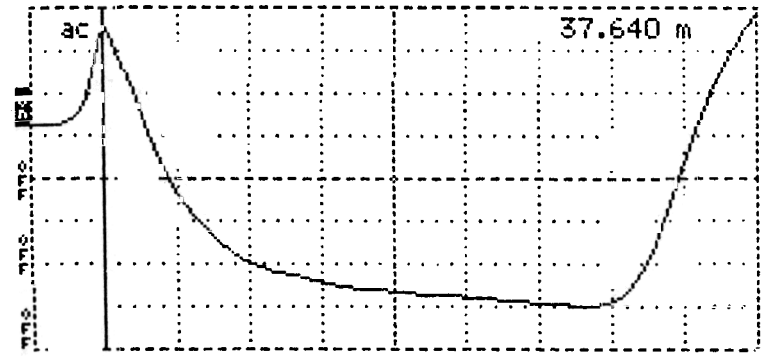
TDR Trace	Apparent Length, (m)	Dielectric Constant[1]
"In Air"	__.__	__ __.__ __

Data Sheet SMP-C01: TDR Probe Check

[redacted] 39ADOT # 8.

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 9]

Cursor ..... 37.640 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 ave
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-ADOT-8
Notes WATER
CWRU
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[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: _____ TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

_____

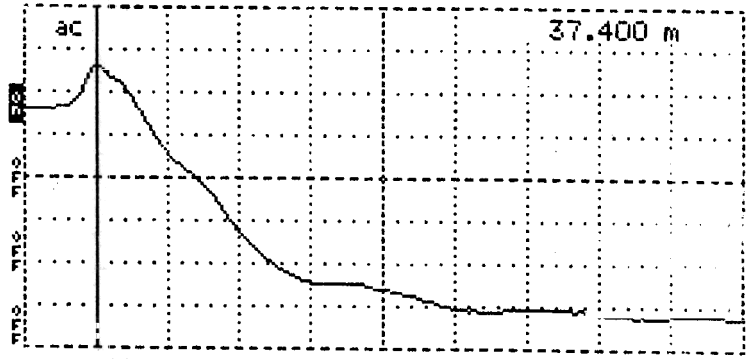
Prepared by: _____ Employer: _____

Date (dd/mm/yy): __/__/__

390901 #9

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

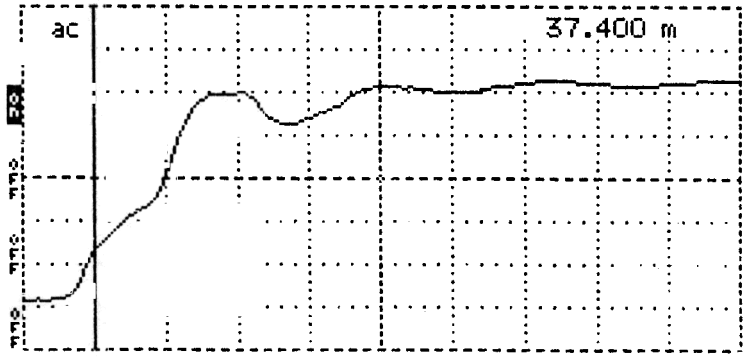
Cursor ..... 37.400 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-ADOT-9
Notes SHORTED
CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.400 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



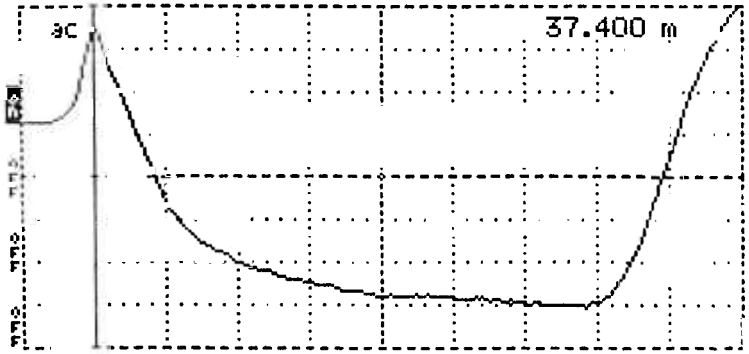
Tektronix 1502B TDR
Date 4/2/95
Cable 39-ADOT-9
Notes AIR
CWRU
Input Trace
Stored Trace
Difference Trace

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

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Cursor ..... 37.400 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-ODOT-9
Notes WATER
CURV
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[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:

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

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: ___ TDR Probe Length, L: ___ m Length of Coax Cable: m

Comments: _____

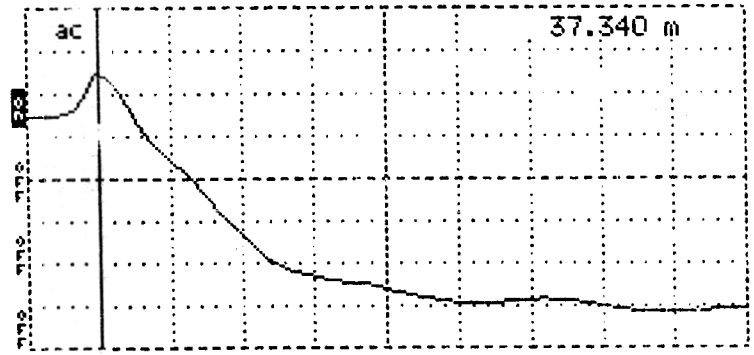
_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ / __ / __

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 1) TDR Probe Check	Agency Code [3 9] LTPP Section ID [S P S 7]

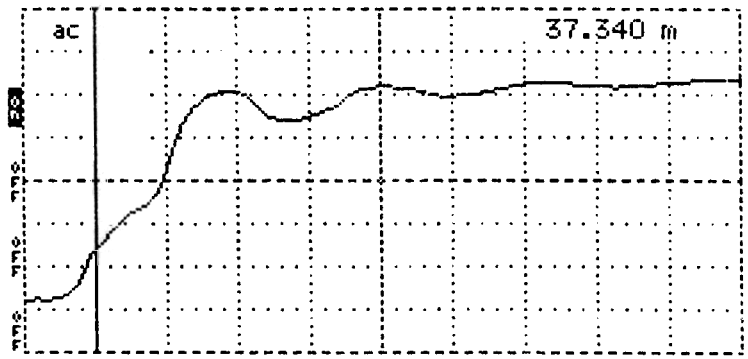
Cursor ..... 37.340 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-ODOT-10
Notes SHORTED
CWRU
Input Trace
Stored Trace
Difference Trace

