GA · SPS-5

Brent Rauhut Engineering Inc.

7 February 1996

Mr. Monte Symons
Pavement Performance Division - LTPP (HNR-40)
Federal Highway Administration
Turner-Fairbanks Highway Research Center
6300 Georgetown Pike, Room F-215
McLean, Virginia 22101

Subject: Final Report - Construction of SPS-5 Project (1205) on IH-75 in Bartow County, Georgia

Dear Monte,

Enclosed is the Final Report for the Specific Pavement Studies (SPS-5) project on IH-75 in Bartow County, Georgia. This report documents the construction of the rehabilitation study test sections at this location.

Please feel free to contact me should you have any questions or comments regarding any of the information included in this report.

Sincerely,

Mark D. Sargent
Project Engineer, SRCO

MDS:dmj

Enclosure: As stated.

c.w/Enc: Ronald Collins, GADOT
Lamar Caylor, GADOT
Donald Watson, GADOT
Wouter Gulden, GADOT
Dennis Richardson, GADOT
Walter Boyd, FHWA-Atlanta
John Miller, PCS/LAW-Kennesaw, GA

c.w/o Enc: Brent Rauhut, SRCO
Morris Reinhardt, RE/SRCO

FINAL REPORT

SPS-5 PROJECT 1305
ASPHALT REHABILITATION STUDY
IH-75, SOUTHBOUND
BARTOW COUNTY, GEORGIA

FHWA/LTPP

SOUTHERN REGION COORDINATION OFFICE

January 1996

BRENT RAUHUT ENGINEERING INC.

8240 Mopac, Suite 220 • Austin, Texas 78759 • (512) 346-0870 • FAX (512) 346-8750

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ASPHALT REHABILITATION STUDY
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INTRODUCTION

As part of the Strategic Highway Research Program's (SHRP) Long Term Pavement Performance (LTPP) Study, sections of highway are being selected to apply very specific treatments to study various facets of construction (both new and rehabilitated). These projects are referred to as Specific Pavement Studies (SPS). This particular project, on IH-75 in Bartow County, Georgia, was identified as a potential candidate for inclusion in the evaluations of asphalt concrete rehabilitation (SPS-5).

SPS-5 General Experiment Design

The anticipated products of the SPS-5 experiment are included in Table 1. The overall intent of the experiment is to evaluate some of the more common asphalt rehabilitation techniques currently used by State Highway Agencies (SHAs). This general evaluation is intended to include condition of the pavement prior to overlay (both structurally and functionally), the loading conditions the project is exposed to (including both environment and traffic) and finally, the various treatment applications. The standard SPS-5 experiment design consists of nine 500′ test sections (as shown in Figure 1). The standard SPS-5 experiment includes four test sections which are subjected to intensive surface preparation (milling) prior to overlay vs. four test sections which will undergo minimal surface preparation, four test sections utilizing recycled mix vs. four with virgin mix and thin overlays (approximately 2″) vs. thick overlays (approximately 5″). The eight test sections represent combinations of the above mentioned features and are placed adjacent to the control section (which receives no rehabilitation) for comparison purposes. Minimal surface preparation will include patching only and/or crack sealing. Intensive surface preparation includes 2″ of milling to be conducted along with patching, if necessary.

As part of the experiment, it was designated that the recycled mixture contain 30% of the Recycled Asphalt Pavement (RAP) and that the RAP material shall be the millings from the intensive surface preparation sections.

For additional information on the general experiment design for SPS-5, please refer to "Specific Pavement Studies: Experimental Design and Participation Requirements" Operational Memorandum No. SHRP-LTPP-OM-005R.

Selection/Nomination of IH-75

The Georgia SPS-5 site location was identified through efforts of the Georgia DOT SPS program. The Georgia DOT reviewed anticipated rehabilitation programs over a five-year period. The list of potential rehabilitation projects which fit the experiment design criteria was narrowed to two

TABLE 1. KEY PRODUCTS OF SPS-5

1. Comparisons and development of empirical prediction models for performance of AC pavements with different intensities of surface preparation, with thin and thick AC overlays, and with virgin and recycled AC overlay mixtures.

2. Evaluation and field verification of the AASHTO Guide design procedures for rehabilitation of existing AC pavements with AC overlays, and other analytical overlay design procedures for AC pavements.

3. Determination of appropriate timing to rehabilitate AC pavements in relation to existing condition and type of rehabilitation procedures.

4. Development of procedures to verify and update the pavement management and life-cycle cost concepts in the AASHTO Guide using the performance prediction models developed for rehabilitated AC pavements.

5. Development of a comprehensive database on the performance of rehabilitation AC pavements for use by state and provincial engineers and other researchers.

FIGURE 1.
SPS-5, REHABILITATION OF ASPHALT CONCRETE PAVEMENTS

REHABILITATION PROCEDURES			FACTORS FOR MOISTURE, TEMPERATURE, AND PAVEMENT CONDITION							
SURFACE PREP	OVERLAY MATERIAL	OVERLAY THICKNESS	WET				DRY			
			FREEZE		NO FREEZE		FREEZE		NO FREEZE	
			FAIR	POOR	FAIR	POOR	FAIR	POOR	FAIR	POOR
Routine Maint. (Control)		0"			X					
MINIMUM	Recycled AC	2"			X					
		5"			X					
	Virgin AC	2"			X					
		5"			X					
INTENSE	Recycled AC	2"			X					
		5"			X					
	Virgin AC	2"			X					
		5'			X					

Subgrade Soil: Fine

Traffic: > 85 KESAL/Year

X = Sections on 48A500

potential sites. As a result, an SPS-5 candidate project was nominated by the State of Georgia on 10 May 1990. Correspondence and site information is included in Appendix A. The project site was located on IH-75 near Cartersville, Georgia, which was located near an existing GPS test section (134119). The GPS project information sheet and section field verification form for 134119 was submitted during the nomination process. The numerical grading system form, which was developed for evaluating the nomination potential, provided a total combined score of 73. The project site, located some 60 miles north/northwest of Atlanta at the base of the Appalachian Mountains, exhibited a hilly terrain, which made it difficult to locate a full 500' monitoring portion in either a cut or fill segment of the highway. Every attempt was made to maintain the entire 500' limit outside of cut/fill transitions. This particular project site was representative of generally fine-grained soils. Traffic levels for this particular site were estimated at approximately 600 KESALs/year in the design lane. The state included 3.5" overlay test sections as transition segments between the standard 2" and 5" SPS-5 test sections. The 3.5" overlay test sections represented both virgin and recycled mixes, which were included in the design as supplemental test sections. The project located on IH-75, in Bartow County, Georgia, was officially approved on 31 October 1990.

Specific Experiment Design for IH-75

The layout from the plants for this particular project are included in Appendix A. As previously mentioned, it was anticipated that the supplemental test sections, which included a 3.5" overlay, would be positioned between the 2" and 5" overlay test sections, for the purpose of providing a smoother transition. During preconstruction material sampling and testing efforts, however, it was determined that soil conditions varied considerably between the north and south portions of the Alatoona Bridge, which divided the project. As a result, all standard SPS-5 test sections were relocated to the north side of the Alatoona Bridge, while all state supplemental test sections were located to the south side of the Alatoona Bridge. More discussion regarding this is included under the heading of "PRECONSTRUCTION MONITORING", subheading of "Materials Sampling and Testing".

PRECONSTRUCTION MONITORING

A number of preconstruction monitoring measurements were performed on IH-75 to establish the condition prior to rehabilitation. Each preconstruction monitoring endeavor will be discussed separately in the following text.

Pavement Surface Distress

Prior to rehabilitation, each test section was marked with paint and signs, etc., to allow for the collection of pavement surface distress. Each test section was rated manually using the SHRP Distress ID Manual. The predominant distress throughout all test sections was low severity longitudinal cracking in both wheel-paths, including a small amount of low severity fatigue cracking. This roadway segment included a 1" surface friction course, which appeared to be raveling and small pieces approximately 1" to 3" in diameter from the wheelpath.

Surface Profile

Surface profile measurements were performed on 1 March 1993, utilizing the SHRP/LTPP profilometer Model 690DNC Inertial Profilometer, manufactured by K.J. Law Engineering, Inc. The K.J. Law high-speed profilometer collects data in the travel lane of each section at 6″ increments. Results of this work are included in Table 2. Transverse profiles were obtained manually using the Dipstick® manufactured by FACE, Inc. Results of the transverse profile (rut depth) are included in Table 3.

Structural Capacity

Deflection measurements were performed beginning on 22 February 1993, in conjunction with materials sampling, and continued into early March 1993, due to inclement weather. Deflection measurements were obtained using the SHRP Falling Weight Deflectometer (FWD) to evaluate the structural capacity of each of these test sections. Deflection measurements were recorded from a series of varying weights in a set pattern at 25′ intervals to measure the subsurface response (deflection) of the structural layers in that highway segment. Results of the deflection testing are included in Appendix B.

Materials Sampling and Testing

Materials sampling and testing was performed, as mentioned above, in conjunction with FWD measurements, by LAW Engineering following a Materials Sampling and Testing Guide established specifically for this project (see Appendix C).

CONSTRUCTION

Following are details of the construction event relating to the asphalt rehabilitation on IH-75 in the southbound lane of Bartow County, Georgia. This specific SPS-5 rehabilitation project included some seventeen 500′ test sections, two of which were observed as control sections and the remaining seven were included as part of the state's supplemental test section program. The state supplemental test sections were originally intended to serve two purposes. The first being an intermediate thickness between the 2″ and 5″ overlays for research purposes, and the second being the facilitation of construction for a smoother progression during travel along the project. However, preconstruction material sampling efforts revealed that the subgrade in Group 2, south of the Alatoona bridge, yielded a subgrade inconsistent with the subgrade sampled on the north end of the project. The south end of the project, south of the Alatoona bridge was consistent of a crushed gravel layer of variable thickness on top of large boulders or bedrock. In most instances, auger refusal was experienced between 30″ and 66″ below the pavement surface. The north end of the project, north of the Alatoona bridge yielded a subgrade consistent of a red sandy silt material. Because of the inconsistent subgrade types between groups, a decision was made between this office and the Georgia Department of Transportation to group all standard SPS-5 test sections on the north end of the project on the fine-grained subgrade as intended and group the supplemental test sections on the south end of the project.

TABLE 2. MEAN VALUES OF IRI (IN/MILE)

Test Section	29 Mar 93		20 Jun 94	
	Preconstruction		Postconstruction	
	Left Wheel Path	Right Wheel Path	Left Wheel Path	Right Wheel Path
130505	73	82	27	42
130506	65	70	23	33
130507	59	53	28	30
130504	63	76	24	42
130503	60	65	26	34
130508	60	61	36	50
130509	52	68	29	36
130502	67	70	24	34
130501	-----	-----	73	76
130567	67	71	84	157
130563	62	69	32	39
130566	64	65	33	38
130562	62	66	27	39
130561	52	48	23	32
130565	55	56	30	34
130564	65	60	28	38
130510	56	52	27	31

TABLE 3. AVERAGE RUT DEPTHS DERIVED FROM DIPSTICK® DATA

Test Section	Average Rut Depth	
	Left Wheel Path (mm)	Right Wheel Path (mm)
130505	9	11
130506	11	10
130507	10	11
130504	9	12
130503	9	13
130508	9	9
130509	8	11
130502	7	8
130501	Not measured due to rearrangement of test sections.	
130567	6	7
130563	7	8
130566	7	8
130562	7	8
130561	8	9
130565	9	10
130564	9	10
130510	9	11

For the most part, all construction events took place during the early evening, throughout the night, into the early morning hours, as the state felt that this was a period of time that would reduce the amount of inconvenience to the motoring public. The following are notes obtained from the field during construction:

> Upon our arrival on site of the SPS-5 experiment, we observed that the state had elected to perform milling operations across all three lanes and along the entire length of the project, to remove the original friction course layer (approximately 1″) due to the delamination of this surface course, as mentioned previously. Therefore, for all purposes of discussion, the new milled surface had then in effect become the surface. The contractor began milling operations at 4:00 p.m. on Monday, 7 June 1993. The make and model of the milling machine utilized on this particular project was a ROADTEC RX-100. All intensive surface preparations (Group 1) were performed on this day and included the outside lane only. The contractor, APAC Construction Company, of the McDonald-Warren Division, began the virgin inlays at 6:45 p.m. All inlays, including both virgin and recycled test sections, were constructed on this day. Prior to inlay, the contractor took great pains to clean all surfaces, utilizing a combination of sweeping apparatus's. A high-volume blower was utilized to clear debris from those areas especially difficult for the rotating brooms to reach. Following the cleaning process, the contractor tacked the inlay sections at a rate of 1650 gallons/1400 lineal ft. at a width of 13′. This equates to approximately .09 gallons/sq. ft. coverage. The laydown machine utilized for this SPS-5 experiment consisted of a ROADTEC Model №. RP-180. The compaction effort included an Ingram Tri-roller for breakdown, followed by a pneumatic-tired or traffic roller, kneading the surface along with a steel-wheel finish double roller. We observed temperatures of the uncompacted mat from 180°F and 195°F throughout this evening of construction. The laydown machine appeared to provide an uncompacted mat that was somewhat coarse in appearance. There were no uneven areas, however, there was a significant amount of evidence of segregation along with areas of pulled aggregate in the uncompacted mat. All inlay mix materials utilized on this project are referred to as Georgia's "B"-mix. For the recycled mix designs, the state elected to utilize only 25% RAP millings into the Georgia "B" RAP-mix.

Surface elevations, including transverse Dipstick® profiles at 50′ intervals, were obtained prior to the removal of the surface friction course. Surface elevations were also obtained from the milled surfaces prior to the actual intensive milling operation for all test sections. The milled surface between Groups 1 and 2 appeared noticeably different. It became apparent that the milled surface for Group 2 exhibited a more coarse surface in appearance than Group 1. The appearance of the milled surface was consistent of 1″ furrows which included a differential between peaks and valleys of approximately 3/8″.

The plant-type utilized for this project was a batch-plant located some 15 miles south of the project. The batch-plant setup enabled the contractor to switch from the virgin mix to the recycled mix, or vice versa, without much delay. Travel time between the plant and the site was approximately 20 minutes in time.

Occasionally, the construction process would be delayed due to the lack of available material for the laydown machine for approximately 5 minutes, which caused imperfections in the uncompacted mat produced by the laydown machine. The ROADTEC RP-180 appeared to leave a transverse mark, or indentation, at each time when forward motion was impeded for any length of time.

Roller patterns included approximately 8 passes with a breakdown tri-roller to reach density, six passes of the pneumatic roller followed by 4 passes of the steel-wheel double drum finish roller. The triple drum roller, an Ingram, weighed 10 to 15 tons, depending on the volume of water contained. The pneumatic roller weighed approximately 14 tons and the finish double-drum roller weighed approximately 12 tons. On Tuesday, 8 June 1993, it was observed that the triple drum roller, or breakdown roller, had been replaced by a double drum roller weighing approximately 14 tons which was utilized on test section 130507. It was observed that this particular breakdown roller lacked the necessary water and scraper pads to maintain a clean set of drums.

On Wednesday, 9 June 1993, it was observed on test section 130504 what appeared to be a dry load between Stations 3 + 00 and 4 + 50. Approximately 1½ hours following a compaction effort on test section 130504 of an upper binder layer, it was realized that the material appeared to be brittle without cohesion.

Due to the nature of the material observed in 130504, the state elected to perform some coring in both test sections 130504 and 130508. In many instances, a large amount of air void or void cavities were observed in each of the core samples. Pictures and video were obtained of the cores in questions. The state performed a split tensile test and determined the theoretical maximum densities for all cores in question. Nuclear density tests were also performed in those areas in question. By Tuesday, 15 June 1993, all virgin and recycled binder layers had been constructed.

On Wednesday, 16 June 1993, the contractor began the construction of Georgia's "E"-mix on test section 130505. A 1½" lift of the "E"-mix was placed on all test sections that were inclusive of the 3½" to 5" overlays. A 2" compacted "E"-mix mat was constructed on those test sections which included minimum surface preparations with a 2" overlay only. Throughout the construction of both binder and surface layers, the contractor utilized the 25% rule, whereby the construction of 1¼" of uncompacted mat would yield an approximately 1" compacted product. Temperatures of the more dense "E"-mix were observed as low as 260°F, and in some instances reached temperatures as high as 315°F, immediately after the laydown machine. Progress was halted during the construction of the "E"-mix layer on test section 130502 when one of the transport vehicles discarded approximately one-half of its tare in front of the laydown machine. This occurred at about Station 2 + 50, and as a result, production was halted while the material was replaced into the hopper of the laydown machine. This took approximately 45 minutes, which ultimately produced a number of surface anomalies which were not successfully removed during the compaction process. Also, prior to the construction of the recycled "E"-mix topping, this particular test section received a ½" skin patch, or binder material, prior to the construction of the 1½" "E"-mix layer. The contractor had accidentally applied a tack coat beyond the intended stopping point continuing throughout test section 130502 and was unwilling to leave the tack coat open to traffic. Hence, the construction of the ½" binder layer. Another unplanned incident occurred on test section 130501 (control section for Group 1) whereby construction of the ½" binder layer was performed beyond the beginning of the control section by 15′. This resulted in a control section of 485′ only in length.

During the collection of rod-shot data on test section 130562, we noticed a number of surface anomalies between Stations 4 + 50 and 5 + 00. The surface exhibited uneven and stretched marks with lumps in the pavement surface. The contractor, upon notification of the above mentioned surface anomalies, attempted further compaction efforts in an attempt to smooth and tighten the surface. The surface anomalies once again were observed in the "E"-mix, or surface layer.

Following the construction of both recycled and virgin surface mixes, a friction course approximately 1" in thickness was applied to all surfaces traversing all three lanes. Rod and level shots were obtained for the most part before and after all lifts constructed.

POSTCONSTRUCTION MONITORING

Following the completion of all rehabilitation applications, postconstruction monitoring was initiated. These monitoring activities consisted of those same types of monitoring activities that took place prior to construction.

Pavement Surface Distress

Following construction, all test sections were identified by paint and filmed by video. All test sections were also filmed by the PASCO ROADRECON unit on 7 April 1994.

Surface Profile

In addition to the rod and level measurements, all sections were again profiled using the SHRP high-speed profilometer on 13 June 1994. Transverse profile measurements again were collected by the PASCO ROADRECON unit on 7 April 1994. The plots of rod and level data before and after overlay are available in Appendix D, which exhibit changes in the transverse profile.

Structural Capacity

Deflection measurements were again taken, after completion of the rehabilitation applications, on 3 November 1994. These results are also included in Appendix B. The structural response appeared to improve (less deflection was observed) after completion of the overlays, with the greatest improvements being observed in the sections with thicker overlays, as expected.

Materials Sampling and Testing

The postconstruction sampling and testing (coring of 4" cores) on 1 November 1993. Coring was performed 50' from the approach and leave end of each test section following a layout diagram indicated in the Material Sampling Plan prepared for this experiment. Sampling was conducted by LAW Engineering under the supervision of Mr. Michael Wilson. Testing is currently underway and near completion, utilizing SHRP test protocols with the exception of P06 creep compliance and P46 resilient modulus of the subgrade. It is our understanding that those samples to be tested under those protocols will be set aside in storage until the required testing protocols are available.

SUMMARY

After review of all pertinent data retrieved from the ensuing construction events, additional monitoring efforts have begun of the test sections located on IH-75 in Bartow County, Georgia. It appears that this project will contribute significantly to the research efforts. Special consideration should be given to members of the Georgia Department of Transportation. In particular, much of the credit is due to individuals such as Ronald Collins, Dennis Richardson and Don Watson, for their efforts in expediting the necessary tasks to make this project possible. Credit is also due to Walter Boyd of the Atlanta FHWA Regional Office, for his efforts in coordinating with the state in making this project come to fruition.

Currently, monitoring efforts are scheduled and we will continue noting changes in the surface distress, surface profile and structural capacity, and compare those data with other projects of this nature around the country in an attempt to improve on existing asphalt pavement rehabilitation design methods.

APPENDIX A

SITE BACKGROUND DATA

RECEIVED MAY 14 1990

Department of Transportation
State of Georgia
Office of Materials and Research

15 Kennedy Drive
Forest Park, Georgia 30050-2599

May 10, 1990

SHRP Regional Coordinator
8240 MoPac Suite 250
Austin, Texas 78759

Attention: Mr. Homer Wheeler, P.E.

Dear Homer:

Please find attached Georgia's nomination for the SPS-5 test site. Also, for your information, you will find attached, a letter detailing the proposed test site layout, proposed mix types, and layer construction for SPS-5.

If you need further information please contact Mr. Ronald Collins at 404/363-7501.

Very truly yours,

Peter Malphurs
State Materials and Research Engineer

PM/RC/blc

cc: Don Watson, State Maintenance Engineer
Stanley Lord, Director, Division of Construction

NOMINATION OF TEST SITES FOR
SPS-5, "REHABILITATION OF ASPHALT CONCRETE PAVEMENTS"

Agency: Georgia Department of Transportation

Name: Peter Malphurs

Title: State Materials and Research Engineer

Phone: (404) 363-7510

Our agency is proposing the following site* for experiment SPS-5 on rehabilitation of asphalt concrete pavements:

Highway (Class and Number) I-75

District 6

Year Open 1978

Traffic for the Year 88

AADT: 40300

Trucks: 21.5 %

Subgrade Type 56

Traffic 600 KESAL/Yr.

AC Thickness 14 in.

Base Type 23

Base Thickness 5.0 in.

*Rehabilitation is planned for 1991/92.

Please return to:
Strategic Highway Research Program
SPS Site Nominations
818 Connecticut Avenue, N.W.
Washington, DC 20006

LAYER DESIGN FOR PROPOSED TEST SITES

ST SITE		ASPHALT TONNAGE	LAYER DESIGN
1	Control	0	Routine Maintenance only
2	30/70 Recycled AC	14.7	Transition
3	30/70 Recycled AC	73.3	2"; 2" E
4	30/70 Recycled AC	40.3	Transition
5	30/70 Recycled AC	128.3	3½"; 1½"E, 2" B
6	30/70 Recycled AC	62.3	Transition
7	30/70 Recycled AC	[illegible]	5"; 1½" E, 1 3/4 B, 1 3/4 B
8	Virgin AC Mix	73.3	Transition
9	Virgin AC Mix	183.3	5"; 1½" E, 1 3/4 B, 1 3/4 B
10	Virgin AC Mix	62.3	Transition
11	Virgin AC Mix	128.3	3½"; 1½" E, 2" B
12	Virgin AC Mix	40.3	Transition
13	Virgin AC Mix	73.3	2"; 2" E
14	Virgin AC/Milled Surface	58.7	Transition
15	Virgin AC/Milled Surface	146.6	4"; 1½" E, 2½" B
16	Virgin AC/Milled Surface	69.7	Transition
17	Virgin AC/Milled Surface	201.7	5½"; 1½" E, 2" B, 2" B
18	Virgin AC/Milled Surface	91.7	Transition
19	Virgin AC/Milled Surface	256.7	7"; 1½" E, 2½" B, 3" B
20	Virgin AC or 30/70 Recycled	102.6	Transition
21	30/70 Recycled AC	256.7	7"; 1½" E, 2½" B, 3" B
22	30/70 Recycled AC	91.7	Transition
23	30/70 Recycled AC	201.7	5½"; 1½" E, 2" B;, 2" B
24	30/70 Recycled AC	69.7	Transition
25	30/70 Recycled AC	146.7	4"; 1½" E, 2½" B
26	30/70 Recycled AC	44.0	Transition
27	Control - GPS 1341119	0	Routine Maintenance only

I-75 BARTOW COUNTY
NORTH OUTSIDE LANE
LENGTH 10,350 FEET (1.96 MILES)

SECTION 1	2	3	4	5	6	7	8	9	10	11	12	13
CONTROL* 500	TRANSITION 200'	2" OVERLAY 500'	TRANSITION 200'	3½" OVERLAY 500'	TRANSITION 200'	5" OVERLAY 500'	TRANSITION 200'	5" OVERLAY 500'	TRANSITION 200'	3½" OVERLAY 500'	TRANSITION 200'	2" OVERLAY 500'

Sections 1–13: MINIMUM SURFACE PREPARATION, I.E., POTHOLE PATCHING, CRACK REPAIR AND SEALING

Sections 1–8: 30/70 RECYCLED A.C. SINGLE GRADED AC SAME MIX CRITERIA AS VIRGIN AC MIX

Sections 8–13: VIRGIN A.C. MIX TO FHWA TECHNICAL ADVISORY T5040-27, MARCH '88

14	15	16	17	18	19	20	21	22	23	24	25	26	27
TRANSITION 200'	2" OVERLAY 500'	TRANSITION 200'	3½" OVERLAY 500'	TRANSITION 200'	5" OVERLAY 500'	TRANSITION 200'	5" OVERLAY 500'	TRANSITION 200'	3½" OVERLAY 500'	TRANSITION 200'	2" OVERLAY 500'	TRANSITION 200'	CONTROL* 1250' GPS-1341119 MP 280.1

Sections 14–27: INTENSIVE SURFACE PREPARATION, I.E., COLD MILLING UP TO 2" AND REPLACED WITH A.C. MIX, INCLUDING CRACK REPAIR AND SEALING

Sections 14–20: VIRGIN A.C. MIX TO FHWA TECHNICAL ADVISORY T5040-27, MARCH '88

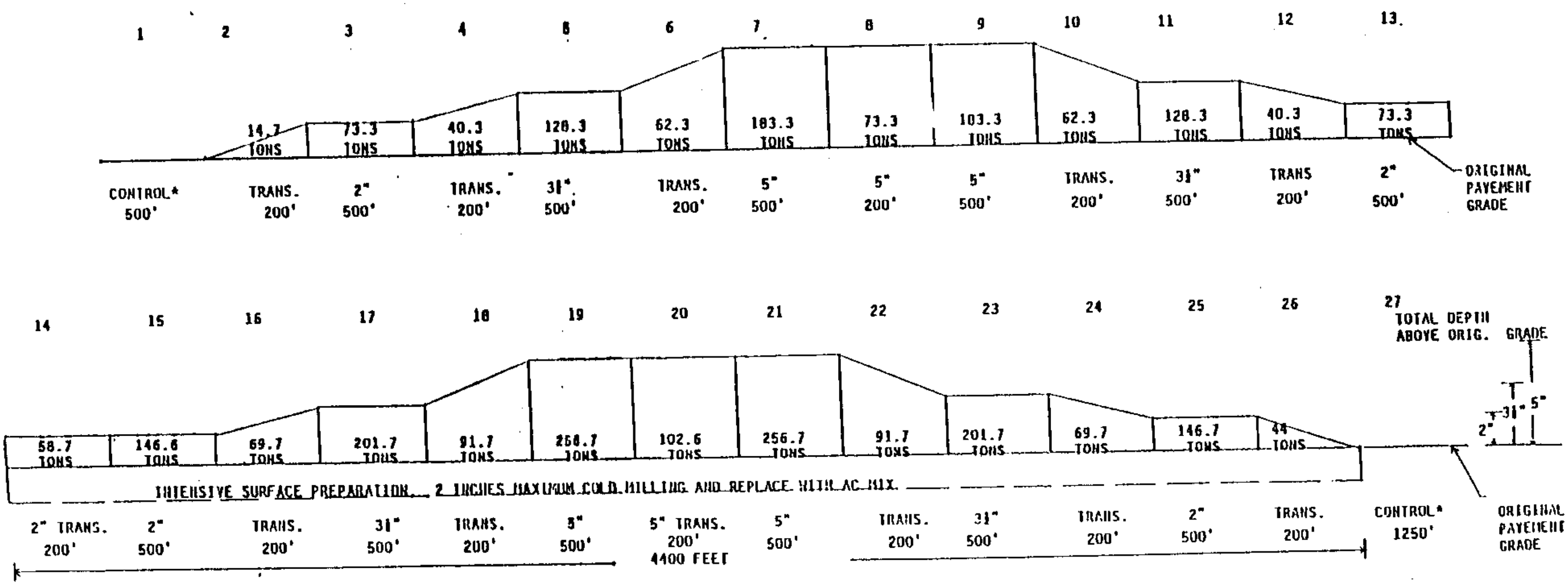
Sections 20–27: 30/70 RECYCLED A.C. SINGLE GRADE A.C. SAME MIX CRITERIA AS VIRGIN A.C. MIX

* CONTROL SECTION
ROUTINE MAINTENANCE ONLY,
I.E., POTHOLE PATCHING
CRACK REPAIR & SEALING

STRATEGIC HIGHWAY RESEARCH PROGRAM
SPS-5, REHABILITATION OF ASPHALT PAVEMENTS

NOT TO SCALE

I-75 BARTOW COUNTY
NORTH OUTSIDE LANE
LENGTH 10,350 FEET (1.96 MILES)



*CONTROL SECTION
ROUTINE MAINTENANCE ONLY, i.e.,
POTHOLE PATCHING, CRACK REPAIR
AND SEALING

STRATEGIC HIGHWAY RESEARCH PROGRAM
SPS-5, REHABILITATION OF ASPHALT PAVEMENT

NOT TO SCALE

Brent Rauhut Engineering Inc.

June 13, 1990

Mr. Gary E. Elkins
Texas Research & Development Foundation
6811 Kenilworth Avenue, Suite 230
Riverdale, Maryland 20737

Subject: SPS-5 Candidate Project Nominated by Georgia.

Dear Gary,

Please find enclosed the Candidate Project Nomination Forms and the letter of nomination for a project to be considered for SPS-5 in Georgia. This project is located on I-75 near Cartersville, Georgia and includes a current GPS test section (134119) within its limits. The GPS Project Information Sheet and Section Field Verification Form for 134119 are also provided for your information. The numerical grading system form which we developed last fall was also completed and is provided for your review (total combined score of 73).

Since this was one of the projects which they had originally nominated in 1989, GDOT was not required to submit the newer version of the nomination forms. Mr. Fitts has transferred whatever information he could to the new forms, which are attached.

The project is located approximately 60 miles north-northwest of Atlanta in the foothills of the Appalachian Mountains. The hilly terrain of this area will cause it to be difficult, if not impossible, to avoid locating test sections in cut/fill transitions and side hill fills. These conditions should be avoided according to the "Specific Pavement Studies Guidelines for Nomination and Evaluation of Candidate Projects for Experiment SPS-5, Rehabilitation of Asphalt Concrete Pavements". However, the extent to which this occurs is impossible to discern without reviewing the original project cross-sections, which are not available to us at this time.

In February 1990, when Mr Fitts discussed the possible nomination of this project for SPS-5 with GDOT in their offices, he expressed concern about this location and asked if changes in soil type could be expected along this project. He was told that minor variations exist as they do on most projects, but that the soils in this particular area were generally fine-grained (AASHTO A-4) and deep.

8240 Mopac, Suite 220 • Austin, Texas 78759 • (512) 346-0870 • FAX (512) 346-8750

The variation in cut and fill on this project did not appear to Mr. Fitts to have affected the distress manifestations which were apparent when he visited the project to identify the location of GPS 134119 in January, 1989. Rutting was observed throughout the project, and appeared to exceed 0.25 in. in the center and outside lanes. The only other distress noted was low severity raveling of the slurry seal, which was usually observed near the lane-lane lines.

The topography also affects the horizontal alignment of a project, especially an Interstate project, since there are stricter standards for features such as percent grade, sight distance, etc. than for most U.S. or state highways. As a result, there are three superelevated curves within the segment of the project which can be considered for the SPS-5 site. Since the cross-slope is constant (approx. 0.016 ft/ft), the inclusion of test sections within the superelevated right curve would not cause a difference in the amount of surface water runoff available at the outside edge of pavement with respect to a tangent section under similar grade conditions. The superelevated left curves should be avoided, however, as there is a tremendous difference between the amount of surface water runoff at the outside edge of pavement compared to what is available in a tangent section, particularly in this case where there are three lanes in each direction.

While this surface water runoff consideration does not appear as a criterion in the guidelines, it really should, and merits consideration by all regions. To illustrate this, consider a case where there is a level (0.00% longitudinal grade) pavement which is 24 ft. wide. Assume that this location receives a one-inch rainfall accumulation in a thunderstorm. A point on the outside (right) edge of pavement with an area of one square inch would be exposed to 1 cubic inch of water if the roadway is in a superelevated left curve, because the pavement is sloping away from this point. However, this point would be exposed to 289 cubic inches (1.25 gallons), less the amount which evaporated, infiltrated into the pavement, or was sprayed off the surface by traffic, if it were in a tangent section with a constant cross slope receiving the same amount of rain. As you can see, the result of allowing sections with different surface drainage is to effectively change the environment with respect to the quantity of moisture available at the outside edge of pavement or in the wheelpaths in the outside lane.

The reason for this discussion is that some difficult decisions will have to be made on this and other projects regarding which feature is more important to avoid when identifying specific test section locations for all SPS experiments. On this project, the choice would be between cut/fill considerations and surface drainage. It may be that similarity in surface drainage conditions (moisture accessibility) is more important than similarity in cut/fill, particularly if cut/fill changes do not result in significant differences in the soil type.

Regarding the project nominated by Georgia, there are features which make it an attractive one to implement into the SPS-5 study. It could perhaps have the highest rate of ESAL applications of any SPS-5 candidate, with an estimated 600 KESAL's/year in the design lane. GDOT is also planning to include, as supplemental sections, 3.5-inch overlays with virgin and 30% recycled mix for both levels of surface preparation, which would allow future researchers to evaluate an important intermediate level of this factor. Since 134119 is the only GPS test section in Georgia which has not been sampled, it should be possible to coordinate the GPS and SPS sampling and field testing operations (to reduce costs to GDOT).

The only significant negative feature about this project is the inability to locate all sections uniformly within fills or cuts and out of cut/fill transitions. This may not be significant on this project, as the distress in the existing pavement is relatively uniform and does not appear to be attributable to differences in cut or fill.

We are concerned about the probable necessity of having both cut and fill within a particular test section, but believe that this project has sufficient merit that it should be accepted for further consideration. If we find a better project for this cell later this summer, we could recommend it instead.

Best wishes,

Brent Rauhut
Program Manager, SRCO

Attachments: As stated above.

cc: Dr. Amir Hanna
Homer Wheeler

SHEET A. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE GA

PROJECT LOCATION

ROUTE NUMBER 75

ROUTE SIGNING [✓] Interstate [] U.S. [] State [] County

Other ______

PROJECT LOCATION Start Milepost 277.1 End Milepost 285.2

Start Station 75+50 End Station 504+00

PROJECT LOCATION DESCRIPTION Project begins at the Bartow - Cherokee Co. line and extends to Emerson - Allatoona Rd. Milemarks are posted and GPS #134119 is located in the NBL within this project.

COUNTY BARTOW

HIGHWAY AGENCY DISTRICT NUMBER 6

SHRP ENVIRONMENTAL ZONE

[] WET FREEZE [✓] WET NO-FREEZE [] DRY FREEZE [] DRY NO-FREEZE

SIGNIFICANT DATES

LATEST DATE OF APPROVAL NOTIFICATION FROM SHRP ______

CONTRACT LETTING DATE 91

ESTIMATED CONSTRUCTION START DATE 91

PROJECT DESCRIPTION

YEAR OPENED TO TRAFFIC 78

NUMBER OF LANES (One Direction) 3

[✓] Divided [] Undivided

OUTSIDE LANE WIDTH (Feet) 12

OUTSIDE SHOULDER TYPE

[] Turf [] Granular [✓] Asphalt Concrete [] Surface Treatment

[] PCC [] Curb and Gutter Other ______

OUTSIDE SHOULDER WIDTH (Feet) 10

SUBSURFACE EDGE DRAINS [] Placed at initial construction [✓] Not Used

[] Retrofitted Retrofit Date ______

ASSESSMENT OF PRESENT PAVEMENT CONDITION [✓] Fair [] Poor

PREDOMINATE DISTRESSES

[] Fatigue Cracking [] Other Cracking [] Potholes/Patches [✓] Rutting

Comments ______

SHEET B. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE GA

PAVEMENT STRUCTURE LAYER DESCRIPTIONS

LAYER[1] NO.	LAYER[2] DESCRIPTION CODE	MATERIAL TYPE[3] CLASS CODE	THICKNESS[4] (INCHES)	(est. by G&F) STRUCTURAL[5] COEFFICIENT
1	SUBGRADE (7)	5 6	———	——
2	0 6	2 5	6.0	0.08
3	0 5	2 3	5.0	0.14
4	0 4	2 8	9.0	0.34
5	0 4	2 8	3.0	0.34
6	0 3	0 1	2.0	0.44
☆ 7	0 2	7 2	0.3	0.00
8			.	0.
9			.	0.

NOTES

1. Layer 1 is the natural occurring subgrade soil. The existing surface will have the largest assigned layer number.

2. Layer description codes:

Overlay 01	Base Layer 05	Porous Friction Course . 09
Seal Coat 02	Subbase Layer 06	Surface Treatment 10
Original Surface . 03	Subgrade 07	Embankment (Fill) 11
Subsurface HMAC .. 04	Interlayer 08	

3. Refer to Tables 1 through 4 for material class codes.
4. If subgrade depth to a rigid layer is known, enter this depth for subgrade, otherwise leave blank for subgrade layer.
5. Enter AASHTO structural layer coefficient used in pavement design or typical coefficient used by agency for this material. For the subgrade, enter either AASHTO soil support value or estimated resilient modulus.

☆ In 1986, the original 1/2" thick asphalt concrete friction course was removed and replaced with a slurry seal.

SHEET C. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE GA

TRAFFIC DATA

ANNUAL AVERAGE DAILY TRAFFIC (TWO DIRECTION)	40300
% HEAVY TRUCKS AND COMBINATIONS (OF AADT)	21.5
COUNT YEAR OF AADT ESTIMATE	1988
TRAFFIC GROWTH RATE SINCE PROJECT OPENED TO TRAFFIC (%/YR)	
18K ESAL RATE IN PROPOSED STUDY LANE (1,000 ESAL/YR)	600
YEAR OF ESAL RATE ESTIMATE	
ESTIMATED TOTAL 18K ESAL APPLICATIONS IN STUDY LANE[1]	

REHABILITATION INFORMATION[2]

PRIMARY CAUSE FOR REHABILITATION Rutting exceeding 1/4".

OVERLAY	Thickness (Inches)	Material Type Class Code
Surface Course	1.5	01
Binder Course	2.0	28

SURFACE PREPARATION PRIOR TO OVERLAY

[] Patching [] Crack Sealing [] Milling Depth of Mill ________

Other ________

OTHER CONSTRUCTION ACTIVITIES TO BE PERFORMED DURING REHABILITATION

NOTES

1. Leave blank if estimate is not available.
2. This information concerns the planned rehabilitation work to be performed by the agency on the non-experimental portions of the project.

SHEET D. SPS-5 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE GA

TEST SECTION LAYOUT

NUMBER OF TEST SECTIONS ENTIRELY ON: FILL ________ CUT ________

SHORTEST TRANSITION BETWEEN CONSECUTIVE TEST SECTIONS (Feet) 200' *

COMMENTS ON DEVIATIONS FROM DESIRED SITE LOCATION CRITERIA

* GDOT has already laid-out a plan for constructing the test sections, which is illustrated in their nomination letter.
Although this layout can be modified (according to Ronald Collins), it is unlikely that cut/fill transitions can be avoided.

OTHER SHRP TEST SECTIONS

DOES PROJECT CONFORM TO GPS-1 OR GPS-2 PROJECT CRITERIA?	[✓] YES	[ ] NO
DOES AGENCY APPLIED TREATMENT QUALIFY FOR GPS-6B?	[✓] YES	[ ] NO
IS PROJECT SUITABLE FOR SPS-3 TEST SECTIONS?	[ ] YES	[ ] NO
IS AGENCY INTERESTED IN USE OF PROJECT AS SPS-3 SITE?	[ ] YES	[✓] NO

DISTANCE TO NEAREST GPS TEST SECTION ON SAME ROUTE (Miles) same project

TEST SECTION NUMBER OF NEAREST GPS SECTION 134119

SUPPLEMENTAL TEST SECTIONS

IF SUPPLEMENTAL EXPERIMENTAL TEST SECTIONS ARE PROPOSED, COMPLETE THE FOLLOWING

TOTAL NUMBER OF SUPPLEMENTAL TEST SECTIONS 4

FACTORS TO BE INVESTIGATED 3 1/2" overlay using virgin and recycled mix on both levels of surface preparation.

RECEIVED JUL 0 2 1990

NATIONAL RESEARCH COUNCIL

STRATEGIC HIGHWAY RESEARCH PROGRAM

818 Connecticut Avenue, N.W., Washington, D.C., 20006 Tel.: (202) 334-3774 Fax: (202)223-2875

June 28, 1990

MEMORANDUM

TO: Homer Wheeler, Southern Region

FROM: Amir N. Hanna

SUBJECT: Nomination for SPS-5 Site in Georgia

We have reviewed the nomination form for the proposed SPS-5 site on I-75 in Georgia (BRE's submission of June 13, 1990).

A preliminary review of the proposed site indicates that the site meets the requirements for the SPS-5 experimental design for roadways in the "wet-no freeze" environment zone. However, in the absence of a site plan and profile sheets indicating the location of the proposed test sections, the suitability of the proposed can not be adequately assessed. Consequently, the nominated site can only be tentatively approved at this time.

Please forward to Gary Elkins (TRDF, Maryland) as soon as possible a site plan and profile sheets for the proposed site in order to complete the review process and notify Georgia Department of Transportation with the final results of the review.

Enclosure (preliminary review)

cc: N. F. Hawks
D. Donnelly
P-001 (G. Elkins)

TECH MEMO NO.:	P1-TM-EC-60	DATE:	June 25, 1990
AUTHOR:	Gary E. Elkins	FILE:	P1-SPS-31
DISTRIBUTION:	Amir Hanna		
SUBJECT:	Review and recommendation on nominated SPS-5 project on I-75 in Georgia.		

This memorandum contains my review comments and recommendations on the SPS-5 project in Georgia. This review is based on the nomination form and information to me under Brent Rauhut's letter of June 13, 1990.

As discussed in Brent's letter, I agree that super-elevated curves should be avoided within test sections, but would note that even right hand super-elevated curves impose differences in drainage patterns that should be avoided, particularly on center crown pavement sections. The operational definition should be that all test sections have the same cross slope (including any super-elevation) and cross section shape (crown - no crown). It is difficult to generalize which is more important, constant cross-slope and section shape, or constant cut-fill. This depends on site conditions. For example, crossing cut-fill transitions with-in a test section could produce significantly different results from the material tests performed adjacent to the ends of the project. Also, deflections within the project section could vary significantly as a function of cut-fill. Depth to a rigid layer could also vary significantly due to cut-fill, or they might not vary.

Given the SN of the pavement structure, it is not surprising that the project displays only moderate amounts of structural distress and that it does not appear to vary as a function of cut-fill. Using the information on layer thicknesses and layer coefficients provided on the nomination form, the pavement has a structural number of 6.14 (uncorrected for drainage). Assuming a subgrade resilient modulus of 3,000 psi (the values assigned to the material at the AASHO Road Test), which could be considered a "weak" material, and a reliability level of 50% (mean life), the 1986 AASHTO design equation predicts that the structure can withstand more than 51 million ESAL applications for a serviceability drop of 2.5. At a 90% reliability level, assuming S_0 of 0.35, the pavement is predicted to withstand 18 million ESAL applications.

Assuming that the estimated 600,000 ESAL/year rate in the study lane was constant since 1978, (to over estimate the effect of the traffic growth), then this estimate the effect of the traffic growth), then this section has received an estimated 7.2 million ESALS. Its' 20 year design traffic is approximately 12 million ESALS. Although this section has what the Southern region describes as a high traffic rate, given the assumptions on the required pavement structure, the existing pavement structure might be considered over designed.

Assuming a 12 million ESAL design traffic (20 years @ 6000,000 ESAL/year), then a pavement structure with an SN of 5.1 would be required (R=50%, , δPSI=2.5, M_R=3,000 psi). An SN of 5.85 would be required for R=90%, S_o=3.5, δPSI=2.5, M_R=3,000 psi. Since we expressed the over/under design considerations in terms of the design SN value based on AASHTO, the as-built SN of 6.14 is less than 1.2 times 5.1 (design SN @ R=50%). Therefore, it meets the over/under design criteria. Although this pavement has a "high" traffic level, in my opinion, this feature does not make it more desirable, than say, a project with 200,000 ESAL'S per year, as suggested in Brent's letter.

Without a site plan and profile sheets, it is not possible to assess the project's suitability. I suggest that you send a short memo to all of the regions requesting that they submit a plan and profile sheet for each project which shows the location of the proposed test sections. Nomination forms should not be submitted without these plans since this important aspect of a sites' suitability cannot be assessed. It does not appear logical to provide tentative project acceptance pending plan review. It also creates a time waste since we must review the project again after the plans have been reviewed to assess the suitability of the site.

Based on the information provided, I recommend that we tentatively accept this project pending a plan review to assess the site suitability for location of test sections.

GEE/gfb
WP51\TECH\ECTM.60

RECEIVED SEP 1 4 1992

Memorandum

U.S. Department of Transportation
Federal Highway Administration

6300 Georgetown Pike
McLean, Virginia 22101

Subject: ACTION: Specific Pavement Study (SPS) - Georgia Allocation of Incentive Funds

Date: SEP 4 1992

From: Director, Office of Engineering and Highway Operations Research and Development

Reply to Attn. of: HNR-40

To: Mr. Leon N. Larson
Regional Federal Highway Administrator (HEO-04)
Atlanta, Georgia

We received and previously approved the nomination from the Georgia Department of Transportation (DOT) for a SPS-5 test site on I-75 in Bartow County. Participation in the SPS-5 experiment is appreciated. The information from this site will contribute significantly to achieving the goals of the experiment.

The inclusion of this site into the Long-Term Pavement Performance (LTPP) program allows Georgia DOT to be eligible for special incentive funds for reimbursement of certain expenses associated with the SPS experiment. This memorandum authorizes the obligation of a total of $30,000 subject to the following:

1. Georgia DOT's continued agreement to conform to all of the design and participation requirements of the experiment.

2. Funds are to be used for reimbursement of costs associated with the SPS site for; (a) the purchase and/or installation of weigh-in-motion and/or automated vehicle classification equipment; (b) conventional sampling and materials testing; and/or (c) traffic control expenditures that are incurred as part of this data collection activity.

3. The expenditures were on projects completed after May 4. Funds are expected to be used within 5 years of this authorization.

4. The appropriation code is 380 and the regular Fiscal Management Information System and regular Federal-aid procedures are to be used.

5. The accounting code for these funds is: 380-04-13-50-0000-005.

The cooperation and assistance of the FHWA Region 4 and Georgia Division staff in the LTPP program is appreciated. Upon receipt of this memorandum, it is expected that the Georgia Division Office will officially notify Georgia DOT of this allotment and establish the appropriate accounts. Any questions concerning the requirements or this allocation should be directed to Mr. Monte Symons at (703) 285-2730. Question related to the project status, testing, and/or coordination should be directed to either Mr. Symons or Mr. Homer Wheeler, LTPP Southern Regional Engineer. Mr. Wheeler can be reached at (512) 346-7477.

Thomas J. Ptak

cc: Mr. Homer Wheeler

PAVEMENT CONSULTANCY SERVICES
A DIVISION OF LAW ENGINEERING

October 2, 1990

Dr. Amir Hanna
Strategic Highway Research Program
818 Connecticut Avenue, NW
Washington, DC 20006

Subject: The Proposed SPS-5 Project on I-75, Georgia

Dear Amir:

This is in response to a letter dated September 11, 1990 from Gary Fitts, Brent Rauhut Engineering, Inc., regarding the suitability of the proposed SPS-5 Project on I-75 in Georgia.

As now proposed, the project will be divided into two groups of test sections with the virgin HMAC sections on the northern end and the RAP section on the southern end of the project. As Gary Fitts indicates, most problems with the layout of the project have been resolved except for the concern related to the project being located in both cut and fill areas. In order to resolve this concern, BRE has analyzed FWD deflection measurements along the project and compared the responses with two other SPS-5 projects. Primarily data for Sensors 1 and 7 were analyzed.

Based on the analysis of the data, BRE is of the opinion that the variability in the deflection response between cut and fill areas is not unusual when compared with two other accepted SPS-5 projects. Also, according to BRE, the distress observed throughout the project is similar regardless of cut and fill heights. BRE therefore recommends approval of the proposed project for the SPS-5 experiment.

PCS/LAW has reviewed the information provided by Gary Fitts and have the following comments to offer:

1. While deflection variations in the proposed section are not greater than those for similar projects, it is quite obvious from the information provided that there are very unique subsections within the project; i.e., Stations 315 to 330, 330 to 360, and 360 to 370. Similar trend could not be ascertained for the Group II area (Station 150 to 210) since deflection data for this area was not included.

2. If one looks at the normalized deflection statistics for each of these subsections, the difference in magnitude is quite marked, particularly when looking at the mean values. The mean geophone 7 normalized deflection for the first subsection, for example, is approximately twice as large (i.e., weaker foundation, fill) as that of the second subsection (i.e., stronger foundation, cut).

3. From the above observations, it is our opinion that the response of the pavement to loadings will be different for each subsection. Before providing a more definitive conclusion, however, we feel that

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FAX (301) 604-5032

further analyses need to be made to resolve several concerns. These concerns are briefly discussed below.

- As the pavement in question is comprised of an asphaltic concrete surface, were there any efforts made to correct the deflection data for temperature prior to undertaking the analysis. This we feel is critical in order to perform comparison studies and ultimately develop conclusions from the results of these studies.

- Along the same lines, only normalized deflection data for the 12 kip load is provided in the letter. We think it is important to look at deflections from both the 9 kip and 12 kip loads in order to assess the non-linear behavior of the materials, particularly that of the subgrade.

- The data analyzed was from Group I area only. Is the Group II area responses similar?

- We suggest that a hypothesis test be performed to determine if there is a significant difference in deflection response of the cut and fill areas.

We agree with SRCO that the variability in normalized deflections on the proposed SPS-5 project in Georgia is not unusual when compared with other accepted SPS-5 projects. However, we would feel more comfortable with recommending the acceptance of the project if the concerns we have expressed are satisfactorily resolved.