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

Cursor ..... 37.340 m
Distance/Div..... .25 m/div
Vertical Scale.... 172 mρ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



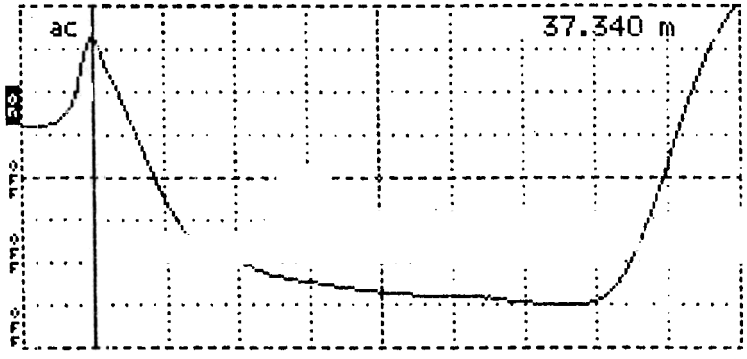
Tektronix 1502B TDR
Date 4/2/95
Cable 39-A-ODOT-10
Notes AIR
CWRU
Input Trace
Stored Trace
Difference Trace

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

Data Sheet SMP-C01: TDR Probe Check

LTPP Seasonal Monitoring Program Data Sheet SMP-C01 (Page 2) TDR Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Cursor ..... 37.340 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 ave
Power..... ac



Tektronix 1502B TDR
Date 9/2/95
Cable 39-A-ODOT-10
Notes WATER
CWRU
Input Trace
Stored Trace
Difference Trace

TDR Trace	Apparent Length, (m)	Dielectric Constant[2]
"In Water"	__.__	___.__

[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: TDR Probe Length, L: m Length of Coax Cable: m

Comments: _____

_____

Prepared by: _____ Employer: _____

Date (dd/mm/yy): __ __ / __ __ / __ __

390901 1-2

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Thermistor Probe Assigned Serial Number : [0 0 0 T] 381I

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

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = * 0.0°C	Other _____; T = * 19.0°C	Comments
1	0.025	*0.2	*18.8	
2	0.051	0.4	18.8	
3	0.089	0.4	18.7	
4	0.254	0.3	19.0	
5	0.824	0.6	19.6	
6	0.100	0.4	19.6	
7	0.176	0.2	19.5	
8	0.252	0.1	19.2	
9	0.328	0.4	19.2	
10	0.481	0.2	18.8	
11	0.629	0.0	18.4	
12	0.775	0.1	18.3	
13	0.927	0.2	18.7	
14	1.080	0.2	19.0	
15	1.233	0.2	18.7	
16	1.386	0.1	18.1	
17	1.537	0.2	17.7	
18	1.690	0.1	18.1	
19	1.837			
END		____.__	____.__	

Comments: They were also tested at a higher temperature

See page 2

Sensor # 19 was not read.

Prepared by: RK Employer: CWRU

Date (dd/mm/yy): 18/04/95

390901

LTPP Seasonal Monitoring Program Data Sheet SMP-C02 Thermistor Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Thermistor Probe Assigned Serial Number : [0 0 0 T] 381I

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

Thermistor Number	Distance from Top (m)	Temperature (°C) – Calibration in: Ice-Bath; T = _ _ _ _ . _ °C	Other _____; T = * 30.0°C	Comments
1	_ . _ _ _ _	_ _ _ _ . _	* 29.5	
2	_ . _ _ _ _	_ _ _ _ . _	29.6	
3	_ . _ _ _ _	_ _ _ _ . _	29.6	
4	_ . _ _ _ _	_ _ _ _ . _	29.9	
5	_ . _ _ _ _	_ _ _ _ . _	28.9	
6	_ . _ _ _ _	_ _ _ _ . _	28.8	
7	_ . _ _ _ _	_ _ _ _ . _	28.8	
8	_ . _ _ _ _	_ _ _ _ . _	28.7	
9	_ . _ _ _ _	_ _ _ _ . _	28.7	
10	_ . _ _ _ _	_ _ _ _ . _	28.7	
11	_ . _ _ _ _	_ _ _ _ . _	29.1	
12	_ . _ _ _ _	_ _ _ _ . _	29.2	
13	_ . _ _ _ _	_ _ _ _ . _	29.3	
14	_ . _ _ _ _	_ _ _ _ . _	29.2	
15	_ . _ _ _ _	_ _ _ _ . _	29.0	
16	_ . _ _ _ _	_ _ _ _ . _	28.7	
17	_ . _ _ _ _	_ _ _ _ . _	28.2	
18	_ . _ _ _ _	_ _ _ _ . _	28.4	
19	_ . _ _ _ _			
		_ _ _ _ . _	_ _ _ _ . _	

Comments: See Page 1 for distances

Prepared by: PK Employer: CWRU

Date (dd/mm/yy): 18/04/95

390901

LTPP Seasonal Monitoring Program Data Sheet SMP-C03 Resistivity Probe Check	Agency Code [39] LTPP Section ID [S P S 9]

Electrical Resistivity Serial Number: C o o R (AODR) ODOT

DB37 Connector Pin Number	Electrode Number	Distance from Top (m) Line 1	Line 2	Avg	Continuity ✓	Spacing (m)	Comments
1 36	1	0.023	0.022	0.023	✓	0.046	
20 35	2	0.069	0.069	0.069	✓	0.055	
2 34	3	0.129	0.123	0.129	✓	0.056	
21 33	4	0.179	0.179	0.179	✓	0.052	
3 32	5	0.227	0.225	0.226	✓	0.051	
22 31	6	0.277	0.277	0.277	✓	0.056	
4 30	7	0.327	0.326	0.327	✓	0.051	
23 29	8	0.376	0.375	0.376	✓	0.056	
5 28	9	0.427	0.425	0.426	✓	0.051	
24 27	10	0.477	0.477	0.477	✓	0.052	
6 26	11	0.529	0.529	0.529	✓	0.051	
25 25	12	0.580	0.580	0.580	✓	0.056	
7 24	13	0.630	0.630	0.630	✓	0.051	
26 23	14	0.681	0.680	0.681	✓	0.056	
8 22	15	0.731	0.730	0.731	✓	0.052	
27 21	16	0.783	0.782	0.783	✓	0.051	
9 20	17	0.834	0.833	0.834	✓	0.051	
28 19	18	0.885	0.885	0.885	✓	0.056	
10 18	19	0.935	0.935	0.935	✓	0.051	
29 17	20	0.986	0.985	0.986	✓	0.052	
11 16	21	1.039	1.037	1.038	✓	0.098	
30 15	22	1.087	1.087	1.087	✓	0.052	
12 14	23	1.139	1.138	1.139	✓	0.056	
31 13	24	1.189	1.189	1.189	✓	0.051	
13 12	25	1.240	1.240	1.240	✓	0.053	
32 11	26	1.294	1.291	1.293	✓	0.049	
14 10	27	1.342	1.341	1.342	✓	0.050	
33 9	28	1.392	1.391	1.392	✓	0.051	
15 8	29	1.444	1.442	1.443	✓	0.051	
34 7	30	1.495	1.493	1.494	✓	0.052	
16 6	31	1.547	1.545	1.546	✓	0.051	
35 5	32	1.598	1.596	1.597	✓	0.051	
17 4	33	1.648	1.647	1.648	✓	0.051	
36 3	34	1.699	1.698	1.699	✓	0.052	
18 2	35	1.751	1.750	1.751	✓	0.050	
37 1	36	1.801	1.801	1.801	✓	0.028	
NOTHING 19	Bottom	1.829	1.827	1.829	n/a	n/a	

Probe Check

Appendix C Instrumentation Installation Information

1. Data Sheet SMP-I01: List of Installed Instrumentation
2. Data Sheet SMP-I02: Instrumentation Locations
3. Data Sheet SMP-I03: Log of Piezometer Hole
4. Data Sheet SMP-I04: Log of Instrumentation Hole
5. Data Sheet SMP-I05: Field Gravimetric Moisture Contents
6. TDR Traces
7. Installation Photographs

LTPP Seasonal Monitoring Program Data Sheet SMP-I01 Instrumentation Installed and Participants	Agency Code [39] 390901 LTPP Section ID [S P S 9] ODOT

List of Equipment:

Equipment	Quantity	Serial Number(s)
Instrument Hole:		
Thermistor Probe	01	381T
Resistivity Probe	01	CODR
TDR Sensors	10	90D01 to 90D10
Equipment Cabinet:		
Campbell Scientific CR10 Datalogger	__	_____
Battery Package	__	_____
Weather Station:		
Rain Gauge	__	_____
Air Temperature Probe	__	____AT
Radiation Shield	__	_____
Observation Piezometer/Bench Mark:	__	n/a

List of Participants:

Name of Participant	Agency/Employer
P. Kusky	CWRU
J.C. Figueroa	CWRU
P. Debuty	CWRU

Prepared by: PK Employer: CWRU

Date (dd/mm/yy): 08/08/95

Data Sheet SMP-I01: List of Installed Instrumentation

390901

LTPP Seasonal Monitoring Program Data Sheet SMP-I02 Installed Instrument Location	Agency Code [3 9] LTPP Section ID [S P S 9]

ODOT

Longitudinal and Transverse Location of Instrumentation:

Instrument	Station (Customary Units)		Offset (m)[1]	
	Planned	Actual	Planned	Actual
Instrumentation Hole	__	0 - 350 +	_ . _	+0.7 6
Observation Piezometer	4 + 0 0	4 + 0 0	-4.0	-4.0
Equipment Cabinet	_ _	0 - 3 1 5	_ . _	+ 11.0
Weather Station		0 - 315	_ . _	- 11.0

[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	_ . _ _ _	_ . _ _ _	
	Metal Bottom	_ . _ _ _	_ . _ _ _	
	PVC Top	0 . 5 5 9	_ . _ _ _	+/-
Resistivity Probe		0 . 5 5 9	0 . 5 5 9	+/-

TDR Number	Depth from Pavement Surface to Probe (m)		Comments
	Planned Location	Actual Location	
1	0.584	0.584	+/-
2	0.737	0.737	+/-
3	0.889	0.889	+/-
4	1.041	1.041	+/-
5	1.194	1.194	+/-
6	1.346	1.346	+/-
7	1.498	1.498	+/-
8	1.651	1.651	+/-
9	1.956	1.956	+/-
10	2.260	2.260	+/-

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: PK Employer: CWRU

Date (dd/mm/yy) 07/08/95

Data Sheet SMP-I02: Instrumentation Location

+ 0-350 means that the instrumentation hole was 350 ft from sta 0+00 of section 390901.

LTPP Seasonal Monitoring Program Data Sheet SMP-I03 Log of Piezometer Hole	Agency Code [39] LTPP Section ID [0901]

Operator: _____ Equipment Used: Drill Rig

Location: Station: 4+00 Offset: 3.9 m (from lane edge)
-0.76 m (from shoulder edge

Bore Hole Diameter: 150 . mm Auger Type: Solid flight

Scale (m)	Depth from Surface[1] (m)	Material Description	Material Code[2]
0.5			
1.0			
1.5			
2.0			
2.5			
3.0			
3.5			
4.0			
4.5			
5.0			

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

Prepared by: Brad Young Employer: Ohio DoT

Date (dd/mm/yy): 24/07/96

Data Sheet SMP-I03: Log of Piezometer Hole

I believe that I submitted this sheet already. Please check your files. Use the data you have on file (if found)

390901

LTPP Seasonal Monitoring Program Data Sheet SMP-I04 Log of Instrumentation Hole	Agency Code [39] LTPP Section ID [S P S 9] ODOT

Operator: ODOT Equipment Used: Drill Rig

Location: Station: 0 - 350 Offset: +0.76 m (from lane edge)

Bore Hole Diameter: 305. mm (12") L Drive Lane wheel path

Scale (m)	Strata Change[1] (m)	Material Description	Material Code[2]
0.10		Light gray coarse gravel base	
0.18			
0.20			
0.30			
0.40			
0.50			
0.60		Light to dark brown silt little sand and gravel some clay d p to moist darker with depth	
0.70			
0.80			
0.90			
1.00			
1.10			
1.20			
1.30			
1.40			
1.50			
1.60			
1.70			
1.80			
1.90			
2.00			
2.10			
2.20			
2.30			
2.40			
2.50			

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

Prepared by: PK Employer: CWRU

Date (dd/mm/yy): 07/08/95 * See-Brad Young (ODOT) -Issam Khoury (C.U.)