Please call me if you have any questions regarding the above discussion.

Sincerely,

Shiraz D. Tayabji

Shiraz D. Tayabji, Ph.D., P.E.
Division Manager

SDT/cs

NATIONAL RESEARCH COUNCIL

STRATEGIC HIGHWAY RESEARCH PROGRAM

Southern Region, 8240 MoPac Expressway, Suite 250, Austin, TX 78759 Tel. (512) 346-7477 Fax (512) 346-8750

HOMER G. WHEELER
Regional Engineer

October 31, 1990

Mr. Peter Malphurs
State Materials & Research Engineer
Georgia Department of Transportation
15 Kennedy Drive
Forest Park, Georgia 30050

Subject: SPS-5 on Interstate-75 in Georgia.

Dear Pete,

The subject nomination has been reviewed and is hereby approved.

The "ideal" SPS-5 project would be located on shallow fills. However, we recognize that finding an "ideal" highway project for this experiment is extremely difficult, consequently we must work with the combination of terrain and available construction projects as they are. In this regard, the Georgia SPS-5 project has a number of the test sections located on deep fills and others are located in fairly deep cuts. This is how we found the project and this is the way it has been approved. However, when you are locating and positioning the test sections in the construction project, the experiment requires the entire length of each 500′ test section be placed completely on cut or fill. Also, any cut-to-fill transitions and sidehill fills should be avoided. Mr. Gary Fitts will assist Georgia DOT personnel in this endeavor.

Pete, we wish to thank you and your staff for your support of SHRP and your commitment to the Specific Pavement Studies Program.

Sincerely,

Homer

Homer G. Wheeler, P.E.
SHRP Regional Engineer, SRCO

cc: Neil Hawks, SHRP-DC
Amir Hanna, SHRP-DC
Brent Rauhut, PM-SRCO

HGW:dmj

NATIONAL RESEARCH COUNCIL

STRATEGIC HIGHWAY RESEARCH PROGRAM

Southern Region, 8240 MoPac Expressway, Suite 250, Austin, TX 78759 Tel. (512) 346-7477 Fax (512) 346-8750

HOMER G. WHEELER
Regional Engineer

March 12, 1993

Mr. Monte Symons
Federal Highway Administration
LTPP Division (HNR-40)
Turner-Fairbank Highway Research Center
6300 Georgetown Pike, Room F 215
McLean, Virginia 22101

Subject: SPS-5 Project in Georgia.

Dear Monte,

Reference is made to the Materials Sampling and Field Testing Plan for the Georgia SPS-5 Project #130500, on IH-75 in Bartow County, Georgia. The sampling for this SPS-5 project was carried out in late February, and review of the results has convinced us that construction and monitoring of this project as is would not be in anyone's best interests.

Attached you will find boring logs for the four borings, A1 through A4. It should be noted that borings A1 and A2 are located on the north side of Lake Allatoona and borings A3 and A4 on the south side. It can also be seen that the pavement structure is different for the first two and the last two borings. The asphalt concrete is 3″ to 4″ thicker and the crushed stone below the HMAC is much thicker for the latter two borings. The stiffness of an 18″ layer of AC is theoretically over twice that of a 14″ layer.

We have also included station numbers and the cut and fill depths at the bottom of each boring. As can be seen, these depths vary from 31′ of cut for A1 to 83′ of fill for A2. These values were taken from the plans furnished by the Georgia DOT.

It can also be seen that all of the borings except A2 terminated in refusal. The reason for this in the two cut areas is obvious as the cuts are through rock. In the fill areas, we suspect that the rock from cuts was used as rock fill. To further complicate the picture, it appears that the materials below the pavements and below the shoulders are often quite different. The results from the shoulder probes appear below:

1. S1 - Refusal was reached at 6′ after augering through silty gravel.

2. S2 - Auger refusal was reached after augering through 19.5′ of sandy silt, except for 1′ of what appeared to be a shale layer between 7.5′ and 8.5′.

3. S3 - Auger refusal was reached at 13'. The first 2½' appeared to be a weathered rock or shale, a silt was found between 2.5' and 10', and the weathered rock or shale was encountered in the next 3' before refusal.

4. S4 - No refusal was reached and the probe was terminated at 20'. The materials encountered ranged from clayey sand to silty clay.

5. S5 - There was no refusal. The auger probe was terminated after boring through 20' of silt and sandy silt.

6. S6 - No refusal occurred and the probe was terminated after augering through 20' of sandy to clayey silts.

The set of plans that was furnished to us by the Georgia DOT provided information on cut and fill, but did not identify materials or give any indication of the variability that we have encountered. We might question some of these results, except that we had personnel on-site watching what was occurring and the engineer in charge of the sampling for Law Engineering was the very competent one that planned, initiated, and supervised the GPS materials sampling for the Southern Region east of the Mississippi River. The Georgia DOT also was represented at the job site by Mr. Dennis Richardson, the same gentleman that has worked closely with us for the past five years, and who has participated in sampling and other activities for every GPS test section in Georgia. He seemed as surprised as any of us at what was found.

The problems that we anticipate with these test sections, as presently planned, are as follows:

1. The pavement structure and supporting soils for the test sections with virgin asphalt on one side of Lake Allatoona and for the recycled asphalt pavements on the other side of Lake Allatoona differ sufficiently that comparisons would not be meaningful.

2. While the subgrade for the test sections with virgin asphalt may marginally satisfy the experimental requirements for fine grained soils, the crushed stone continued to auger refusal (rock or rock fill) for those test sections having RAP. We already have too many SPS-5 projects in the national experiment that rest on coarse instead of fine-grained soils per experiment design.

3. In view of the very considerable variability in structure and supporting soils, future monitoring data may be expected to introduce unwanted bias into the data base for future analyses. While certainly some useful information would be obtained, the data could be expected to be more of a problem than an asset for the analyses.

As this work is under contract and will likely start in May, we feel that an alternative to cancellation of the project should be sought. The alternative that we propose involves the following:

a. Construct all the SHRP sections on the north side of Lake Allatoona. (This area can accommodate the eight treatments, but not the control section, 130501.)

b. Construct all supplemental test sections on the south side of Lake Allatoona. (This precludes direct comparisons of the 3½" virgin and RAP mixes to the SHRP overlays of 2" and 5", but does leave comparisons of the 3½" virgin and RAP mixes, milling and inlaying prior to overlay versus overlays on the old surface, and effects of milling and inlaying versus the control section.)

Table 1 (attached) indicates the proposed relocations of test sections to accomplish this alternative. The relocations are planned to minimize impact on the construction. We were able to keep three of the test sections in their currently planned locations.

It is unfortunate that the SHRP portion of the experiment must sacrifice its control section and that Georgia DOT will lose their primary trust of comparing 3½" overlays to 2" and 5" overlays. However, this appears to be the only approach that maintains reasonable viability for the project to contribute to future analyses, as well as some utility from the supplemental test sections.

We do not want to broach revision of the project with the Georgia DOT until we have your agreement to doing so. On the other hand, this is under contract and construction could start in May. Consequently, we must ask you to give this priority and to give us your response as early as possible next week. We will still have to coordinate with the Georgia DOT and will undertake that immediately after we receive your response.

It is frustrating to us that this has occurred so late in the process, as we are sure it will be to you. Please feel free to call either Brent or myself, as required, to expedite a position on this.

Sincerely,

Homer

Homer G. Wheeler, P.E.
SHRP Regional Engineer, SRCO

HGW:dmj

Attachment: Boring Logs.

cc.w/Att: Shiraz Tayabji, PCS/Law
Brent Rauhut, SRCO
John Miller, PCS/Law

Boring Logs for the GEORGIA SPS-5 PROJECT

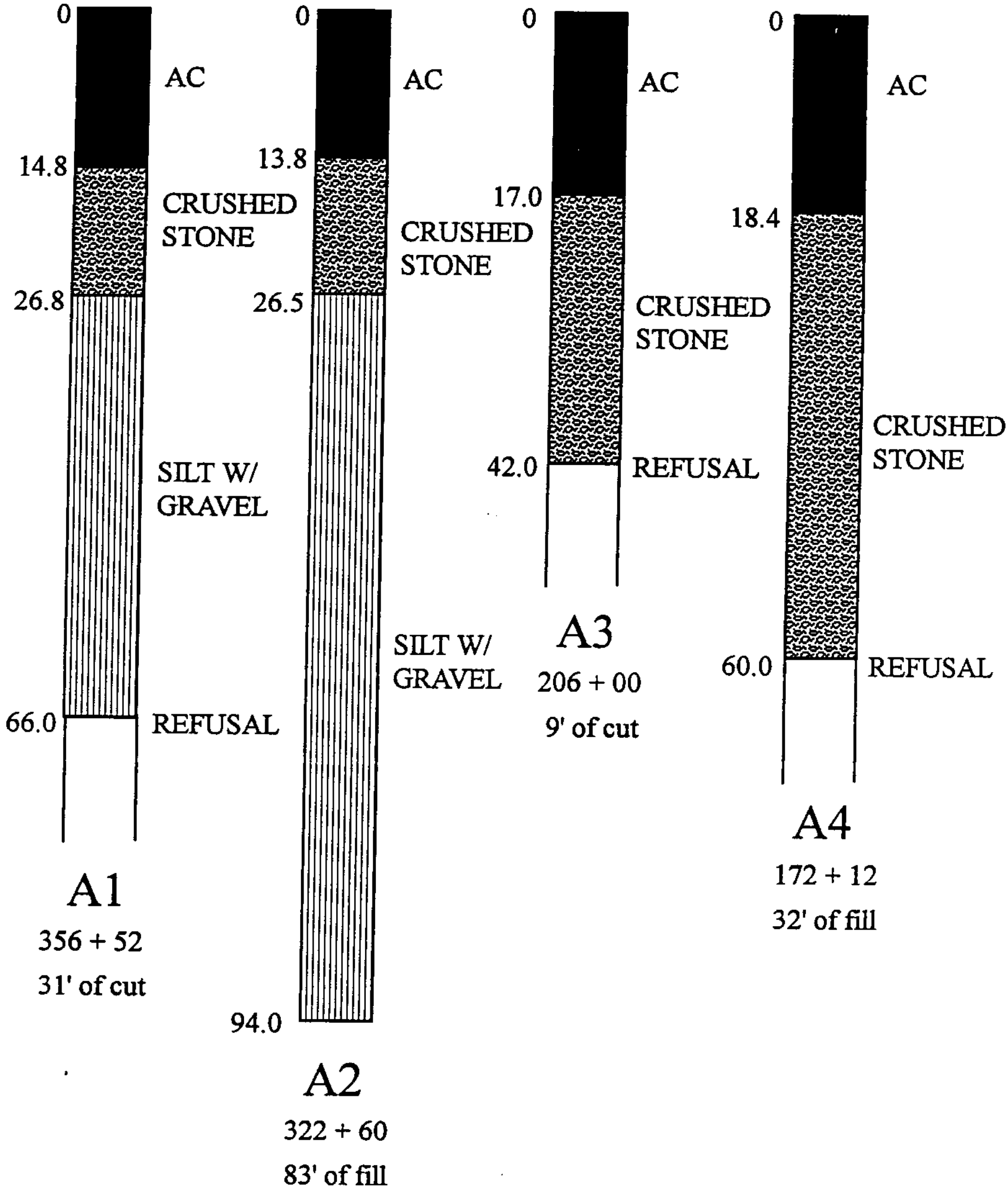


TABLE 1. ALTERNATIVE SUBSTITUTIONS TO INCLUDE ALL SHRP TEST SECTIONS ON ONE SIDE OF LAKE ALLATOONA

Original Section №.	Original Treatment Type	Revised Section №.	Revised Treatment Type
North Side of Lake Allatoona:			
1305S3	Mill 2″/Inlay 2″ (Virgin AC)	130506	Mill/Inlay 2″ Overlay (Virgin AC)
130506	Mill/Inlay 2″ Overlay (Virgin AC)	130507	Mill/Inlay 5″ Overlay (Virgin AC)
1305S6	Mill/Inlay 3½″ Overlay (Virgin AC)	130504	5″ Overlay (Virgin AC)
130507	Mill/Overlay 5″ Overlay (Virgin AC)	130505	2″ Overlay (Virgin AC)
130504	5″ Overlay (Virgin AC)	130509	Mill/Inlay 2″ RAP Overlay
1305S2	3½″ Overlay (Virgin AC)	130508	Mill/Inlay 5″ RAP Overlay
130505	2″ Overlay (Virgin AC)	130503	5″ RAP Overlay
130501	Control #1	130502	2″ RAP Overlay
South Side of Lake Allatoona:			
1305S4	Mill 2″ Inlay 2″ RAP	1305S4	Mill 2″ Inlay 2″ RAP
130509	Mill/Inlay 2″ RAP Overlay	1305S5	Mill/Inlay 3½″ RAP Overlay
1305S5	Mill/Inlay 3½″ RAP Overlay	1305S1	3½″ RAP Overlay
130508	Mill/Inlay 5″ RAP Overlay	1305S2	3½″ Overlay (Virgin AC)
130503	5″ RAP Overlay	1305S6	Mill/Ilay 3½″ Overlay (Virgin AC)
1305S1	3½″ RAP Overlay	1305S3	Mill 2″ Inlay 2″ Virgin AC
1305S7	Control #2	1305S7	Control #2
130510	Planned Treatment	130510	Planned Treatment

DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS AND RESEARCH
15 KENNEDY DRIVE
FOREST PARK, GA. 30050-2599

(404) 363-7500
FAX (404) 363-7684

FAX TRANSMITTAL

DATE 1-31-94

FROM Dennis Richardson OFFICE ____________ PHONE ____________

TO Mark Sargent OFFICE ____________ PHONE ____________

REQUEST FOR APPROVAL/REVISION OF ASPHALTIC CONCRETE JOB MIX FORMULA

Project IM-75-3 (82) 01 County Bartow Cherokee Cobb

Contract I.D. Number: B-16009.000-1 Date: 6-7-93

From: APAC of Georgia (Contractor/Subcontractor)

To:

Original Reply To: Michael Wright, Area Engineer

MATERIALS DATA

Type of Mix	Mix I.D. No.	Aggr. Size	%	Source No.	Source/Location
E	046X151E5	RAP	25	151C	024-7-93 Kennesaw GA
		007	34	046C	Vulcan Materials Co. Kennesaw GA
		810	10	046C	" "
		777	30	046C	" "
E	046-E9	007	33	046C	Vulcan Materials Co. Kennesaw GA
		810	60	046C	" "
		777	6	046C	" "
B	046X151B10	RAP	25	151C	024-7-93 Kennesaw GA
		006	22	046C	Vulcan Materials Co. Kennesaw GA
		007	30	046C	" "
		777	23	046C	" "
B	046-B9	006	22	046C	
		007	30	046C	
		810	27	046C	
		777	20	046C	
Grade of AC: AC 20S			X	0024	Shell Oil Co. Atlanta GA.
		% (X)	.9	0001	Cheney Lime Allgood Ala.
Type of Anti-strip Add.:		Lime: % (X)	.9	0003	Blue Circle Birmingham Ala.
		L/qd: % (X)	.5	0602	Kling beta 2550 HM

MIXTURE DATA

Sieve Size	Type Mix E RAP	Virgin Type Mix E	Type Mix B RAP	Virgin Type Mix B
1 1/2"				
1"				
3/4"			100	100
1/2"	100	100	99	99
3/8"	99	99		
No. 4	85	85	68	65
No. 8	45			
No. 50	19	45	33	33
No. 200	5	19	15	13
		6	5	5
Percent AC	5.1	5.1	4.2	~~4.5~~ 4.4
Theo.Sp.Grav.	2.535	2.585	2.586	2.591
Act.Sp.Grav.	2.420	2.470	2.461	2.466
Temp. (°F)	300	300	300	300

APPROVED [X] DISAPPROVED [ ] BY: [signature] DATE: 6-7-93

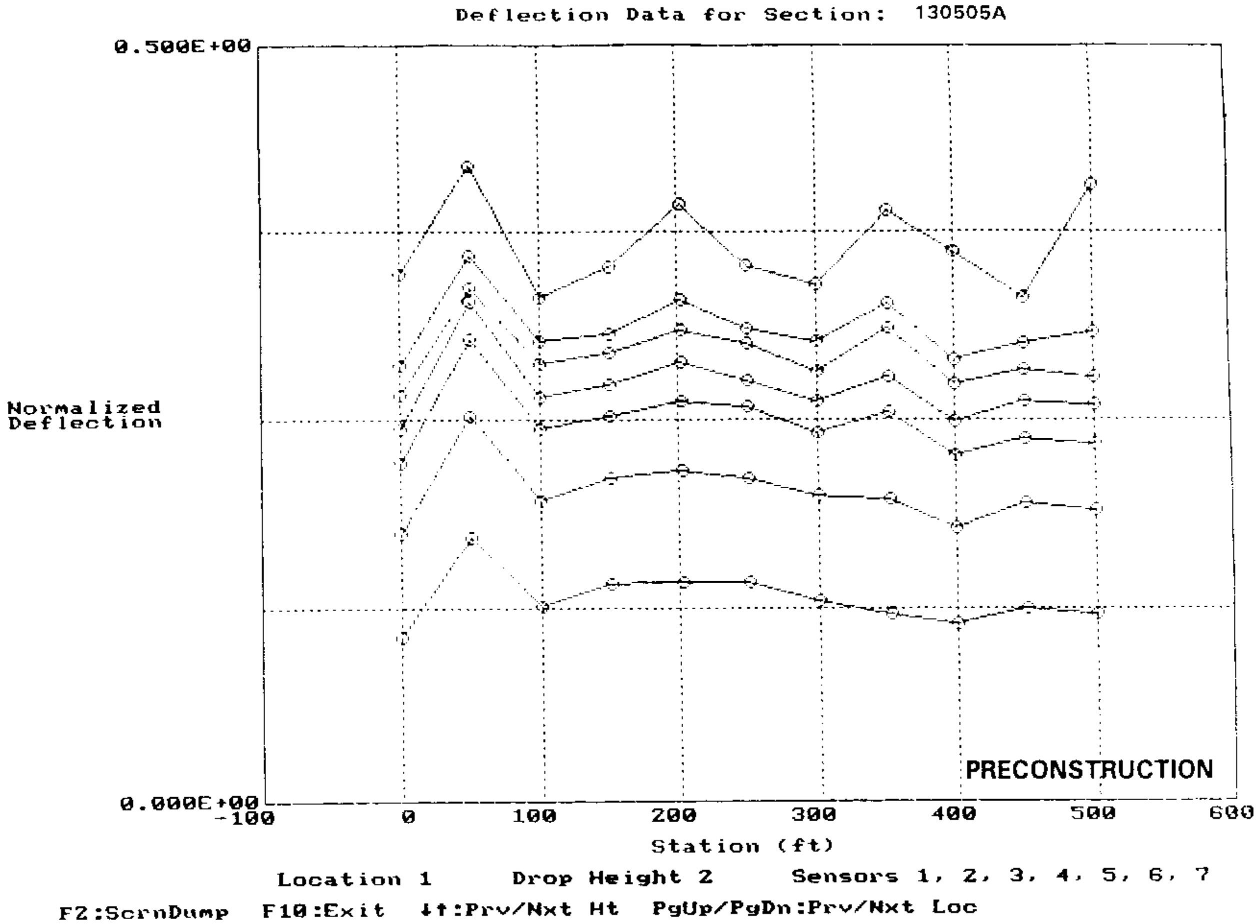
Copies To:

Remarks: Both additive + Lime Req

APPENDIX B

DEFLECTION PLOTS -

PRECONSTRUCTION/POSTCONSTRUCTION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Station (ft)
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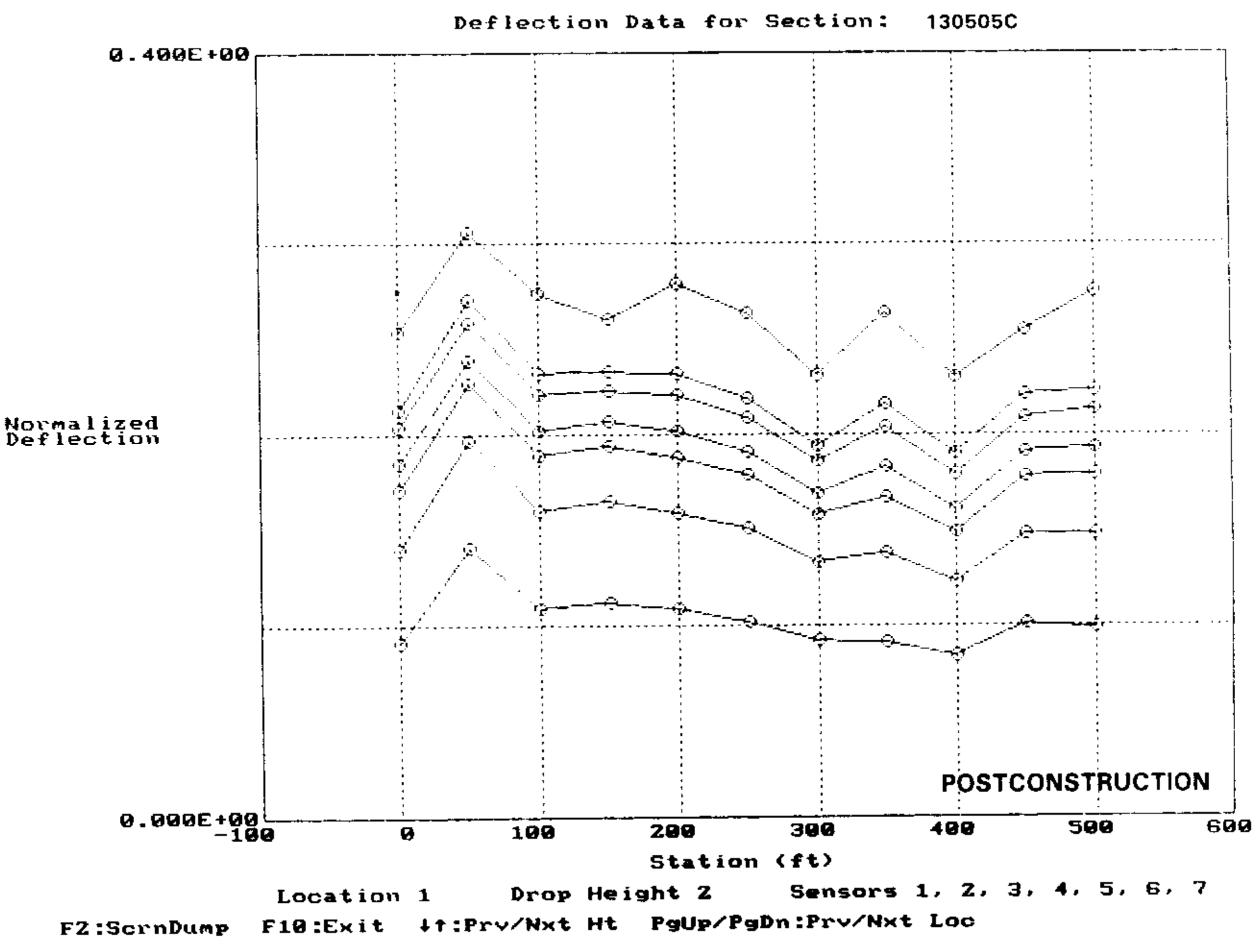
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc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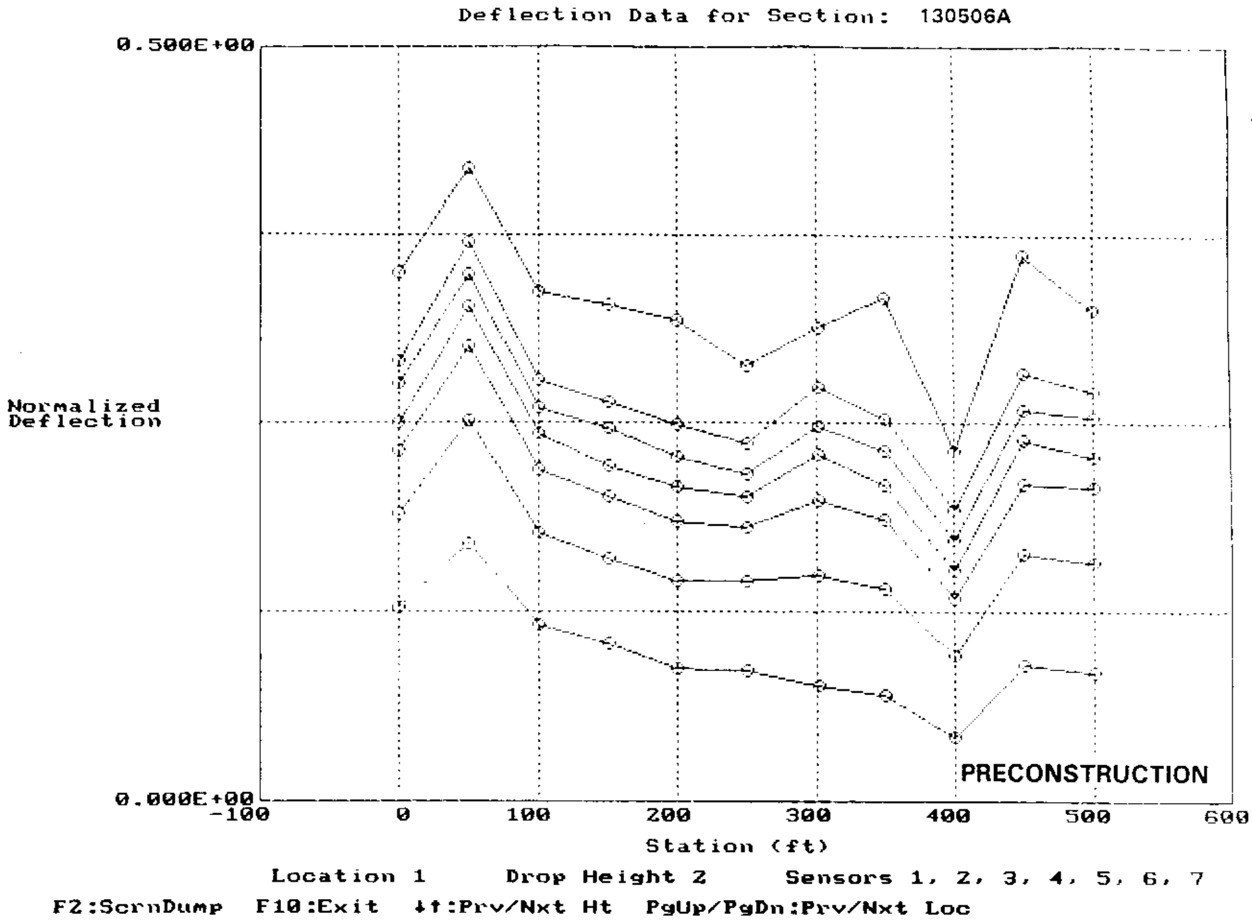
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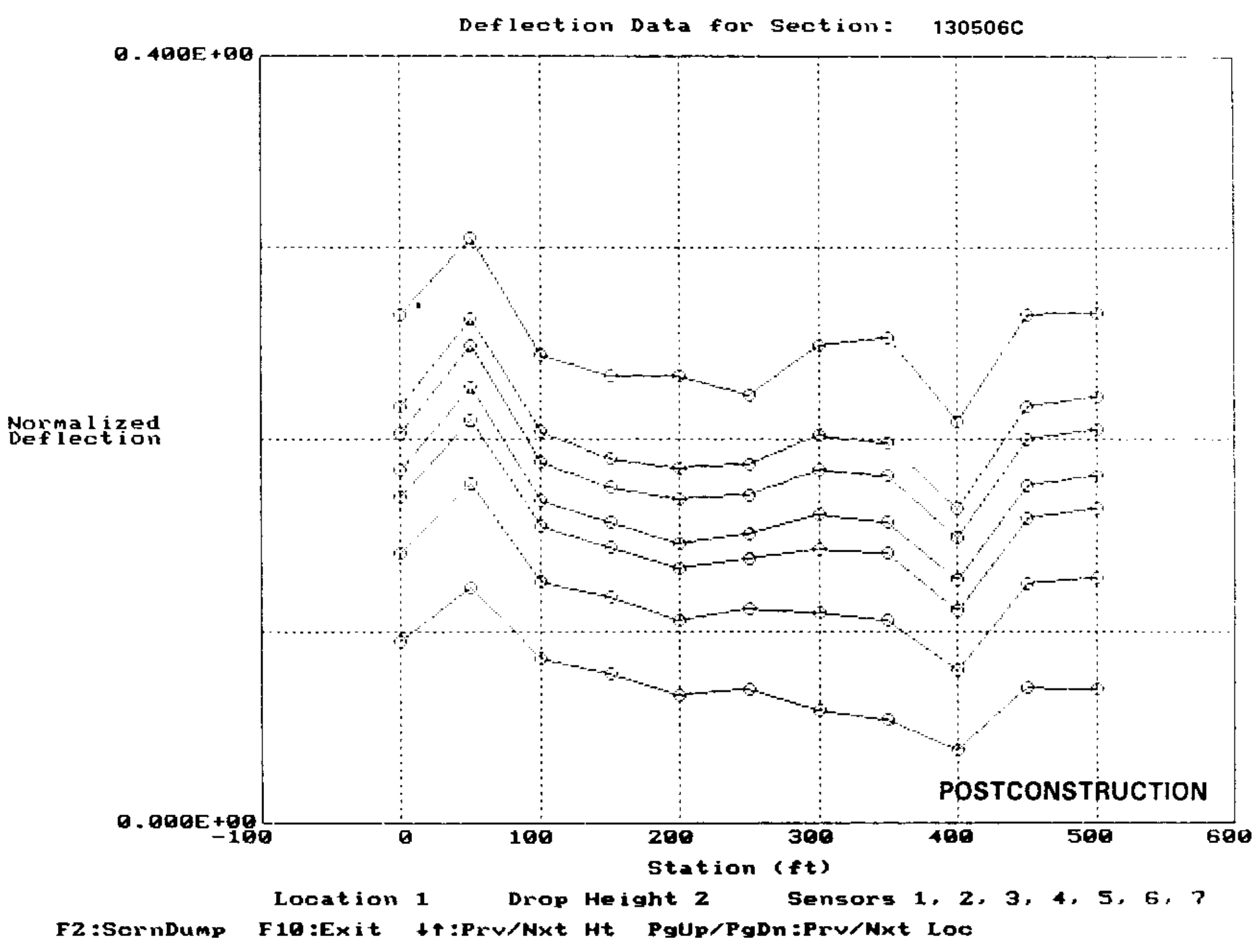
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Station (ft)
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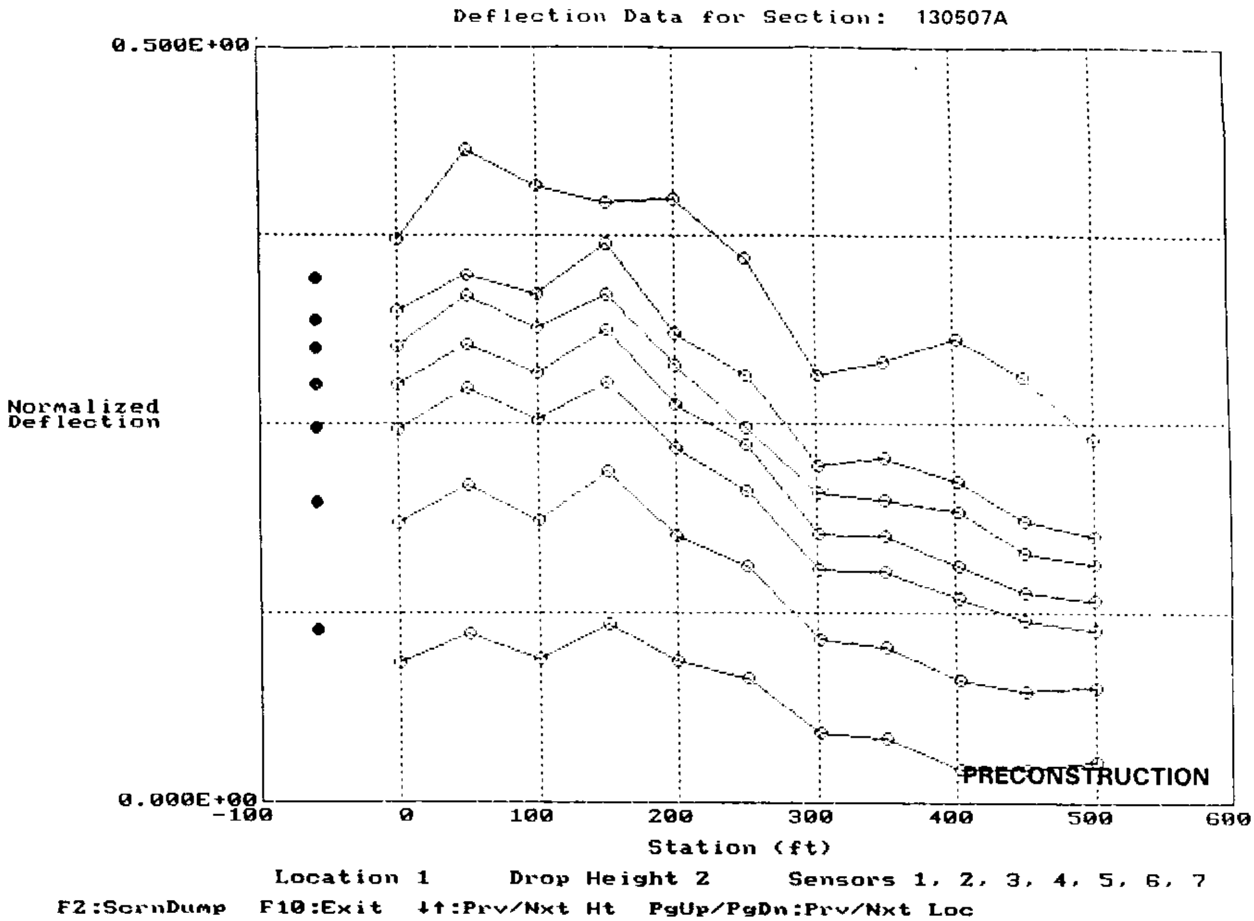
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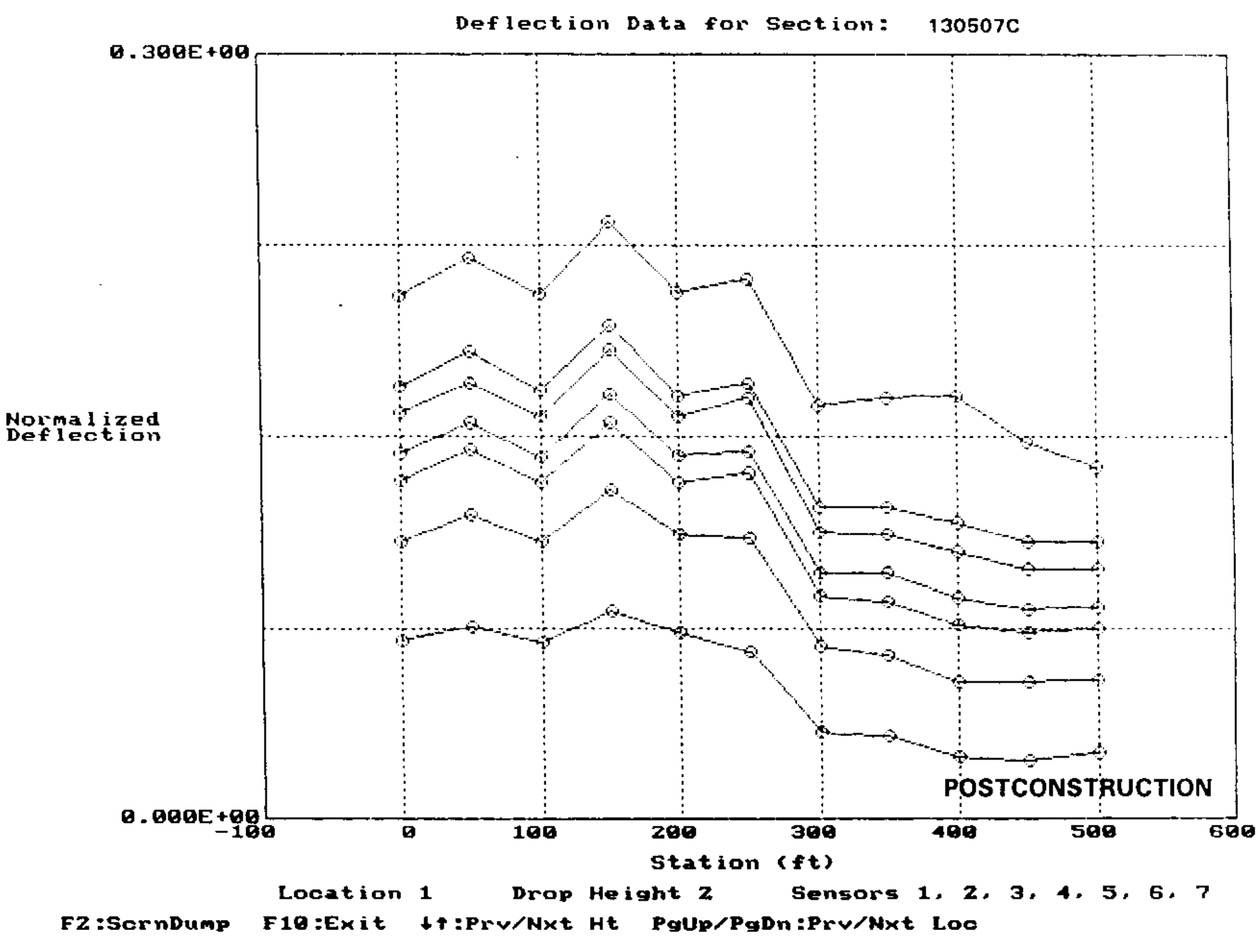
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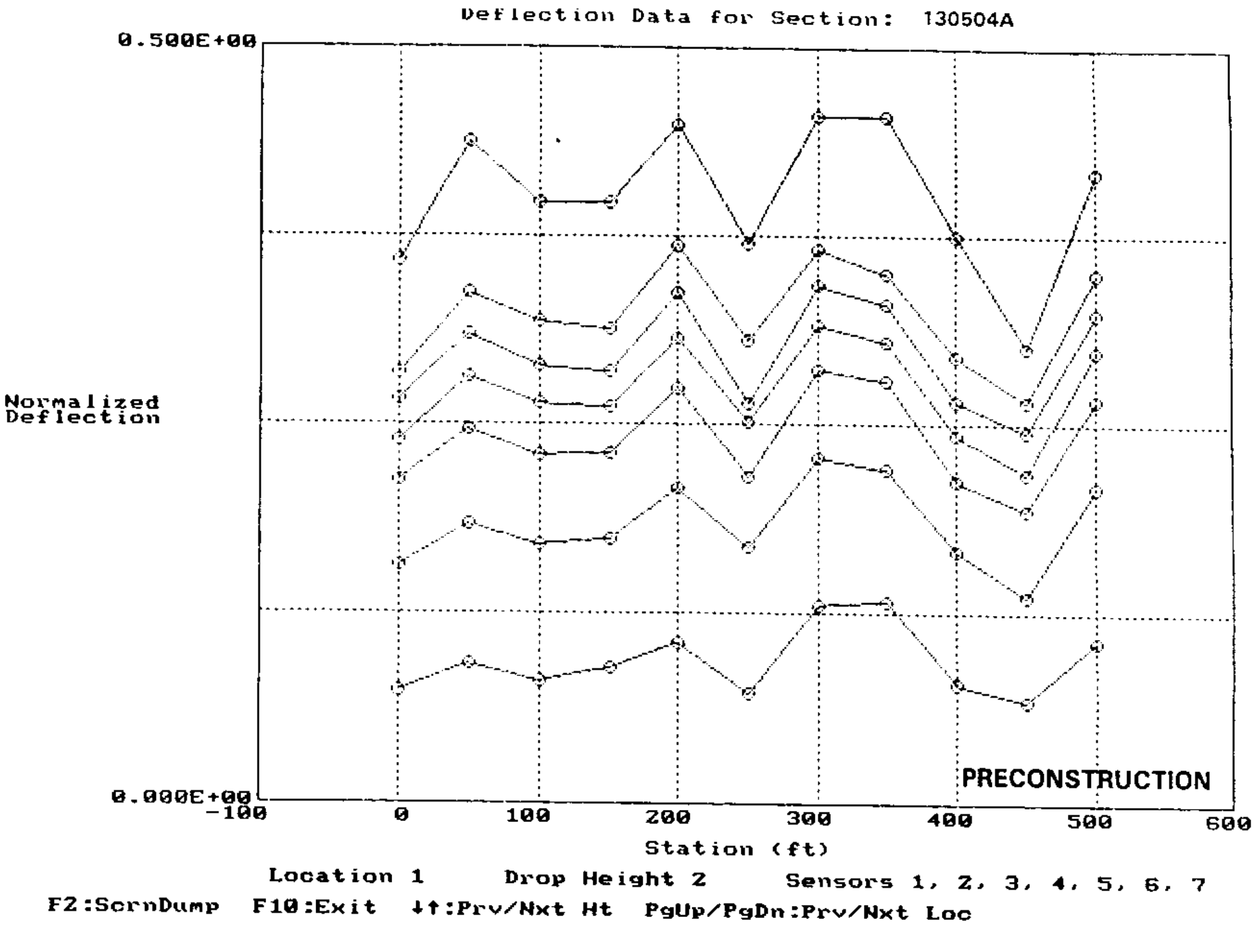
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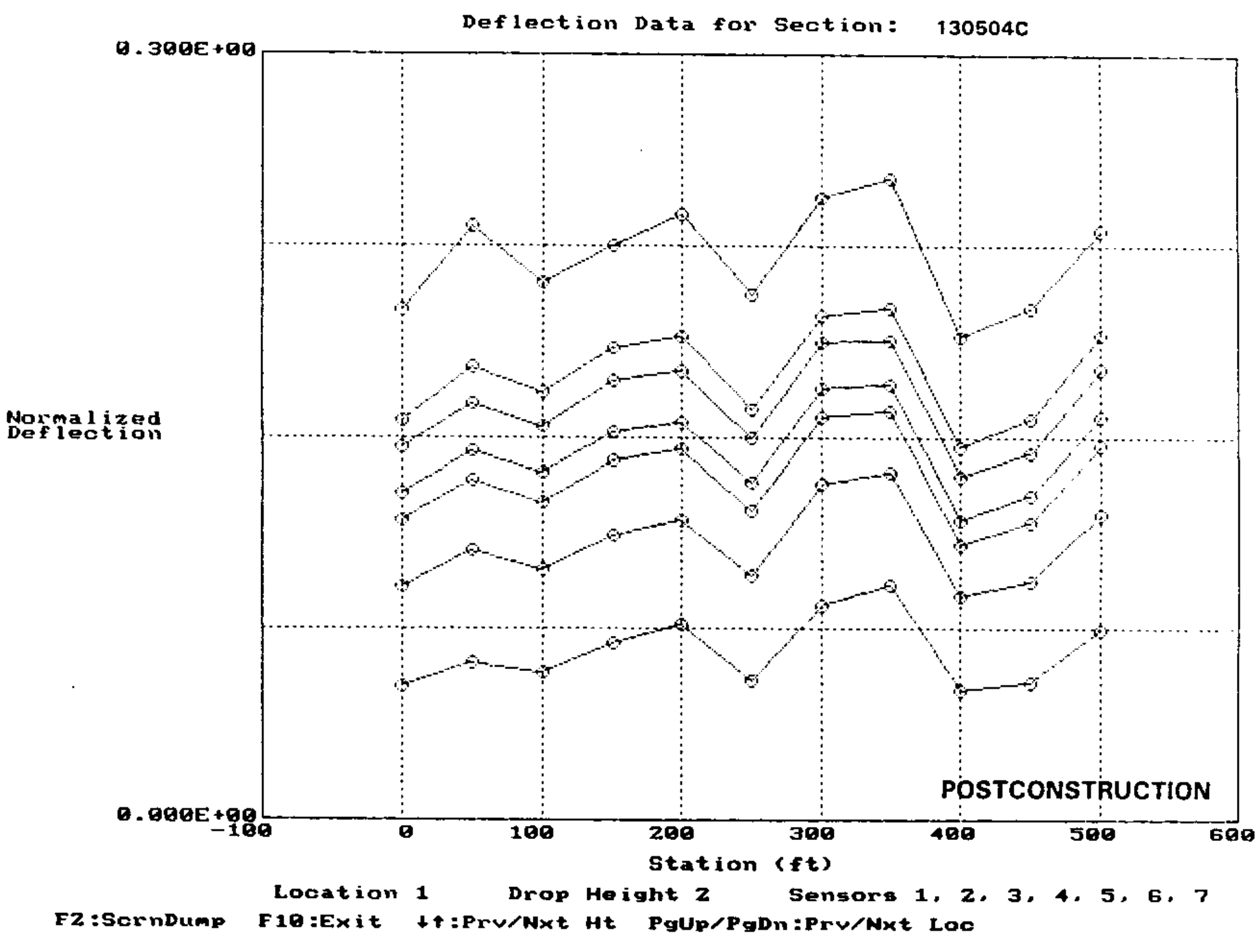
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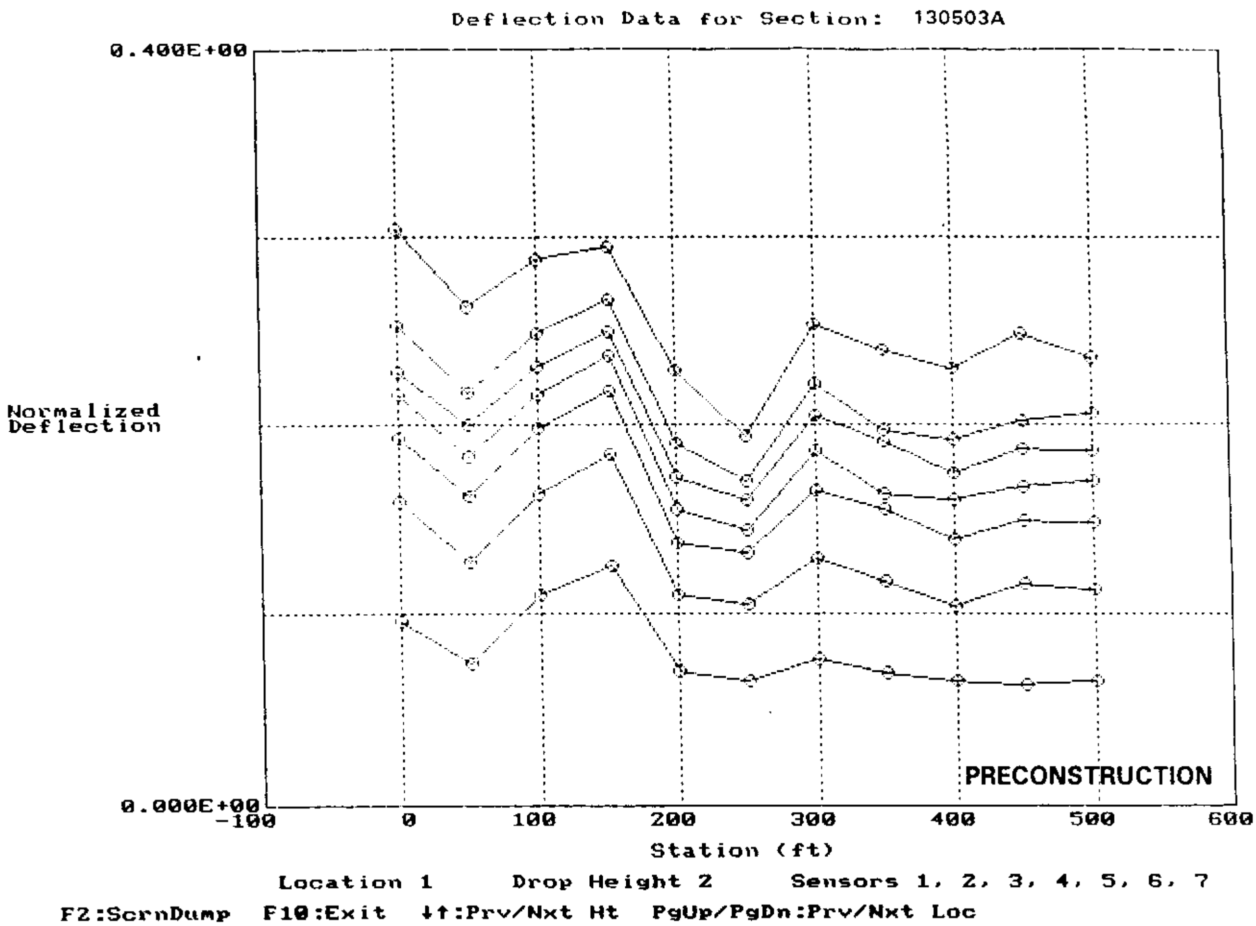
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Station (ft)
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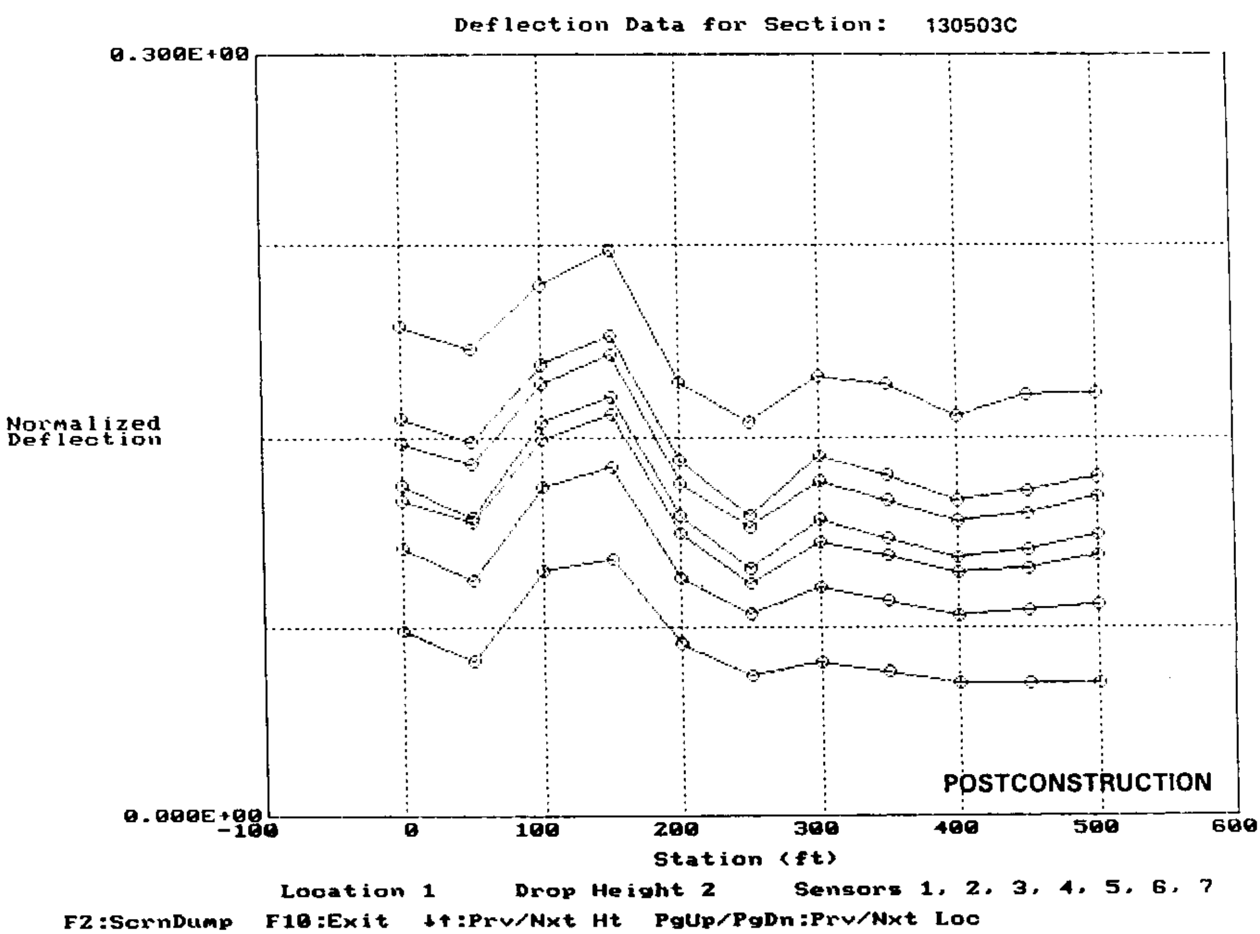
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Station (ft)
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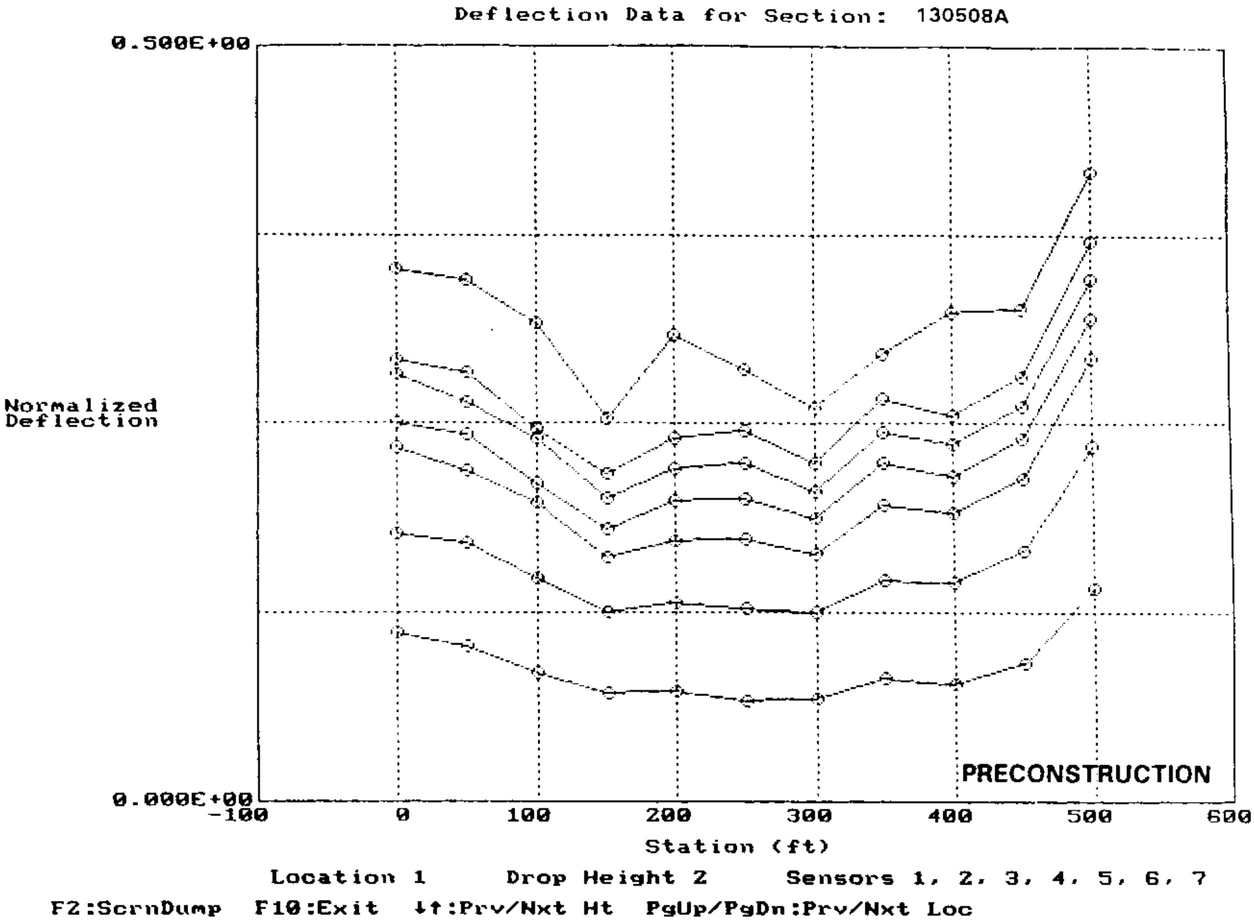
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Station (ft)
PRECONSTRUCTION
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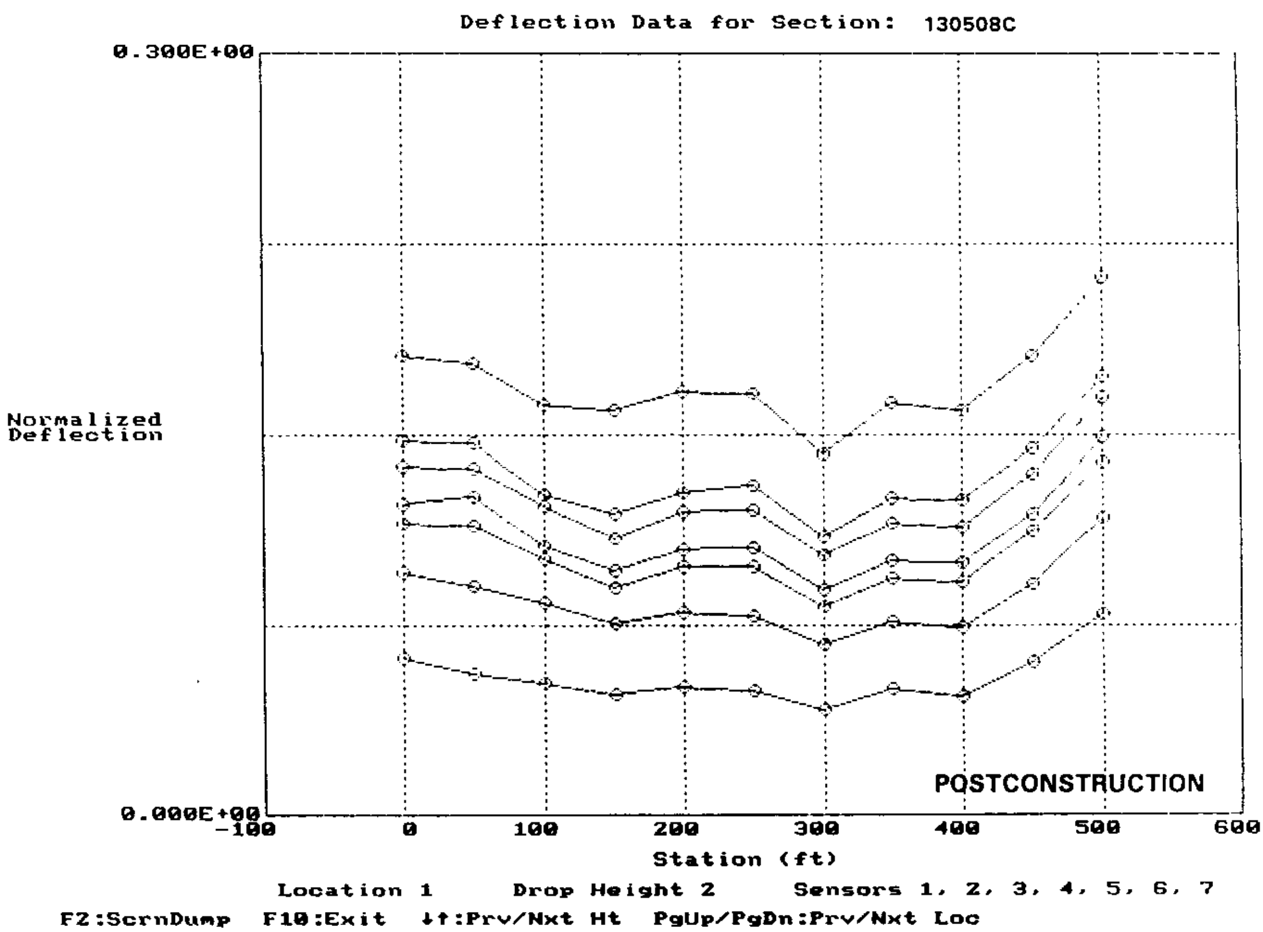
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Station (ft)
POSTCONSTRUCTION
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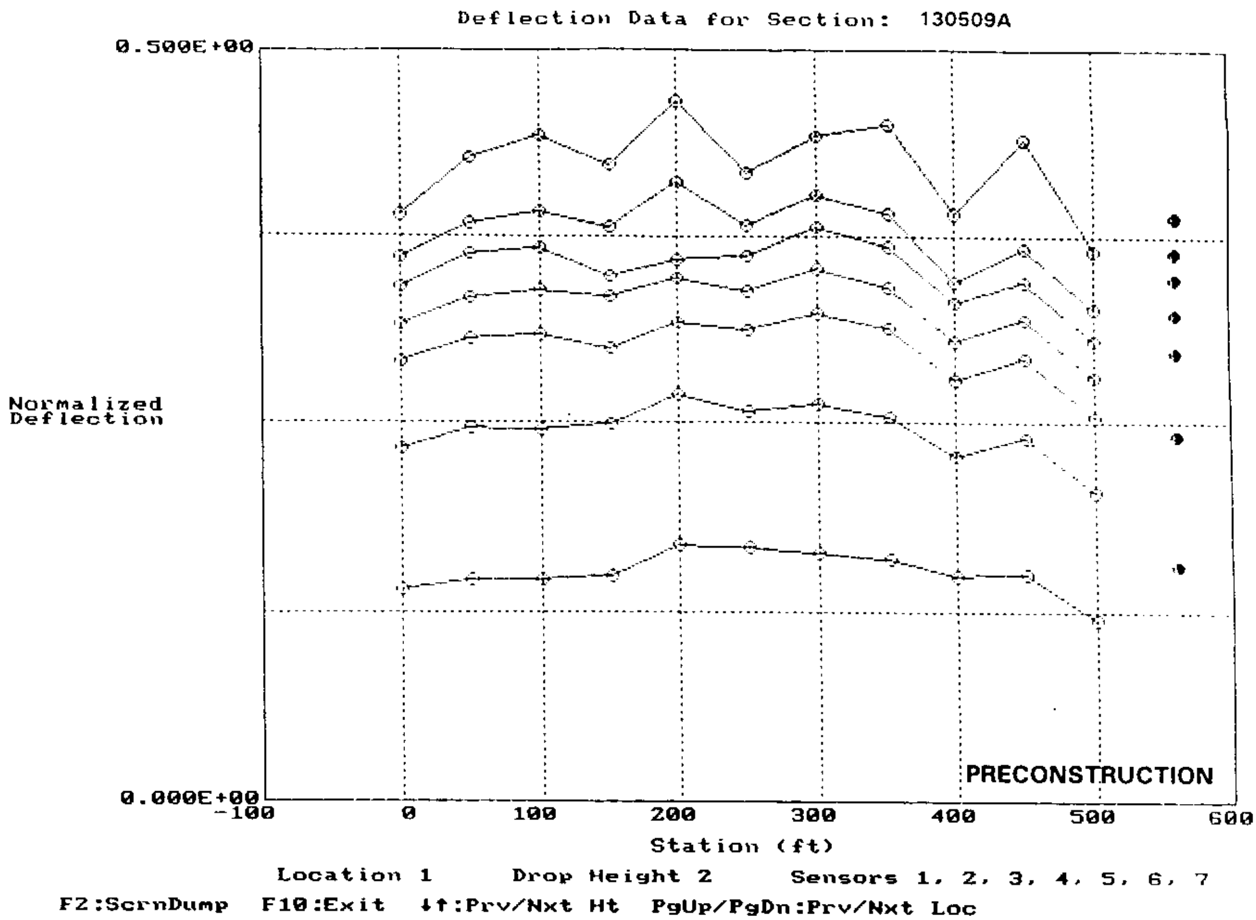
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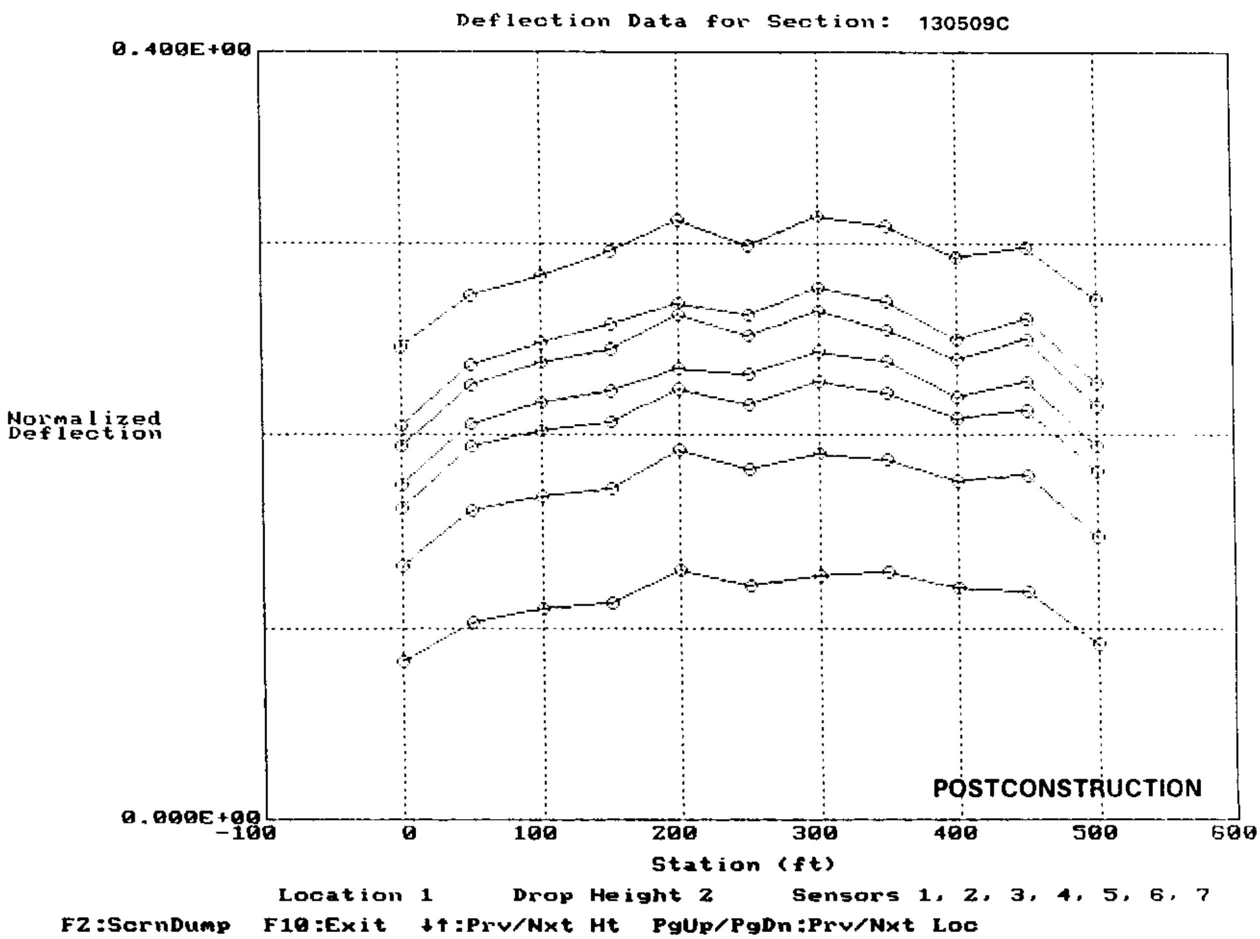
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Station (ft)
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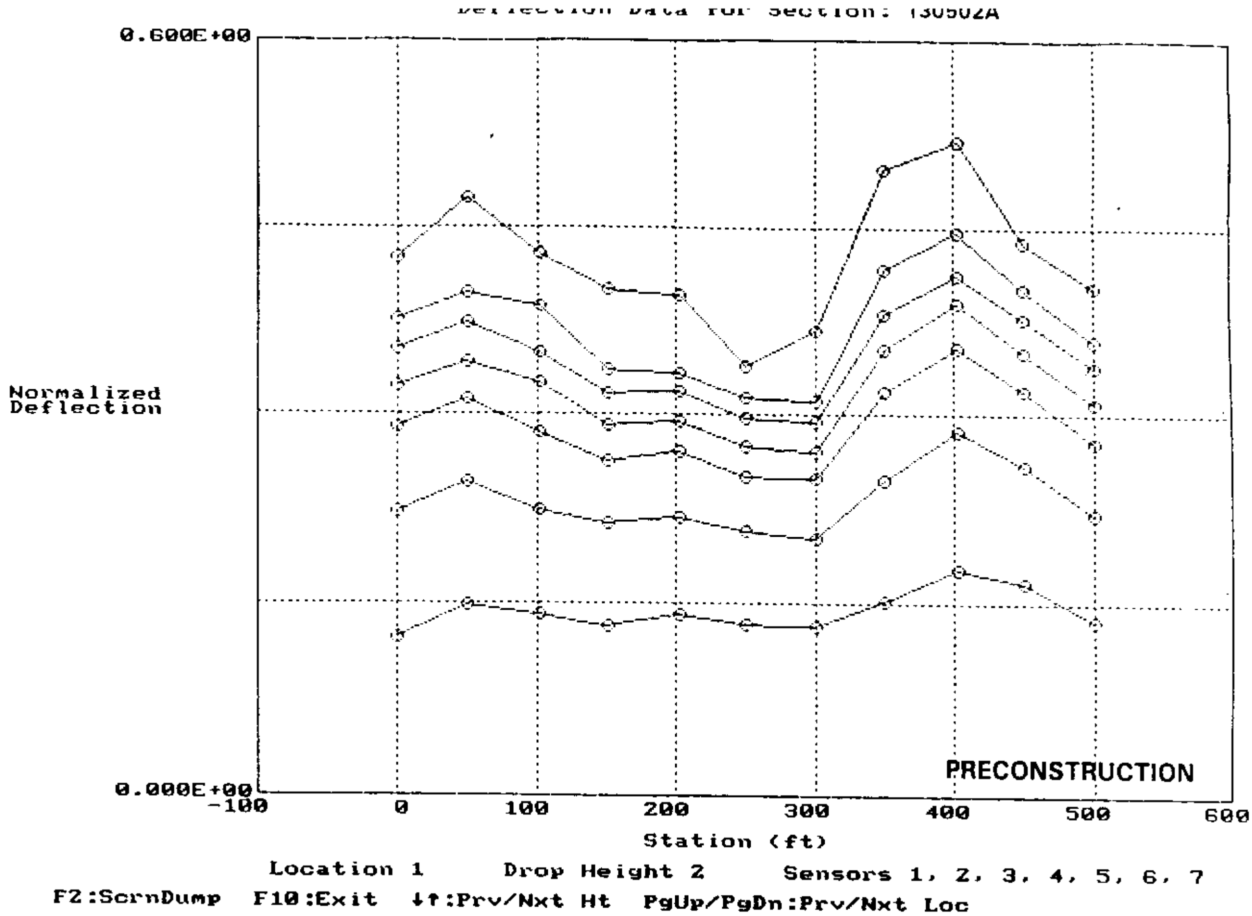
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Station (ft)
Location 1
Drop Height 2
Sensors 1, 2, 3, 4, 5, 6, 7
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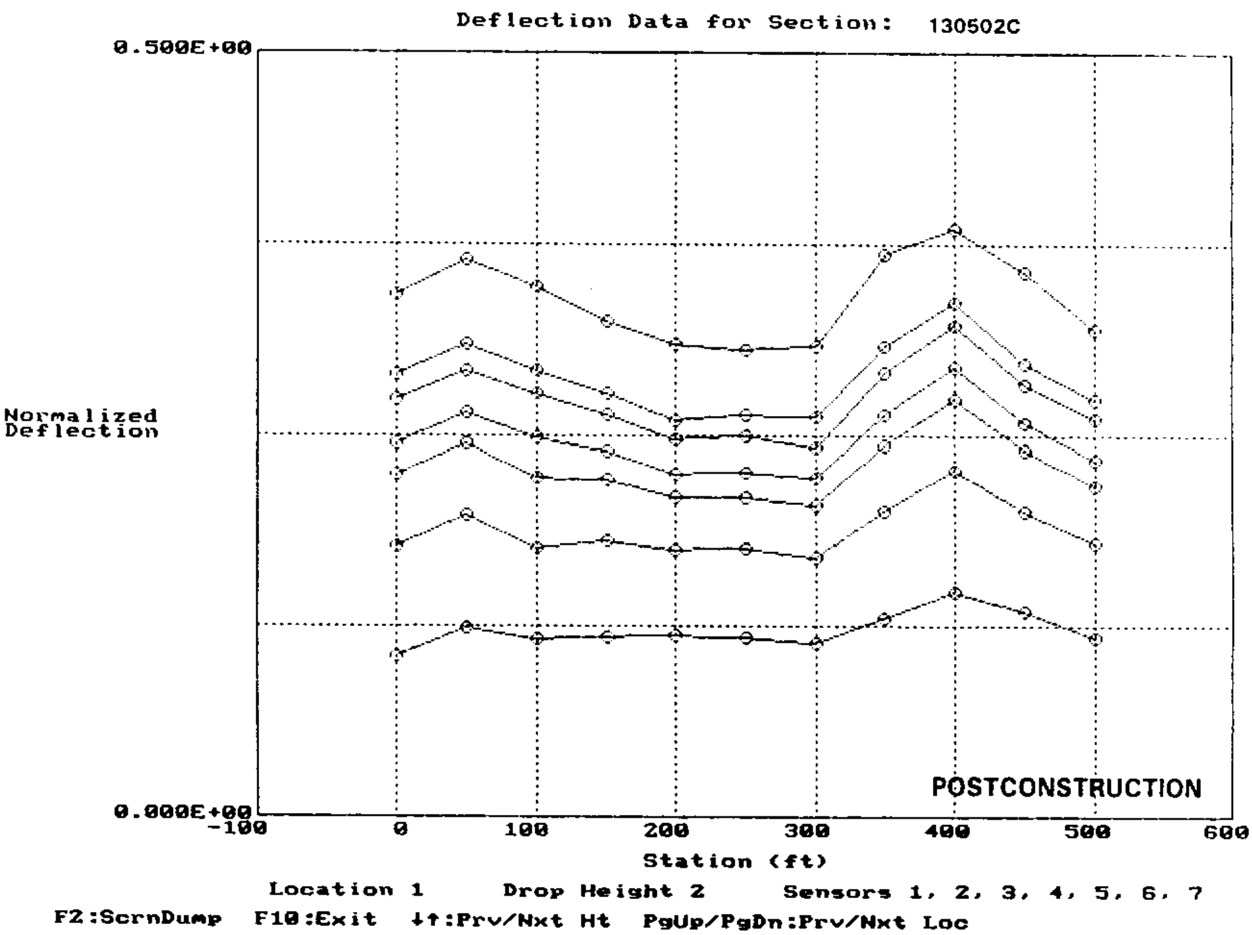
PgUp/PgDn:Prv/Nxt Loc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Station (ft)
Location 1
Drop Height 2
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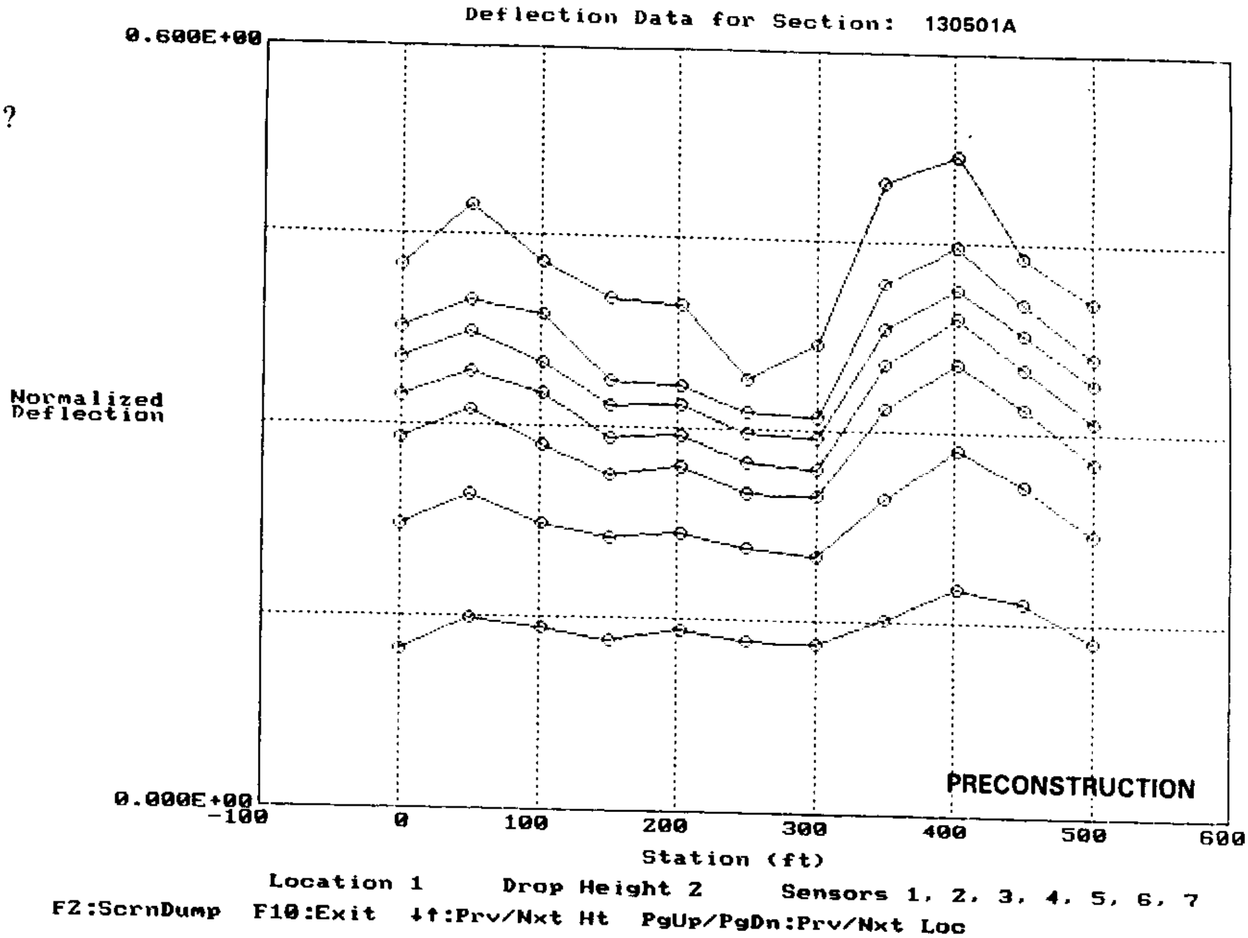
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Station (ft)
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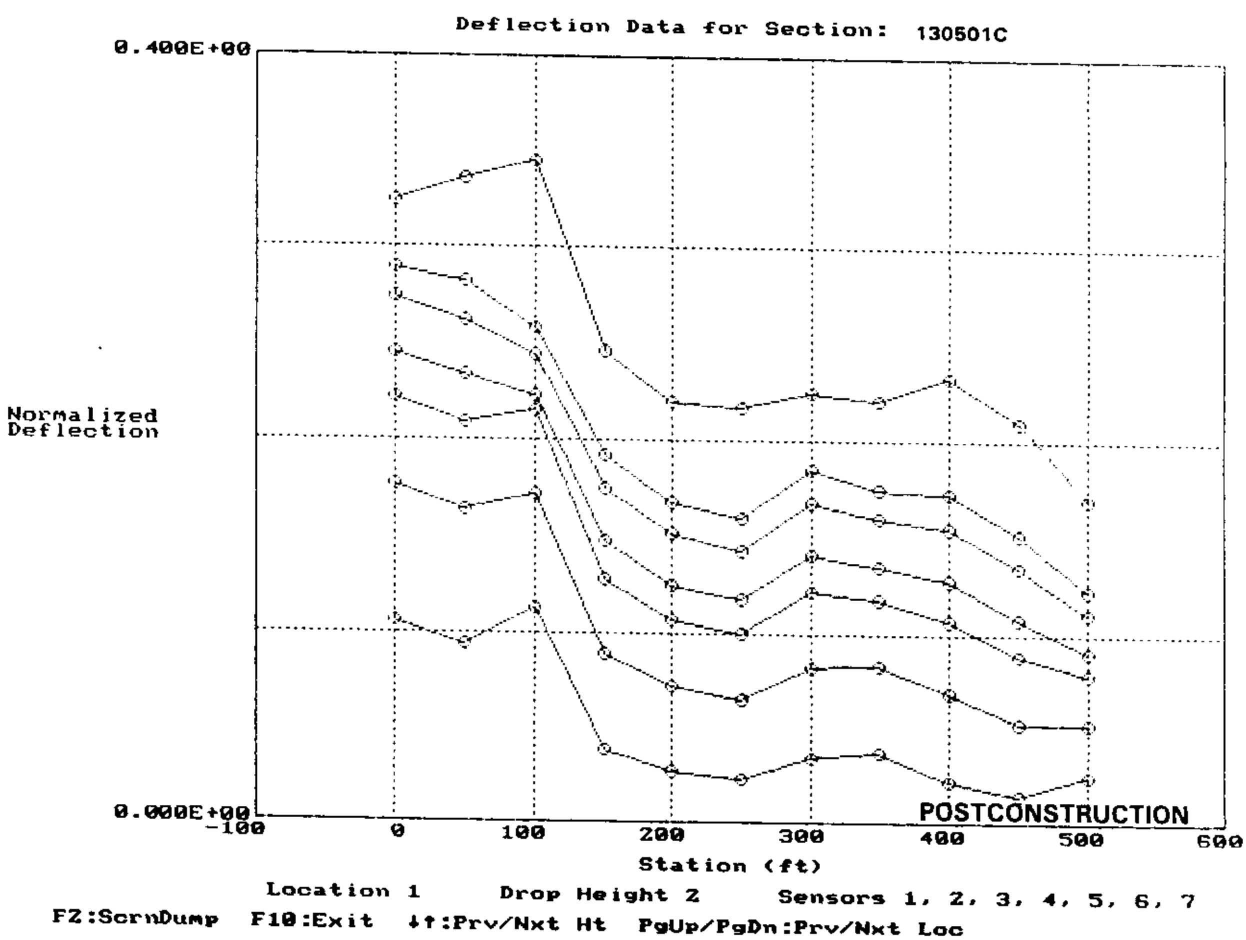
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Station (ft)
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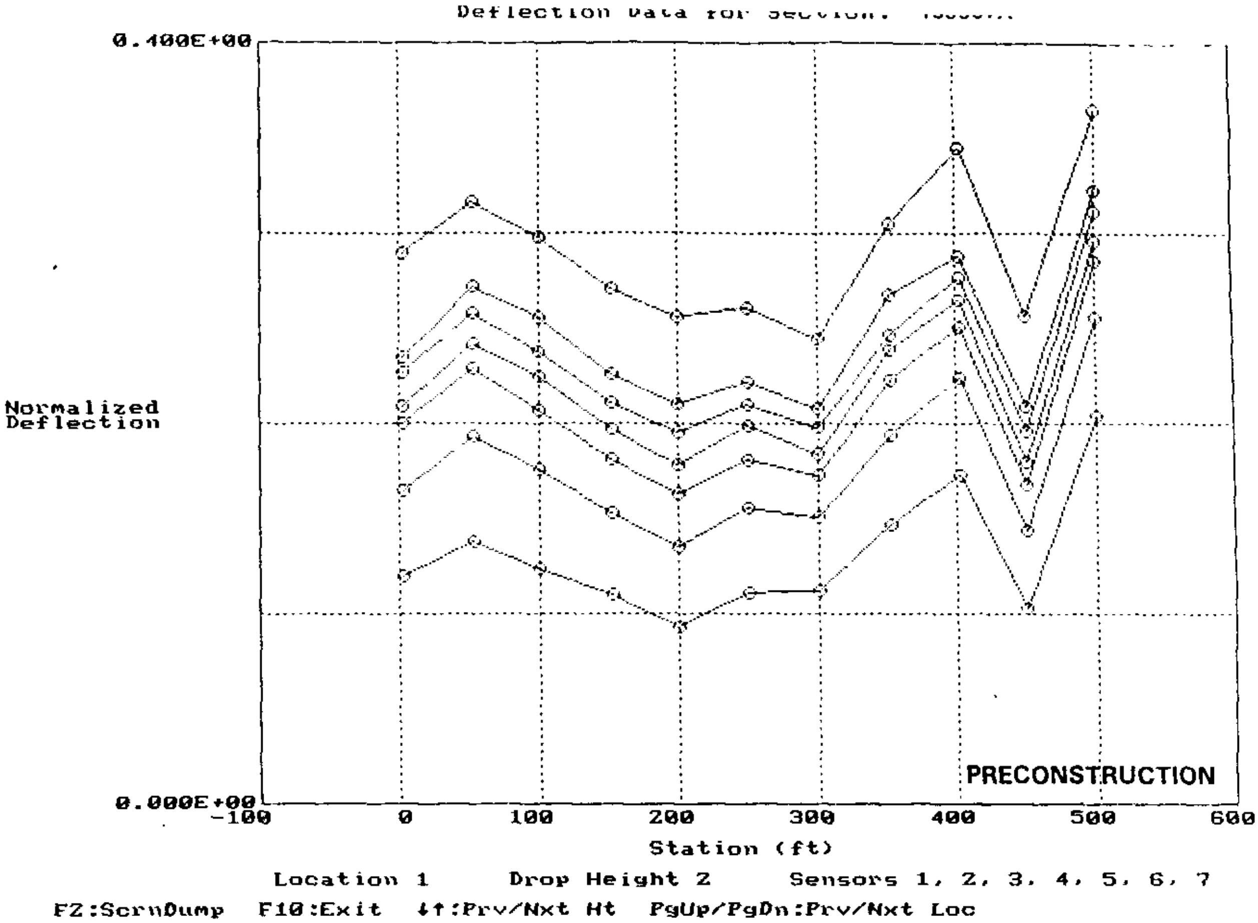
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PRECONSTRUCTION
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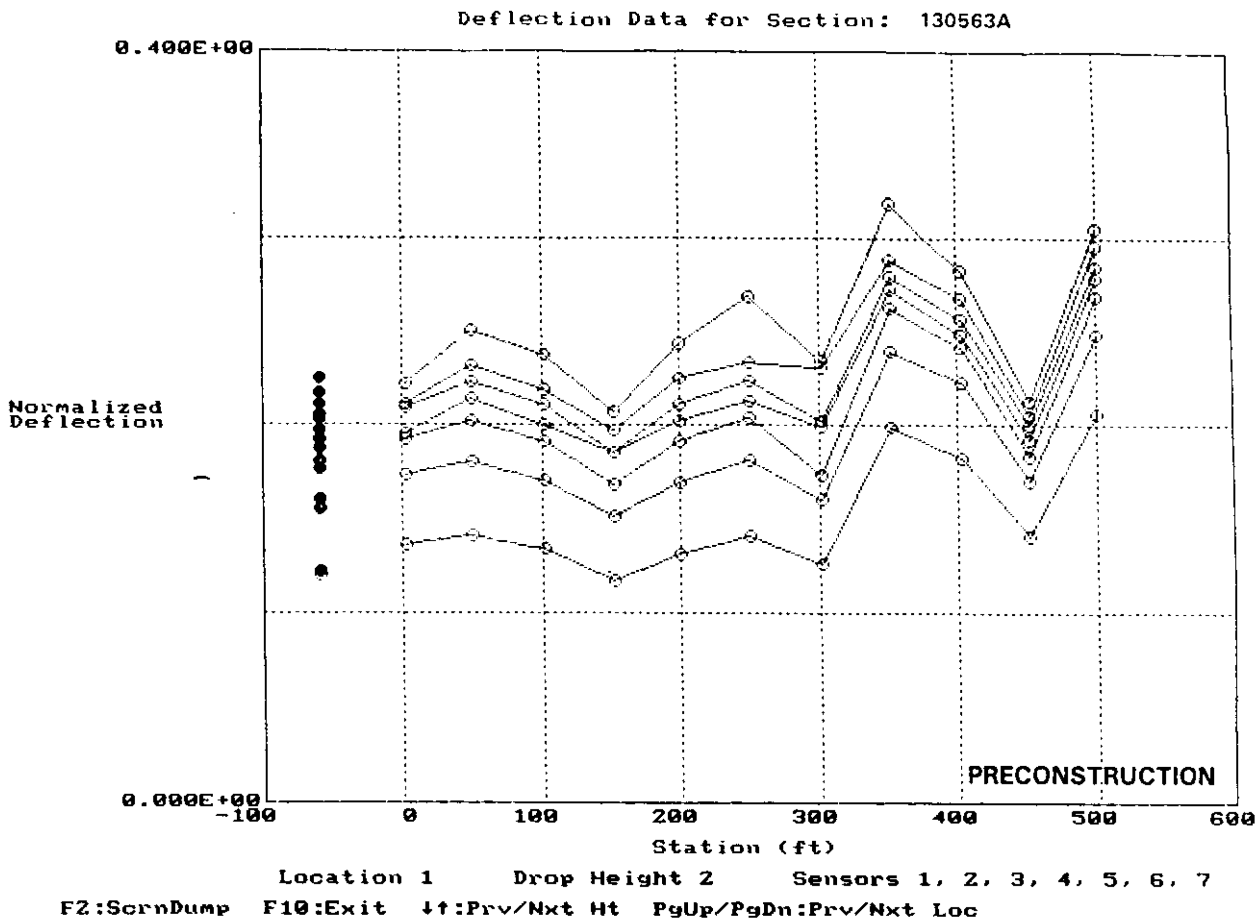

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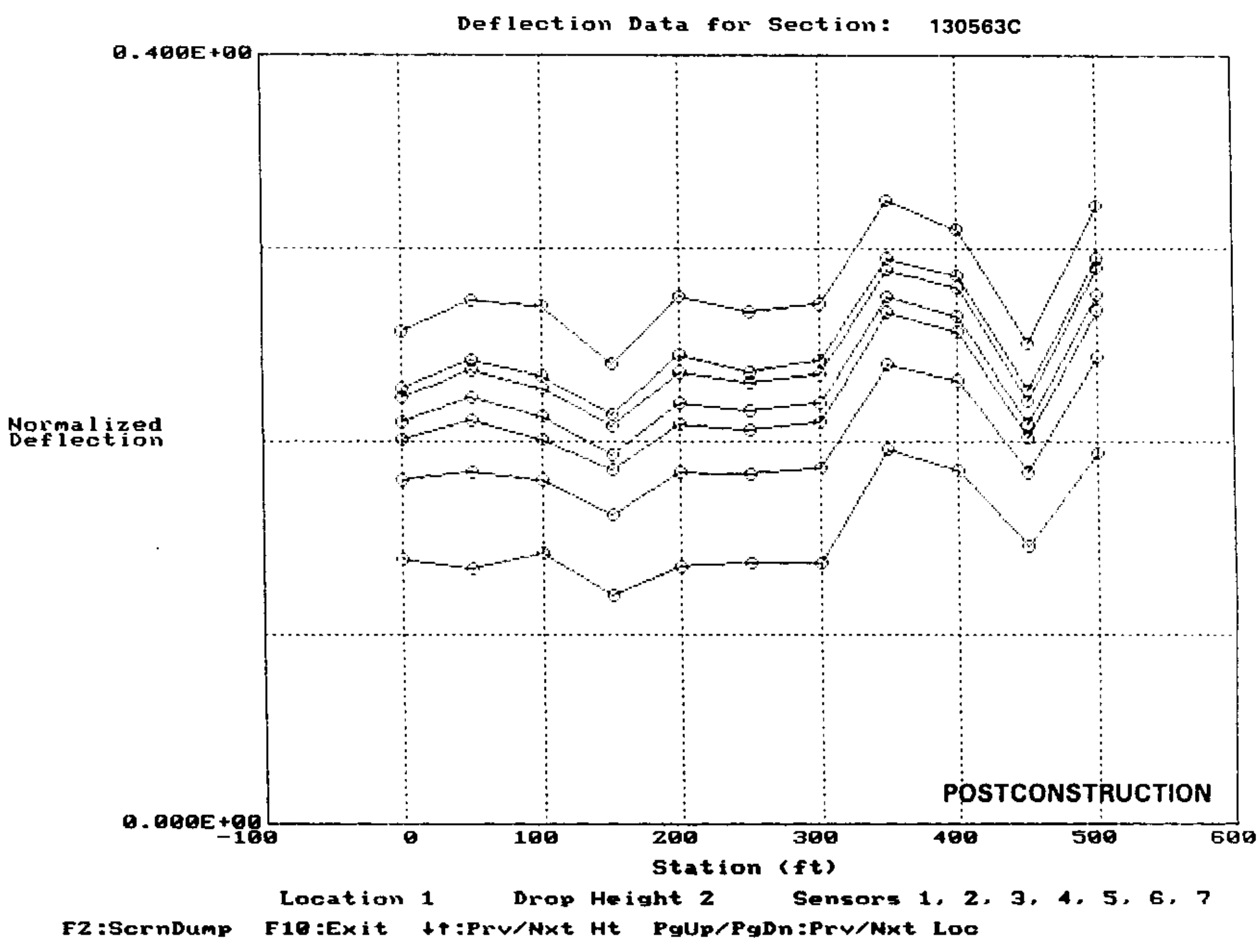