390901

LTPP Seasonal Monitoring Program Data Sheet SMP-I05 Field Gravimetric Moisture Content	Agency Code [39]
	LTPP Section ID [S P S 9] 0007

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	0.589	1	M1	22.42	182.07	172.52	150.10	9.55	6.36
2	0.737	2	M2	22.40	159.10	151.66	129.26	7.44	5.76
3	0.889	3	M3	22.48	125.89	113.52	091.04	12.37	13.59
4	1.041	4	M15	22.22	135.95	122.84	100.62	13.11	13.03
5	1.194	5	G17	22.53	125.85	112.96	090.43	12.89	14.25
6	1.346	6	G13	22.41	125.00	113.00	090.59	12.00	13.25
7	1.498	7	M14	22.39	141.96	126.20	103.81	15.76	15.18
8	1.651	8	G11	22.49	124.0	110.10	087.66	13.90	15.86
9	1.956	9	G19	22.50	147.63	130.28	107.78	17.35	16.10
10	2.260	10	M23	22.58	146.78	130.67	108.09	16.11	14.90

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

Comments: _____

Prepared by: PK Employer: CWRU

Date (dd/mm/yy): __ __ / __ __ / __ __

Data Sheet SMP-I05: Field Gravimetric Moisture Contents

SPS9
ODOT
CWRU

Sample No.	1	2	3	4	5	6	7	8	9	10
Pan No.	M1	M2	M3	M15	G17	G13	M140	G11	G14	M23
Wt. of Pan (g)	22.42	22.40	22.48	22.22	22.53	22.41	22.39	22.44	22.50	22.58
Wt. of Pan + Wet Soil (g)	182.07	159.10	125.89	135.95	125.85	125.00	141.96	124.00	147.63	146.78
Wt. of Pan + Dry Soil (g)	172.52	151.66	113.52	122.84	112.96	113.00	126.20	110.10	130.28	130.67
Wt. of Dry Soil (g)	150.10	129.26	91.04	100.62	90.43	90.59	103.81	87.66	107.78	108.09
Wt. of Water (g)	9.55	7.44	12.37	13.11	12.89	12.00	15.76	13.90	17.35	16.11
Moisture Content (%)	6.36	5.76	13.59	13.03	14.25	13.25	15.18	15.86	16.10	14.90

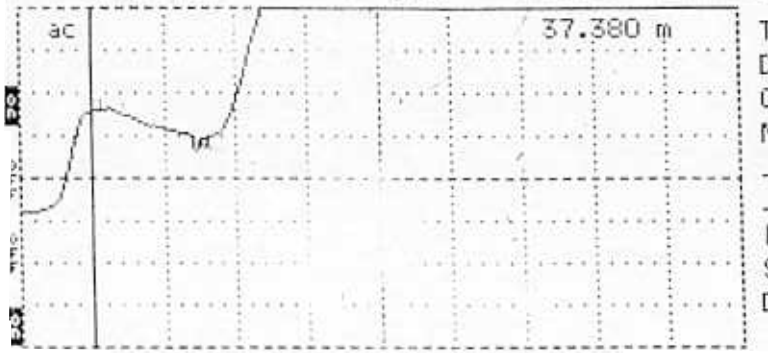
Samples taken de 5
ons allation
8/4/5

Following pages show
TDR traces 0 days after
installation

Inst 4 95
290901

[redacted]

Cursor ..... 37.380 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mV/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac

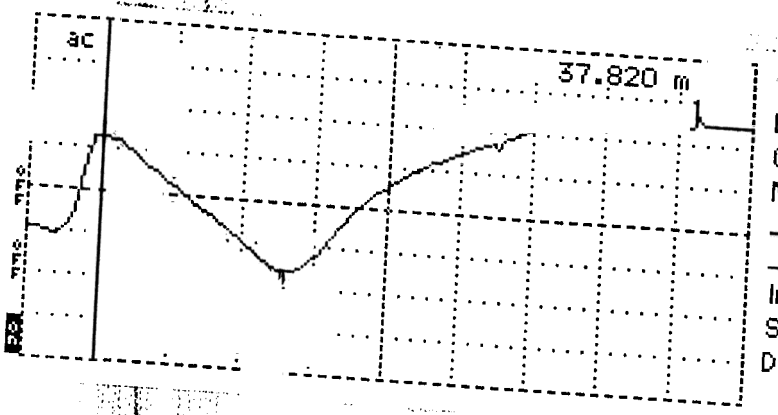


Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

390901
#1
8/14/95

[redacted]

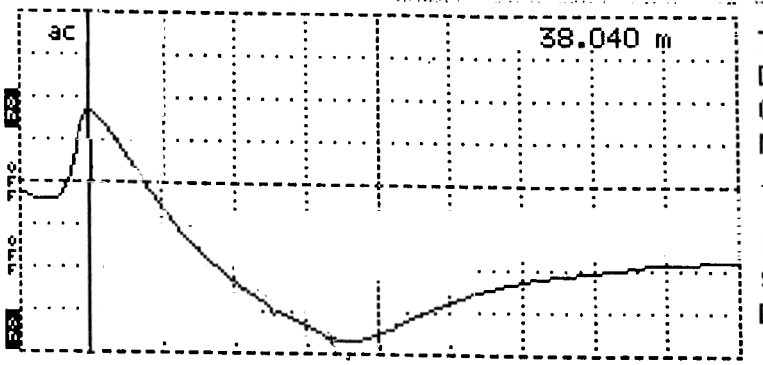
Cursor ..... 37.820 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mP/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace .
Stored Trace .....
Difference Trace .....