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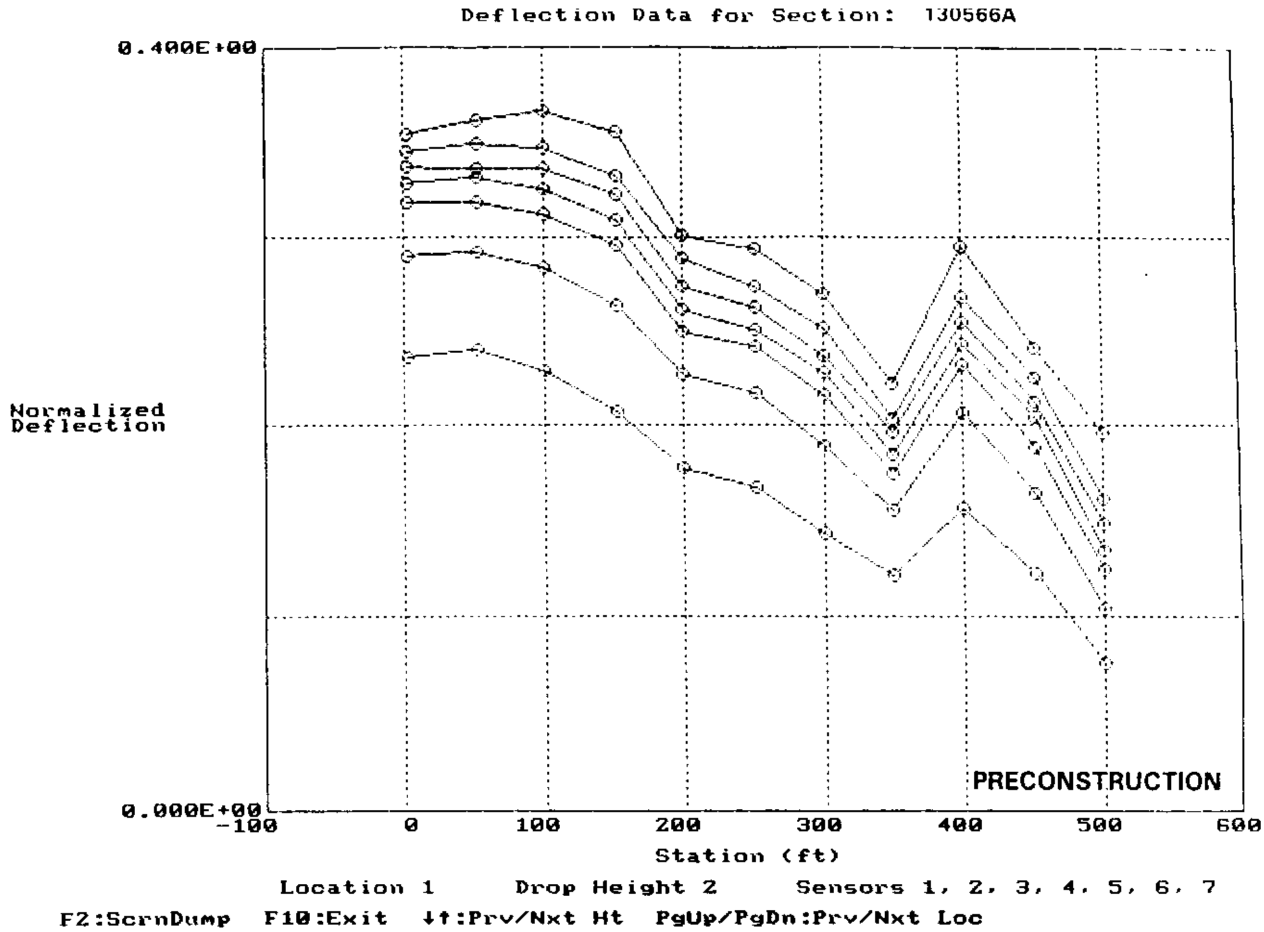
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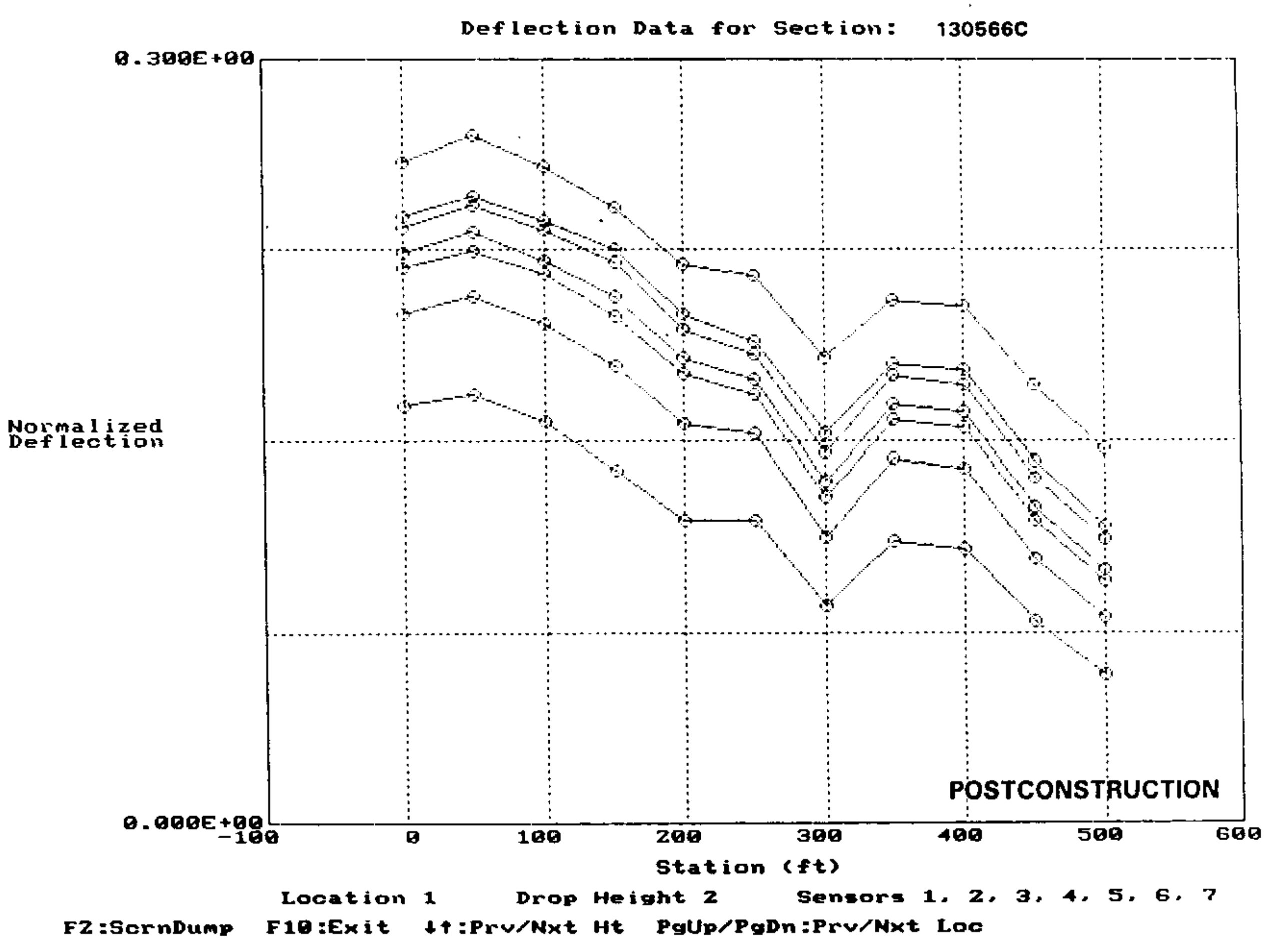
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POSTCONSTRUCTION
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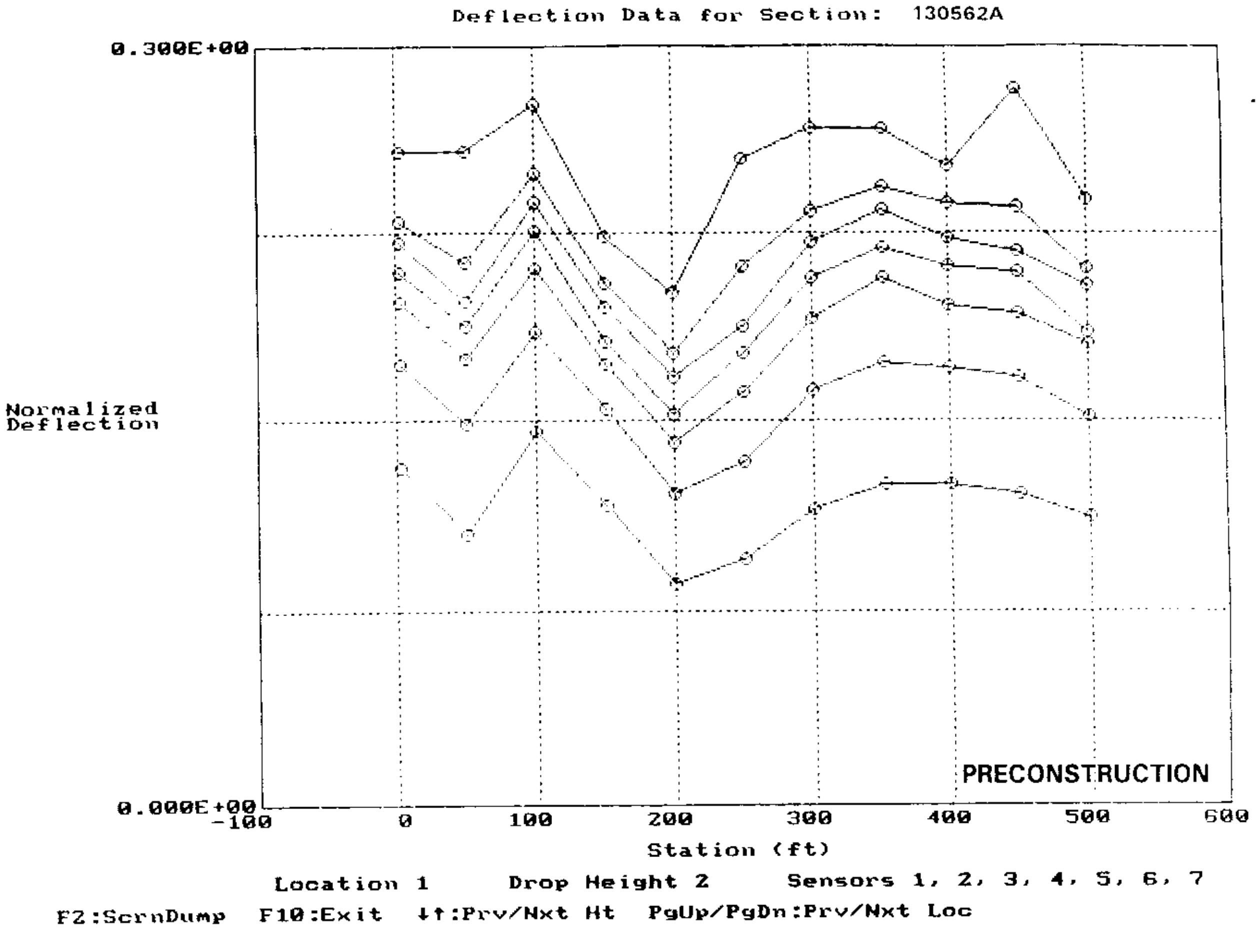
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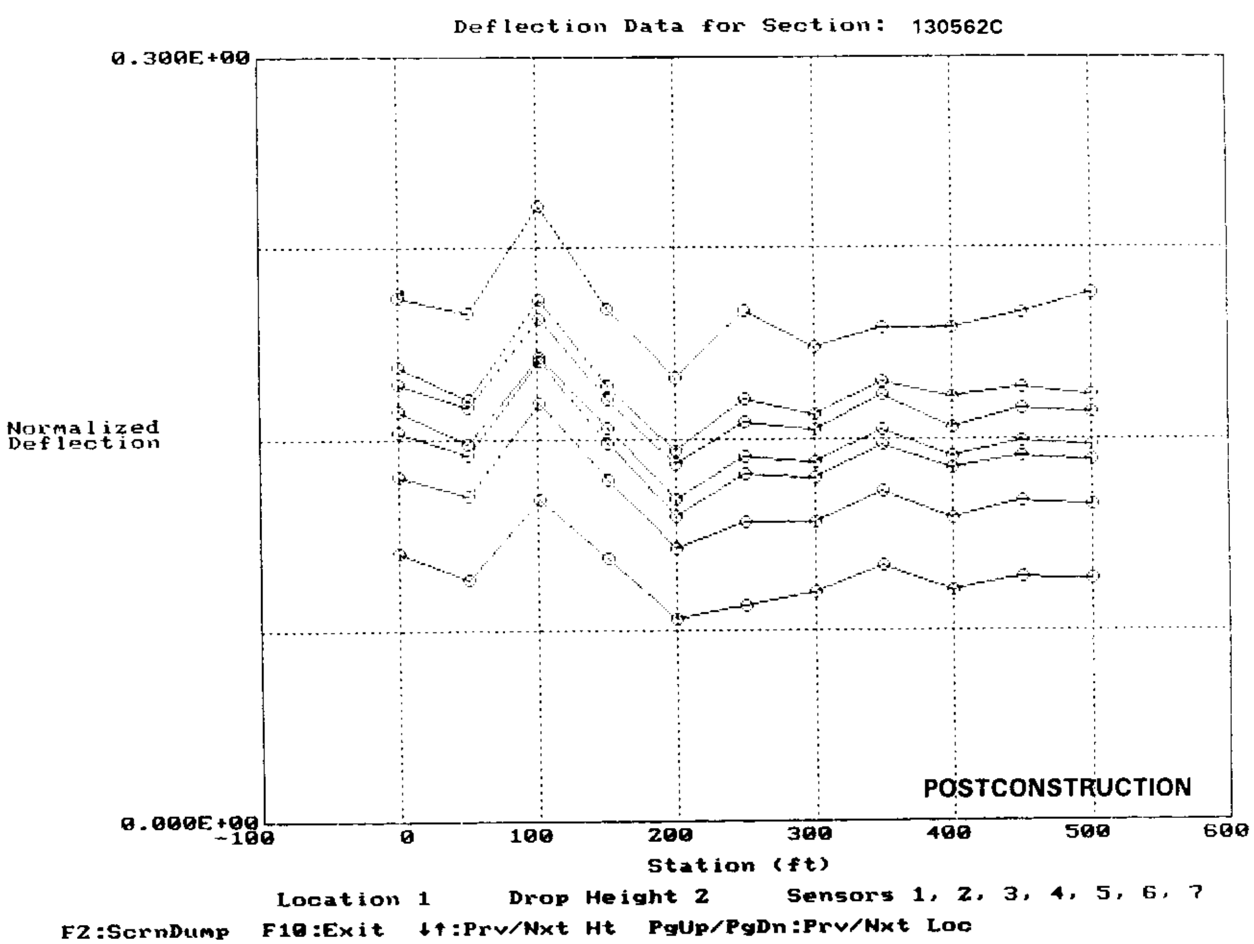
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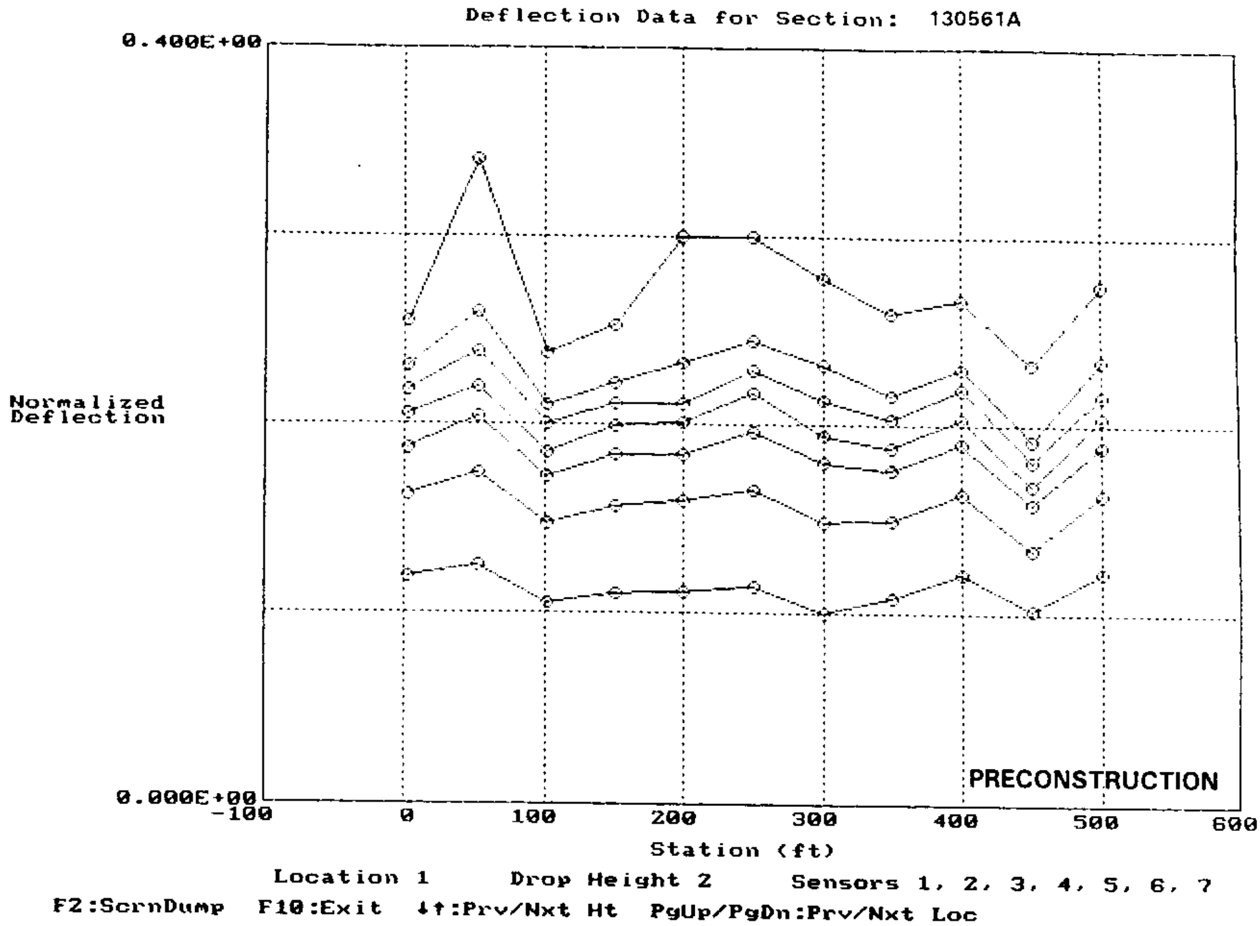
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Station (ft)
PRECONSTRUCTION
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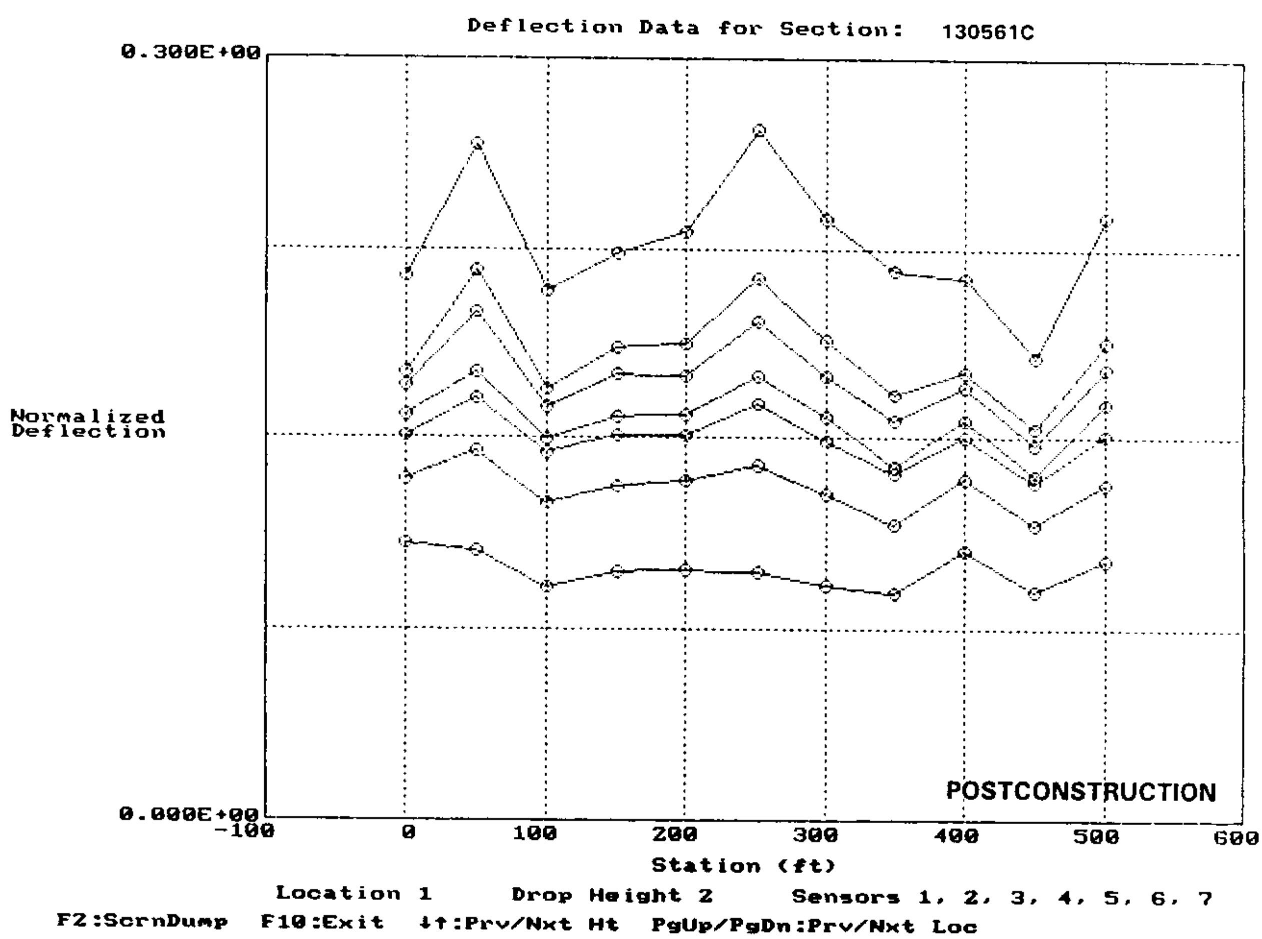
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc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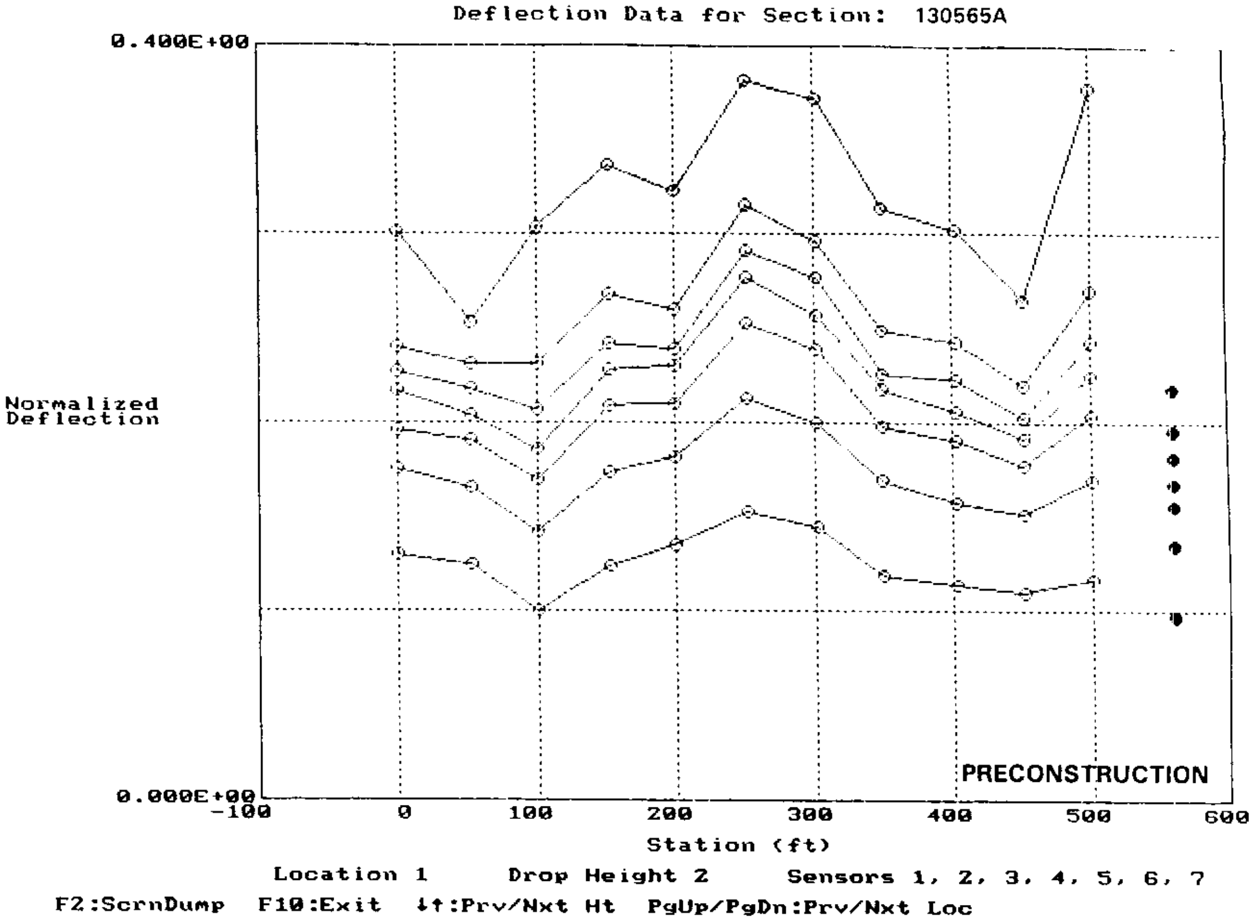
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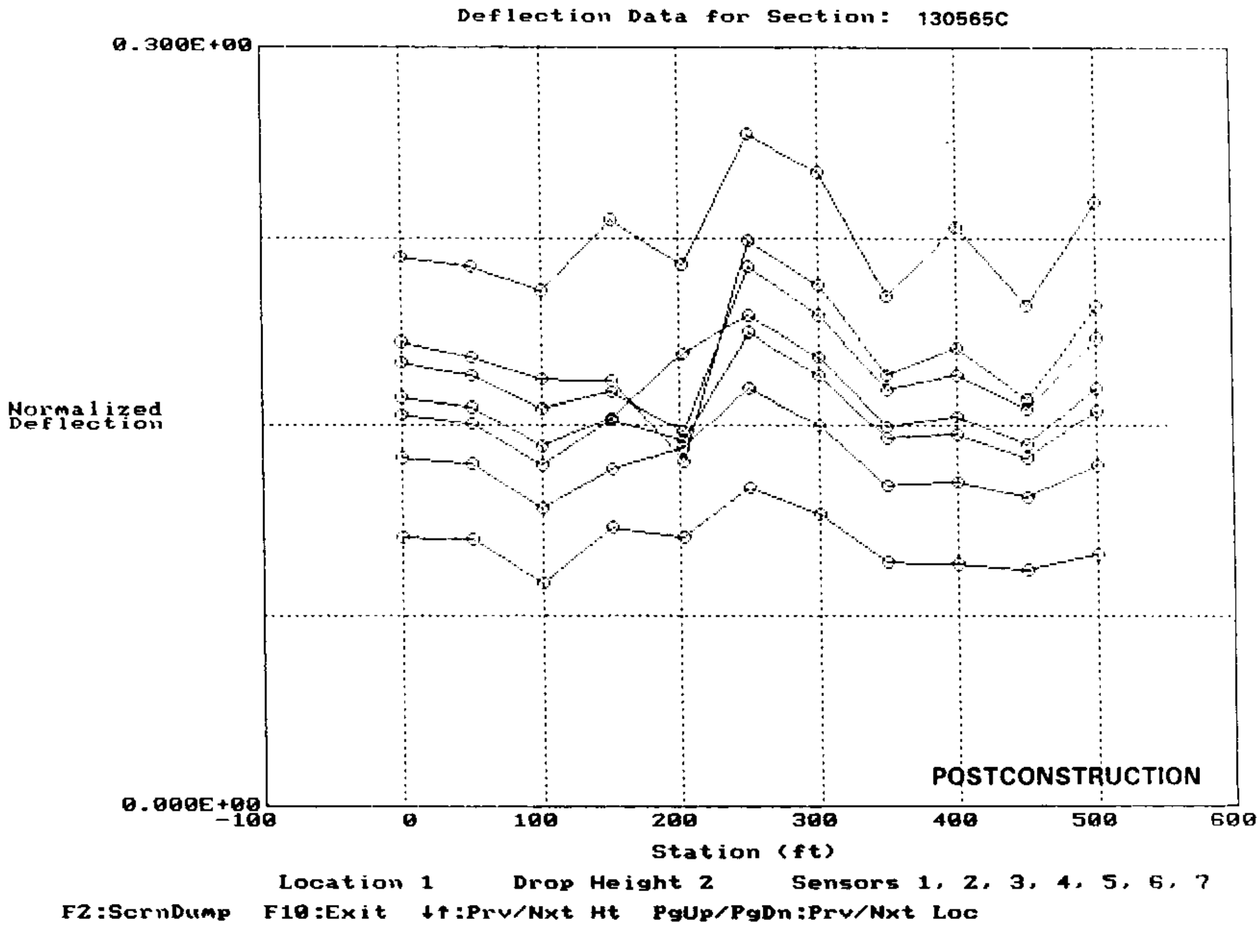
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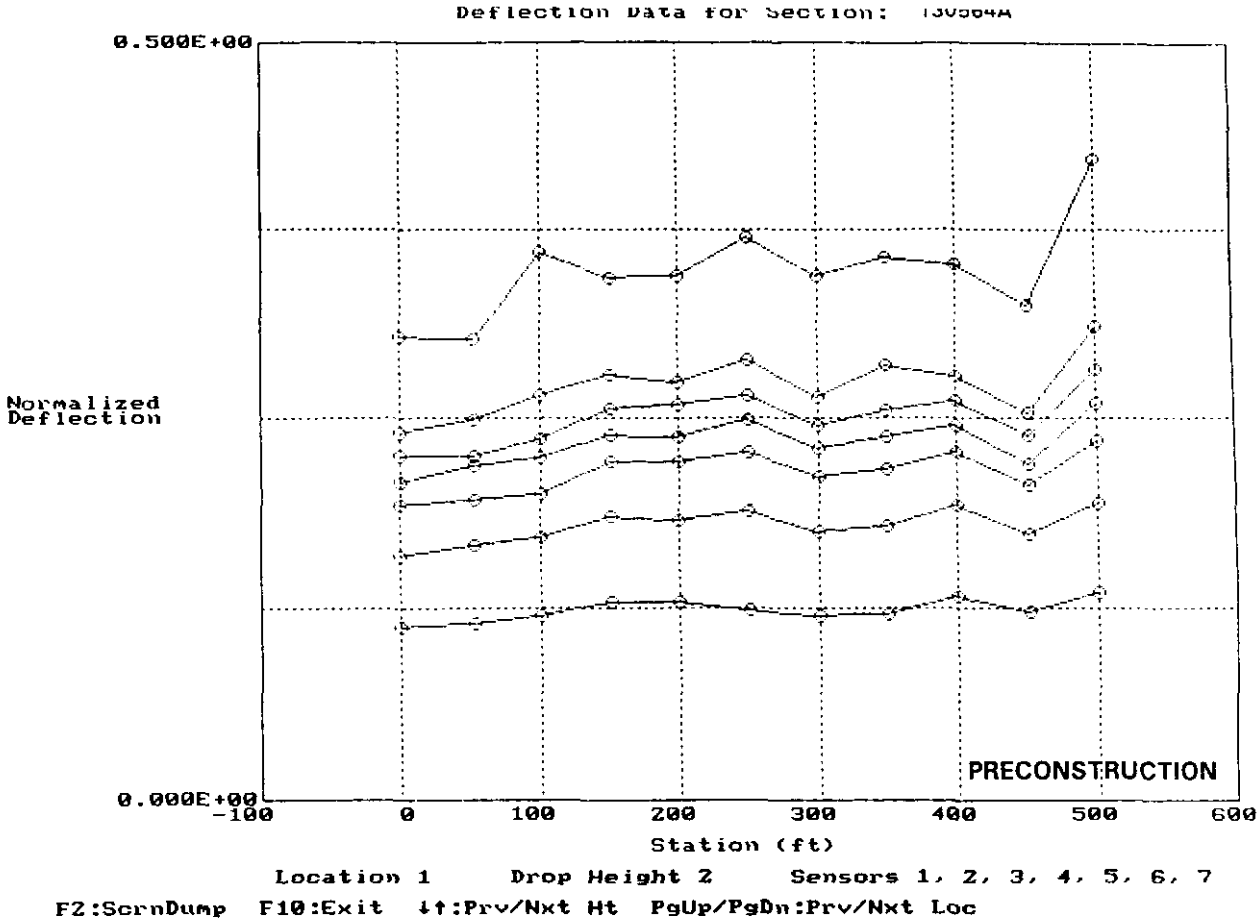
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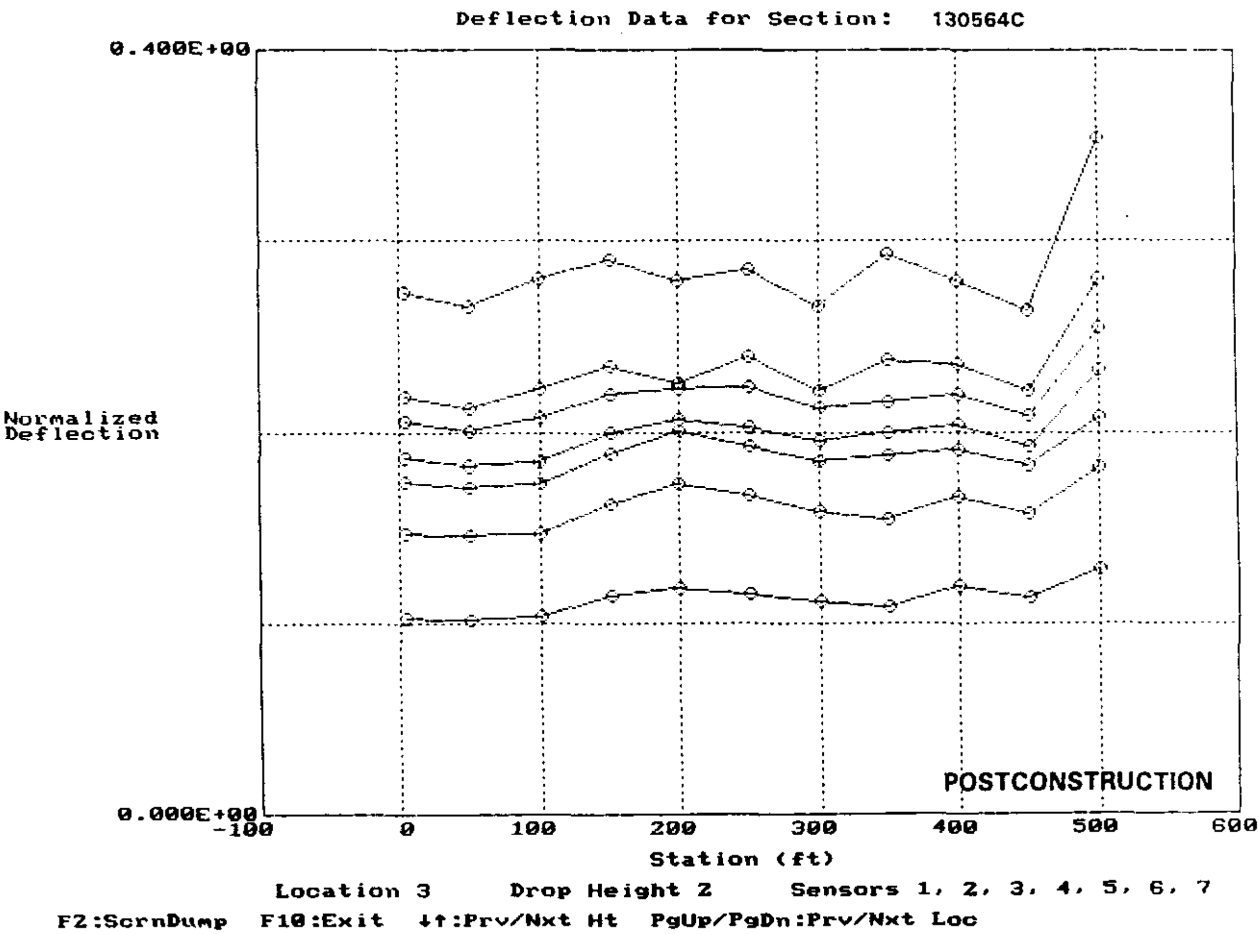
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0.000E+00
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Deflection
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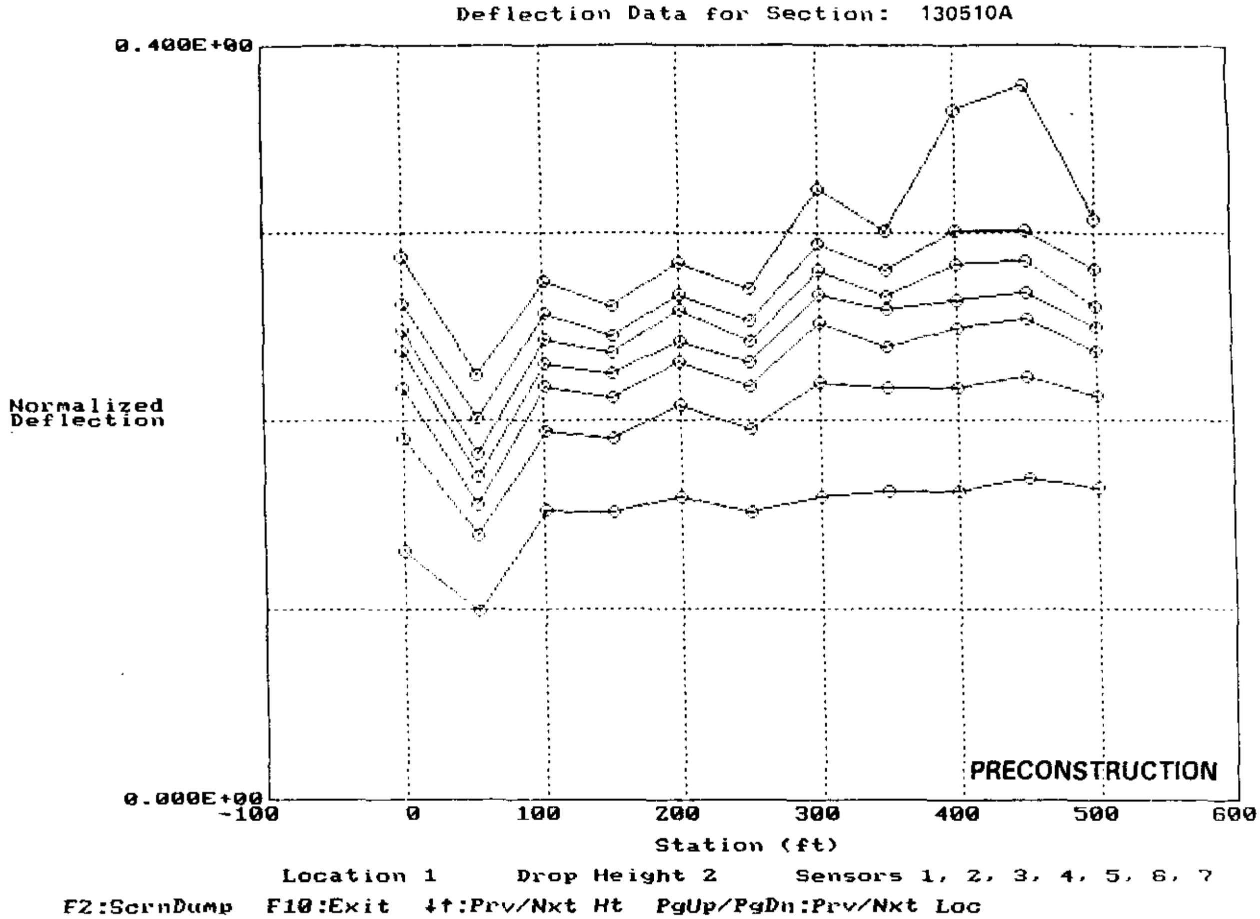
300
400
500
600
Station (ft)
Location 3 Drop Height 2 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc



Deflection Data for Section: 130510A
0.400E+00
Normalized Deflection
0.000E+00
-100
0
100
200
300
400
500
600
Station (ft)
PRECONSTRUCTION
Location 1 Drop Height 2 Sensors 1, 2, 3, 4, 5, 6, 7
F2:ScrnDump F10:Exit ↓↑:Prv/Nxt Ht PgUp/PgDn:Prv/Nxt Loc

PRECONSTRUCTION

POSTCONSTRUCTION

Summary of Data for section 130501C
Analyzed by: Peter Jordahl on 07-13-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2384	0.1825	0.1687	0.1419	0.1253	0.0895	0.0417
	2	0.2496	0.1961	0.1798	0.1542	0.1359	0.0981	0.0484
	3	0.2554	0.2033	0.1867	0.1611	0.1417	0.1033	0.0519
	4	0.2654	0.2136	0.1962	0.1710	0.1504	0.1112	0.0575

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0544	0.0518	0.0508	0.0493	0.0475	0.0429	0.0274
	2	0.0581	0.0552	0.0546	0.0538	0.0530	0.0483	0.0367
	3	0.0590	0.0581	0.0578	0.0568	0.0559	0.0506	0.0380
	4	0.0627	0.0621	0.0618	0.0610	0.0597	0.0545	0.0412

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	22.80%	28.40%	30.13%	34.74%	37.94%	47.98%	65.57%
	2	23.26%	28.14%	30.35%	34.88%	39.01%	49.31%	75.91%
	3	23.08%	28.56%	30.97%	35.24%	39.46%	49.01%	73.12%
	4	23.63%	29.07%	31.49%	35.66%	39.71%	49.01%	71.66%

PRECONSTRUCTION

Summary of Data for section 130502A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3995	0.3459	0.3201	0.2964	0.2635	0.2098	0.1296
	2	0.4264	0.3709	0.3464	0.3201	0.2896	0.2313	0.1437
	3	0.4374	0.3849	0.3609	0.3344	0.3037	0.2439	0.1534
	4	0.4543	0.3992	0.3759	0.3482	0.3187	0.2573	0.1628

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0608	0.0384	0.0362	0.0319	0.0300	0.0229	0.0172
	2	0.0542	0.0443	0.0375	0.0369	0.0330	0.0259	0.0162
	3	0.0547	0.0458	0.0413	0.0385	0.0345	0.0272	0.0179
	4	0.0664	0.0510	0.0454	0.0425	0.0383	0.0305	0.0193

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	15.23%	11.10%	11.31%	10.76%	11.39%	10.94%	13.26%
	2	12.70%	11.96%	10.84%	11.53%	11.38%	11.20%	11.27%
	3	12.50%	11.89%	11.45%	11.50%	11.35%	11.14%	11.66%
	4	14.61%	12.77%	12.09%	12.21%	12.02%	11.87%	11.87%

POSTCONSTRUCTION

Summary of Data for section 130502C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3284	0.2714	0.2586	0.2317	0.2154	0.1768	0.1142
	2	0.3397	0.2885	0.2734	0.2478	0.2288	0.1878	0.1221
	3	0.3569	0.3059	0.2896	0.2643	0.2436	0.2013	0.1315
	4	0.3778	0.3274	0.3104	0.2849	0.2630	0.2187	0.1440

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0269	0.0227	0.0227	0.0206	0.0192	0.0164	0.0108
	2	0.0272	0.0243	0.0240	0.0219	0.0205	0.0173	0.0117
	3	0.0282	0.0253	0.0252	0.0228	0.0211	0.0178	0.0120
	4	0.0309	0.0277	0.0274	0.0251	0.0234	0.0190	0.0129

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	8.20%	8.37%	8.80%	8.88%	8.92%	9.26%	9.49%
	2	8.01%	8.43%	8.76%	8.83%	8.96%	9.20%	9.54%
	3	7.90%	8.25%	8.72%	8.64%	8.67%	8.85%	9.16%
	4	8.18%	8.47%	8.84%	8.81%	8.88%	8.68%	8.98%

PRECONSTRUCTION

Summary of Data for section 130503A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2405	0.2040	0.1857	0.1708	0.1521	0.1192	0.0740
	2	0.2530	0.2152	0.1985	0.1814	0.1633	0.1298	0.0798
	3	0.2607	0.2219	0.2062	0.1886	0.1707	0.1354	0.0842
	4	0.2654	0.2267	0.2119	0.1939	0.1764	0.1413	0.0884

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0337	0.0265	0.0264	0.0263	0.0278	0.0257	0.0205
	2	0.0328	0.0302	0.0279	0.0296	0.0279	0.0268	0.0211
	3	0.0337	0.0302	0.0308	0.0296	0.0300	0.0280	0.0218
	4	0.0335	0.0313	0.0309	0.0309	0.0302	0.0277	0.0229

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	13.99%	13.00%	14.22%	15.42%	18.29%	21.60%	27.63%
	2	12.96%	14.03%	14.04%	16.30%	17.10%	20.67%	26.45%
	3	12.94%	13.63%	14.92%	15.69%	17.58%	20.65%	25.86%
	4	12.62%	13.81%	14.57%	15.95%	17.13%	19.64%	25.88%

POSTCONSTRUCTION

Summary of Data for section 130503C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.1769	0.1412	0.1345	0.1174	0.1132	0.0950	0.0647
	2	0.1796	0.1456	0.1371	0.1216	0.1150	0.0968	0.0666
	3	0.1852	0.1516	0.1420	0.1273	0.1194	0.1000	0.0687
	4	0.1929	0.1589	0.1482	0.1343	0.1250	0.1051	0.0719

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0224	0.0221	0.0219	0.0209	0.0207	0.0195	0.0172
	2	0.0211	0.0219	0.0219	0.0214	0.0215	0.0202	0.0177
	3	0.0220	0.0222	0.0221	0.0216	0.0214	0.0202	0.0170
	4	0.0222	0.0224	0.0226	0.0220	0.0218	0.0211	0.0179

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	12.64%	15.67%	16.27%	17.79%	18.27%	20.58%	26.66%
	2	11.76%	15.08%	15.95%	17.63%	18.72%	20.83%	26.55%
	3	11.88%	14.67%	15.59%	16.93%	17.89%	20.14%	24.77%
	4	11.50%	14.10%	15.22%	16.35%	17.40%	20.07%	24.87%

PRECONSTRUCTION

Summary of Data for section 130504A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3751	0.2972	0.2657	0.2448	0.2120	0.1601	0.0801
	2	0.4005	0.3231	0.2961	0.2711	0.2404	0.1836	0.0931
	3	0.4175	0.3394	0.3140	0.2869	0.2571	0.1978	0.1050
	4	0.4261	0.3518	0.3260	0.3002	0.2696	0.2098	0.1144

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0499	0.0336	0.0341	0.0342	0.0328	0.0275	0.0210
	2	0.0478	0.0342	0.0342	0.0326	0.0318	0.0287	0.0227
	3	0.0463	0.0345	0.0342	0.0333	0.0315	0.0295	0.0237
	4	0.0439	0.0328	0.0322	0.0320	0.0309	0.0281	0.0233

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	13.30%	11.30%	12.84%	13.96%	15.49%	17.15%	26.28%
	2	11.92%	10.58%	11.55%	12.04%	13.22%	15.63%	24.41%
	3	11.09%	10.15%	10.90%	11.61%	12.27%	14.91%	22.59%
	4	10.30%	9.32%	9.88%	10.67%	11.45%	13.38%	20.39%

POSTCONSTRUCTION

Summary of Data for section 130504C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2091	0.1631	0.1513	0.1320	0.1240	0.0987	0.0587
	2	0.2208	0.1756	0.1631	0.1450	0.1339	0.1082	0.0660
	3	0.2335	0.1885	0.1751	0.1570	0.1450	0.1182	0.0720
	4	0.2506	0.2039	0.1901	0.1725	0.1591	0.1314	0.0825

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0194	0.0191	0.0192	0.0185	0.0177	0.0187	0.0173
	2	0.0202	0.0187	0.0184	0.0177	0.0177	0.0166	0.0141
	3	0.0185	0.0176	0.0175	0.0169	0.0167	0.0159	0.0144
	4	0.0182	0.0169	0.0169	0.0162	0.0162	0.0153	0.0136

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	9.30%	11.70%	12.69%	14.01%	14.28%	18.90%	29.56%
	2	9.15%	10.66%	11.26%	12.24%	13.22%	15.30%	21.37%
	3	7.92%	9.36%	9.99%	10.76%	11.52%	13.47%	20.00%
	4	7.25%	8.28%	8.86%	9.41%	10.18%	11.64%	16.49%

PRECONSTRUCTION

Summary of Data for section 130505A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3471	0.2955	0.2730	0.2562	0.2294	0.1890	0.1185
	2	0.3652	0.3115	0.2935	0.2716	0.2486	0.2022	0.1314
	3	0.3729	0.3202	0.3003	0.2800	0.2560	0.2103	0.1355
	4	0.3798	0.3279	0.3086	0.2880	0.2641	0.2173	0.1410

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0290	0.0222	0.0212	0.0257	0.0255	0.0212	0.0201
	2	0.0306	0.0203	0.0205	0.0229	0.0226	0.0212	0.0178
	3	0.0269	0.0200	0.0195	0.0208	0.0201	0.0195	0.0172
	4	0.0287	0.0213	0.0198	0.0214	0.0209	0.0205	0.0178

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	8.35%	7.53%	7.77%	10.03%	11.14%	11.21%	16.98%
	2	8.38%	6.53%	6.99%	8.43%	9.10%	10.47%	13.52%
	3	7.21%	6.25%	6.48%	7.44%	7.84%	9.29%	12.69%
	4	7.55%	6.51%	6.42%	7.43%	7.91%	9.44%	12.61%

POSTCONSTRUCTION

Summary of Data for section 130505C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2559	0.2129	0.2041	0.1847	0.1721	0.1459	0.0977
	2	0.2632	0.2223	0.2116	0.1931	0.1799	0.1511	0.1029
	3	0.2757	0.2345	0.2226	0.2043	0.1899	0.1599	0.1086
	4	0.2892	0.2479	0.2351	0.2168	0.2017	0.1699	0.1161

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0236	0.0234	0.0226	0.0244	0.0220	0.0191	0.0135
	2	0.0215	0.0216	0.0209	0.0205	0.0205	0.0196	0.0155
	3	0.0223	0.0223	0.0221	0.0220	0.0214	0.0209	0.0170
	4	0.0213	0.0213	0.0213	0.0212	0.0208	0.0201	0.0166

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	9.23%	11.00%	11.05%	13.23%	12.81%	13.12%	13.86%
	2	8.18%	9.71%	9.90%	10.60%	11.40%	12.94%	15.08%
	3	8.09%	9.52%	9.95%	10.77%	11.28%	13.05%	15.66%
	4	7.38%	8.58%	9.06%	9.78%	10.34%	11.84%	14.31%

PRECONSTRUCTION

Summary of Data for section 130506A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3067	0.2473	0.2270	0.2083	0.1850	0.1455	0.0831
	2	0.3281	0.2693	0.2491	0.2279	0.2051	0.1614	0.0958
	3	0.3395	0.2803	0.2602	0.2393	0.2167	0.1721	0.1029
	4	0.3440	0.2870	0.2671	0.2464	0.2237	0.1789	0.1081

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0459	0.0429	0.0419	0.0418	0.0415	0.0383	0.0311
	2	0.0459	0.0431	0.0431	0.0425	0.0408	0.0381	0.0334
	3	0.0451	0.0434	0.0429	0.0419	0.0408	0.0378	0.0327
	4	0.0430	0.0417	0.0415	0.0406	0.0394	0.0366	0.0314

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	14.96%	17.36%	18.46%	20.08%	22.45%	26.30%	37.43%
	2	13.98%	15.99%	17.31%	18.63%	19.89%	23.62%	34.90%
	3	13.29%	15.49%	16.47%	17.51%	18.81%	21.97%	31.75%
	4	12.50%	14.52%	15.53%	16.47%	17.62%	20.44%	29.01%

POSTCONSTRUCTION

Summary of Data for section 130506C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2389	0.1914	0.1772	0.1540	0.1415	0.1122	0.0690
	2	0.2495	0.2044	0.1886	0.1667	0.1516	0.1208	0.0738
	3	0.2629	0.2175	0.2005	0.1785	0.1618	0.1292	0.0791
	4	0.2801	0.2333	0.2156	0.1933	0.1755	0.1410	0.0873

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0249	0.0254	0.0258	0.0257	0.0260	0.0257	0.0226
	2	0.0261	0.0257	0.0260	0.0260	0.0253	0.0243	0.0224
	3	0.0273	0.0269	0.0270	0.0266	0.0259	0.0248	0.0219
	4	0.0293	0.0287	0.0287	0.0280	0.0272	0.0253	0.0221

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	10.42%	13.27%	14.56%	16.68%	18.35%	22.87%	32.70%
	2	10.48%	12.60%	13.77%	15.57%	16.67%	20.11%	30.40%
	3	10.40%	12.38%	13.47%	14.88%	16.03%	19.19%	27.62%
	4	10.44%	12.30%	13.30%	14.47%	15.48%	17.94%	25.31%

PRECONSTRUCTION

Summary of Data for section 130507A
Analyzed by: Peter Jordahl on 07-14-1994

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
0	1	0.3113	0.2885	0.2718	0.2456	0.2171	0.1708	0.0926
	2	0.3462	0.3185	0.2994	0.2757	0.2475	0.1984	0.1140
	3	0.3592	0.3299	0.3114	0.2868	0.2606	0.2089	0.1195
	4	0.3697	0.3396	0.3216	0.2978	0.2710	0.2189	0.1295
1	1	0.3211	0.2549	0.2241	0.2058	0.1742	0.1280	0.0589
	2	0.3424	0.2724	0.2494	0.2233	0.1967	0.1432	0.0684
	3	0.3564	0.2871	0.2612	0.2372	0.2080	0.1545	0.0760
	4	0.3684	0.2973	0.2719	0.2482	0.2199	0.1646	0.0830

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	1	0.0602	0.0636	0.0631	0.0590	0.0571	0.0490	0.0310
	2	0.0641	0.0695	0.0681	0.0683	0.0633	0.0559	0.0365
	3	0.0672	0.0726	0.0741	0.0710	0.0683	0.0594	0.0398
	4	0.0683	0.0734	0.0763	0.0736	0.0703	0.0615	0.0419

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1	1	18.76%	24.96%	28.15%	28.69%	32.75%	38.28%	52.57%
	2	18.71%	25.53%	27.31%	30.57%	32.18%	39.02%	53.39%
	3	18.84%	25.30%	28.39%	29.95%	32.84%	38.43%	52.38%
	4	18.54%	24.69%	28.06%	29.66%	31.99%	37.36%	50.56%

POSTCONSTRUCTION

Summary of Data for section 130507C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.1786	0.1393	0.1320	0.1136	0.1047	0.0841	0.0487
	2	0.1873	0.1480	0.1382	0.1218	0.1119	0.0894	0.0526
	3	0.1985	0.1581	0.1473	0.1312	0.1203	0.0966	0.0567
	4	0.2120	0.1708	0.1594	0.1435	0.1315	0.1067	0.0649

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0298	0.0305	0.0296	0.0294	0.0297	0.0276	0.0215
	2	0.0322	0.0324	0.0327	0.0321	0.0318	0.0299	0.0238
	3	0.0342	0.0352	0.0354	0.0351	0.0347	0.0325	0.0258
	4	0.0355	0.0368	0.0372	0.0371	0.0367	0.0347	0.0283

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	16.66%	21.86%	22.40%	25.88%	28.37%	32.85%	44.17%
	2	17.20%	21.86%	23.64%	26.36%	28.43%	33.44%	45.34%
	3	17.25%	22.28%	24.02%	26.73%	28.83%	33.62%	45.57%
	4	16.72%	21.55%	23.37%	25.87%	27.95%	32.52%	43.54%

PRECONSTRUCTION

Summary of Data for section 130508A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3047	0.2563	0.2335	0.2138	0.1896	0.1458	0.0806
	2	0.3167	0.2656	0.2475	0.2243	0.2015	0.1541	0.0878
	3	0.3235	0.2746	0.2540	0.2325	0.2082	0.1623	0.0924
	4	0.3280	0.2779	0.2592	0.2366	0.2137	0.1666	0.0965

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0433	0.0392	0.0373	0.0361	0.0336	0.0297	0.0197
	2	0.0456	0.0426	0.0411	0.0392	0.0382	0.0328	0.0226
	3	0.0458	0.0448	0.0423	0.0411	0.0386	0.0349	0.0231
	4	0.0465	0.0454	0.0438	0.0426	0.0407	0.0359	0.0250

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	14.22%	15.30%	15.99%	16.91%	17.74%	20.36%	24.50%
	2	14.41%	16.04%	16.59%	17.48%	18.98%	21.26%	25.79%
	3	14.15%	16.30%	16.65%	17.70%	18.55%	21.52%	24.96%
	4	14.19%	16.32%	16.90%	18.02%	19.06%	21.52%	25.92%

POSTCONSTRUCTION

Summary of Data for section 130508C
Analyzed by: Peter Jordahl on 07-13-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.1667	0.1297	0.1222	0.1064	0.1007	0.0830	0.0529
	2	0.1703	0.1342	0.1255	0.1111	0.1034	0.0848	0.0546
	3	0.1760	0.1402	0.1300	0.1161	0.1070	0.0876	0.0567
	4	0.1845	0.1478	0.1370	0.1232	0.1134	0.0931	0.0608

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0160	0.0157	0.0156	0.0151	0.0145	0.0132	0.0093
	2	0.0179	0.0175	0.0174	0.0170	0.0160	0.0138	0.0102
	3	0.0191	0.0189	0.0193	0.0184	0.0179	0.0154	0.0111
	4	0.0210	0.0211	0.0211	0.0204	0.0196	0.0173	0.0126

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	9.60%	12.13%	12.75%	14.22%	14.39%	15.87%	17.59%
	2	10.50%	13.07%	13.83%	15.34%	15.47%	16.26%	18.61%
	3	10.85%	13.47%	14.87%	15.84%	16.69%	17.62%	19.63%
	4	11.36%	14.28%	15.42%	16.59%	17.25%	18.58%	20.65%

PRECONSTRUCTION

Summary of Data for section 130509A
Analyzed by: Peter Jordahl on 07-14-1994

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
0	1	0.3545	0.3388	0.3194	0.2976	0.2705	0.2167	0.1385
	2	0.3878	0.3653	0.3472	0.3235	0.2969	0.2416	0.1551
	3	0.4015	0.3802	0.3616	0.3368	0.3107	0.2548	0.1620
	4	0.4188	0.3967	0.3788	0.3550	0.3282	0.2734	0.1763
1	1	0.4002	0.3558	0.3313	0.3093	0.2793	0.2250	0.1393
	2	0.4230	0.3768	0.3524	0.3285	0.3001	0.2443	0.1509
	3	0.4356	0.3906	0.3653	0.3420	0.3131	0.2554	0.1607
	4	0.4449	0.4019	0.3755	0.3544	0.3242	0.2668	0.1685

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	1	0.0308	0.0243	0.0210	0.0216	0.0196	0.0173	0.0123
	2	0.0301	0.0246	0.0210	0.0209	0.0201	0.0182	0.0140
	3	0.0292	0.0269	0.0229	0.0232	0.0206	0.0188	0.0147
	4	0.0283	0.0266	0.0211	0.0239	0.0197	0.0183	0.0131

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1	1	7.70%	6.82%	6.32%	6.97%	7.01%	7.70%	8.81%
	2	7.11%	6.52%	5.96%	6.38%	6.70%	7.44%	9.30%
	3	6.71%	6.89%	6.26%	6.77%	6.57%	7.38%	9.12%
	4	6.37%	6.62%	5.61%	6.75%	6.09%	6.85%	7.77%

POSTCONSTRUCTION

Summary of Data for section 130509C
Analyzed by: Peter Jordahl on 07-13-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2807	0.2369	0.2284	0.2057	0.1947	0.1622	0.1081
	2	0.2905	0.2514	0.2402	0.2193	0.2053	0.1714	0.1135
	3	0.3026	0.2634	0.2517	0.2313	0.2161	0.1815	0.1209
	4	0.3210	0.2820	0.2693	0.2485	0.2325	0.1964	0.1331

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0228	0.0223	0.0228	0.0205	0.0208	0.0186	0.0141
	2	0.0205	0.0214	0.0215	0.0210	0.0200	0.0188	0.0155
	3	0.0200	0.0212	0.0214	0.0207	0.0202	0.0188	0.0151
	4	0.0204	0.0219	0.0221	0.0207	0.0207	0.0191	0.0155

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	8.11%	9.40%	9.96%	9.96%	10.71%	11.50%	13.05%
	2	7.06%	8.52%	8.97%	9.56%	9.76%	10.96%	13.62%
	3	6.60%	8.06%	8.51%	8.95%	9.37%	10.34%	12.49%
	4	6.34%	7.76%	8.19%	8.33%	8.88%	9.72%	11.67%

PRECONSTRUCTION

Summary of Data for section 130510A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2957	0.2624	0.2484	0.2371	0.2214	0.1967	0.1493
	2	0.2976	0.2673	0.2532	0.2403	0.2257	0.2006	0.1508
	3	0.2997	0.2693	0.2558	0.2436	0.2290	0.2024	0.1530
	4	0.2979	0.2675	0.2551	0.2423	0.2291	0.2023	0.1530

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0468	0.0313	0.0277	0.0285	0.0253	0.0262	0.0220
	2	0.0449	0.0292	0.0292	0.0281	0.0280	0.0240	0.0199
	3	0.0439	0.0305	0.0291	0.0284	0.0270	0.0253	0.0210
	4	0.0422	0.0298	0.0288	0.0278	0.0269	0.0240	0.0205

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	15.84%	11.94%	11.14%	12.03%	11.43%	13.32%	14.72%
	2	15.09%	10.93%	11.53%	11.71%	12.38%	11.97%	13.19%
	3	14.66%	11.32%	11.39%	11.68%	11.79%	12.52%	13.73%
	4	14.16%	11.14%	11.29%	11.47%	11.75%	11.86%	13.41%

POSTCONSTRUCTION

PRECONSTRUCTION

Summary of Data for section 130561A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2634	0.2203	0.2027	0.1908	0.1758	0.1503	0.1061
	2	0.2726	0.2279	0.2128	0.1984	0.1836	0.1564	0.1126
	3	0.2722	0.2277	0.2123	0.1987	0.1844	0.1569	0.1125
	4	0.2717	0.2275	0.2123	0.1985	0.1849	0.1575	0.1127

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0337	0.0187	0.0149	0.0151	0.0121	0.0116	0.0093
	2	0.0312	0.0180	0.0151	0.0147	0.0125	0.0109	0.0084
	3	0.0313	0.0183	0.0157	0.0147	0.0130	0.0117	0.0093
	4	0.0292	0.0173	0.0146	0.0141	0.0130	0.0107	0.0091

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	12.79%	8.48%	7.36%	7.89%	6.87%	7.72%	8.76%
	2	11.43%	7.92%	7.10%	7.41%	6.80%	6.99%	7.45%
	3	11.49%	8.04%	7.41%	7.42%	7.04%	7.45%	8.23%
	4	10.75%	7.59%	6.89%	7.11%	7.04%	6.81%	8.10%

POSTCONSTRUCTION

Summary of Data for section 130561C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2299	0.1850	0.1743	0.1560	0.1504	0.1334	0.0984
	2	0.2277	0.1842	0.1733	0.1571	0.1495	0.1305	0.0981
	3	0.2302	0.1870	0.1753	0.1599	0.1515	0.1320	0.0988
	4	0.2359	0.1918	0.1794	0.1643	0.1551	0.1347	0.1005

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0301	0.0221	0.0160	0.0122	0.0095	0.0096	0.0090
	2	0.0257	0.0188	0.0153	0.0126	0.0098	0.0088	0.0068
	3	0.0260	0.0190	0.0154	0.0130	0.0102	0.0085	0.0071
	4	0.0259	0.0188	0.0151	0.0125	0.0103	0.0084	0.0065

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	13.07%	11.94%	9.16%	7.84%	6.34%	7.16%	9.13%
	2	11.31%	10.22%	8.84%	8.04%	6.55%	6.72%	6.90%
	3	11.28%	10.16%	8.76%	8.15%	6.73%	6.47%	7.21%
	4	10.99%	9.79%	8.44%	7.59%	6.63%	6.25%	6.50%

PRECONSTRUCTION

Summary of Data for section 130562A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2440	0.2192	0.2055	0.1932	0.1798	0.1550	0.1117
	2	0.2520	0.2219	0.2094	0.1968	0.1840	0.1582	0.1159
	3	0.2517	0.2228	0.2113	0.1986	0.1856	0.1601	0.1168
	4	0.2492	0.2208	0.2089	0.1967	0.1841	0.1585	0.1157

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0248	0.0221	0.0213	0.0217	0.0200	0.0193	0.0168
	2	0.0237	0.0208	0.0213	0.0219	0.0206	0.0189	0.0165
	3	0.0229	0.0210	0.0203	0.0204	0.0192	0.0180	0.0145
	4	0.0222	0.0196	0.0192	0.0192	0.0180	0.0167	0.0134

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	10.17%	10.08%	10.39%	11.22%	11.14%	12.43%	15.02%
	2	9.40%	9.38%	10.17%	11.12%	11.17%	11.97%	14.25%
	3	9.12%	9.41%	9.62%	10.25%	10.33%	11.27%	12.38%
	4	8.90%	8.87%	9.18%	9.76%	9.78%	10.56%	11.59%

POSTCONSTRUCTION

Summary of Data for section 130562C
Analyzed by: Peter Jordahl on 07-13-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2015	0.1695	0.1634	0.1499	0.1448	0.1292	0.0997
	2	0.2001	0.1697	0.1629	0.1501	0.1446	0.1278	0.0972
	3	0.2017	0.1713	0.1633	0.1519	0.1446	0.1275	0.0968
	4	0.2069	0.1765	0.1675	0.1563	0.1483	0.1305	0.0992

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0201	0.0166	0.0169	0.0179	0.0176	0.0167	0.0169
	2	0.0165	0.0142	0.0142	0.0140	0.0149	0.0147	0.0125
	3	0.0159	0.0140	0.0145	0.0147	0.0147	0.0142	0.0127
	4	0.0152	0.0136	0.0141	0.0140	0.0144	0.0138	0.0123

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	10.00%	9.79%	10.34%	11.97%	12.14%	12.92%	16.99%
	2	8.26%	8.38%	8.71%	9.32%	10.32%	11.50%	12.85%
	3	7.88%	8.17%	8.89%	9.68%	10.19%	11.10%	13.17%
	4	7.33%	7.69%	8.40%	8.93%	9.72%	10.56%	12:41%

PRECONSTRUCTION

Summary of Data for section 130563A
Analyzed by: Peter Jordahl on 07-14-1994

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
0	1	0.2137	0.2008	0.1934	0.1818	0.1745	0.1538	0.1131
	2	0.2211	0.2077	0.1999	0.1892	0.1776	0.1573	0.1208
	3	0.2209	0.2060	0.1979	0.1891	0.1785	0.1573	0.1189
	4	0.2197	0.2049	0.1963	0.1875	0.1772	0.1567	0.1196
1	1	0.2511	0.2359	0.2248	0.2157	0.2054	0.1870	0.1491
	2	0.2532	0.2369	0.2261	0.2183	0.2069	0.1879	0.1504
	3	0.2520	0.2353	0.2247	0.2167	0.2063	0.1878	0.1491
	4	0.2479	0.2318	0.2215	0.2139	0.2046	0.1864	0.1489

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.0044	0.0032	0.0018	0.0021	0.0058	0.0032	0.0041
	2	0.0053	0.0042	0.0039	0.0037	0.0030	0.0039	0.0018
	3	0.0001	0.0005	0.0001	0.0005	0.0001	0.0000	0.0000
	4	0.0009	0.0013	0.0006	0.0013	0.0004	0.0004	0.0005
1	1	0.0410	0.0379	0.0375	0.0374	0.0376	0.0374	0.0343
	2	0.0367	0.0331	0.0334	0.0330	0.0349	0.0334	0.0305
	3	0.0353	0.0321	0.0319	0.0315	0.0328	0.0316	0.0286
	4	0.0339	0.0320	0.0313	0.0320	0.0319	0.0313	0.0286

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	2.05%	1.61%	0.95%	1.13%	3.31%	2.11%	3.63%
	2	2.39%	2.03%	1.94%	1.95%	1.68%	2.47%	1.45%
	3	0.04%	0.25%	0.03%	0.26%	0.03%	0.00%	0.02%
	4	0.43%	0.64%	0.29%	0.67%	0.24%	0.29%	0.45%
1	1	16.34%	16.07%	16.68%	17.34%	18.31%	20.01%	22.98%
	2	14.48%	13.98%	14.75%	15.12%	16.86%	17.76%	20.28%
	3	14.02%	13.64%	14.21%	14.52%	15.88%	16.82%	19.19%
	4	13.69%	13.79%	14.15%	14.96%	15.61%	16.77%	19.19%

POSTCONSTRUCTION

Summary of Data for section 130563C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2839	0.2516	0.2472	0.2310	0.2243	0.2008	0.1549
	2	0.2783	0.2495	0.2435	0.2291	0.2197	0.1963	0.1515
	3	0.2798	0.2533	0.2460	0.2328	0.2226	0.1992	0.1549
	4	0.2824	0.2563	0.2483	0.2358	0.2255	0.2022	0.1577

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0334	0.0337	0.0346	0.0345	0.0350	0.0342	0.0329
	2	0.0282	0.0287	0.0289	0.0289	0.0293	0.0282	0.0267
	3	0.0272	0.0280	0.0278	0.0280	0.0285	0.0276	0.0259
	4	0.0261	0.0271	0.0271	0.0272	0.0276	0.0267	0.0251

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	11.75%	13.41%	13.99%	14.94%	15.59%	17.03%	21.22%
	2	10.13%	11.51%	11.86%	12.61%	13.32%	14.38%	17.63%
	3	9.73%	11.04%	11.30%	12.04%	12.78%	13.87%	16.76%
	4	9.23%	10.55%	10.90%	11.54%	12.24%	13.20%	15.92%

PRECONSTRUCTION

Summary of Data for section 130564A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.3470	0.2645	0.2430	0.2276	0.2082	0.1754	0.1194
	2	0.3474	0.2713	0.2499	0.2335	0.2138	0.1787	0.1237
	3	0.3424	0.2677	0.2475	0.2308	0.2120	0.1772	0.1213
	4	0.3355	0.2636	0.2443	0.2276	0.2090	0.1745	0.1195

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0372	0.0198	0.0187	0.0170	0.0125	0.0112	0.0085
	2	0.0327	0.0203	0.0177	0.0150	0.0141	0.0110	0.0070
	3	0.0305	0.0200	0.0179	0.0153	0.0139	0.0113	0.0076
	4	0.0295	0.0206	0.0178	0.0162	0.0146	0.0125	0.0082

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	10.72%	7.49%	7.69%	7.45%	6.02%	6.38%	7.15%
	2	9.42%	7.47%	7.07%	6.44%	6.61%	6.16%	5.66%
	3	8.92%	7.45%	7.24%	6.64%	6.57%	6.36%	6.25%
	4	8.79%	7.81%	7.27%	7.13%	7.01%	7.15%	6.87%

POSTCONSTRUCTION

Summary of Data for section 130564C
Analyzed by: Peter Jordahl on 07-12-1994

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	0.2903	0.2311	0.2187	0.1980	0.1885	0.1607	0.1109
	2	0.2845	0.2321	0.2177	0.1993	0.1872	0.1607	0.1131
	3	0.2862	0.2338	0.2186	0.2002	0.1873	0.1589	0.1112
	4	0.2905	0.2381	0.2224	0.2040	0.1905	0.1616	0.1131

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	0.0262	0.0176	0.0147	0.0131	0.0101	0.0099	0.0070
	2	0.0249	0.0181	0.0145	0.0138	0.0110	0.0113	0.0082
	3	0.0247	0.0184	0.0155	0.0141	0.0119	0.0107	0.0067
	4	0.0245	0.0189	0.0161	0.0145	0.0120	0.0110	0.0076

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
3	1	9.01%	7.63%	6.73%	6.60%	5.36%	6.18%	6.32%
	2	8.74%	7.82%	6.67%	6.94%	5.88%	7.05%	7.25%
	3	8.63%	7.87%	7.11%	7.04%	6.37%	6.73%	5.98%
	4	8.44%	7.94%	7.26%	7.08%	6.32%	6.82%	6.74%

PRECONSTRUCTION

Summary of Data for section 130565A
Analyzed by: Peter Jordahl on 07-14-1994

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
0	1	0.2176	0.2009	0.1811	0.1792	0.1476	0.1404	0.1008
	2	0.2181	0.1962	0.1821	0.1680	0.1562	0.1353	0.0966
	3	0.2217	0.1994	0.1853	0.1727	0.1613	0.1369	0.1004
	4	0.2188	0.1928	0.1810	0.1656	0.1573	0.1323	0.0961
1	1	0.3136	0.2462	0.2279	0.2128	0.1956	0.1651	0.1180
	2	0.3206	0.2565	0.2359	0.2216	0.2036	0.1731	0.1249
	3	0.3190	0.2547	0.2360	0.2205	0.2039	0.1732	0.1244
	4	0.3151	0.2518	0.2337	0.2189	0.2024	0.1718	0.1232

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	1	0.0453	0.0280	0.0235	0.0235	0.0208	0.0187	0.0131
	2	0.0428	0.0292	0.0273	0.0269	0.0244	0.0204	0.0154
	3	0.0426	0.0298	0.0274	0.0261	0.0245	0.0215	0.0162
	4	0.0410	0.0300	0.0280	0.0270	0.0253	0.0225	0.0181

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
0	1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	4	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1	1	14.46%	11.39%	10.29%	11.04%	10.65%	11.33%	11.06%
	2	13.35%	11.40%	11.56%	12.13%	12.00%	11.76%	12.36%
	3	13.36%	11.69%	11.61%	11.86%	12.00%	12.38%	13.05%
	4	13.00%	11.93%	11.98%	12.32%	12.48%	13.12%	14.73%

POSTCONSTRUCTION

Summary of Data for section 130565C
Analyzed by: Peter Jordahl on 07-13-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2279	0.1764	0.1731	0.1615	0.1534	0.1383	0.1037
	2	0.2243	0.1795	0.1726	0.1615	0.1524	0.1352	0.1033
	3	0.2271	0.1822	0.1743	0.1633	0.1531	0.1356	0.1031
	4	0.2327	0.1896	0.1801	0.1670	0.1574	0.1387	0.1059

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0228	0.0288	0.0197	0.0178	0.0149	0.0143	0.0108
	2	0.0217	0.0238	0.0190	0.0166	0.0151	0.0136	0.0109
	3	0.0211	0.0229	0.0183	0.0169	0.0151	0.0140	0.0113
	4	0.0220	0.0204	0.0184	0.0178	0.0166	0.0154	0.0137

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	9.98%	16.33%	11.39%	11.03%	9.74%	10.36%	10.45%
	2	9.67%	13.27%	11.03%	10.29%	9.89%	10.04%	10.53%
	3	9.30%	12.55%	10.51%	10.33%	9.87%	10.34%	10.99%
	4	9.47%	10.77%	10.19%	10.65%	10.58%	11.08%	12.93%

PRECONSTRUCTION

Summary of Data for section 130566A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2921	0.2761	0.2628	0.2551	0.2408	0.2156	0.1677
	2	0.2959	0.2768	0.2651	0.2544	0.2427	0.2174	0.1704
	3	0.2931	0.2737	0.2625	0.2531	0.2400	0.2154	0.1681
	4	0.2882	0.2683	0.2580	0.2479	0.2370	0.2121	0.1656

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0544	0.0561	0.0600	0.0569	0.0586	0.0567	0.0482
	2	0.0591	0.0635	0.0639	0.0648	0.0645	0.0616	0.0534
	3	0.0571	0.0620	0.0633	0.0628	0.0627	0.0610	0.0523
	4	0.0558	0.0611	0.0616	0.0627	0.0621	0.0600	0.0521

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	18.62%	20.31%	22.85%	22.30%	24.34%	26.31%	28.73%
	2	19.96%	22.94%	24.09%	25.48%	26.57%	28.35%	31.35%
	3	19.49%	22.66%	24.13%	24.83%	26.12%	28.31%	31.10%
	4	19.35%	22.78%	23.89%	25.28%	26.20%	28.30%	31.44%

POSTCONSTRUCTION

Summary of Data for section 130566C
Analyzed by: Peter Jordahl on 07-12-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2176	0.1908	0.1873	0.1738	0.1703	0.1537	0.1198
	2	0.2156	0.1913	0.1859	0.1748	0.1688	0.1519	0.1190
	3	0.2172	0.1942	0.1877	0.1770	0.1701	0.1536	0.1195
	4	0.2170	0.1937	0.1867	0.1766	0.1692	0.1523	0.1194

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0397	0.0426	0.0429	0.0430	0.0429	0.0413	0.0363
	2	0.0393	0.0426	0.0432	0.0434	0.0430	0.0412	0.0358
	3	0.0392	0.0435	0.0438	0.0439	0.0436	0.0427	0.0367
	4	0.0359	0.0405	0.0411	0.0415	0.0415	0.0409	0.0361

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	18.23%	22.33%	22.93%	24.76%	25.21%	26.86%	30.28%
	2	18.22%	22.27%	23.22%	24.84%	25.46%	27.10%	30.10%
	3	18.06%	22.39%	23.32%	24.82%	25.63%	27.76%	30.71%
	4	16.54%	20.89%	22.03%	23.49%	24.55%	26.82%	30.24%

PRECONSTRUCTION

Summary of Data for section 130567A
Analyzed by: Peter Jordahl on 07-14-1994

UNCORRECTED Overall Deflection Statistics

Mean Values (mils/kip)

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.2901	0.2433	0.2294	0.2167	0.2009	0.1760	0.1281
	2	0.2915	0.2469	0.2333	0.2193	0.2056	0.1770	0.1305
	3	0.2911	0.2457	0.2327	0.2193	0.2049	0.1774	0.1287
	4	0.2876	0.2443	0.2305	0.2184	0.2039	0.1769	0.1289

Standard Deviations

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	0.0427	0.0425	0.0418	0.0450	0.0413	0.0416	0.0386
	2	0.0388	0.0373	0.0373	0.0379	0.0385	0.0371	0.0334
	3	0.0369	0.0360	0.0364	0.0366	0.0366	0.0356	0.0322
	4	0.0352	0.0355	0.0352	0.0354	0.0343	0.0342	0.0308

Coefficient of Variation

Test Loc.	Drop Ht	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6	Sensor 7
1	1	14.73%	17.46%	18.23%	20.78%	20.53%	23.65%	30.18%
	2	13.30%	15.12%	15.99%	17.27%	18.72%	20.94%	25.56%
	3	12.67%	14.65%	15.67%	16.70%	17.84%	20.07%	24.99%
	4	12.24%	14.52%	15.29%	16.19%	16.82%	19.31%	23.88%

POSTCONSTRUCTION

APPENDIX C

MATERIAL SAMPLING AND FIELD TESTING PLAN

MATERIAL SAMPLING
AND
FIELD TESTING PLAN

GEORGIA SPS-5 PROJECT 130500
IH-75, SOUTHBOUND
BARTOW COUNTY, GEORGIA

PREPARED BY:

BRENT RAUHUT ENGINEERING INC.
SHRP SOUTHERN REGION COORDINATION OFFICE
8240 MOPAC, SUITE 220
AUSTIN, TEXAS 78759

APRIL 1993

MATERIALS SAMPLING AND FIELD TESTING PLAN

GEORGIA SPS-5 PROJECT (1305)
IH-75, SOUTHBOUND
BARTOW COUNTY, GEORGIA

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TABLE 1

SHRP SPS-5, REHABILITATION OF ASPHALT CONCRETE PAVEMENTS
IH-75 SBL, BARTOW CO., GEORGIA - GROUP I

SECTION	TREATMENT TYPE	BEGIN ¢ STATION	END ¢ STATION	TRANSITION (FT.)
130505	2″ Overlay (Virgin)	369 + 63	364 + 57	150
130506	Mill/Inlay, 2″ Overlay (Virgin)	363 + 05	357 + 99	200
130507	Mill/Inlay, 5″ Overlay (Virgin)	355 + 97	350 + 91	200
130504	5″ Overlay (Virgin)	348 + 88	343 + 82	200
130503	5″ Overlay (30% RAP)	341 + 80	336 + 74	200
130508	Mill/Inlay 5″ Overlay (30% RAP)	334 + 71	329 + 65	150
130509	Mill/Inlay 2″ Overlay (30% RAP)	328 + 15	323 + 15	150
130502	2″ Overlay (30% RAP)	321 + 65	316 + 65	200
130501	Control #1	314 + 65	309 + 65	---

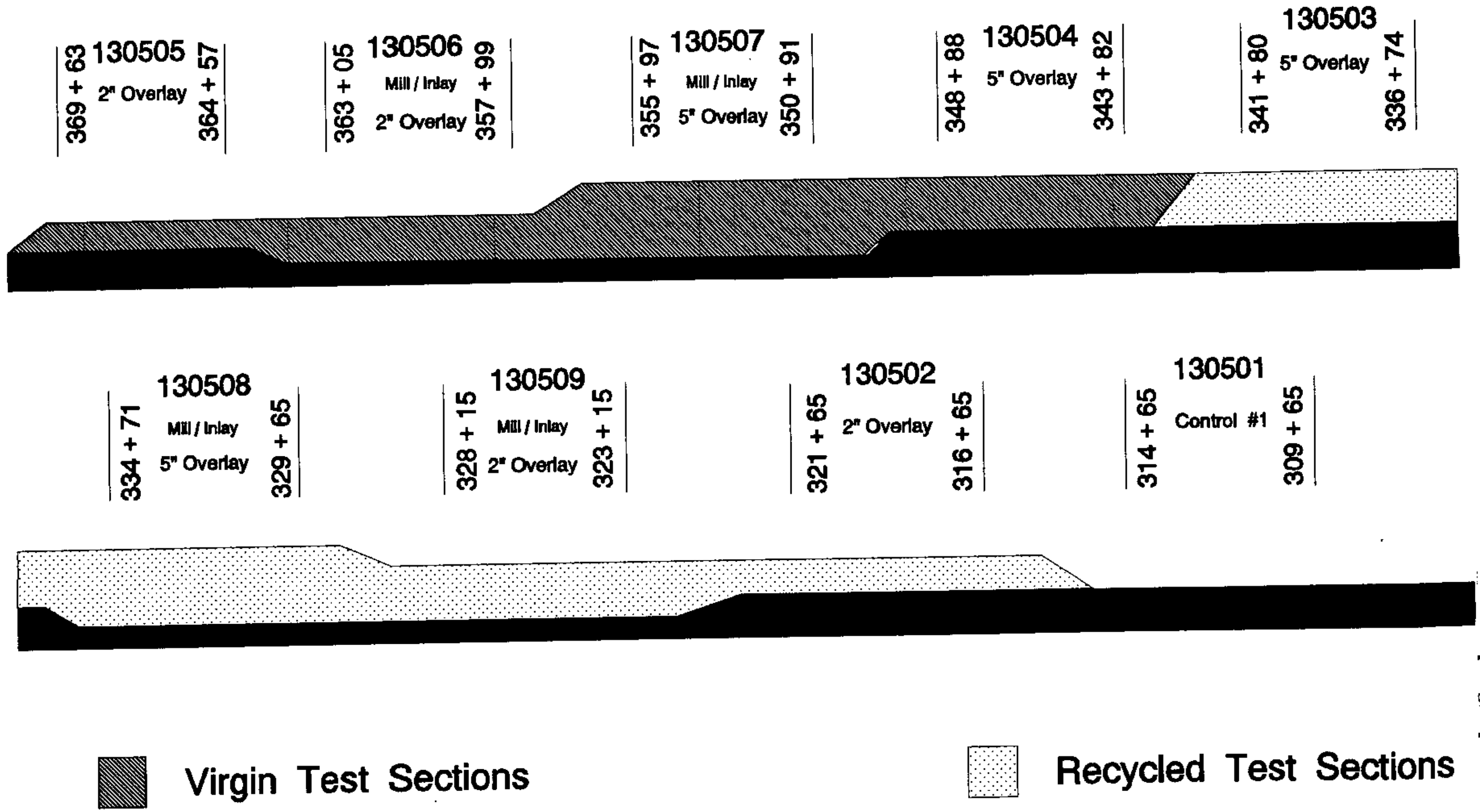
TABLE 2

SHRP SPS-5, REHABILITATION OF ASPHALT CONCRETE PAVEMENTS IH-75 SBL, BARTOW CO., GEORGIA - GROUP II

SECTION	TREATMENT TYPE	BEGIN ¢ STATION	END ¢ STATION	TRANSITION (FT.)
130567	Control #2	212 + 50	207 + 47	200
130563	Mill/Inlay, (Virgin)	205 + 45	200 + 39	200
130566	Mill/Inlay, 3.5″ Overlay (Virgin)	198 + 36	193 + 30	200
130562	3.5″ Overlay (Virgin)	191 + 28	186 + 22	200
130561	3.5″ Overlay (30% RAP)	184 + 19	179 + 17	150
130565	Mill/Inlay 3.5″ Overlay (30% RAP)	177 + 67	172 + 67	200
130564	Mill/Inlay (30% RAP)	170 + 67	165 + 67	200
130510	Planned Treatment	163 + 67	158 + 67	---

Georgia SPS - 5 Alternative Test Section Layout

(5" Overlays Grouped)



Georgia SPS - 5 Alternative Test Section Layout

Supplemental (3 -1\ 2" Overlays Grouped)

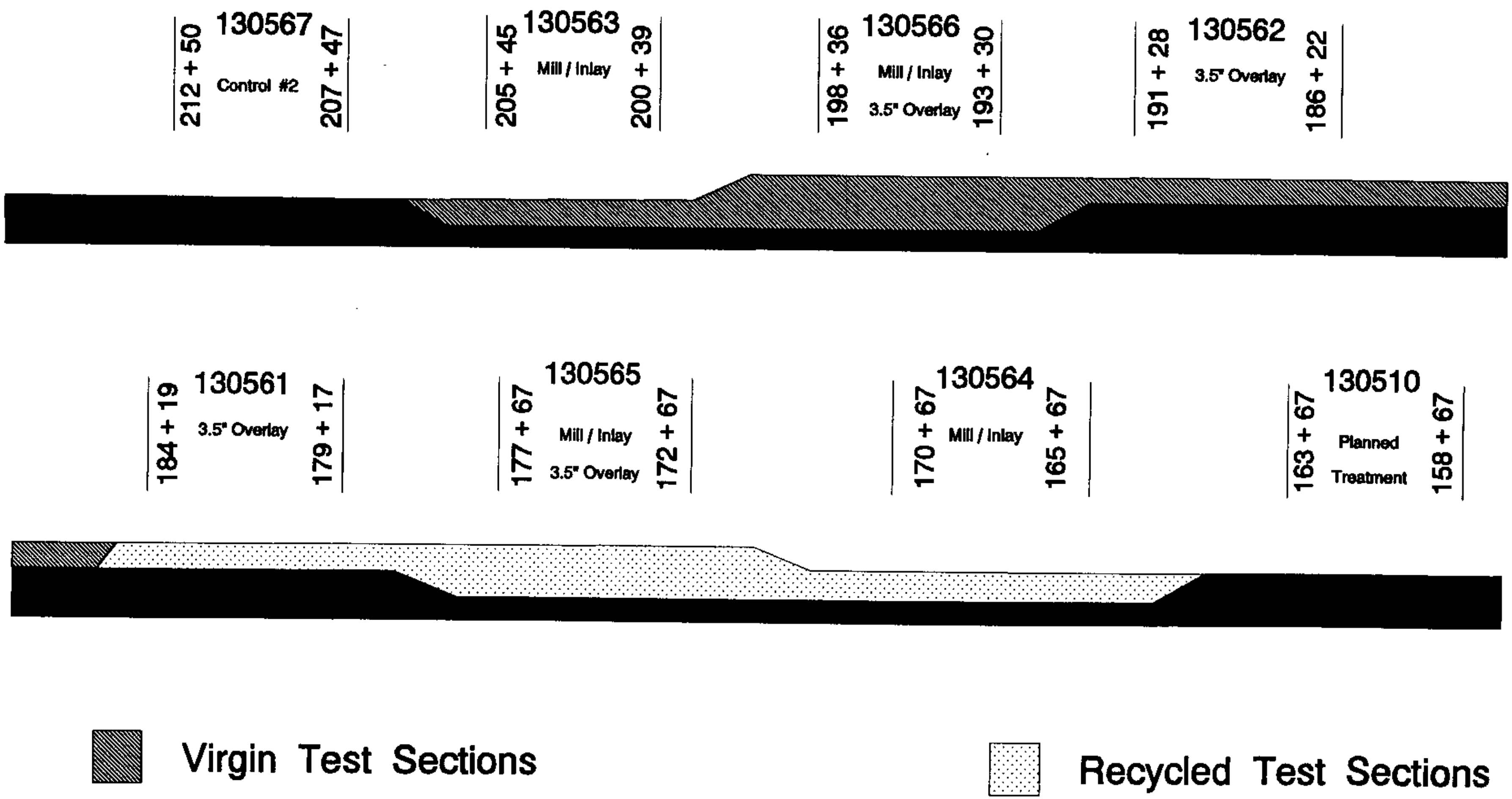


TABLE 3. SCOPE OF MATERIALS SAMPLING AND FIELD TESTING

MATERIAL & SAMPLING DESCRIPTION	NUMBER OF MATERIAL SAMPLES	SAMPLE TYPE DESIGNATION
PRE-CONSTRUCTION SAMPLING		
1. Asphalt Concrete (Original Layer)		
Coring - 4″ diam. cores	42	C1-C42
Coring - 6″ diam. cores	4	A1-A4
Coring - 12″ diam. cores	12	BA1-BA12
Bulk Sampling (3-12" diam. cores)	3	BA4-BA6
2. Unbound Base/Subbase Layers (Per Layer)		
Augering 6″ diam. holes	4	A1-A4
Bulk Sampling in 12″ diam. holes	12	BA1-BA12
Bulk Sampling in Test Pits	3	BA4-BA6
Moisture Content Samples	12	BA1-BA12
3. Subgrade		
Thin-walled Tube Sampling *(Two tube samples per hole. If undisturbed tube sampling is not possible, splitspoon sampling will be conducted.)	8*	A1-A4
Bulk Sampling in 12″ diam. holes	12	BA1-BA12
Bulk Sampling in Test Pits (12″ diam. cores)	3	BA4-BA6
Moisture Content Samples	12	BA1-BA12
4. Shoulder Auger Probes	6	S1-S6
POST-CONSTRUCTION SAMPLING		
1. Asphaltic Concrete (Overlay)		
Coring - 4″ diam. cores	68	C45-C84, C85-C112

TABLE 4. SPS-5 LABORATORY TESTING PLANS (PRECONSTRUCTION)

MATERIAL TYPE AND PROPERTIES	SHRP TEST DESIGNATION	SHRP PROTOCOL	NO. OF TESTS PER LAYER	MATERIAL SOURCE/ SAMPLE TYPE DESIGNATION
A. ASPHALTIC CONCRETE:				
Core Examination/Thickness	AC01	P01	44	All C-Type Cores
Bulk Specific Gravity	AC02	P02	12	[C5 C6 C7], [C17 C18 C19], [C24 C25 C26], [C36 C37 C38] (Note 3)
Maximum Specific Gravity	AC03	P03	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Asphalt Content (Extraction)	AC04	P04	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Creep Compliance	AC06	P06	4	C2, C9, C20-30 (Note 1)
Resilient Modulus	AC07	P07	8	[C6 C7], [C18 C19], [C25 C26], [C37 C38]
Tensile Strength	AC07	P07	12	[C4 C5 C6], [C17 C18 C19], [C24 25 C26], [C36 C37 C38]
Field Moisture Damage	ACO8	P08	4	A1, A2, A3, A4
B. EXTRACTED AGGREGATE:				
Type and Classification:				
Coarse Aggregate	AG03	P13	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Fine Aggregate	AG03	P13	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Gradation of Aggregate	AG04	P14	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
NAA Test for Fine Aggregate Particle Shape	AG05	P14A (Note 2)	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
C. ASPHALT CEMENT:				
Abson Recovery	AE01	P21	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Penetration at 77F & 115F	AE02	P22	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Specific Gravity (60F)	AE03	P23	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Viscosity at 77F	AE04	P24	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Viscosity at 140F & 275F	AE05	P25	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]

NOTES:
1. Creep compliance will be performed when suitable procedures are developed -- cores will be stored.
2. National Aggregate Association will perform tests at no cost to the State.
3. Cores within brackets are from the same sampling area.

TABLE 4. SPS-5 LABORATORY TESTING PLANS (PRECONSTRUCTION) (Continued)

MATERIAL TYPE AND PROPERTIES	SHRP TEST DESIGNATION	SHRP PROTOCOL	NO. OF TESTS PER LAYER	MATERIAL SOURCE/ SAMPLE TYPE DESIGNATION
D. BOUND (TREATED) BASE AND SUBBASE				
Type and Classification of Material and Treatment	TB01	P31	4	[C6 C7], [C18 C19], [C25 C26], [C37 C38]
Pozzolanic/Cementitious: Compression Strength	TB02	P32	4	[C6 C7], [C18 C19], [C25 C26], [C37 C38]
Asphalt Treated: Dynamic Modulus (77F)	TB03	P33	4	[C6 C7], [C18 C19], [C25 C26], [C37 C38]
HMAC: Resilient Modulus	ACO7	P07	4	[C6 C7], [C18 C19], [C25 C26], [C37 C38]
E. UNBOUND GRANULAR BASE AND SUBBASE				
Particle Size Analysis	UG01	P41	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Sieve Analysis (Washed)	UG02	P41	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Atterberg Limits	UG04	P43	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Moisture-Density Relations	UG05	P44	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Resilient Modulus	UG07	P46	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Classification	UG08	P47	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Permeability	UG09	P48	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Natural Moisture Content	UG10	P49	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
F. SUBGRADE				
Sieve Analysis	SS01	P51	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Hydrometer to 0.001 mm.	SS02	P42	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Atterberg Limits	SS03	P43	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Classification	SS04	P52	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Moisture-Density Relations	SS05	P55	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Resilient Modulus	SS07	P46	4	A1, A2, A3, A4, or [BA1-3], [BA4-6], [BA7-9], [BA10-12]
Unit Weight	SS08	P56	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Natural Moisture Content	SS09	P49	4	[BA1-3], [BA4-6], [BA7-9], [BA10-12]
Depth to Rigid Layer			6	S1, S2, S3, S4, S5, S6

TABLE 5. SPS-5 LABORATORY TESTING PLANS (POSTCONSTRUCTION)

MATERIAL TYPE AND PROPERTIES	SHRP TEST DESIGNATION	SHRP PROTOCOL	NO. OF TESTS PER LAYER	MATERIAL SOURCE/ SAMPLE TYPE DESIGNATION
A. ASPHALTIC CONCRETE:				
Core Examination/Thickness	AC01	P01	68	All Cores
Bulk Specific Gravity	AC02	P02	68	All Cores
Maximum Specific Gravity	AC03	P03	6	BV1, BV2, BV3, BR1, BR2, BR3
Asphalt Content (Extraction)	AC04	P04	6	BV1, BV2, BV3, BR1, BR2, BR3
Moisture Susceptibility	AC05	P05	6	BV1, BV2, BV3, BR1, BR2, BR3
Creep Compliance	AC06	P06	4	[C53 C54 C55], [C71 C72 C73] (Note 1)
Resilient Modulus	AC07	P07	6	[C57 C58], [C60 C61], [C63 C64], [C75 C76], [C65 C66], [C69 C70]
Tensile Strength	AC07	P07	18	[C56 C57 C58], [C59 C60 C61], [C62 C63 C64], [C74 C75 C76], [C65 C66 C67], [C68 C69 C70]
B. EXTRACTED AGGREGATE:				
Bulk Specific Gravity:				
Coarse Aggregate	AG01	P11	6	BV1, BV2, BV3, BR1, BR2, BR3
Fine Aggregate	AG02	P12	6	BV1, BV2, BV3, BR1, BR2, BR3
Type and Classification:				
Coarse Aggregate	AG03	P13	6	BV1, BV2, BV3, BR1, BR2, BR3
Fine Aggregate	AG03	P13	6	BV1, BV2, BV3, BR1, BR2, BR3
Gradation of Aggregate	AG04	P14	6	BV1, BV2, BV3, BR1, BR2, BR3
NAA Test for Fine Aggregate Particle Shape	AG05	P14A (Note 2)	6	BV1, BV2, BV3, BR1, BR2, BR3
C. ASPHALT CEMENT:				
Abson Recovery	AE01	P21	6	BV1, BV2, BV3, BR1, BR2, BR3
Penetration at 77F & 115F	AE02	P22	6	BV1, BV2, BV3, BR1, BR2, BR3
Specific Gravity (60F)	AE03	P23	6	BV1, BV2, BV3, BR1, BR2, BR3
Viscosity at 77F	AE04	P24	6	BV1, BV2, BV3, BR1, BR2, BR3
Viscosity at 140F & 275F	AE05	P25	6	BV1, BV2, BV3, BR1, BR2, BR3

NOTES:
1. Creep compliance will be performed when suitable procedures are developed -- cores will be stored.
2. National Aggregate Association will perform tests at no cost to the State.

TABLE 6. BULK MATERIAL SAMPLING DURING CONSTRUCTION

Materials to be Tested as a Part of LTPP.

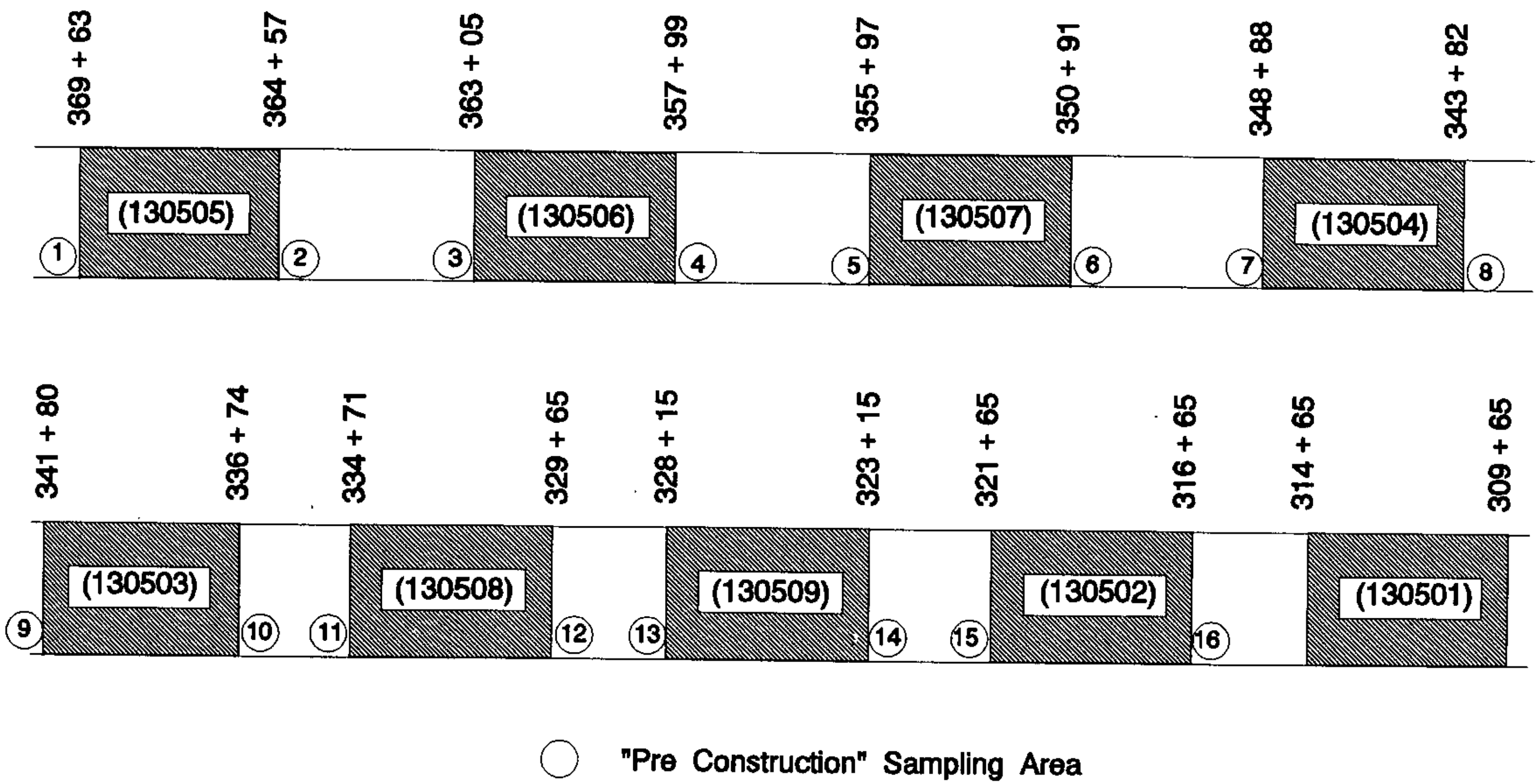
MATERIAL & SAMPLING DESCRIPTION	NUMBER OF MATERIAL SAMPLES	SAMPLE LOCATION
1. Virgin Asphalt Concrete Mix	100 lb.	BV1, BV2, BV3 Mix Plant
2. Recycled Asphalt Concrete Mix	100 lb.	BR1, BR2, BR3 Mix Plant

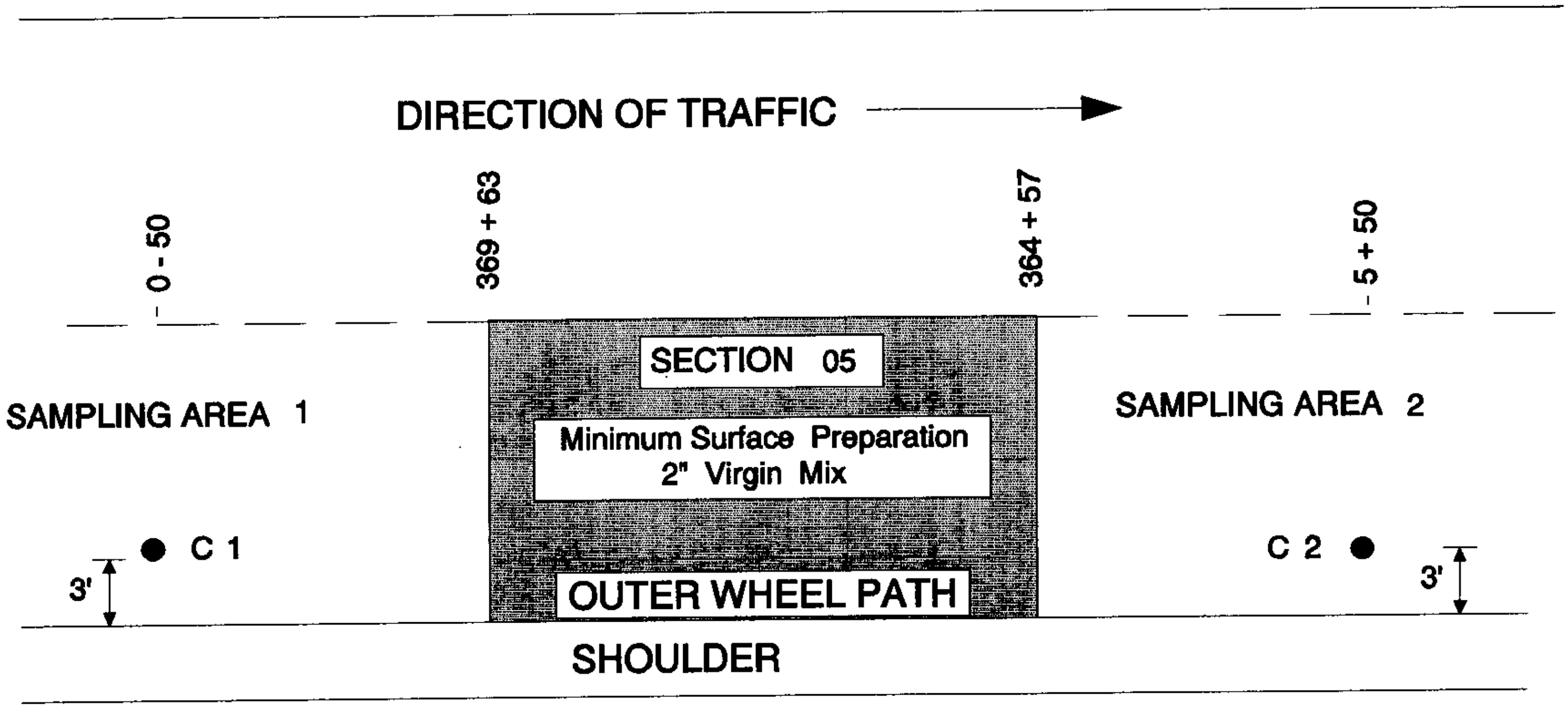
SPS - 5; Bartow County, Ga.