390901
#2
8/14/95

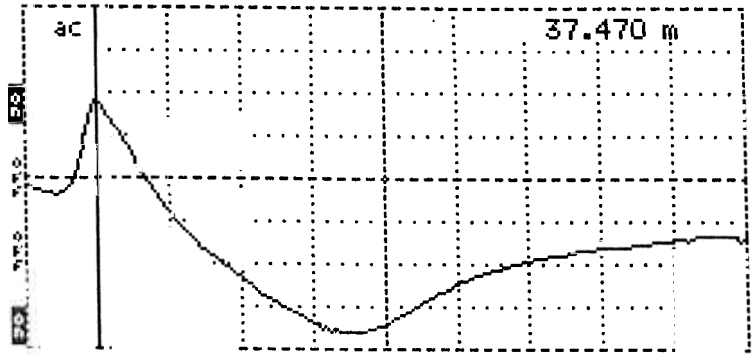
Cursor ..... 38.040 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

390901
3
8/14/95

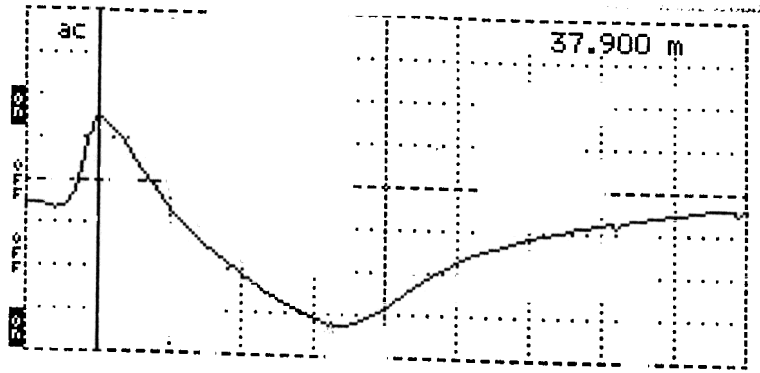
Cursor ..... 37.470 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mρ/div
Vp 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

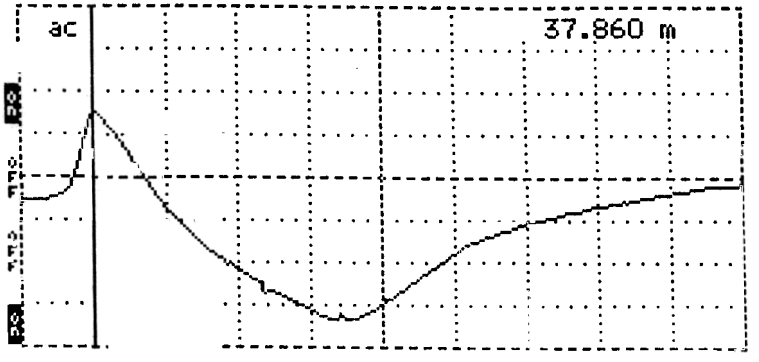
390901
#4
8/14/95

Cursor ..... 37.900 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mP/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

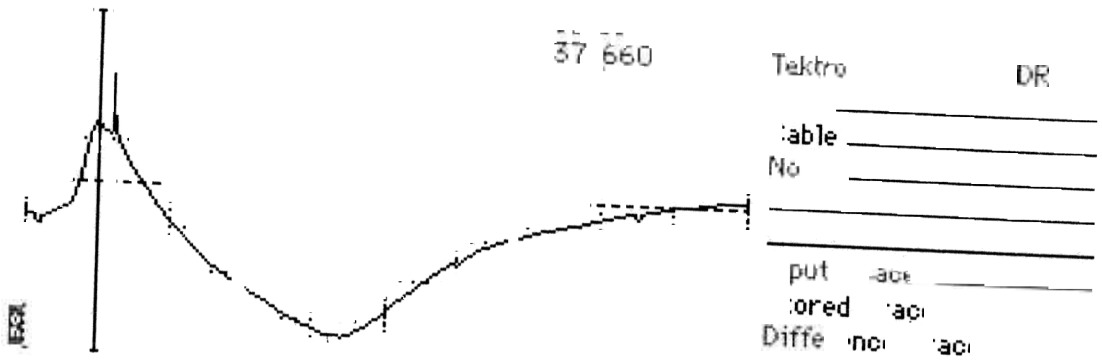
390901
#5
8/14/95



Cursor ..... 37.860 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac

Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

390901
#6
8/14/95

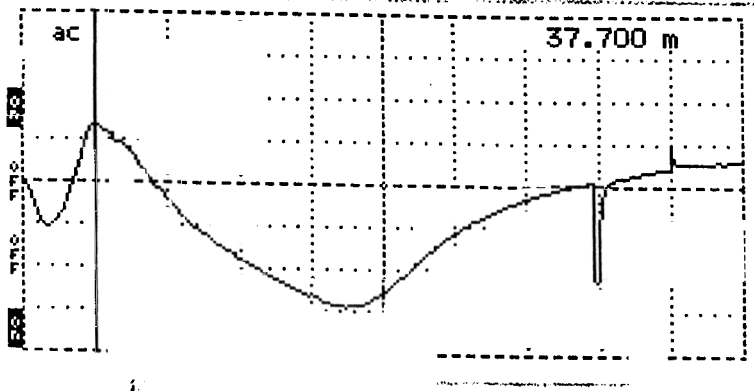


390 0

#7

8/14/9

Cursor ..... . 37.700 m
Distance/Div... . .25 m/div
Vertical Scale.. . 74.8 mΩ/div
VP 0.99
Noise Filter.... . 1 avg
Power..... . ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

390901
#8
8/14/95

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VP 0.99
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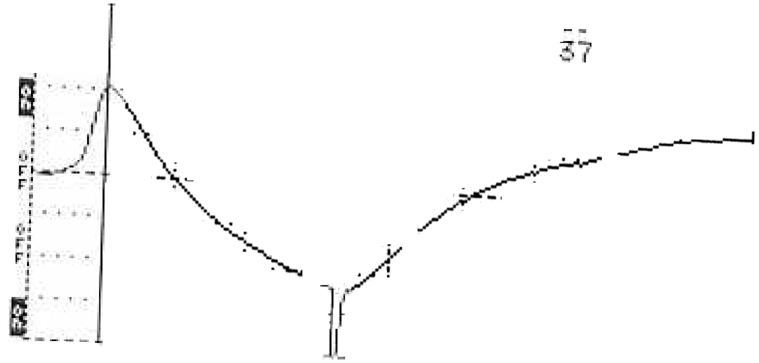