Sampling Area Layout

"Pre Construction"

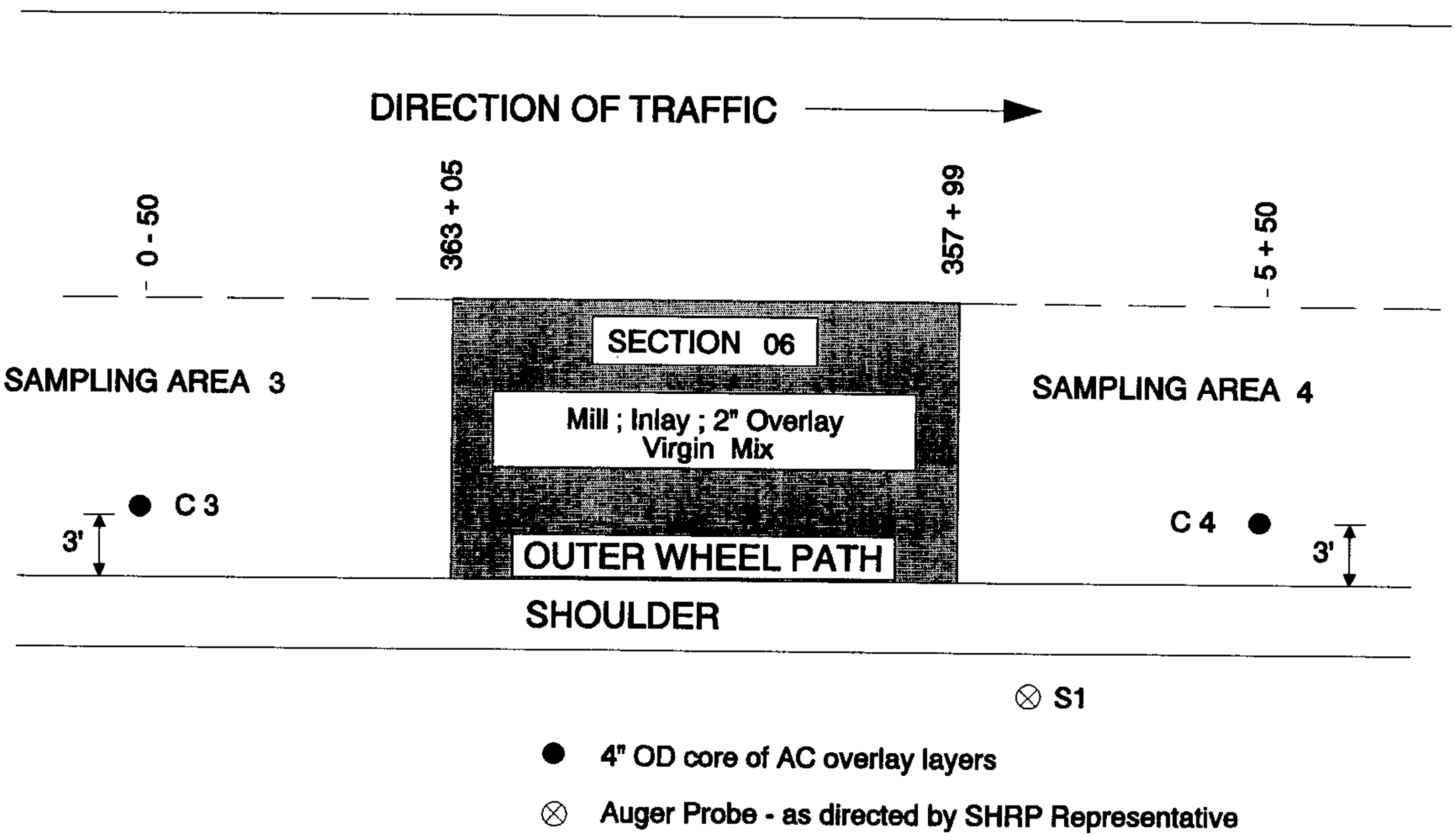
Group 1



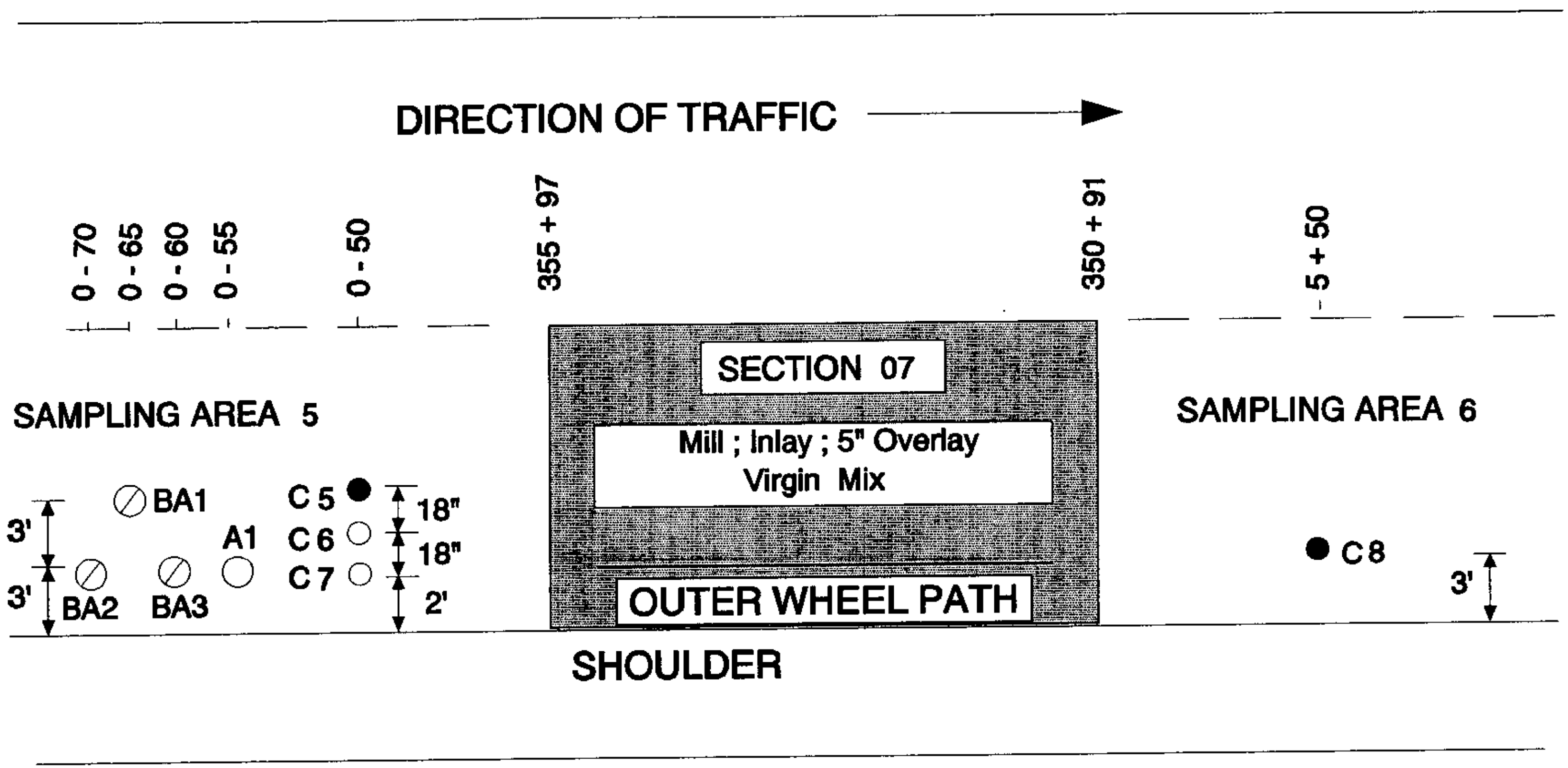


● 4" OD core of AC overlay layers

" Pre - Construction " Sampling Plan for Section , 05



" Pre - Construction " Sampling Plan for Section 06



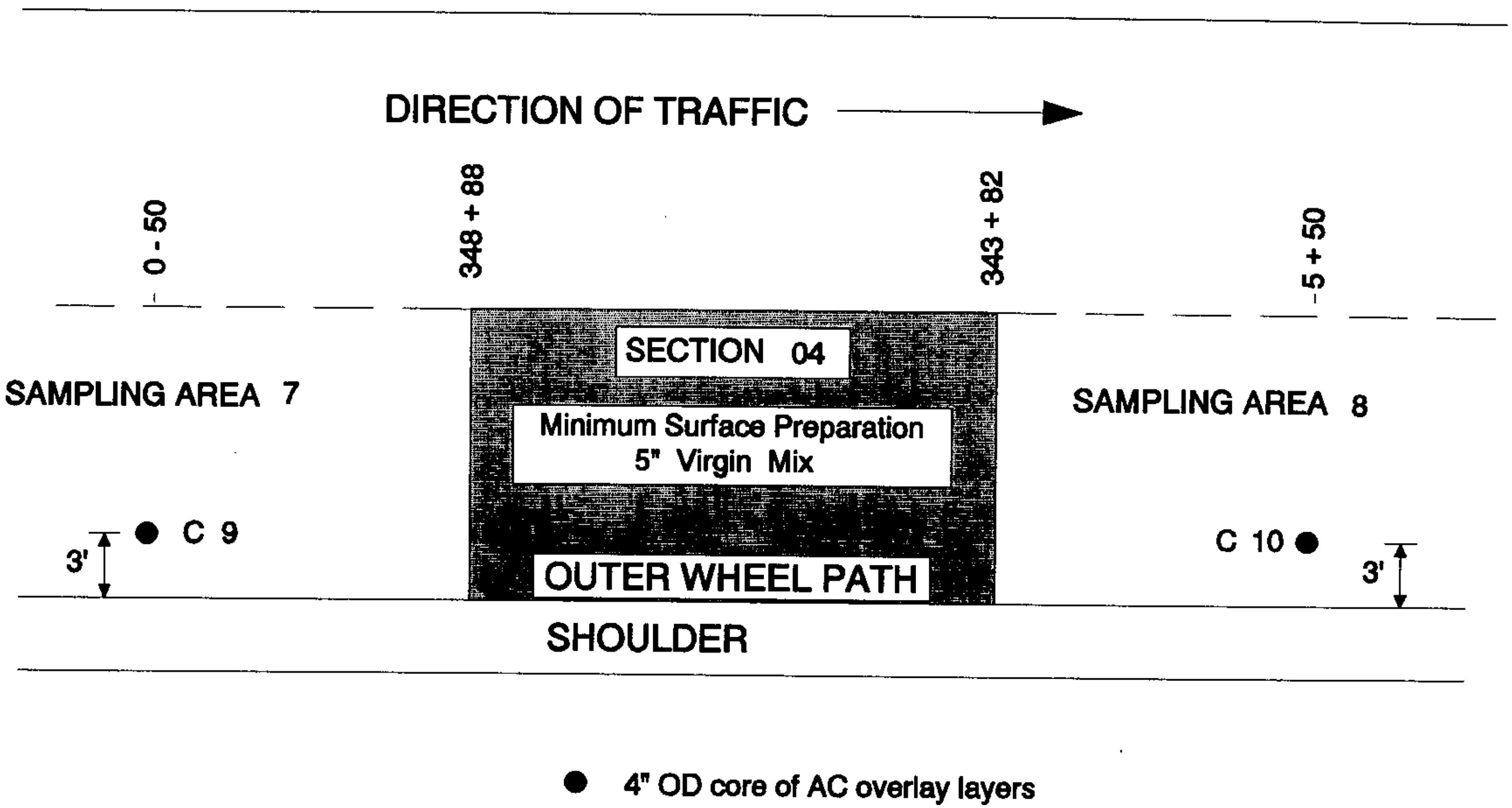
● 4" OD core of AC overlay layers

○ 4" OD core of AC pavement surface and treated layers

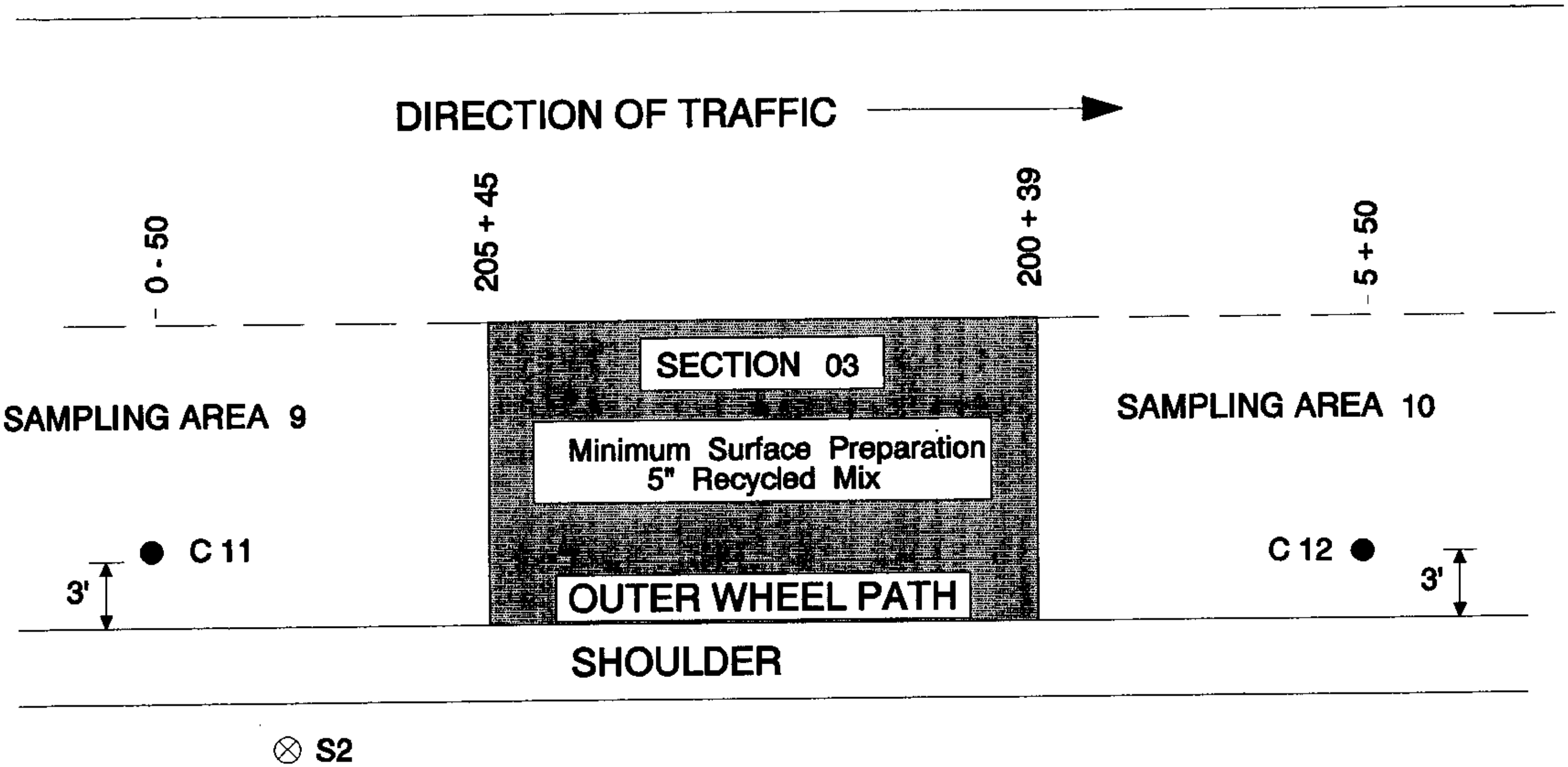
◯ 6" OD of AC pavement surface and treated layers ; augering of unbound granular base and subbase; thin-walled tube and/or splitspoon sampling as directed by SHRP Representative to 4' below top of subgrade.

⊘ 12" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase and untreated subgrade to 12" below top of subgrade for bulk sample retrieval.

"Pre - Construction" Sampling Plan for Section 07



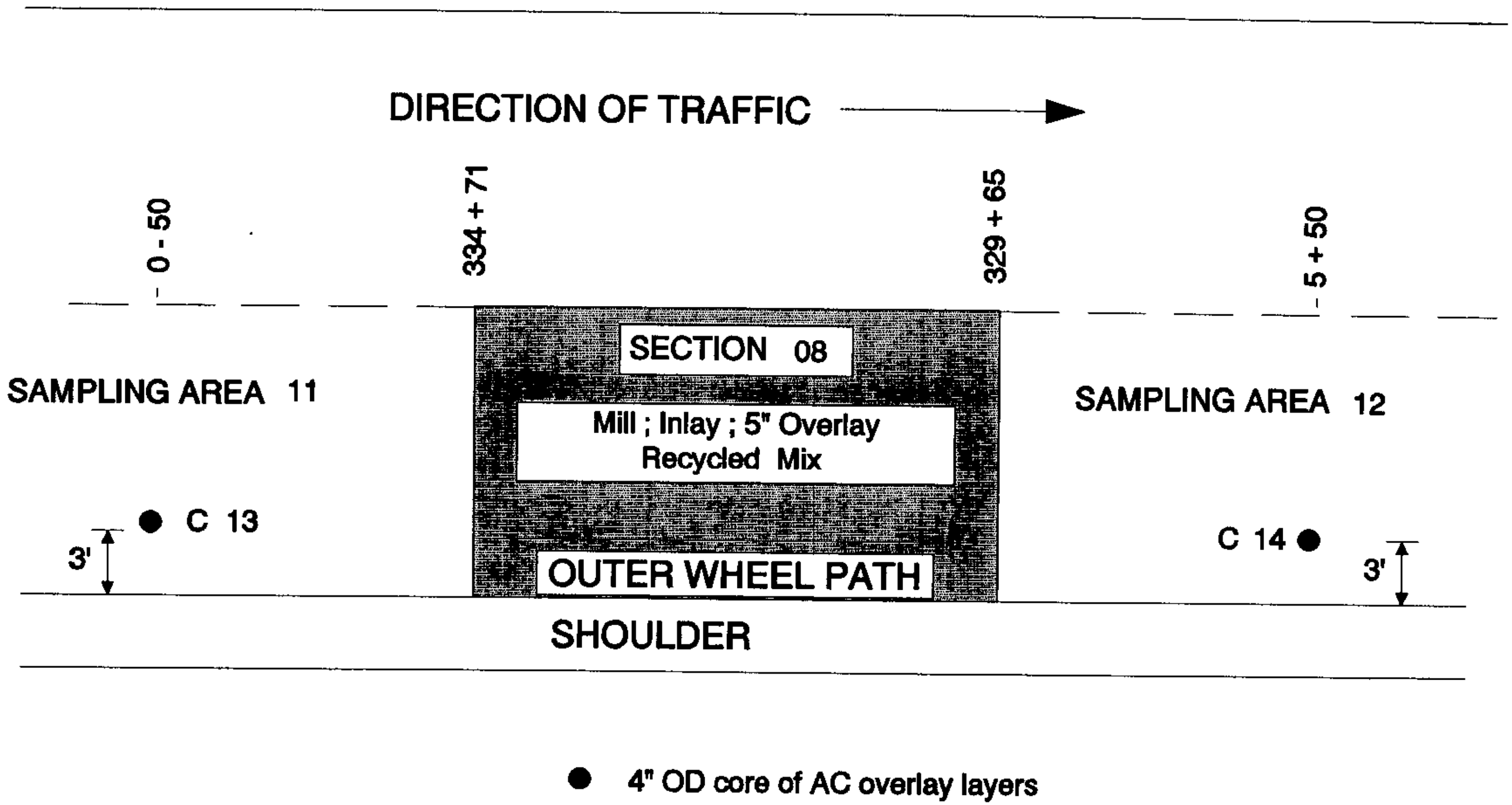
" Pre - Construction " Sampling Plan for Section 04



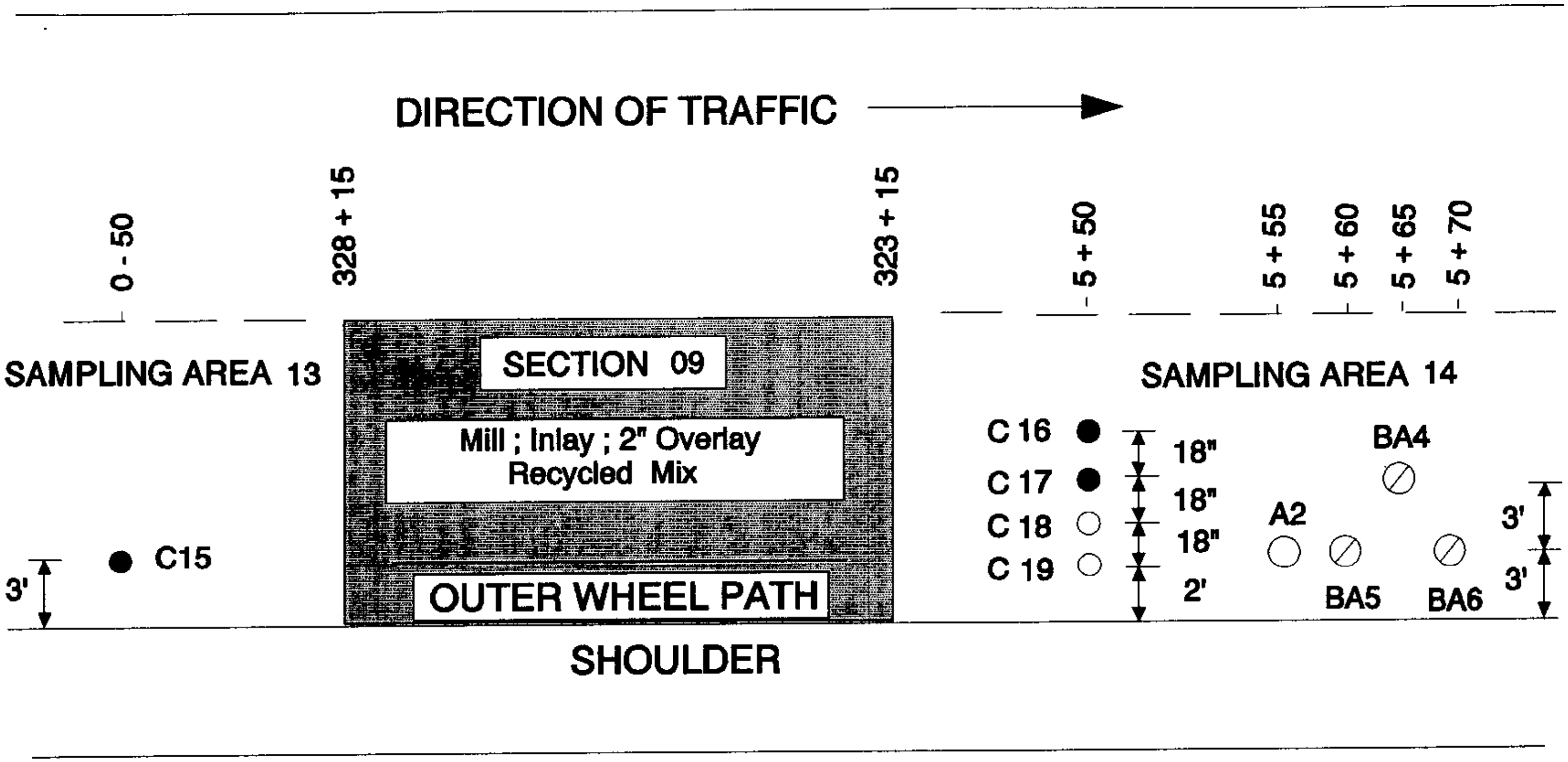
● 4" OD core of AC overlay layers

⊗ Auger Probe - as directed by SHRP Representative

" Pre - Construction " Sampling Plan for Section 03



" Pre - Construction " Sampling Plan for Section 08



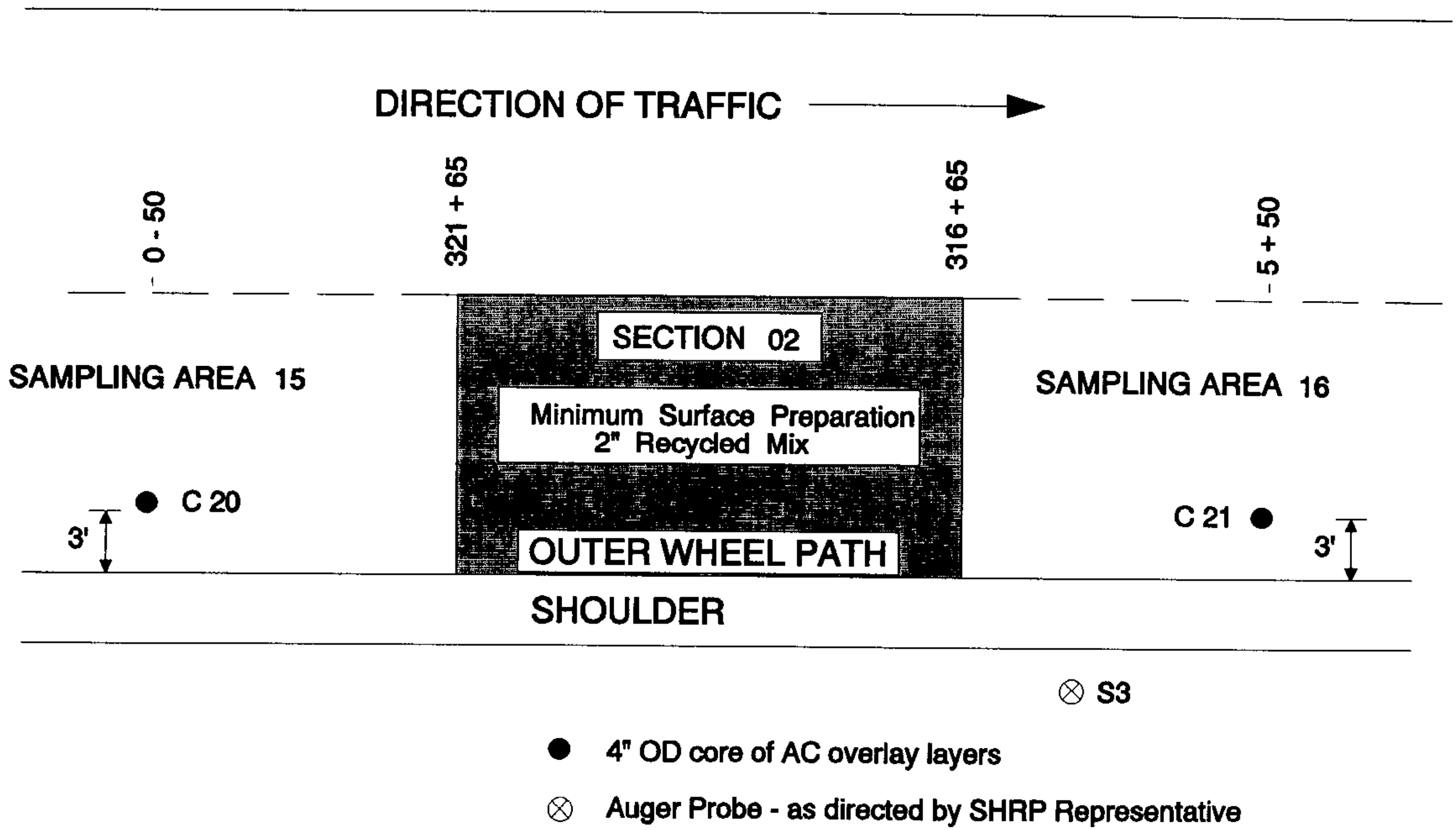
● 4" OD core of AC overlay layers

○ 4" OD core of AC pavement surface and treated layers

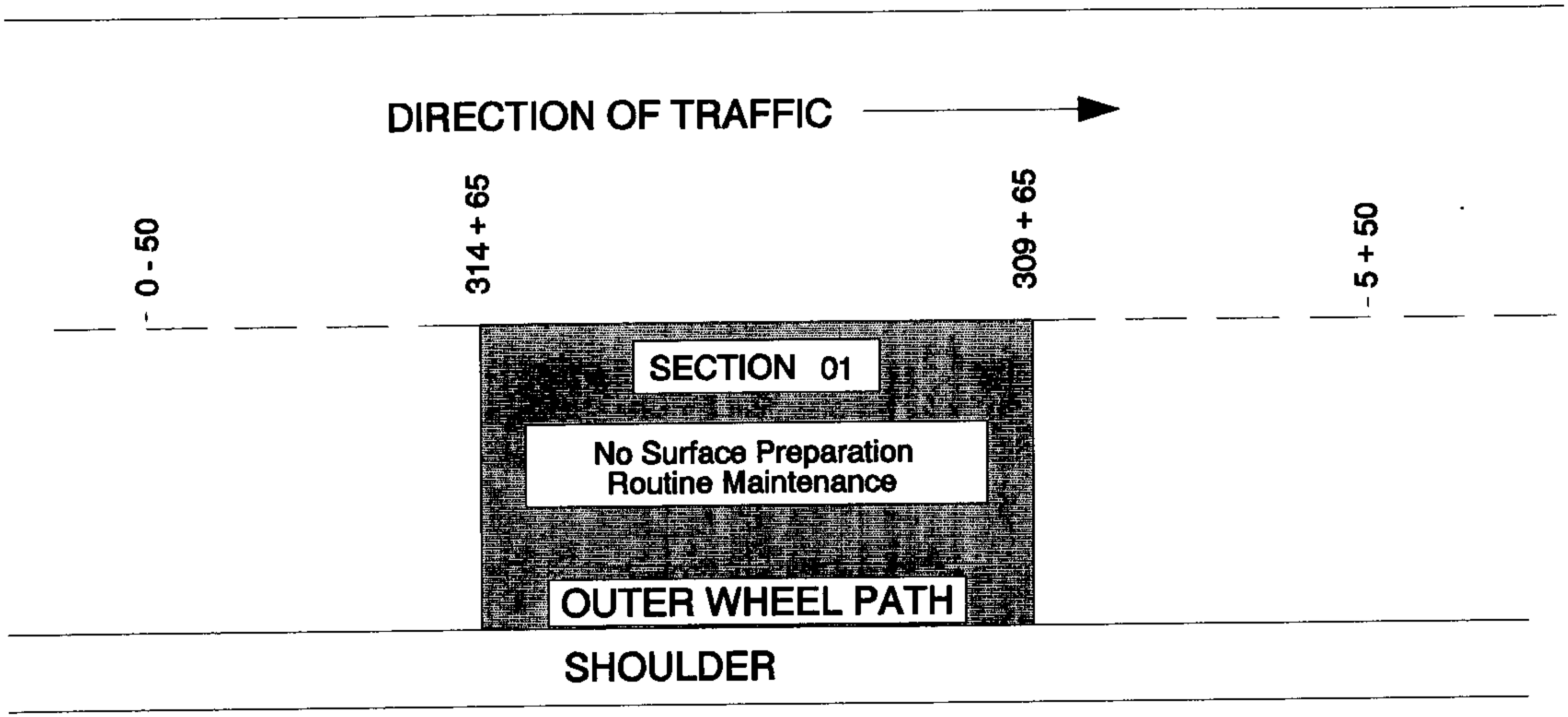
◯ 6" OD of AC pavement surface and treated layers ; augering of unbound granular base and subbase; thin-walled tube and/or splitspoon sampling as directed by SHRP Representative to 4' below top of subgrade.

⊘ 12" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase and untreated subgrade to 12" below top of subgrade for bulk sample retrieval.

"Pre - Construction" Sampling Plan for Section 09



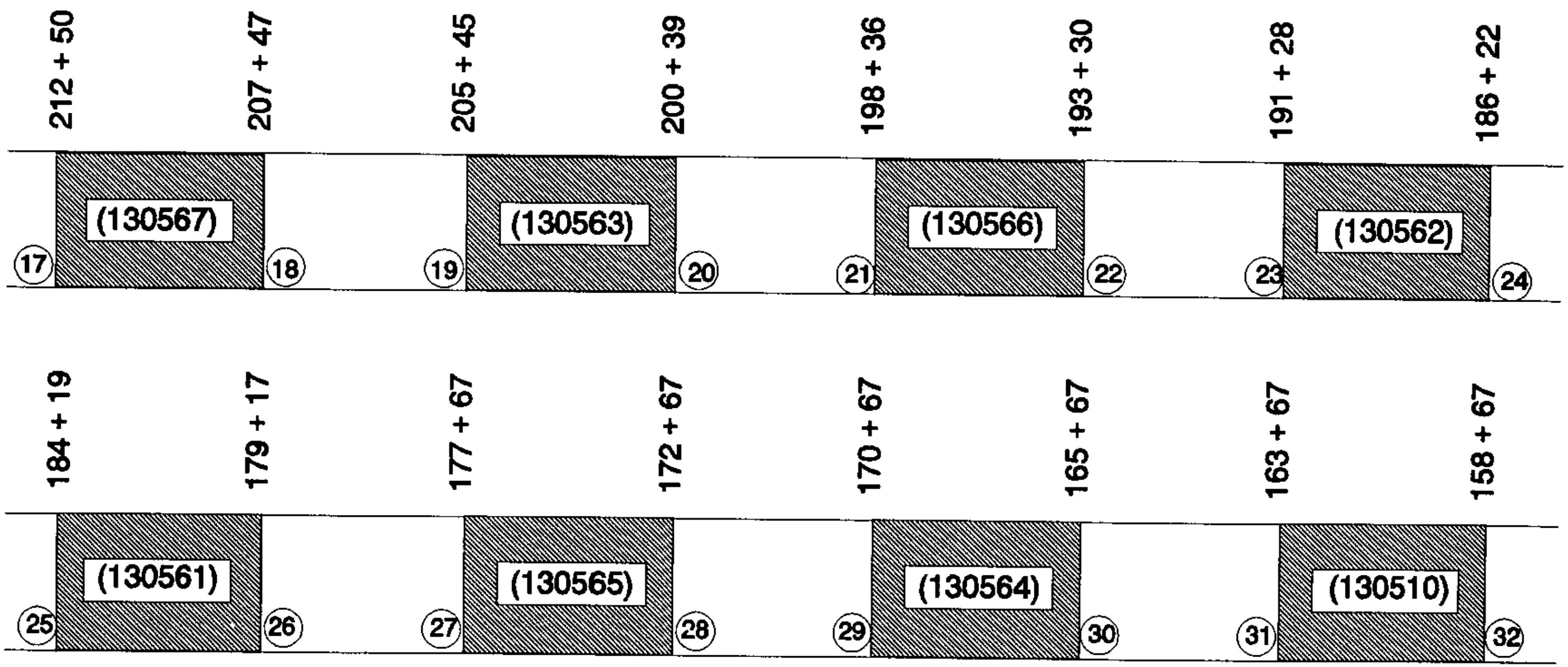
" Pre - Construction " Sampling Plan for Section 02



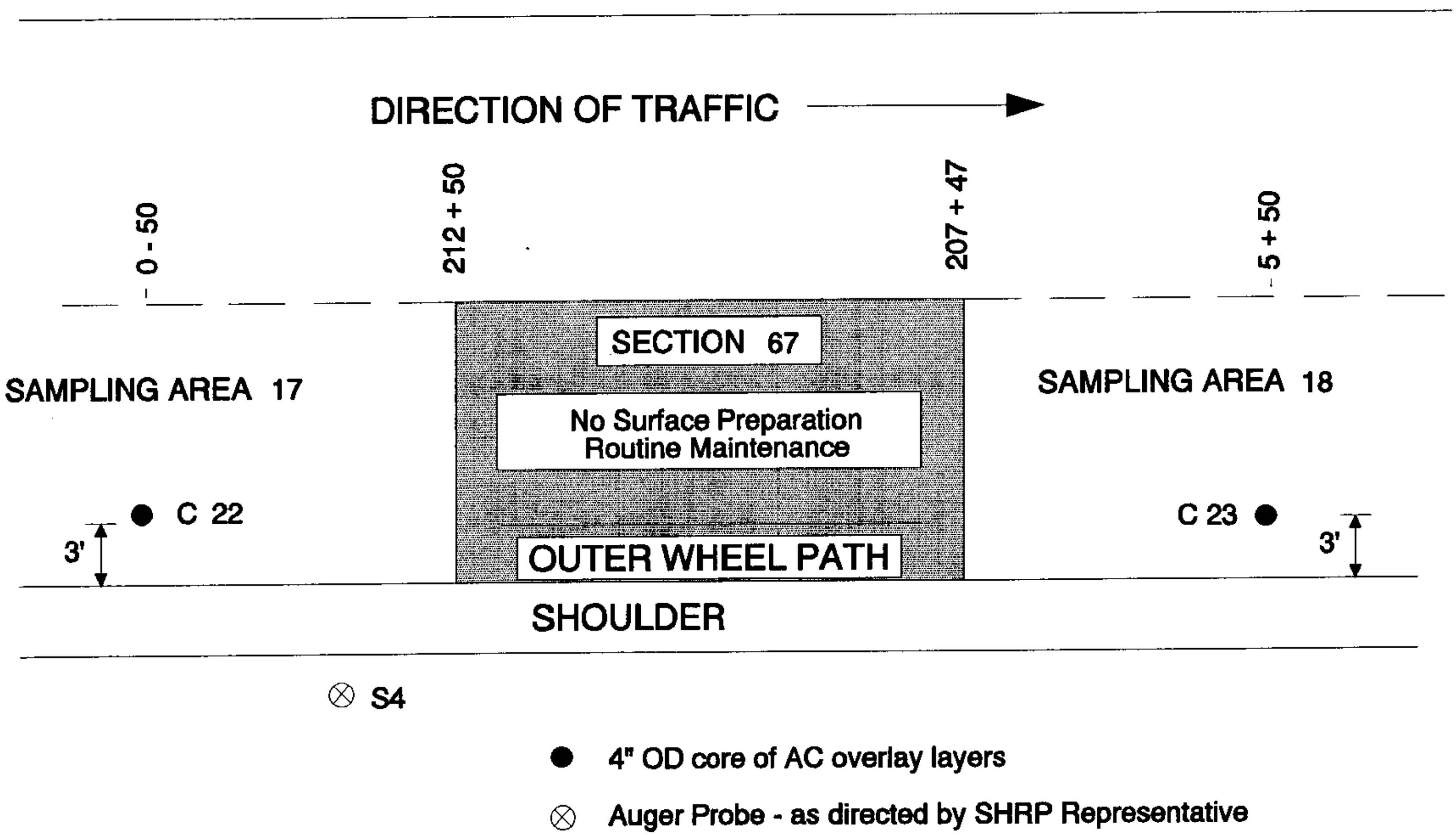
● 4" OD core of AC overlay layers

" Pre - Construction " Sampling Plan for Section 01

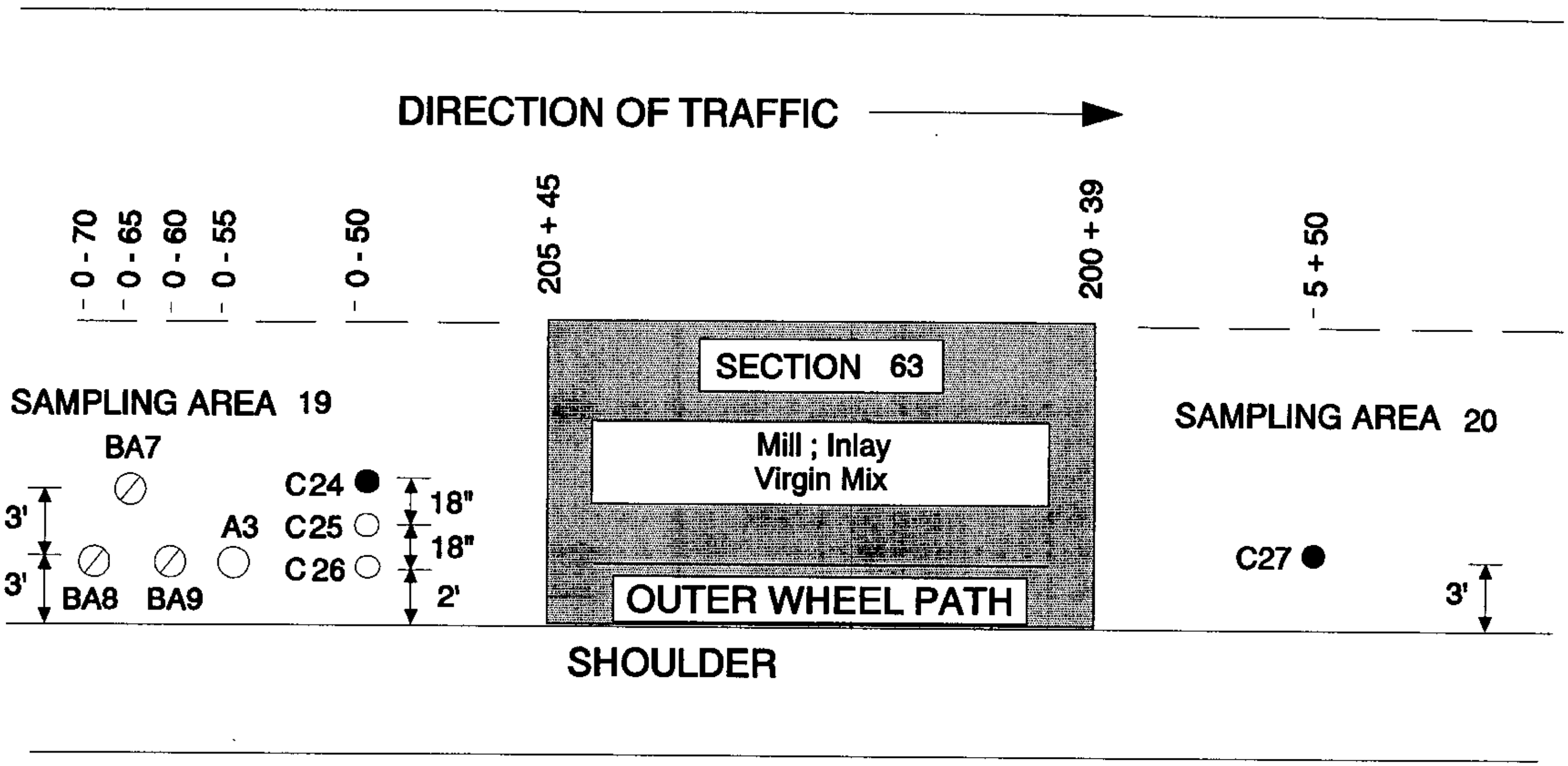
SPS - 5; Bartow County, Ga.
Sampling Area Layout
"Pre Construction"
Group 2



○ "Pre Construction" Sampling Area



" Pre - Construction " Sampling Plan for Section 67



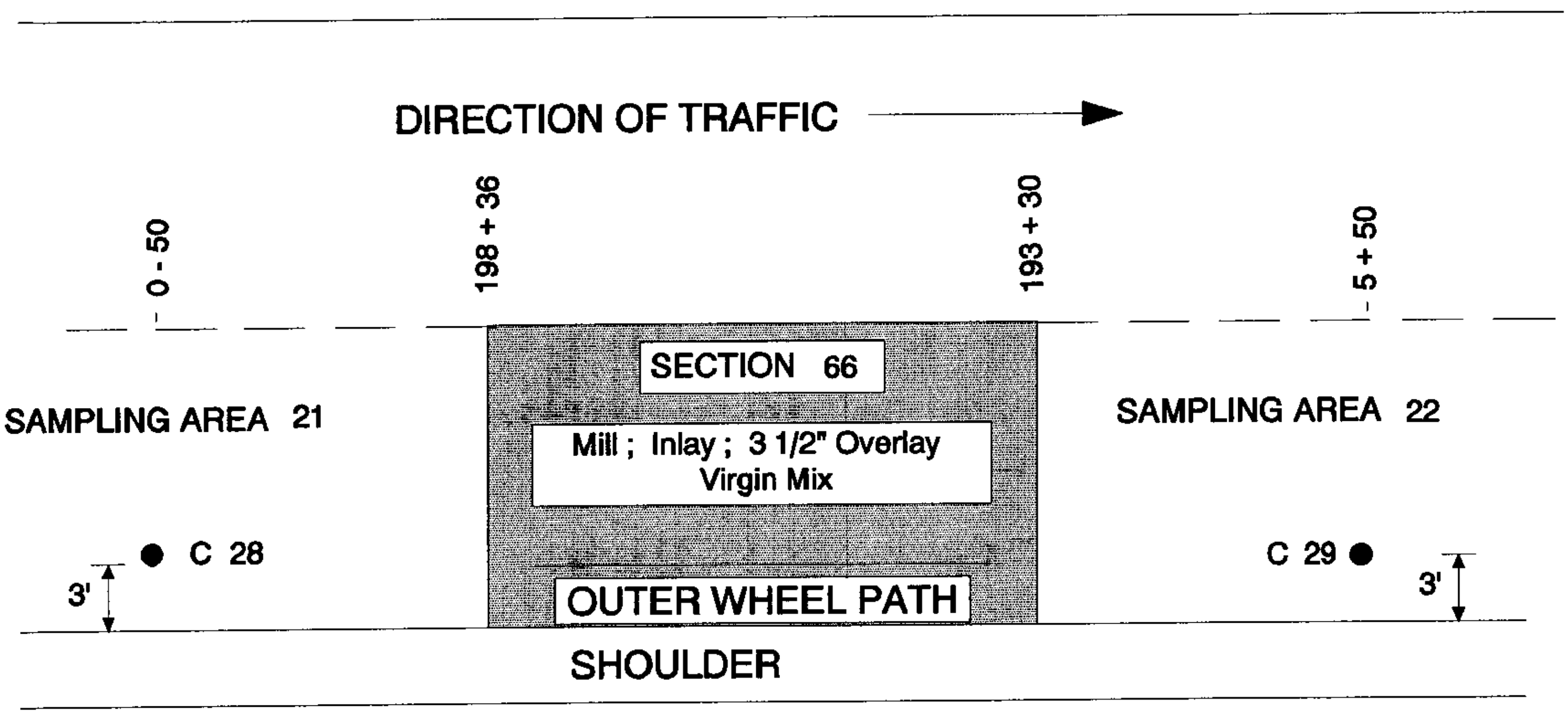
● 4" OD core of AC overlay layers

○ 4" OD core of AC pavement surface and treated layers

◯ 6" OD of AC pavement surface and treated layers ; augering of unbound granular base and subbase; thin-walled tube and/or splitspoon sampling as directed by SHRP Representative to 4' below top of subgrade.

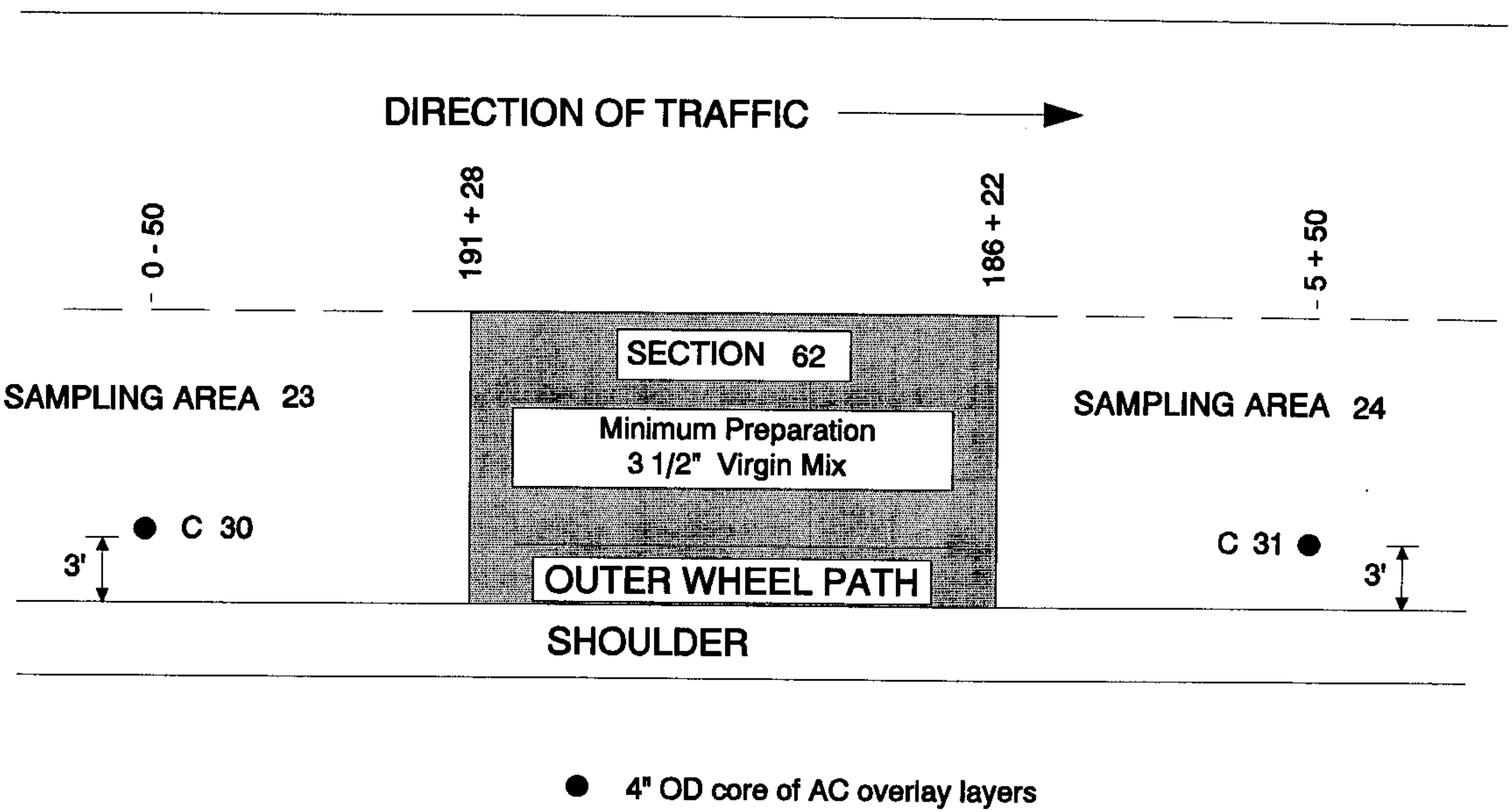
⊘ 12" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase and untreated subgrade to 12" below top of subgrade for bulk sample retrieval.

"Pre - Construction" Sampling Plan for Section 63

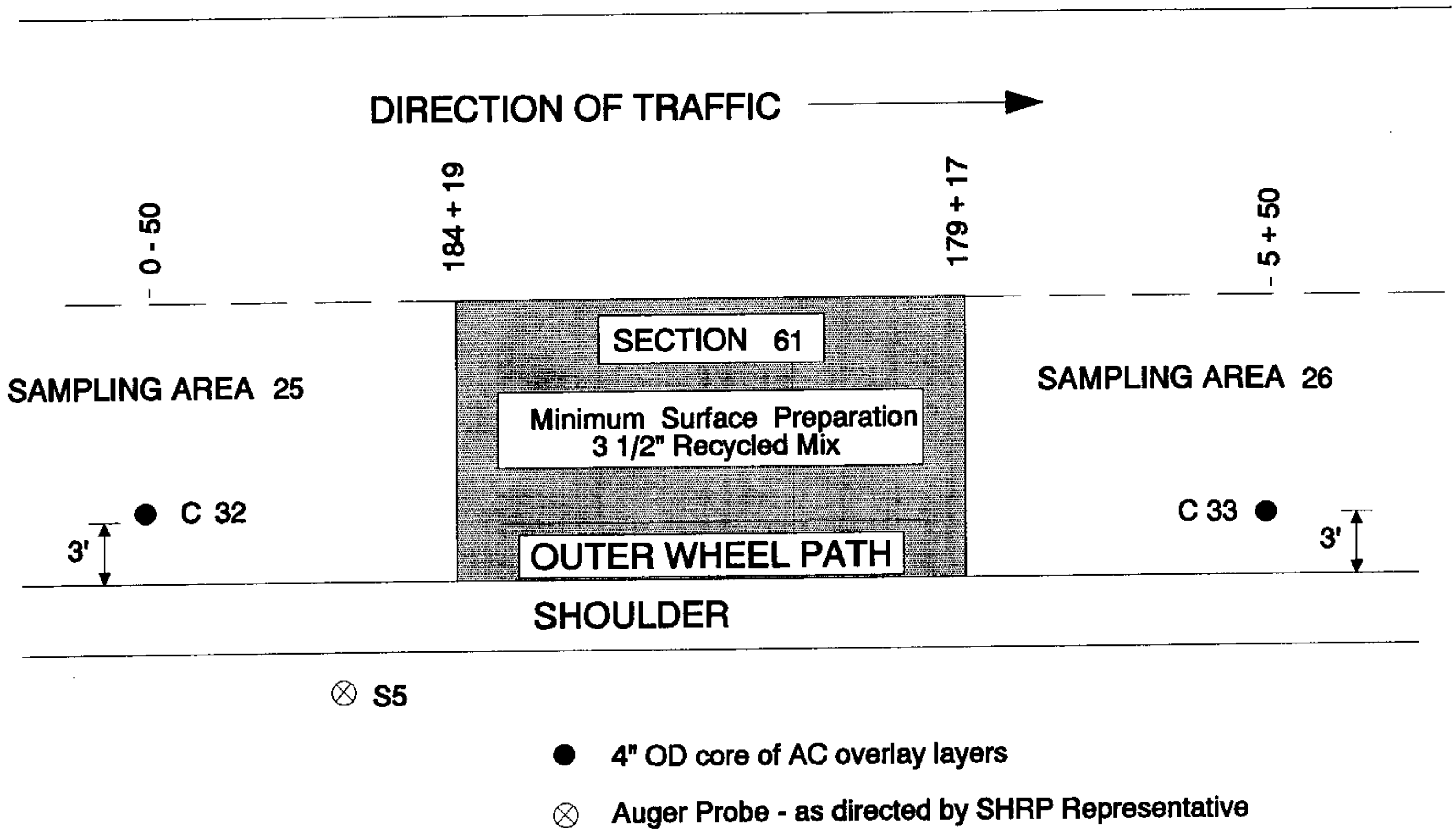


● 4" OD core of AC overlay layers

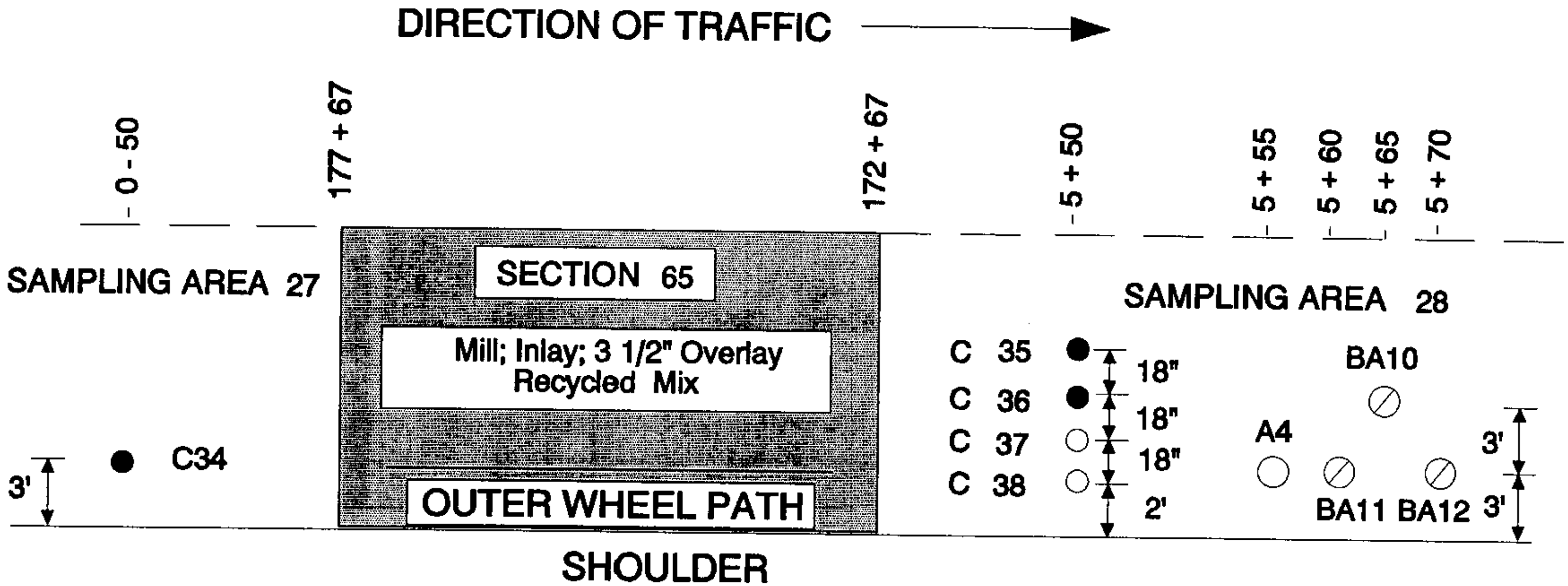
" Pre - Construction " Sampling Plan for Section 66



" Pre - Construction " Sampling Plan for Section 62



" Pre - Construction " Sampling Plan for Section 61



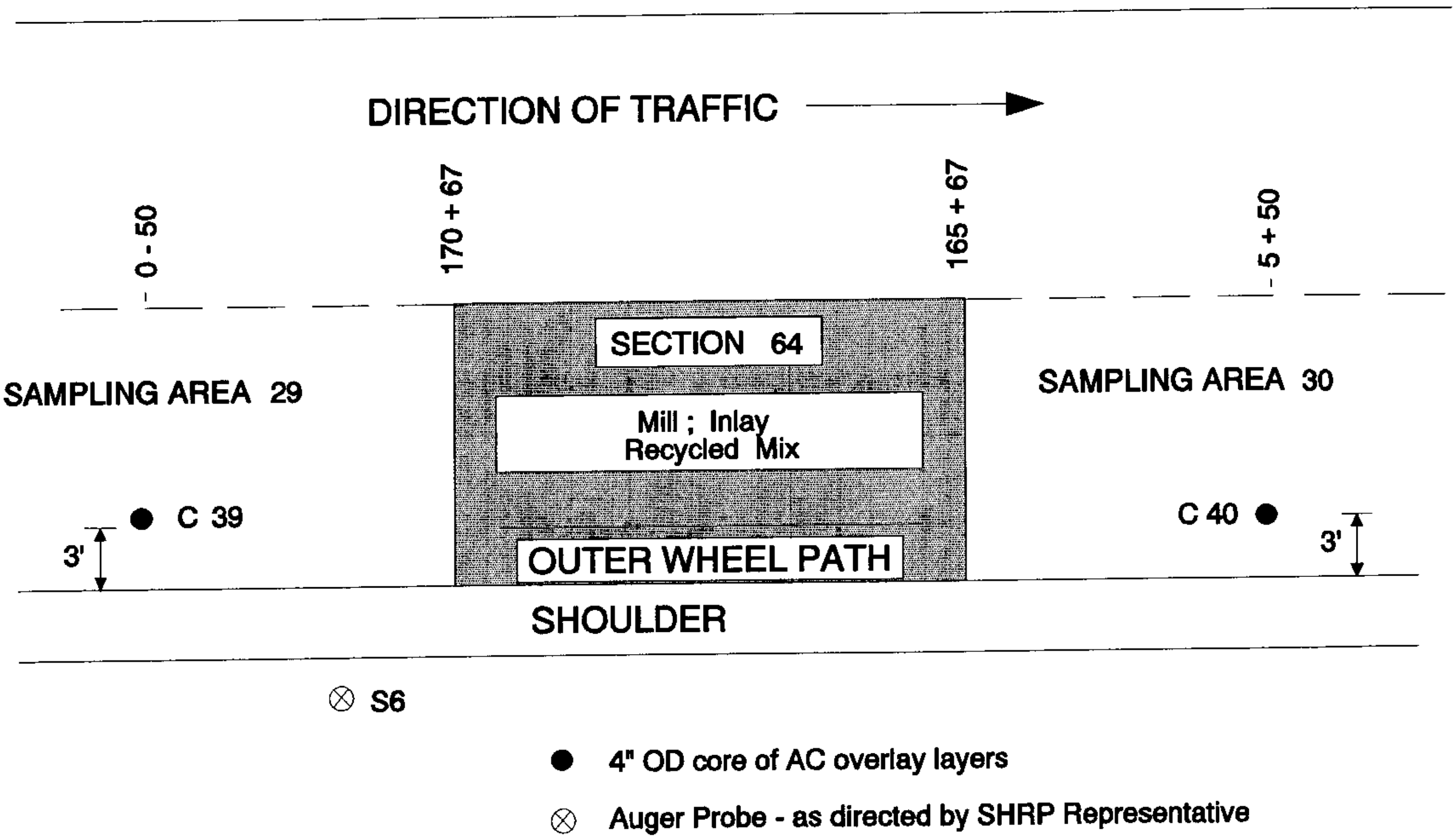
● 4" OD core of AC overlay layers

○ 4" OD core of AC pavement surface and treated layers

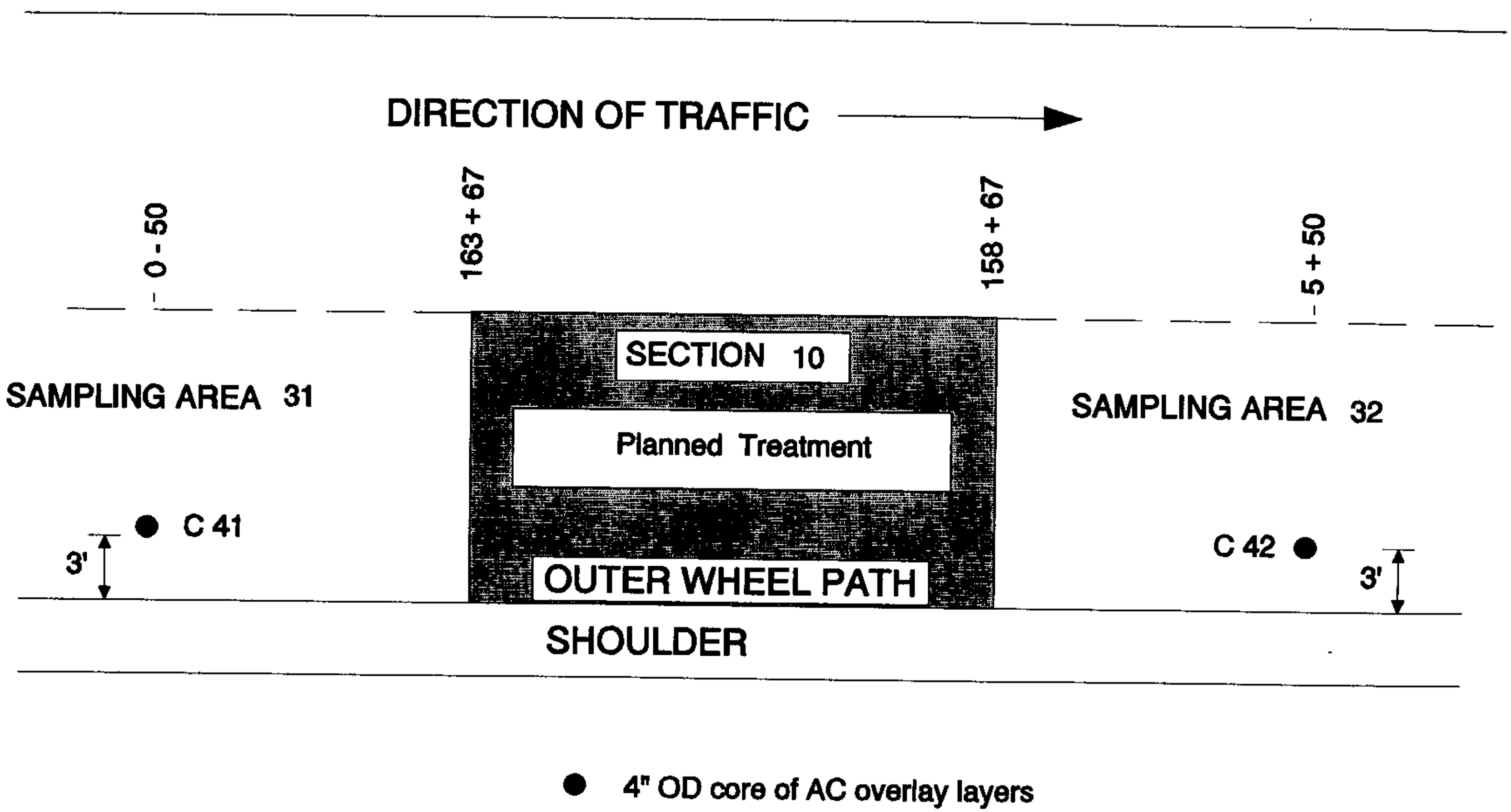
◯ 6" OD of AC pavement surface and treated layers ; augering of unbound granular base and subbase; thin-walled tube and/or splitspoon sampling as directed by SHRP Representative to 4' below top of subgrade.

⊘ 12" OD core of AC pavement surface and treated layers; augering of unbound granular base and subbase and untreated subgrade to 12" below top of subgrade for bulk sample retrieval.

"Pre - Construction" Sampling Plan for Section 65

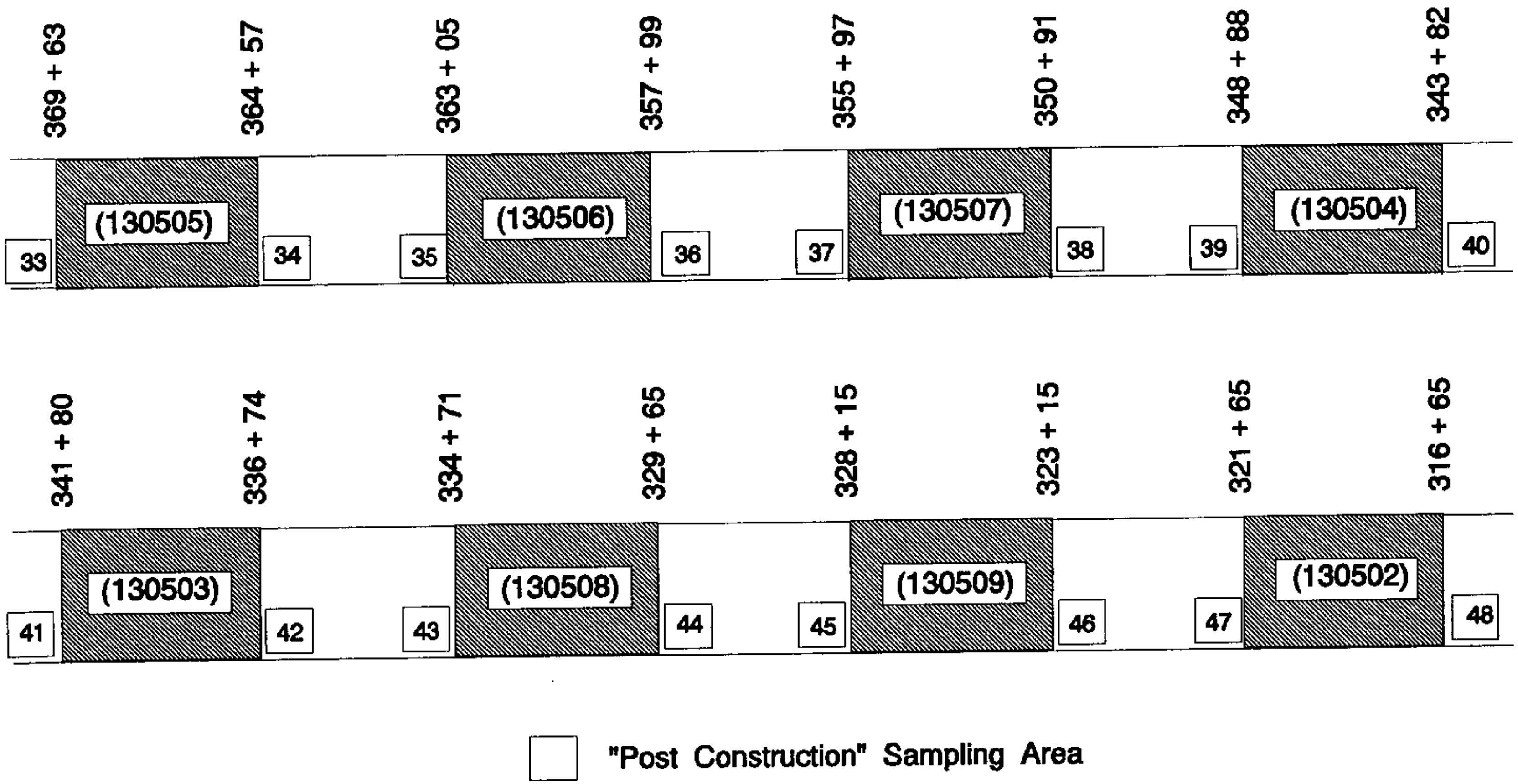


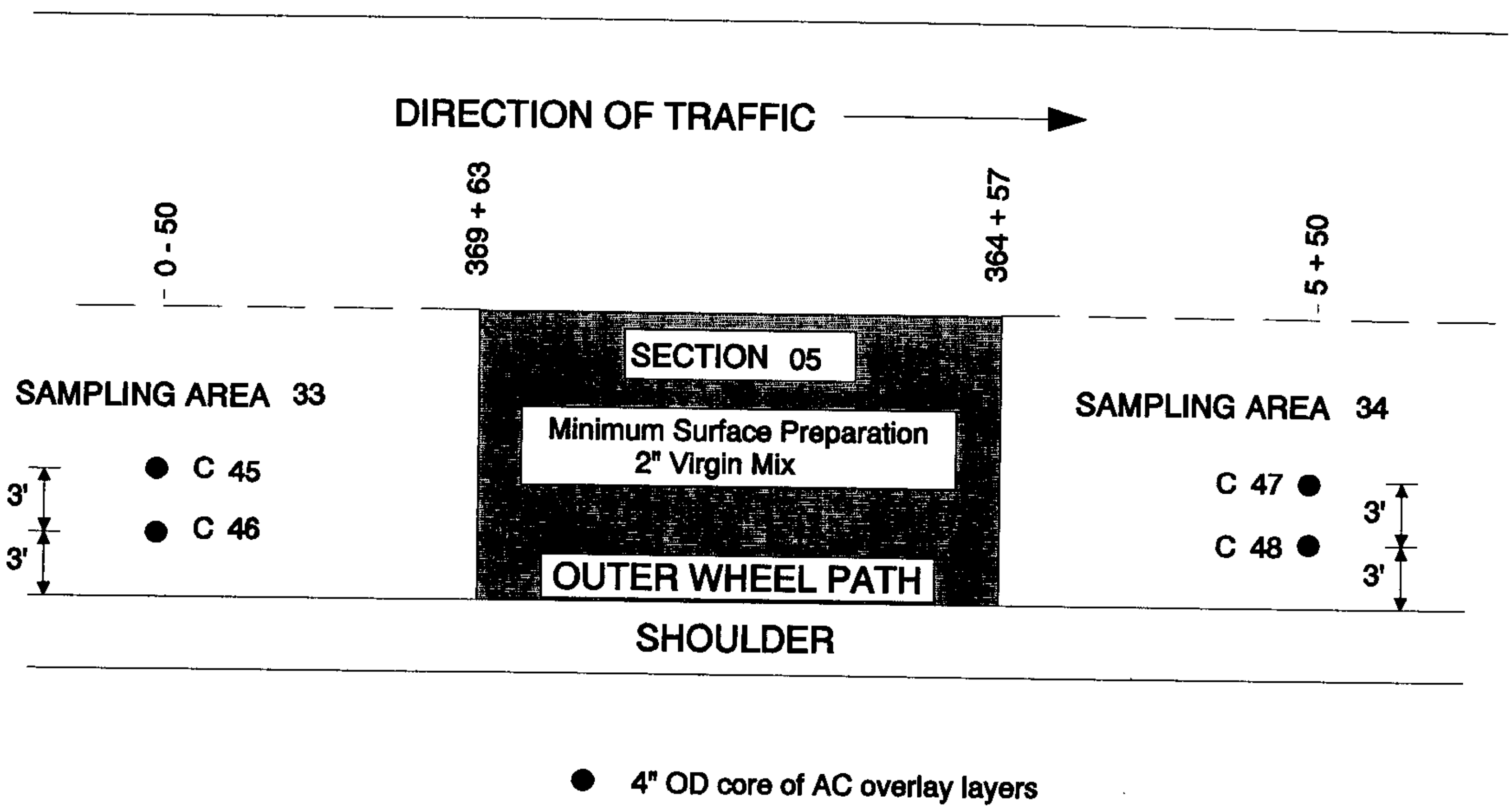
" Pre - Construction " Sampling Plan for Section 64



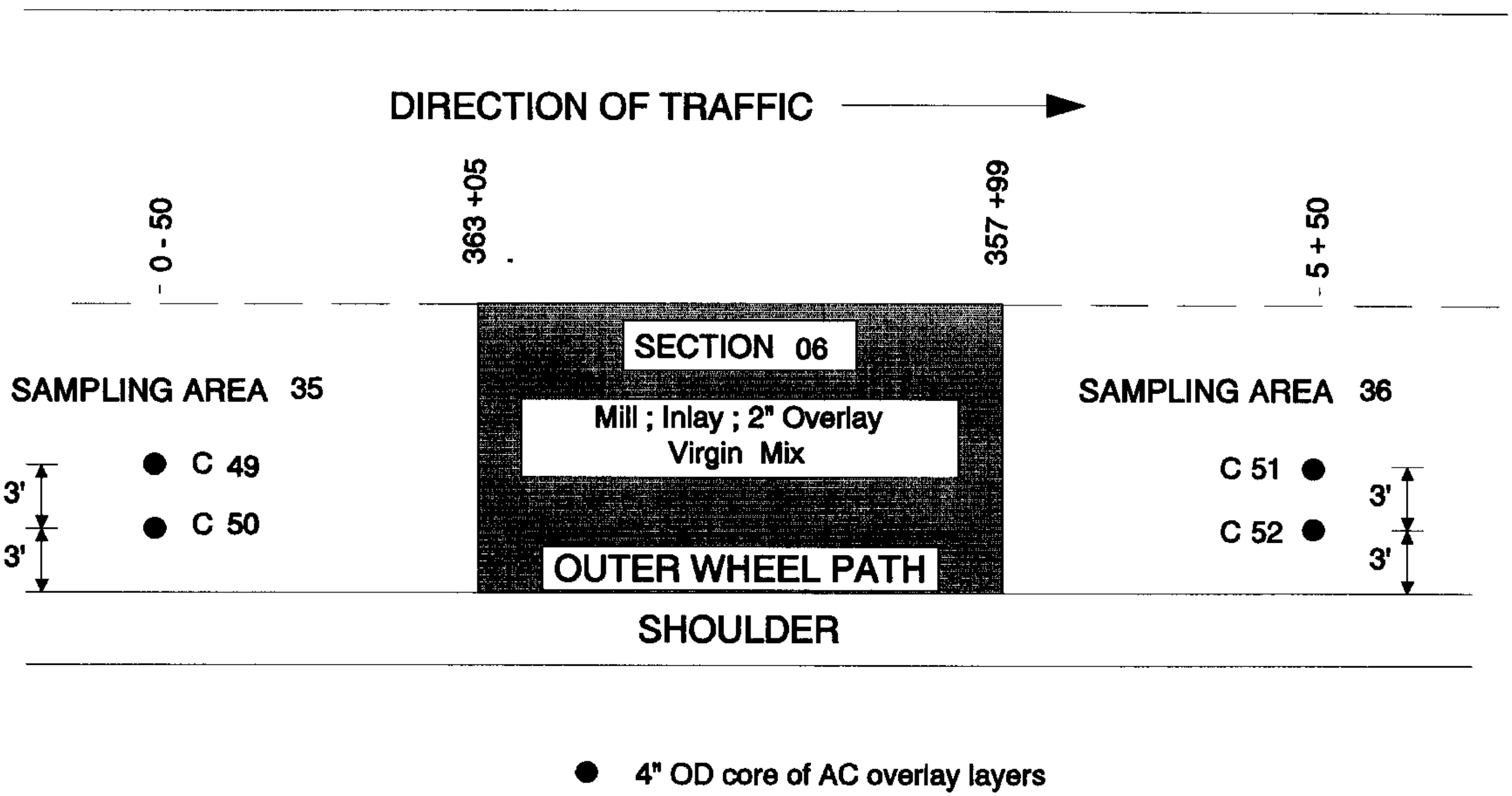
" Pre - Construction " Sampling Plan for Section 10

SPS - 5; Bartow County, Ga.
Sampling Area Layout
"Post Construction"
Group 1

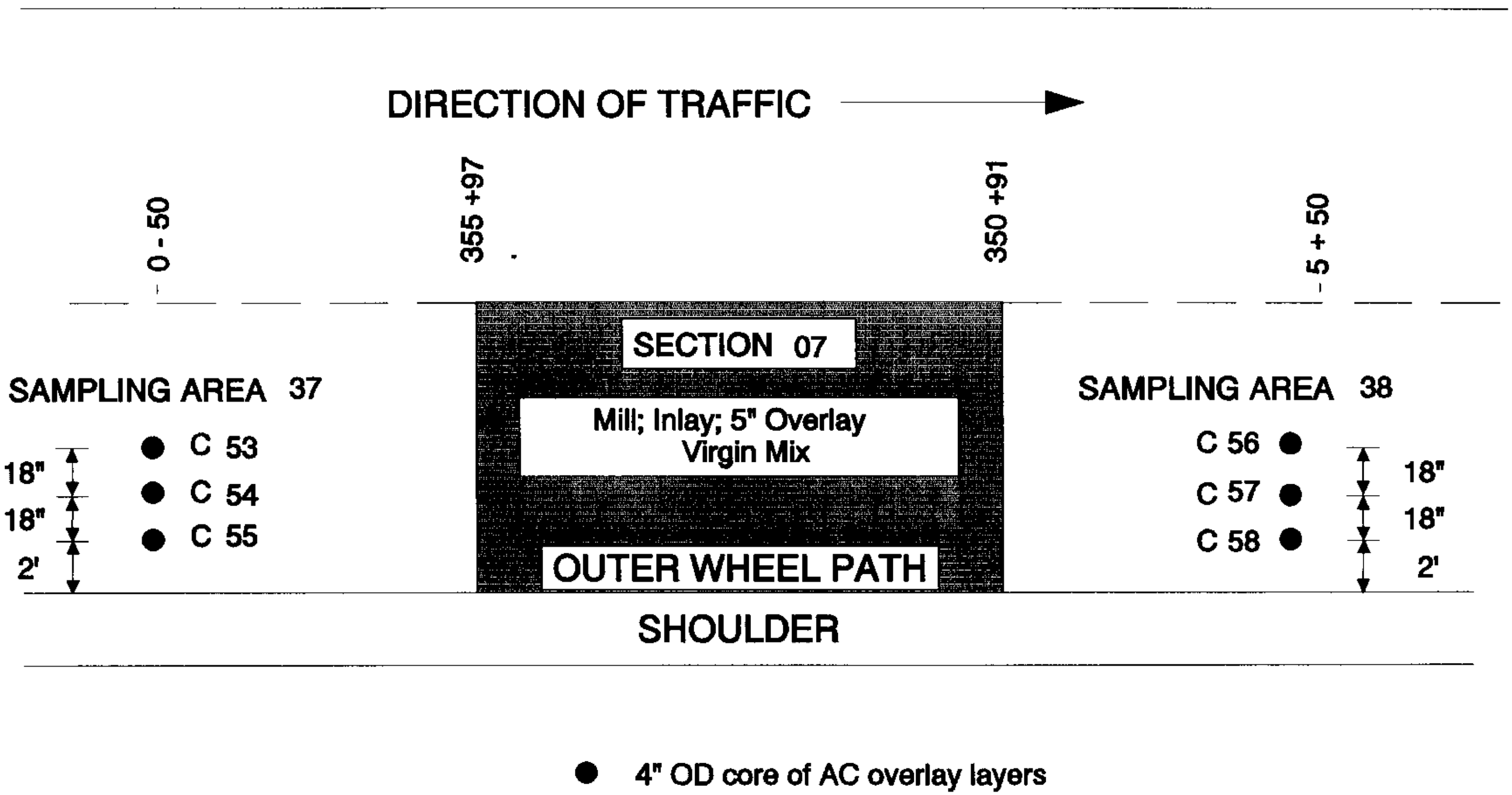




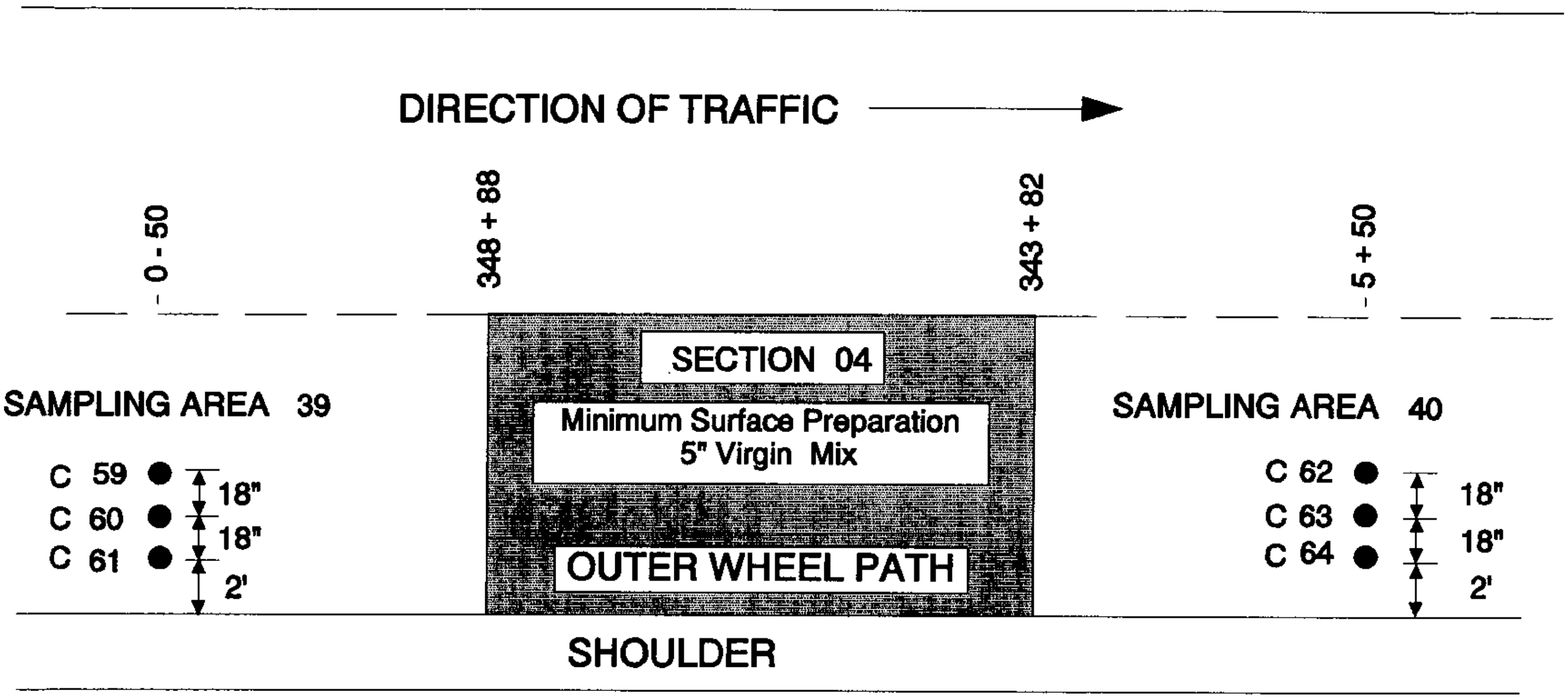
"Post - Construction" Sampling Plan for Section 05



"Post - Construction" Sampling Plan for Section 06

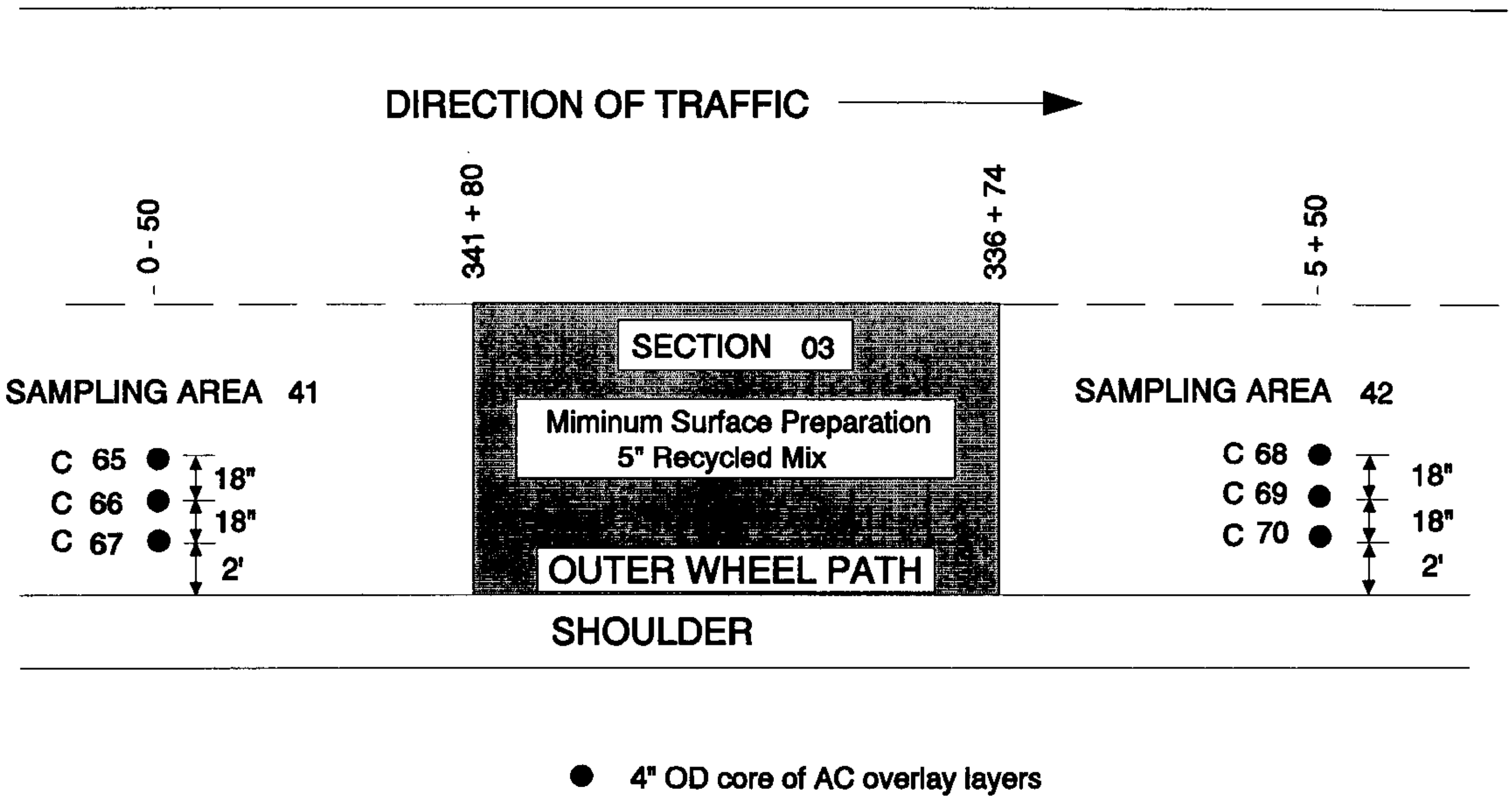


"Post - Construction" Sampling Plan for Section 07

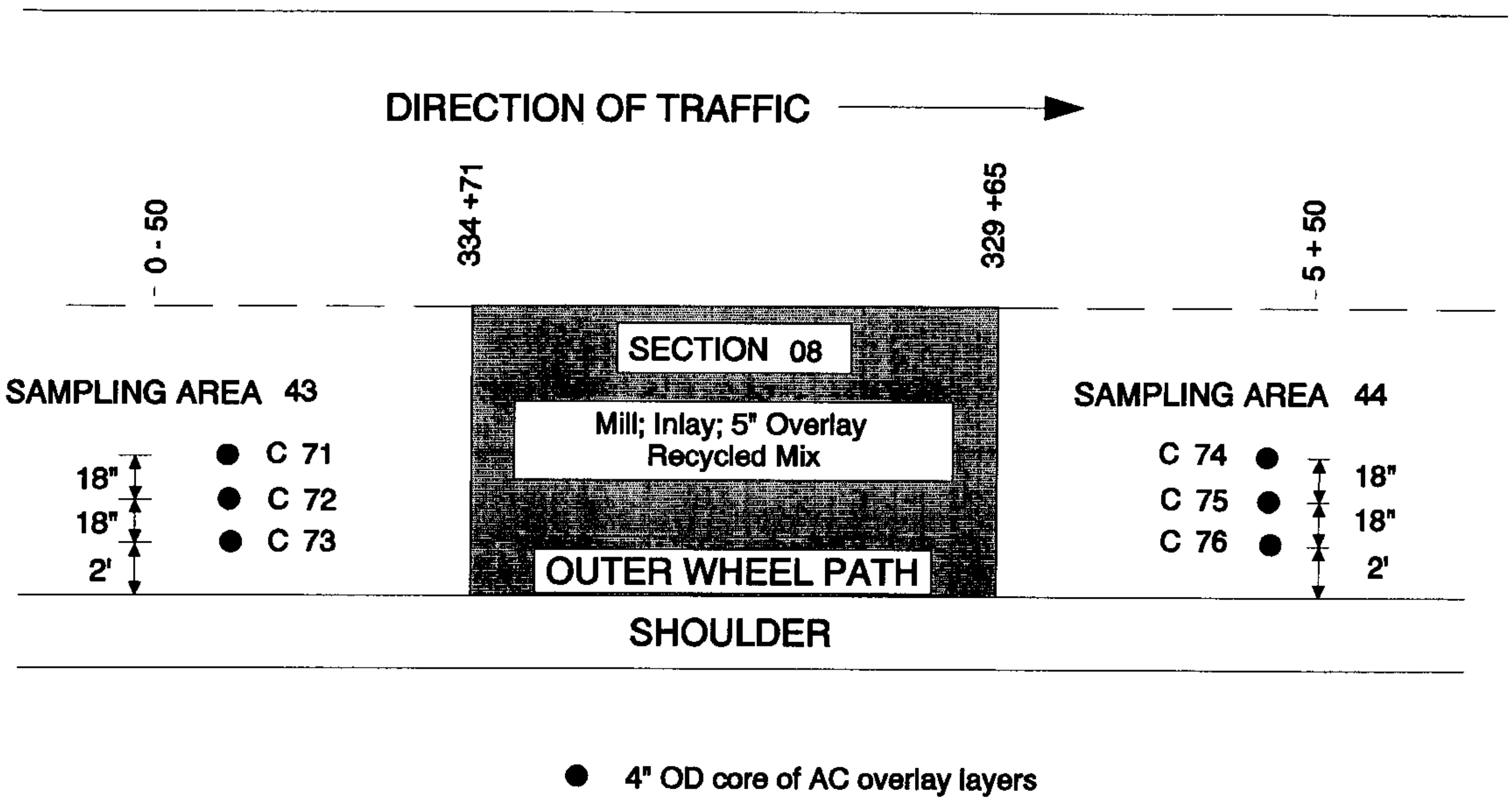


● 4" OD core of AC overlay layers

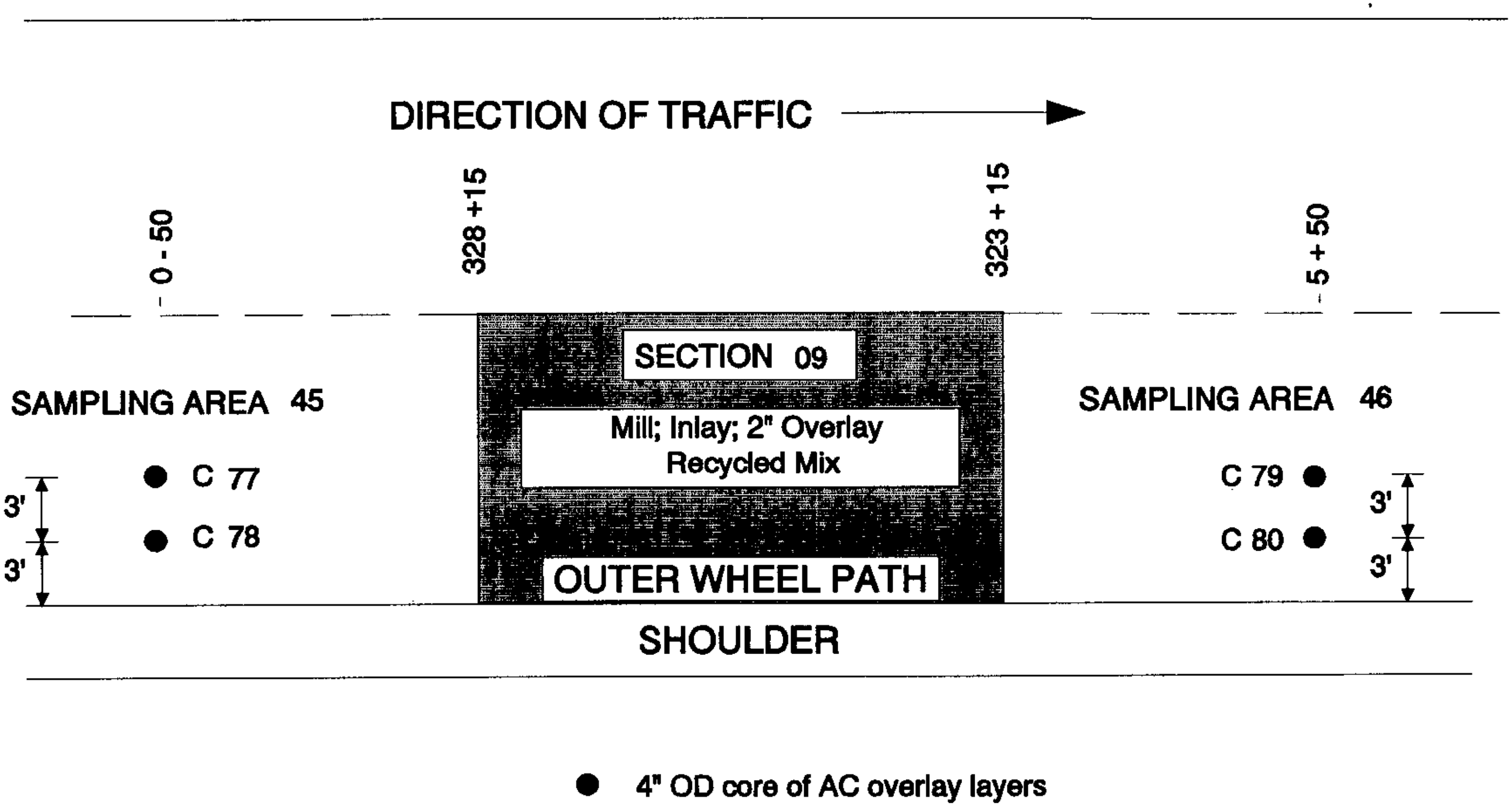
"Post - Construction" Sampling Plan for Section 04



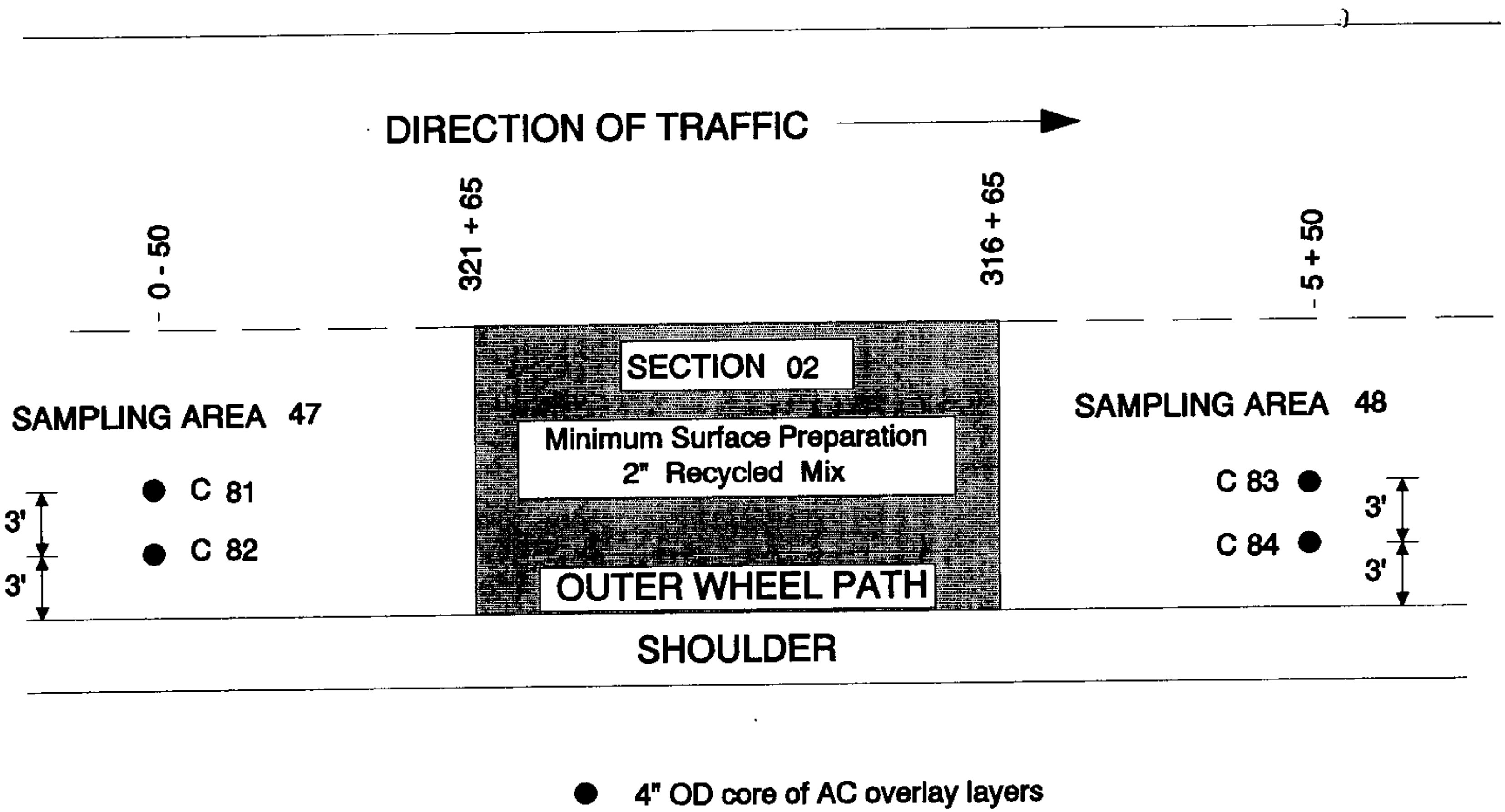
"Post - Construction" Sampling Plan for Section 03