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Ca
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Input Trace
:tored Traci
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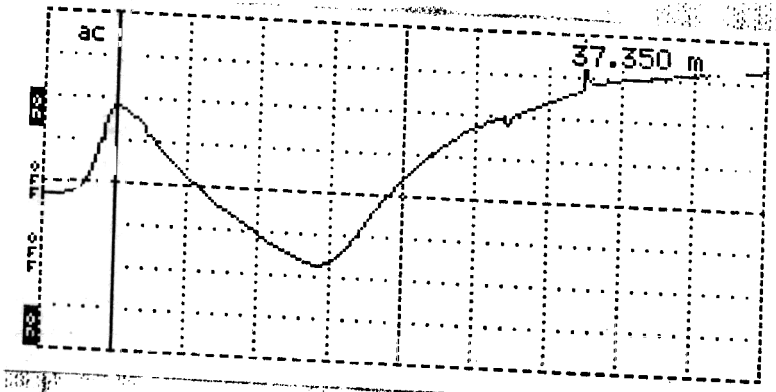
390 0
#9
8/14/95

Cursor ..... 37.350 m
Distance/Div..... .25 m/div
Vertical Scale.... 74.8 mΩ/div
VP 0.99
Noise Filter..... 1 avg
Power..... ac



Tektronix 1502B TDR
Date _____
Cable _____
Notes _____
_____
_____
Input Trace _____
Stored Trace .....
Difference Trace .....

390901
#10
8/14/95

SPS9-ODOT 39090

PROBE No.	Cable Length (m)	Cable Length (ft-in)	Probe Length (cm)
1	29.72	97'-6"	20.40
2	29.72	97'-6.25"	20.40
3	29.88	98'-0.5"	20.19
4	29.87	98'	20.47
5	29.81	97'-9.75"	20.34
6	30.02	98'-6"	20.30
7	29.91	98'-1.5"	20.30
8	29.95	98'-3"	20.29
9	29.87	98'	20.29
10	29.82	97'-10"	20.29

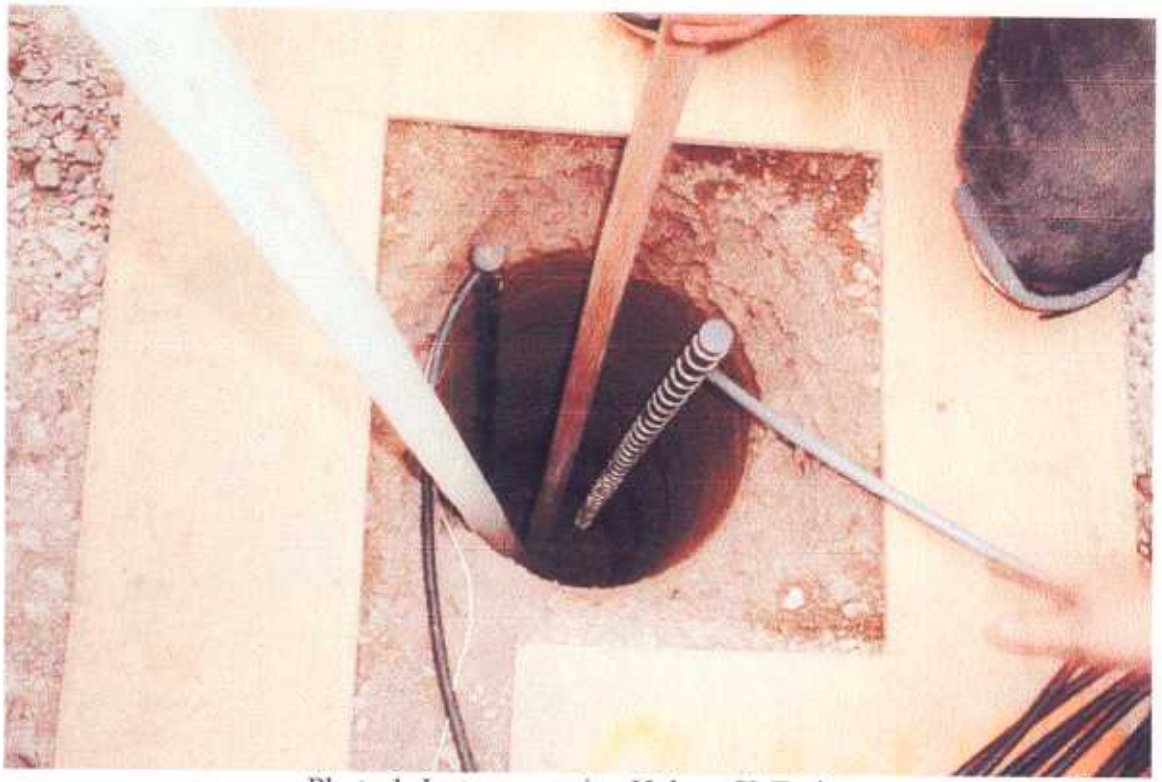


Photo 1 Instrumentation Hole at SMP site

Photo 2 Wires from Probes at Instrumentation Hole

Appendix D Initial and Regular SMP Monitoring Data Collection

1. Data Sheet SMP-D10: SMP Field Activity Report
2. Data Sheet SMP-C06: Resistivity Calibration Block Check
3. Data Sheet SMP-D03: Contact Resistance Measurements
4. Data Sheet SMP-D04: Four-Point Resistivity Measurements
5. Data Sheet SMP-D05: Ground Water Table Measurements
6. Data Sheet SMP-D08: Surface Elevation Measurements – AC Pavements
7. Summary of regular data collection activities

LTPP Seasonal Monitoring Program Data Sheet SMP-D10 SMP Field Activity Report		Agency Code [39] LTPP Section ID [0901]
Onsite Datalogger and Instrumentation		
File Name - *.ONS	39JB98CE	Comments:
Battery Replace	Yes (No)	Voltages : 13.1
Repairs/Calib.		
Other:		
Mobile Datalogger		
File Name - *.MOB	39JB98CE	Comments:
TDR/Resistance Voltages	Sets (0 1)	
Other:		
Manual Data Collection		
Piezometer	(Yes) - No	Comments:
Resistance 2 pt.	Sets (0 1)	
Resistivity 4 pt.	Sets (0 1)	
Elevations	Sets (0 1)	
Distress Survey	Yes (No)	
Long. Dipstick Profile	Yes (No)	
Photos or Video	Yes - (No)	
Other:		
FWD and Associated Data		
FWD Testing	Sets (0 3)	Operator: GFE
JCP - Snap Rings	Sets (__)	AC
JCP - Faulting	Sets (__)	AC
Other:		

IF REQUIRED, ATTACH SKETCHES TO THIS DATA SHEET

Comments: _____

Prepared by: GFE Employer: ERES/UCR

Date (dd/mmm/yy): 14/MAY/98 Daylight Savings Time (Y or N): Y

LTPP Seasonal Monitoring Program Data Sheet SMP-C06 Resistivity Calibration Block Check	Agency Code	[39]
	LTPP Section ID	[0701]

Test Position	Switch Box Settings		Voltage		Current		Resistance
	I1 V1	I2 V2	Setting	Reading	Setting	Reading	Calculated (Ω)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1	2	milli	154.4	micro	154.5	
2	2	3		137.2		137.2	
3	3	4		154.1		154.5	
4	4	5		144.6		145.1	
5	5	6		154.4		154.4	
6	6	7		154.2		154.5	
7	7	8		153.9		154.4	
8	8	9		142.0		142.5	
9	9	10		154.6		151.0	
10	10	11		156.6		152.9	
11	11	12		154.0		153.0	
12	12	13		154.2		154.9	
13	13	14		154.0		151.0	
14	14	15		152.7		153.5	
15	15	16		153.7		154.3	
16	16	17		152.9		154.5	
17	17	18		153.5		154.0	
18	18	19		152.9		152.9	
19	19	20		154.0		154.8	
20	20	21		154.1		154.5	
21	21	22		146.4		146.6	
22	22	23		0.4		0.4	
23	23	24		154.0		154.0	
24	24	25		154.3		154.9	
25	25	26		154.0		154.6	
26	26	27				154.4	
27	27	28				136.5	
28	28	29				154.5	
29	29	30				154.6	
30	30	31				152.1	
31	31	32				150.4	
32	32	33				154.9	
33	33	34				154.5	
34	34	35				155.1	
35	35	36				154.8	

Comments:

Prepared by: GFE Employer: ERES/APR

Date (dd/mmm/yy): 14 /May /98

Data Sheet SMP-C06: Resistivity Calibration Block Check

LTPP Seasonal Monitoring Program Data Sheet SMP-D03 Contact Resistance Measurements	Agency Code [3 9] LTPP Section ID [0 9 0 1]

Start Time (military): 1220

Test Position	Switch Settings		Voltage (ACV)		Current (ACA)		Comments
	I1 V1	I2 V2	Range Setting	Reading	Range Setting	Reading	
1	1	2	auto	177.8	auto	131.2	
2	2	3		156.3		144.8	
3	3	4		143.1		161.5	
4	4	5		68.6		79.5	
5	5	6		139.0		165.0	
6	6	7		177.9		166.2	
7	7	8		134.7		167.0	
8	8	9		1.5		1.8	
9	9	10		127.5		161.7	
10	10	11		122.6		178.6	
11	11	12		111.9		188.3	
12	12	13		123.6		178.5	
13	13	14		110.7		189.6	
14	14	15		81.4		211.8	
15	15	16		88.1		208.6	
16	16	17		247.7		71.6	
17	17	18		329.7		0.1	
18	18	19		335.5		0.7	
19	19	20		146.7		158.7	
20	20	21		70.2		142.4	
21	21	22		86.1		14.8	
22	22	23		0.4		0.7	
23	23	24		65.1		163.1	
24	24	25		68.4		167.2	
25	25	26		68.0		166.2	
26	26	27		64.7		168.5	
27	27	28		57.8		122.3	
28	28	29		58.9		178.5	
29	29	30		56.0		181.0	
30	30	31		~~53.3~~ 119.4		~~186.9~~ 186.9	
31	31	32		~~50.1~~ 106.3		~~193.4~~ 193.4	
32	32	33		~~32.0~~ 91.3		~~206.9~~ 206.2	
33	33	34		~~39.2~~ 78.4		~~217.1~~ 217.0	
34	34	35		~~225.6~~ 240.6		~~78.3~~ 78.3	
35	35	36		~~228.4~~ 306.7		~~22.2~~ 22.1	
36	36	37		0.3		284.5	R1 =
37	37	38		26.3		261.7	R2 =
38	38	39		157.5		157.2	
39	39	00		372.0		0.3	

Note: R = V/I, in ohms; measured resistances should be compared with known values.

Comments: —

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 14/MAY/98

Data Sheet SMP-D03: Contact Resistance Measurements

LTPP Seasonal Monitoring Program Data Sheet SMP-D04 Four-Point Resistivity Measurements	Agency Code [3 9] LTPP Section ID [0 9 0 1]

Start Time (military): 1 2 2 5

Test Position	Switch Settings I1	V1	V2	I2	Voltage (ACV) Range Setting	Reading (Volts)	Current (ACA) Range Setting	Reading (Amps)	Comments
1	1	2	3	4	2 Volts	3.7	2 Amps	141.1	
2	2	3	4	5		3.9		140.4	
3	3	4	5	6		4.4		161.2	
4	4	5	6	7		4.2		161.4	
5	5	6	7	8		4.4		164.3	
6	6	7	8	9		4.1		167.7	
7	7	8	9	10		3.9		162.8	
8	8	9	10	11		3.7		173.1	
9	9	10	11	12		3.7		173.9	
10	10	11	12	13		3.3		167.9	
11	11	12	13	14		3.7		198.6	
12	12	13	14	15		3.2		197.6	
13	13	14	15	16		3.2		183.3	
14	14	15	16	17		1.8		71.6	
15	15	16	17	18		0.1		0.1	
16	16	17	18	19		5.9		192.8	
17	17	18	19	20		5.3		64.6	
18	18	19	20	21		0.1		0.5	
19	19	20	21	22		4.9		176.1	
20	20	21	22	23		3.7		144.1	
21	21	22	23	24		4.1		147.9	
22	22	23	24	25		0.1		0.5	
23	23	24	25	26		4.1		160.7	
24	24	25	26	27		4.4		165.9	
25	25	26	27	28		4.1		169.3	
26	26	27	28	29		3.9		168.8	
27	27	28	29	30		3.1		148.9	
28	28	29	30	31		3.6		181.6	
29	29	30	31	32		3.7		183.6	
30	30	31	32	33		3.3		196.1	
31	31	32	33	34		3.2		200.1	
32	32	33	34	35		1.6		76.2	
33	33	34	35	36		2.7		28.4	
36	36	36	37	37		0.3		284.1	R1 =
	37	37	38	38		26.3		261.8	R2 =
	38	38	39	39		153.2		157.0	R3 =
	39	39	00	00		332.1		0.3	R4 =

Note: R = V/I, in ohms; measured resistances should be compared with known value.

Comments:

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 14/MAY/98

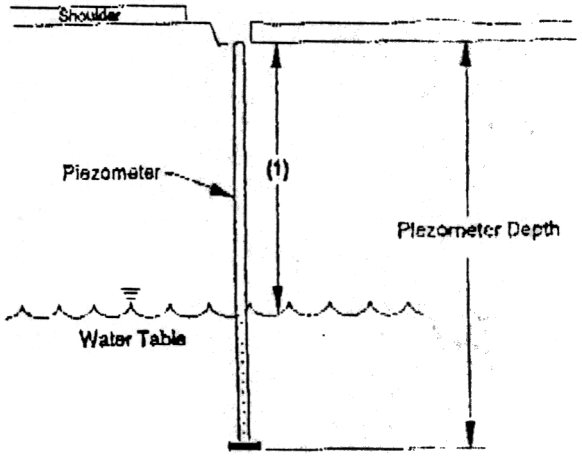
LTPP Seasonal Monitoring Program Data Sheet SMP-D05 Ground Water Table Measurement	Agency Code [39] LTPP Section ID [0901]

Piezometer Depth (m): 4.670

Measurement Number	Time (military)	Depth to Water[1,2] (m)	Comments
1	0900	1.75	5.9' to water
2	1400	1.75	

[1] Distance from top of piezometer pipe to top of ground water table; to an accuracy of ±10 mm (0.4 in)

[2] If piezometer pipe is dry or frozen, enter "time" when observation was made, leave "depth to water" field blank, and enter "pipe is dry" or "pipe is frozen" under comments column.



Comments: _____

Prepared by: GFE Employer: ERES/NCR

Date (dd/mmm/yy): 14/MAY/98

LTPP Seasonal Monitoring Program Data Sheet SMP-D08 Elevation Measurements - AC	Agency Code [37]
	LTPP Section ID [0 1 0 1]

Type of Instrument: NA 290M

Start Time (military): 0 0 3 5

BM	Station	BS	HI	IFS	FS	ELEV	CLOSE
Piez.	4+00	1.0741					
Other							1.0728

Station	Offset (PE): 0.16 m (6")	Offset (OWP): 0.76 m (30")	Offset (ML): 1.83 m (72")	Offset (IWP): 2.90 m (114")	Offset (ILE): 3.51 m (138")	Comments
0+00	1.3416	1.3352	1.3192	1.3048	1.2983	
0+25	1.3355	1.3291	1.3145	1.3000	1.2937	
0+50	1.3251	1.3164	1.2987	1.2832	1.2769	
0+75	1.3088	1.2999	1.2837	1.2652	1.2582	
1+00	1.2928	1.2835	1.2661	1.2484	1.2421	
1+25	1.2767	1.2682	1.2514	1.2378	1.2283	
1+50	1.2617	1.2536	1.2375	1.2212	1.2157	
1+75	1.2461	1.2397	1.2252	1.2082	1.2043	
2+00	1.2277	1.2221	1.2074	1.1907	1.1840	

0.0
7.6
15.2
22.9
30.5
38.1
45.7
53.3
61.0

Comments: Missed closure = 1.0741 − 1.0728 = .0013

Prepared by: GFE Employer: ERES/PCR

Date (dd/mmm/yy): 14/MAY/98

39SB-390901, US-23 SB LANES, 5 MI N OF DELAWARE, OH

		ONSITE Data			MOBILE Data		Manual Data								FWD Data				Distress		Profile		Comments
Date dd/mmm/yy	Visit ID	Pvmt. Temp.	Air Temp.	Rain	TDR	Frost Volts	Backup TDR	Backup TDR	Frost 2-Pt.	Frost 4-Pt.	Water Table	Pvmt. Elev.	Joint Open.	Joint Fault	Man. Temp.	OWP	ML	PE	M	P	P	D	
19-Mar-98	98A	P	P	P	P	P																	Reduced data collection due to weather
15-Apr-98	98B	P	P	P	P	P																	Reduced data collect; FWD malf.
14-May-98	98C	P	P	P	P	P			P	P	P	P			X	3	3						First full data collection at site
18-Jun-98	98D	P	P	P	P	P			P	P	P				X	4	4						AT probe malf; replace and check: OK
31-Jul-98	98E	P	P	P	P	P					P				X	3	3						2nd AT probe malf, no spare
30-Sep-98	98F	P	P	P	P	P					P	P			X	4	4		P				
30-Oct-98	98G	P	P	P	P	P					P				X	4	4						Took manual TDR data
24-Nov-98	98H	P	P	P	P	P			P	P	P				X	4	4						
23-Dec-98	98I	P	P	P	P	P			P	P													
27-Jan-99	99A	P	P	P	P	P			P	P	P												No traffic control due to weather
17-Feb-99	99B	P	P	P	P	P					P												No traffic control due to weather
24-Mar-99	99C	P	P	P	P	P			P	P	P	P			X	4	4		P				Took manual TDR data
14-Apr-99	99D	P	P	P	P	P			P	P	P				X	4	4						Took manual TDR data
19-May-99	99E	P	P	P					P	P	P	P			X	4	4						Cable reader under repair
10-Jun-99	99F	P	P	P	P	P																	Mobile unit fixed, cable lengths OK
15-Jul-99	99G	P	P	P																			
26-Aug-99	99H	P	P	P																			
16-Sep-99	99I	P	P	P																			
14-Oct-99	99J	P	P	P																			
19-Nov-99	99K	P	P	P																			
16-Dec-99	99L	P	P	P																			

Notes

P Denotes data collected and processed by ERES Consultants, Inc
X Denotes data collected by ERES Consultants, Inc.

Updated April 18, 2000

Submitted to

Mr. Jack Springer
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LTPP Division, HRDI-13
Turner-Fairbanks Highway Research Center
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Submitted by

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