"Post - Construction" Sampling Plan for Section 08

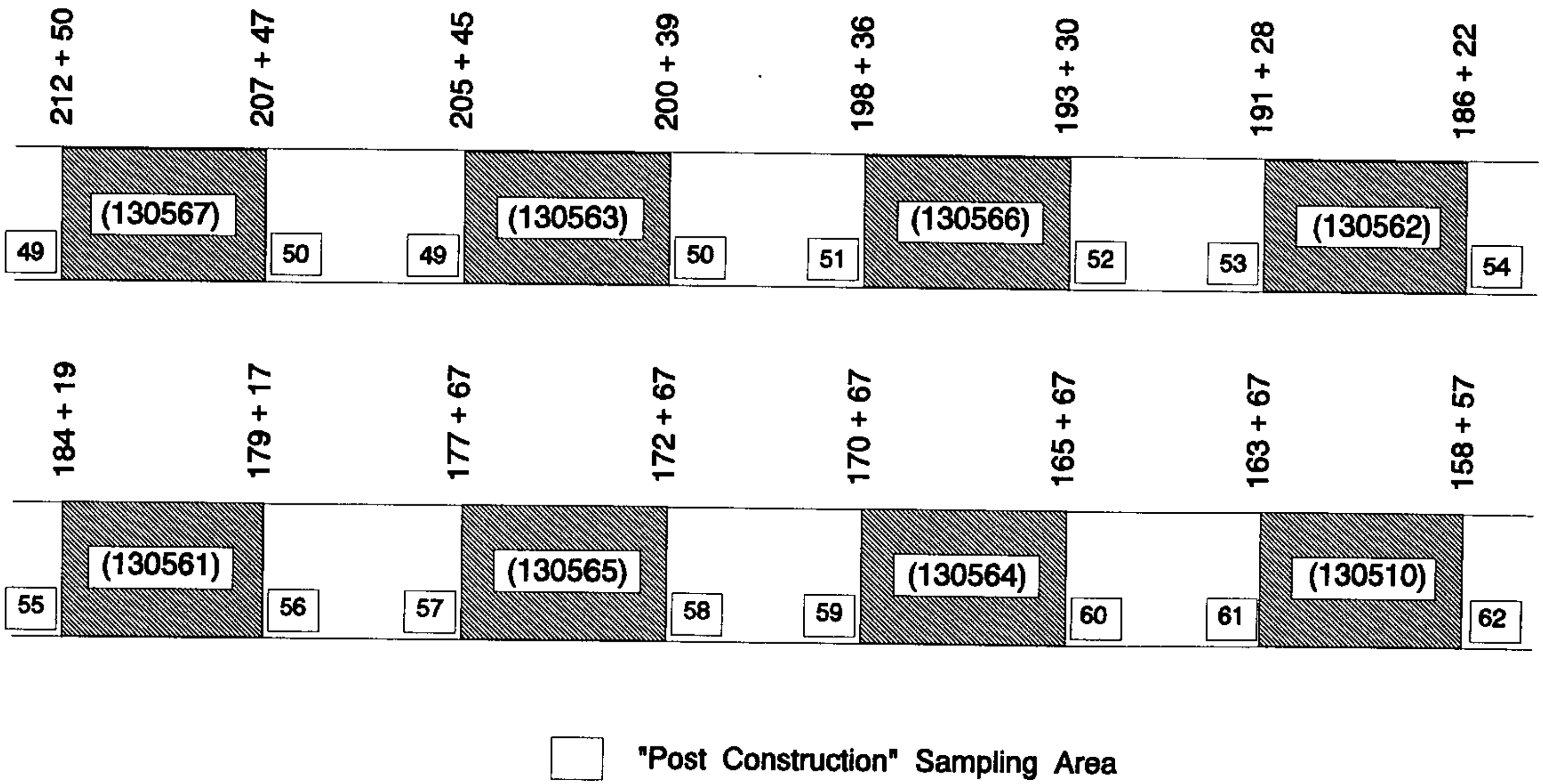


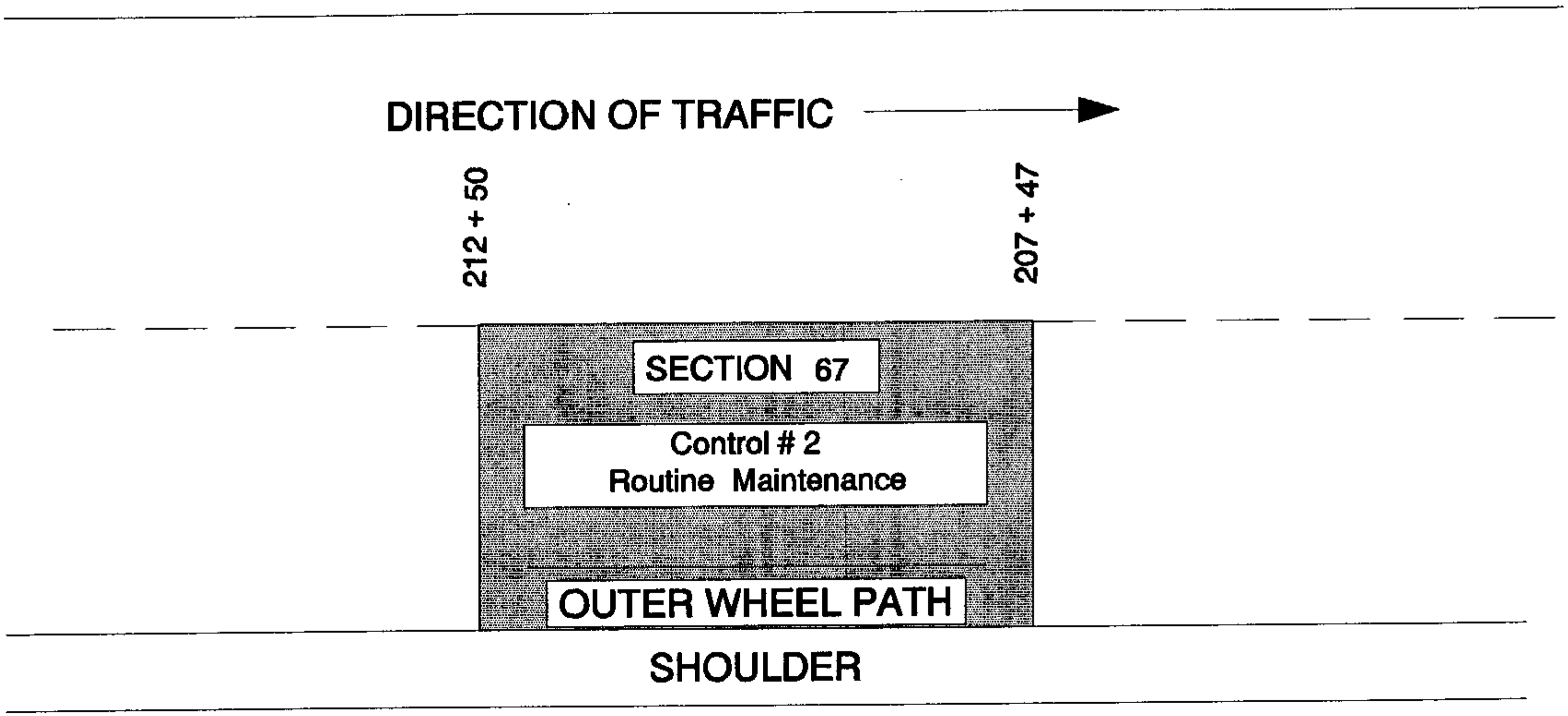
"Post - Construction" Sampling Plan for Section 09



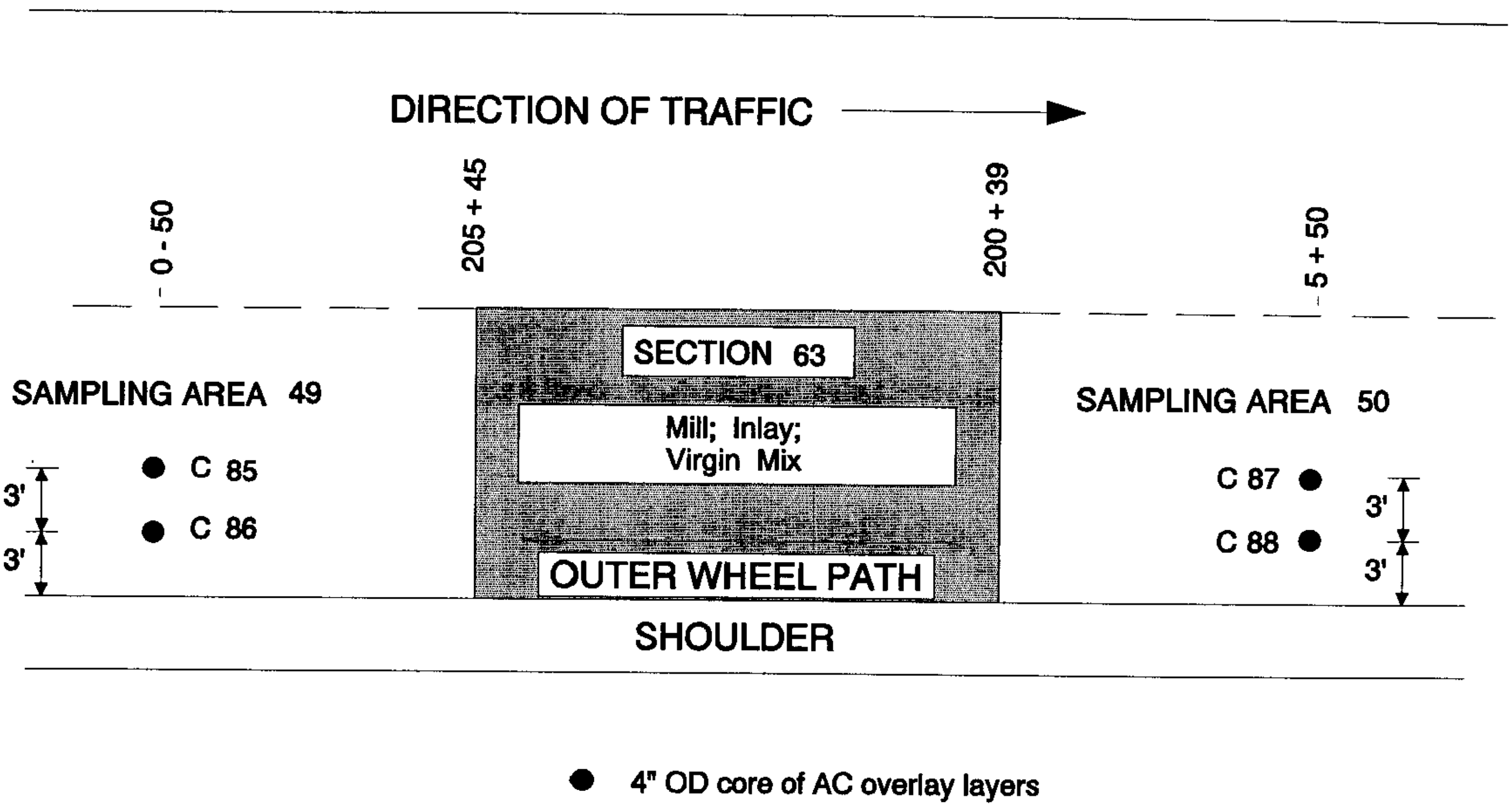
"Post - Construction" Sampling Plan for Section 02

SPS - 5; Bartow County, Ga.
Sampling Area Layout
"Post Construction"
Group 2

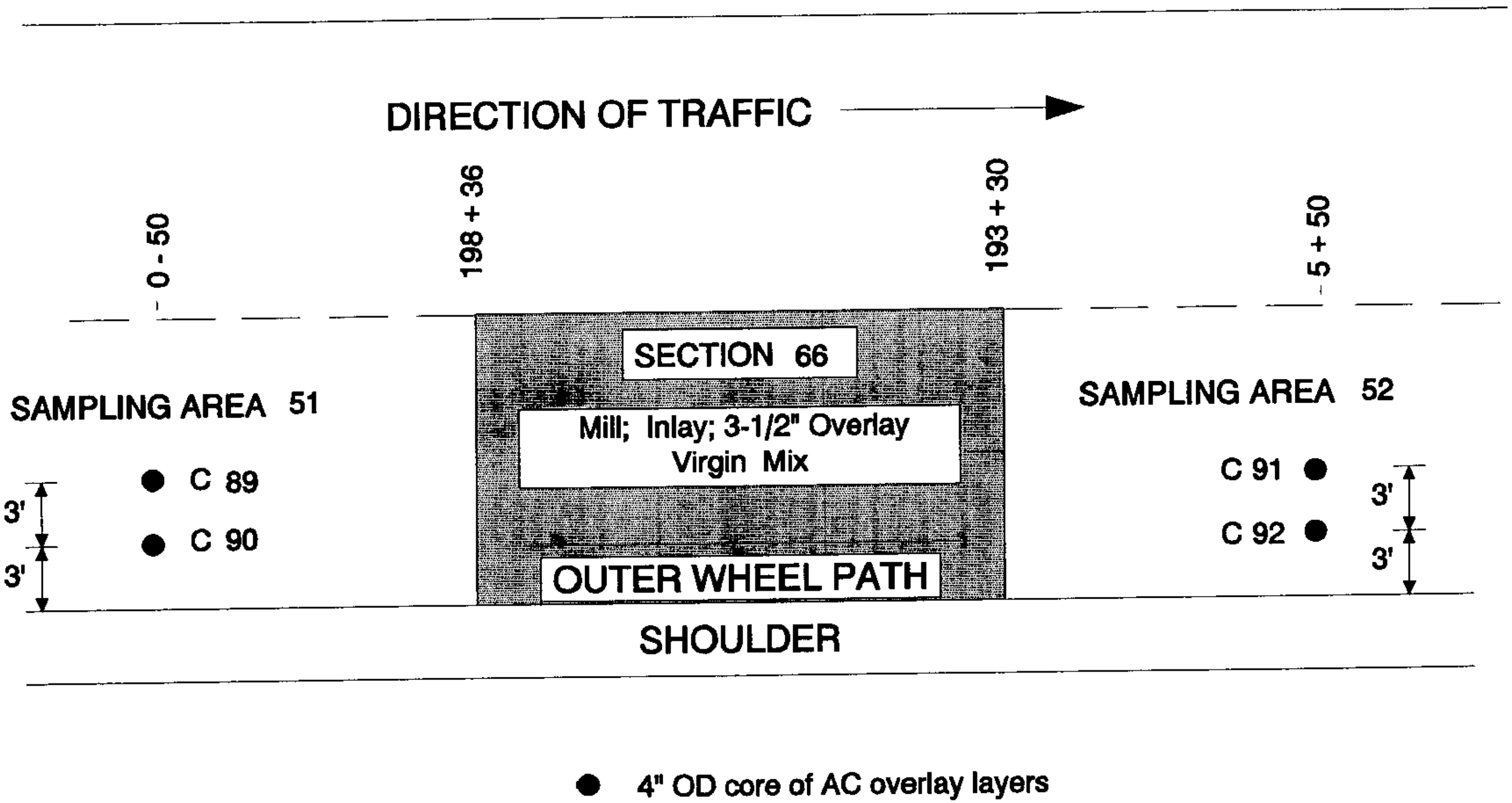




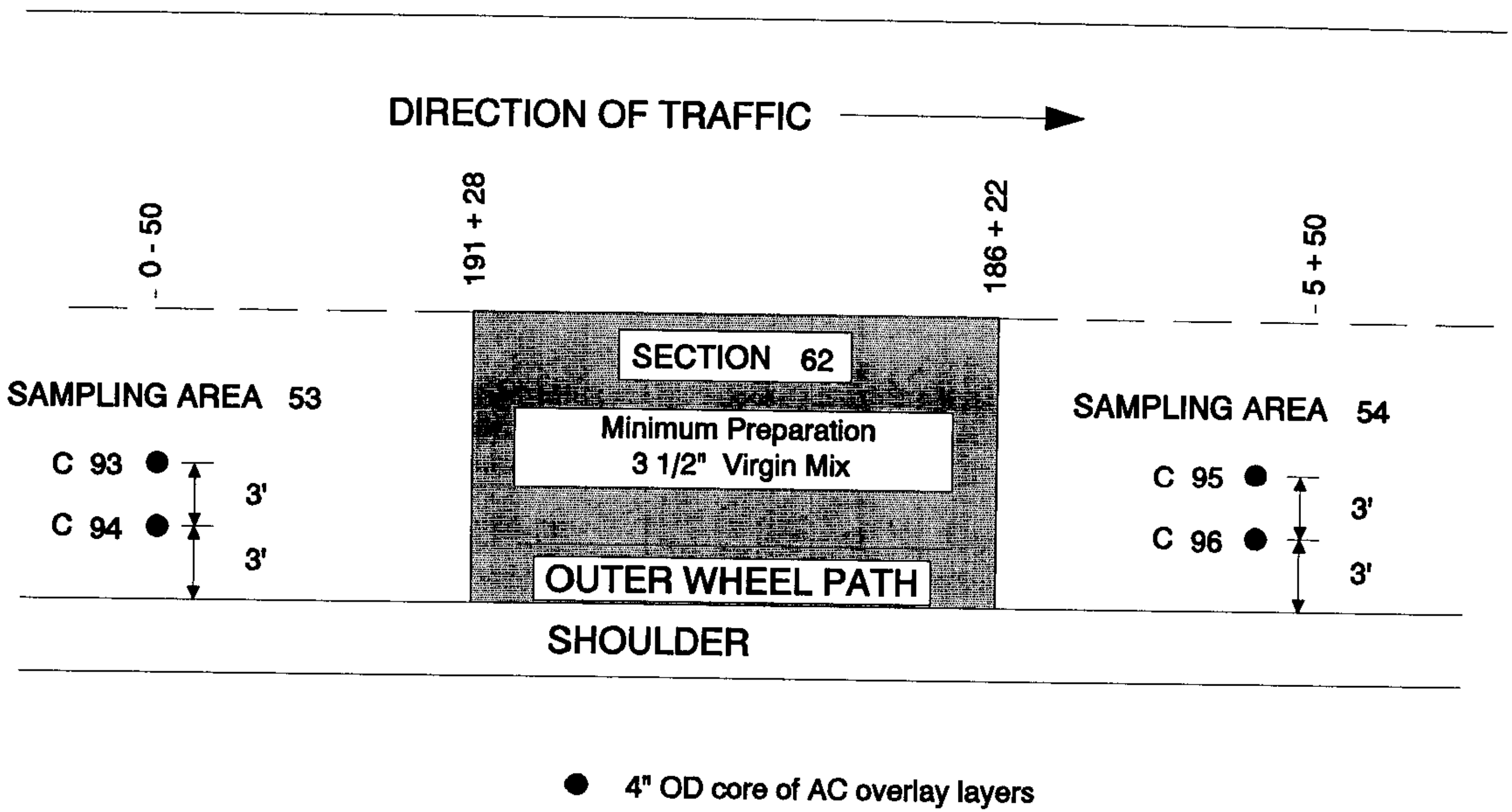
"Post - Construction" Sampling Plan for Section 67



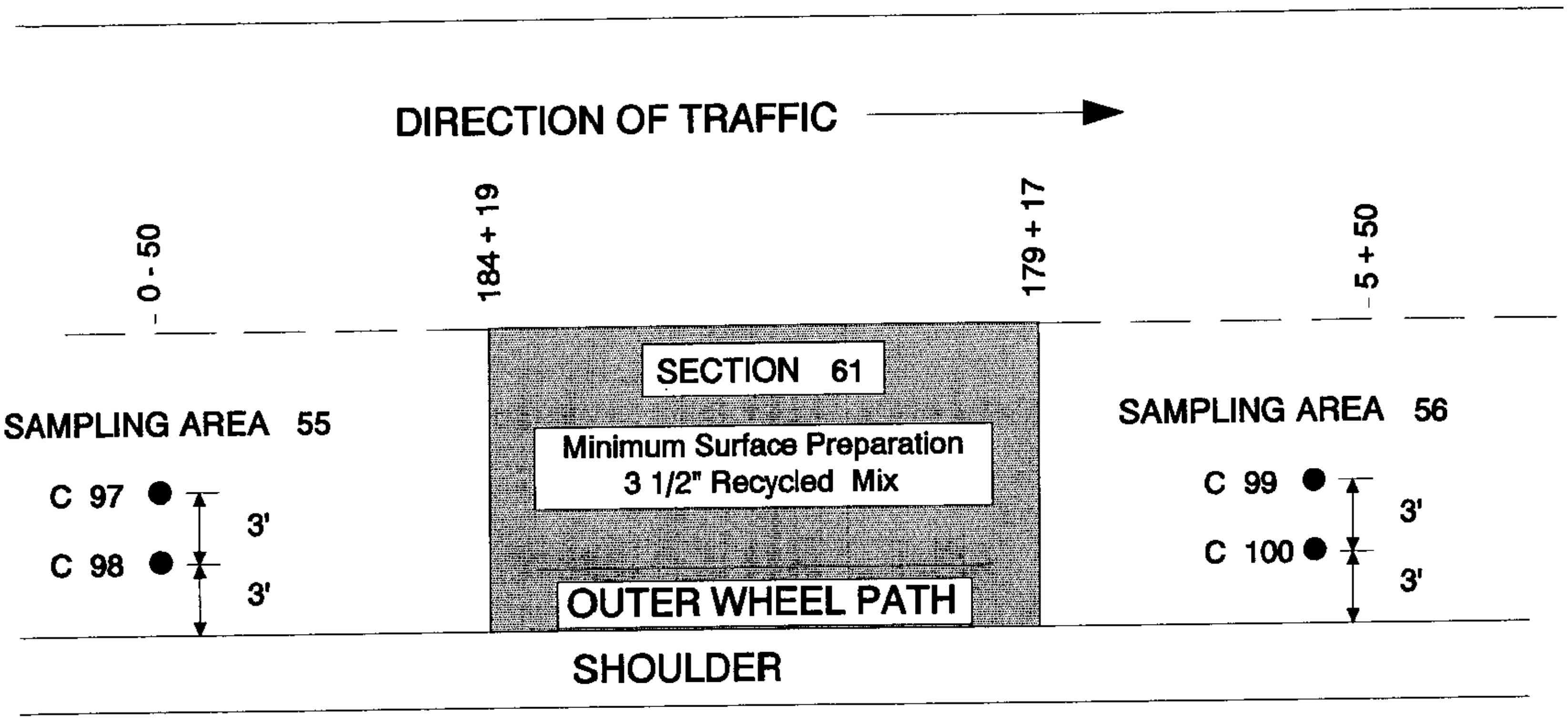
"Post - Construction" Sampling Plan for Section 63



"Post - Construction" Sampling Plan for Section 66

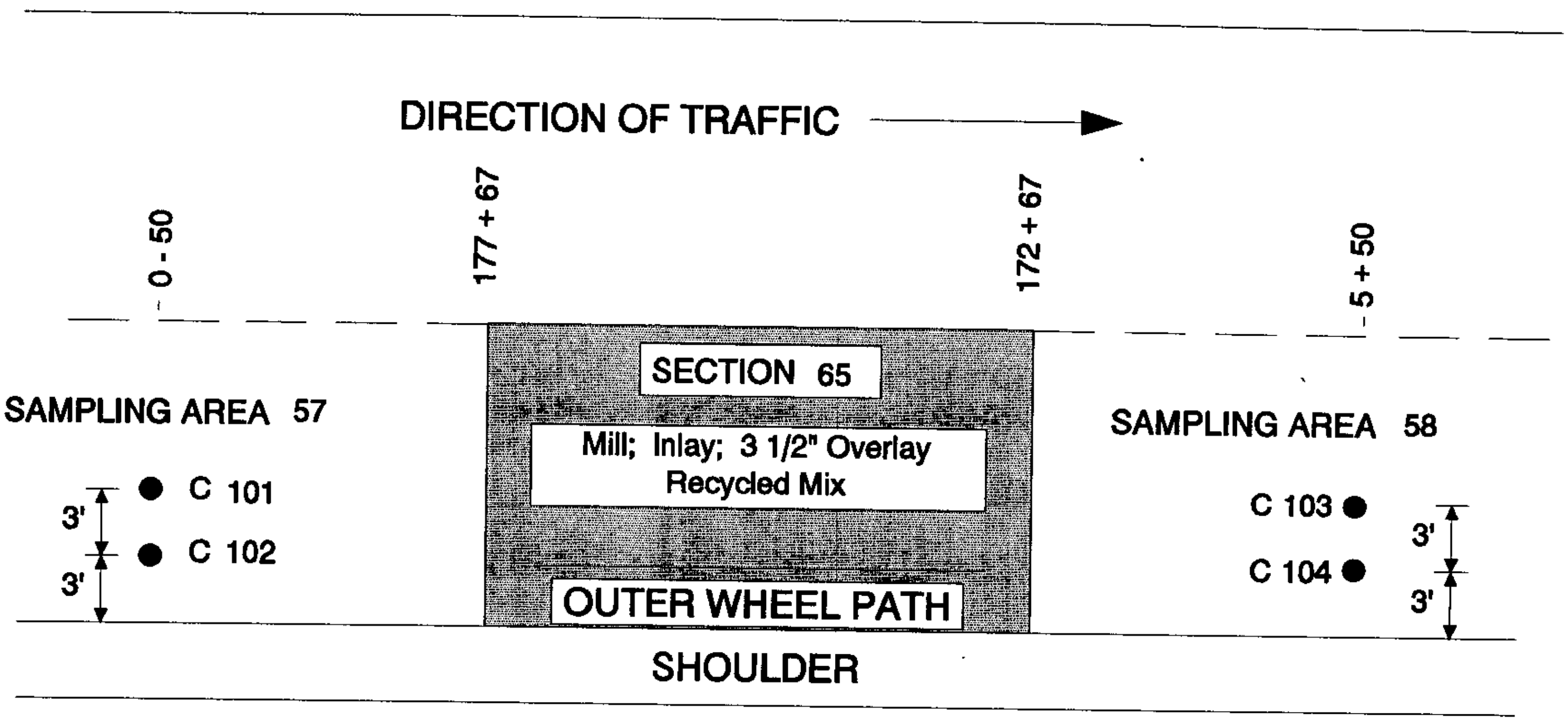


"Post - Construction" Sampling Plan for Section 62



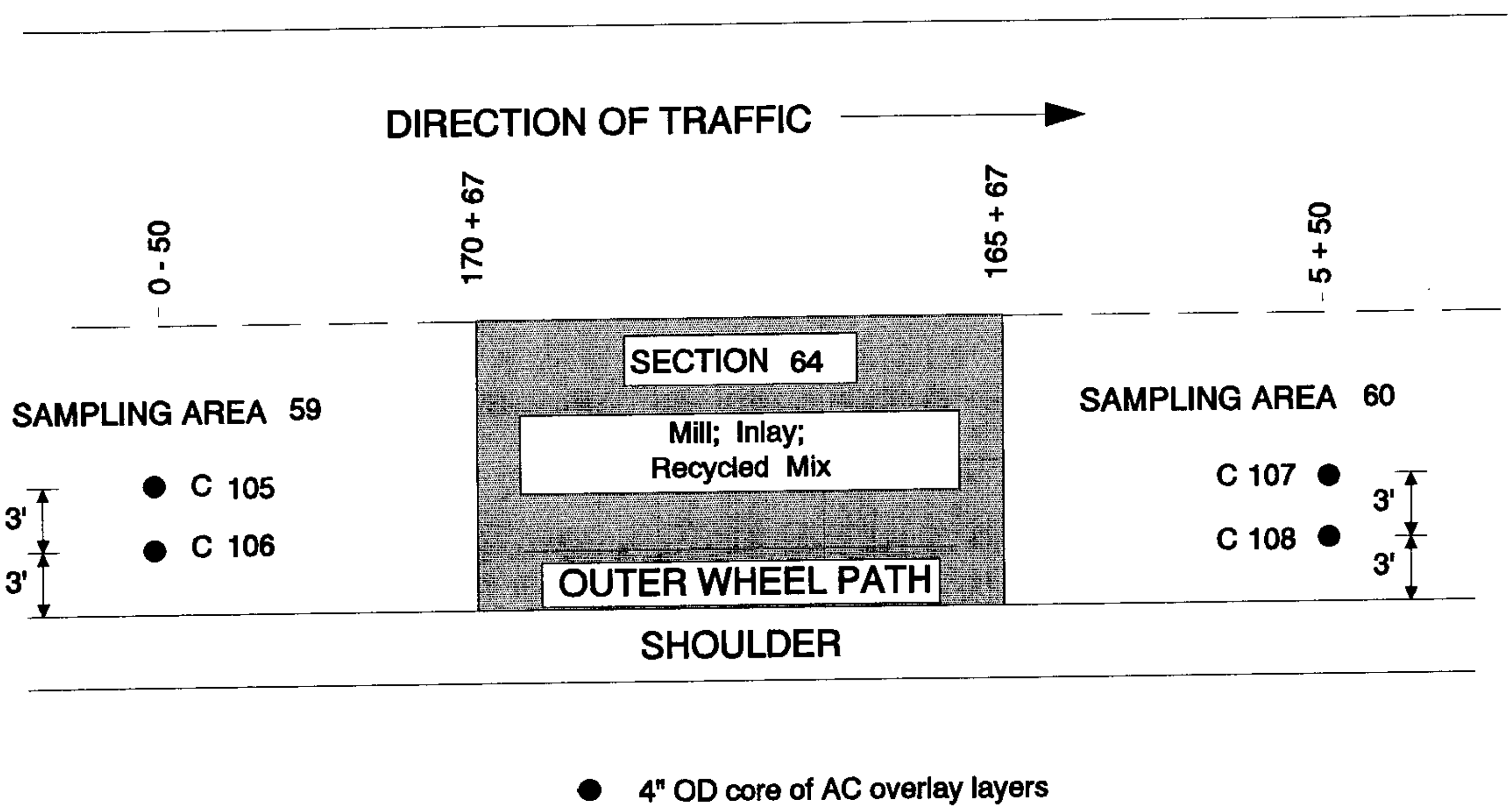
● 4" OD core of AC overlay layers

"Post - Construction" Sampling Plan for Section 61

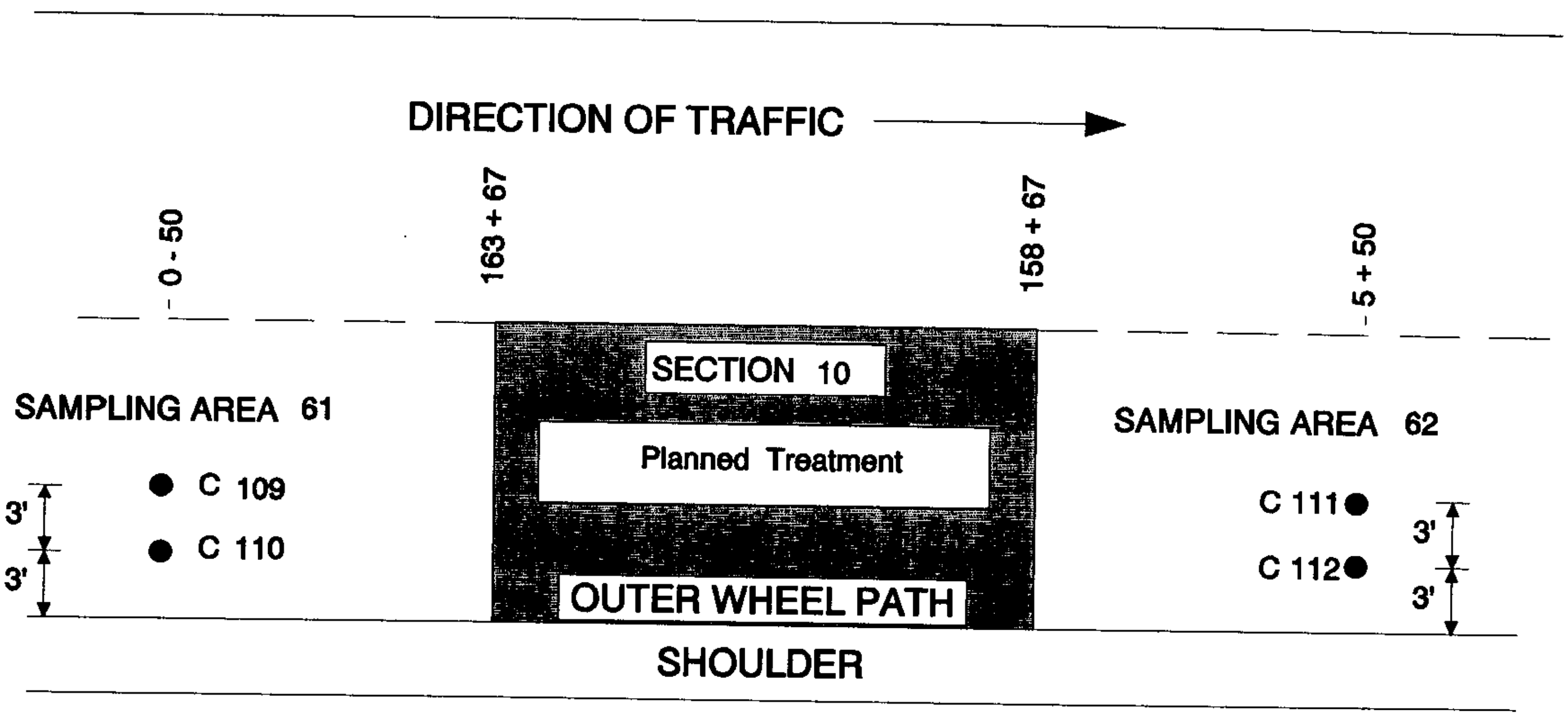


● 4" OD core of AC overlay layers

"Post - Construction" Sampling Plan for Section 65



"Post - Construction" Sampling Plan for Section 64



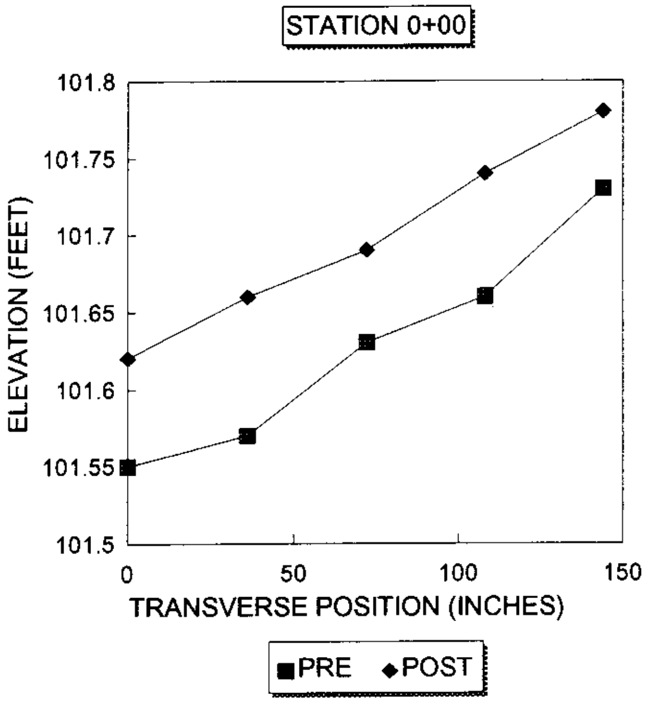
● 4" OD core of AC overlay layers

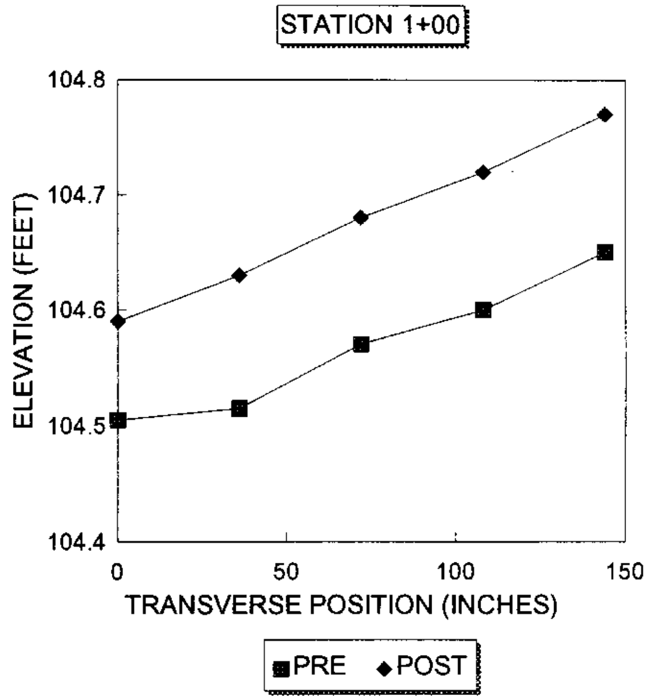
"Post - Construction" Sampling Plan for Section 10

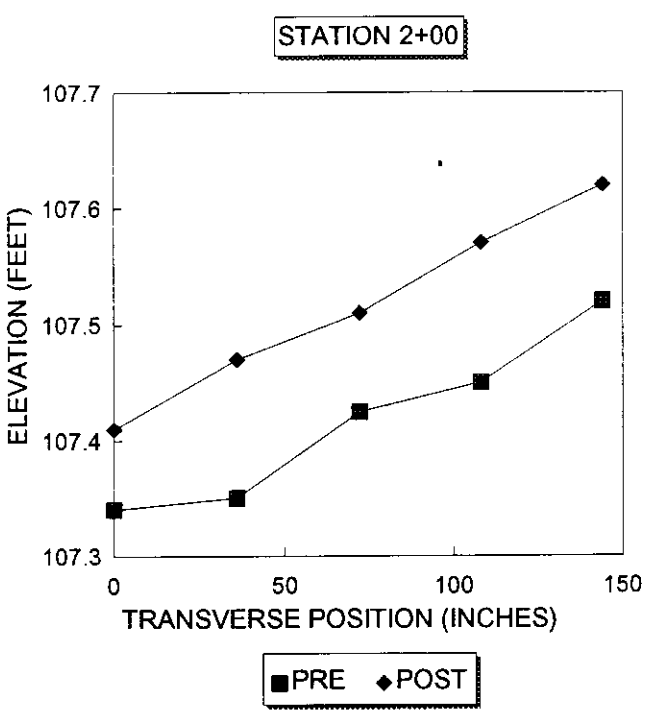
APPENDIX D

ROD AND LEVEL PLOTS

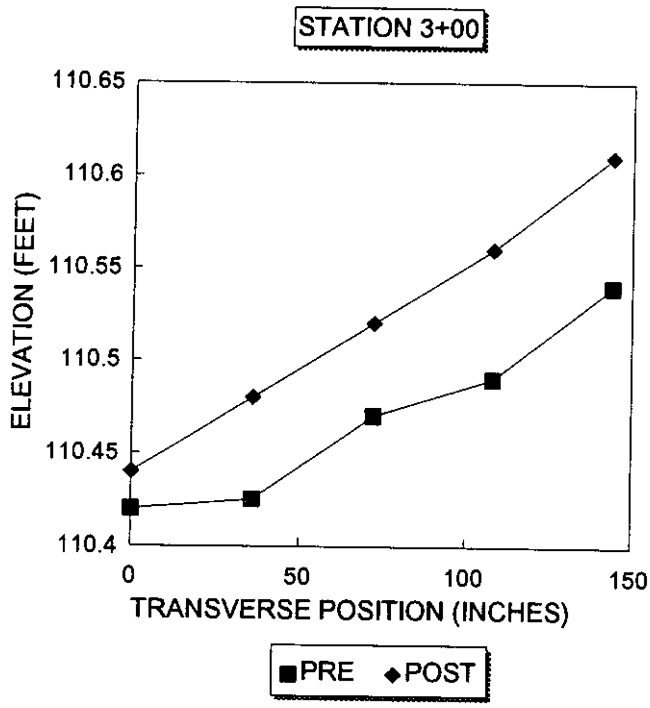
SECTION 130502

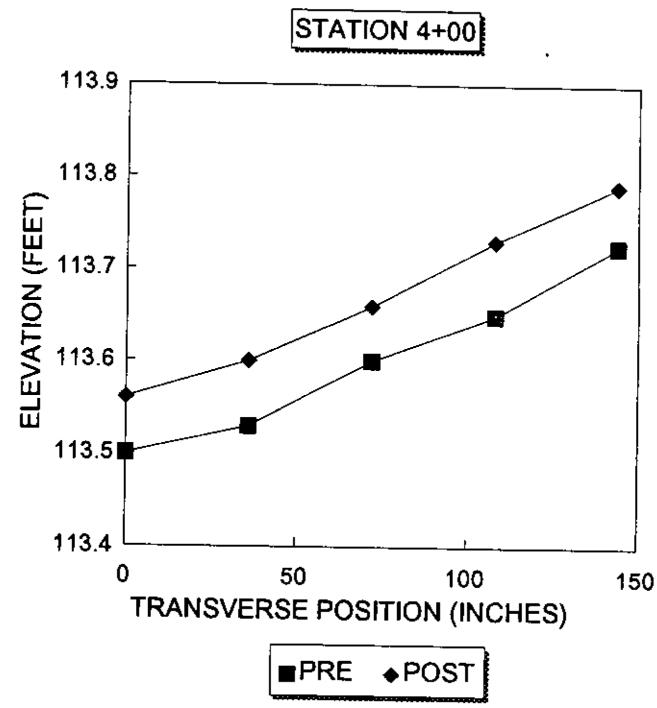


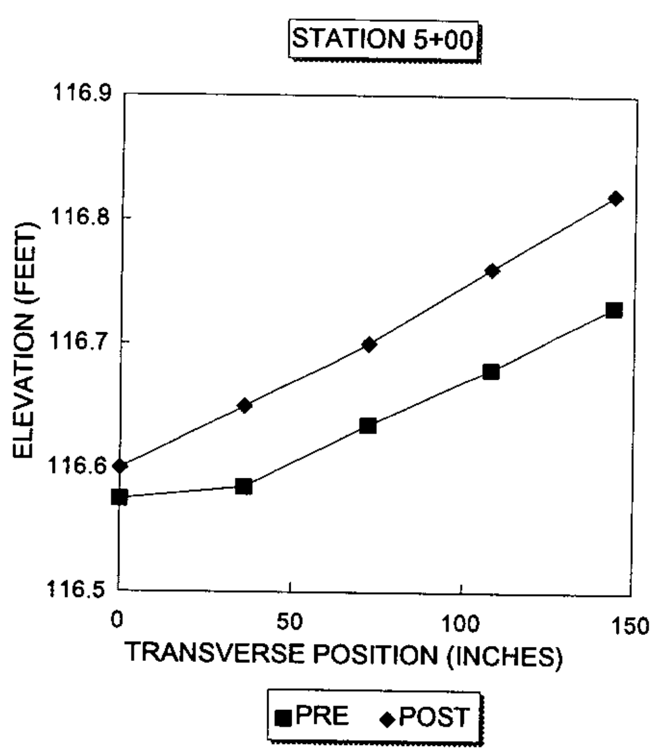




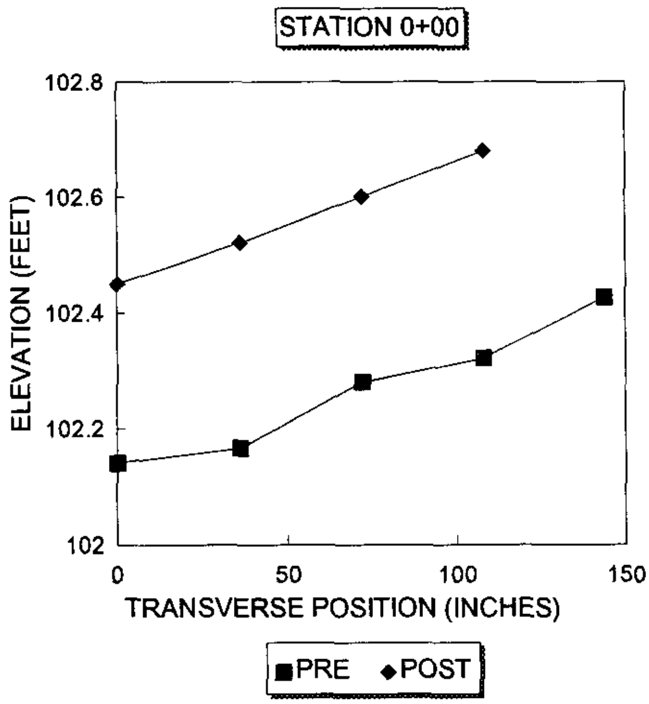
SECTION 130502

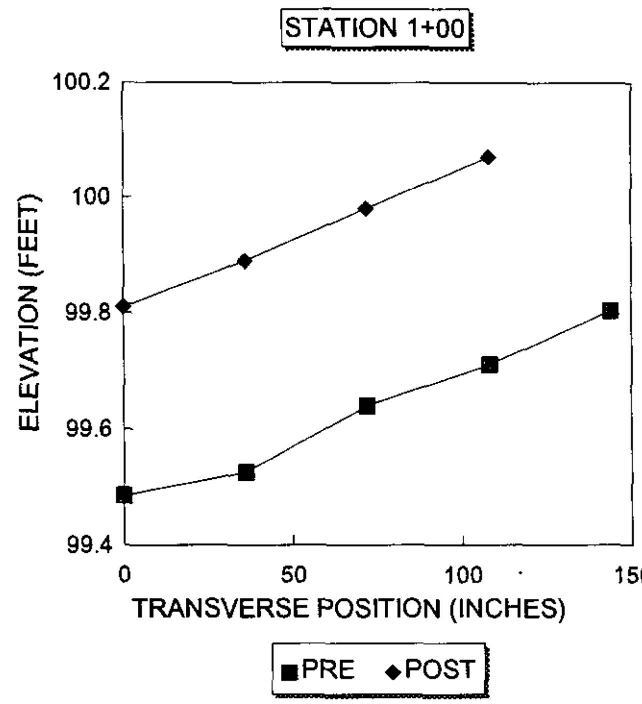


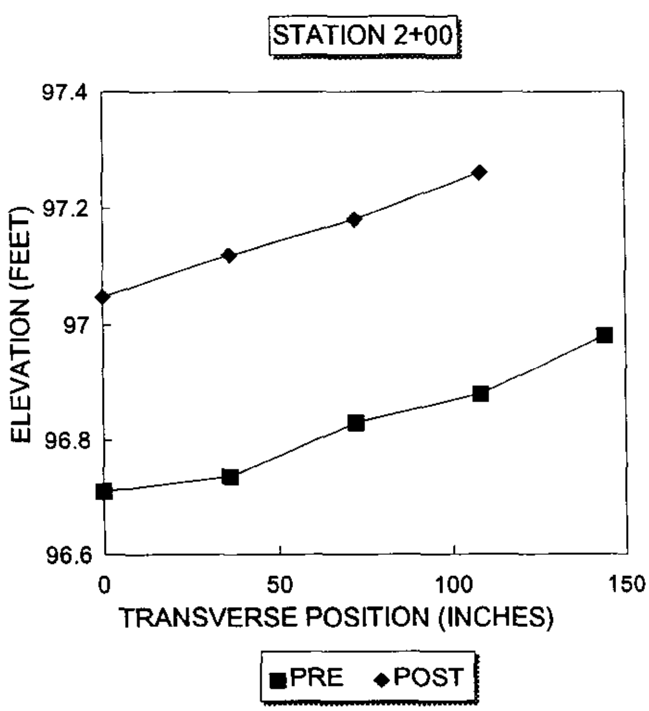




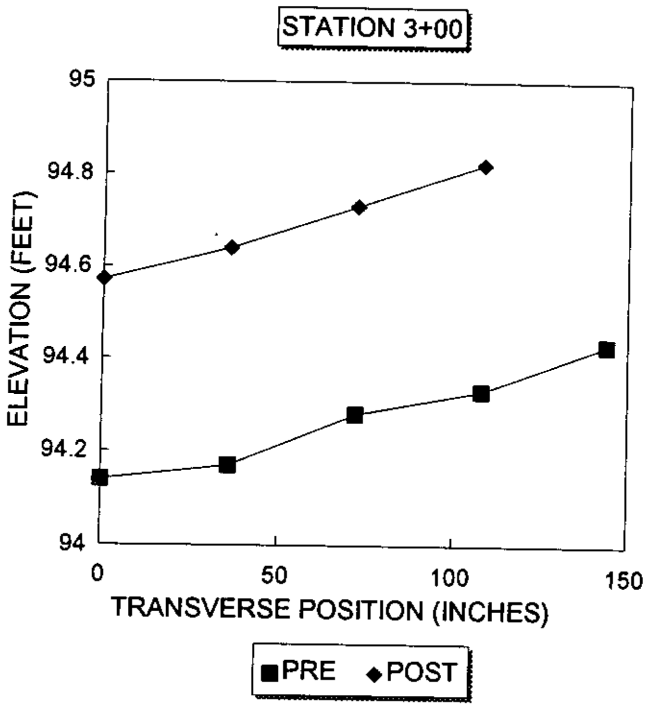
SECTION 130503

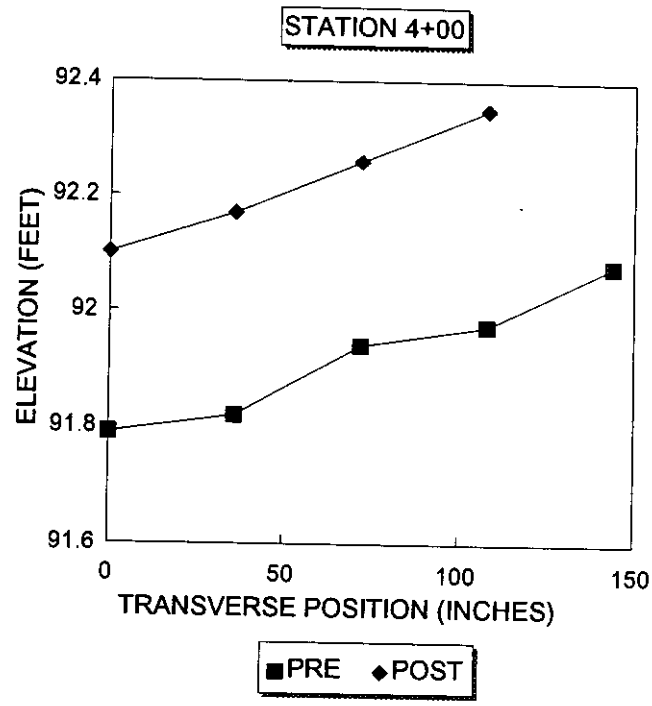


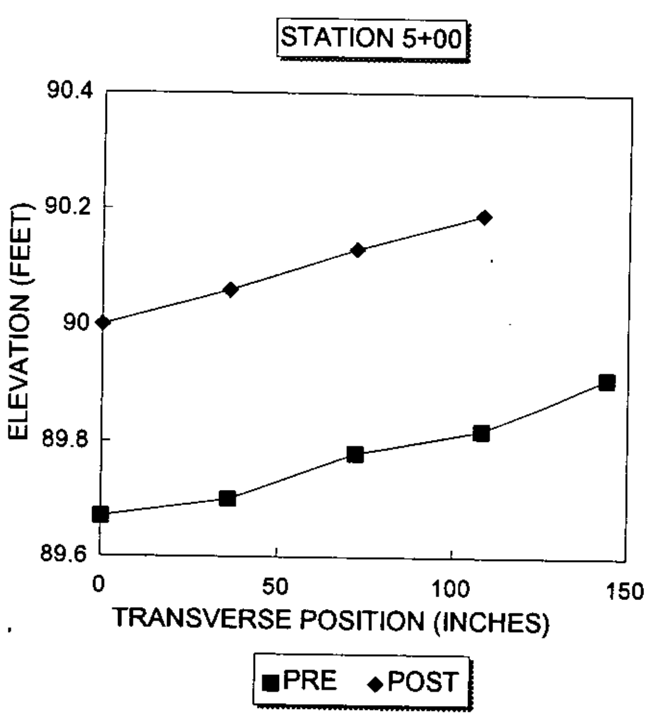




SECTION 130503







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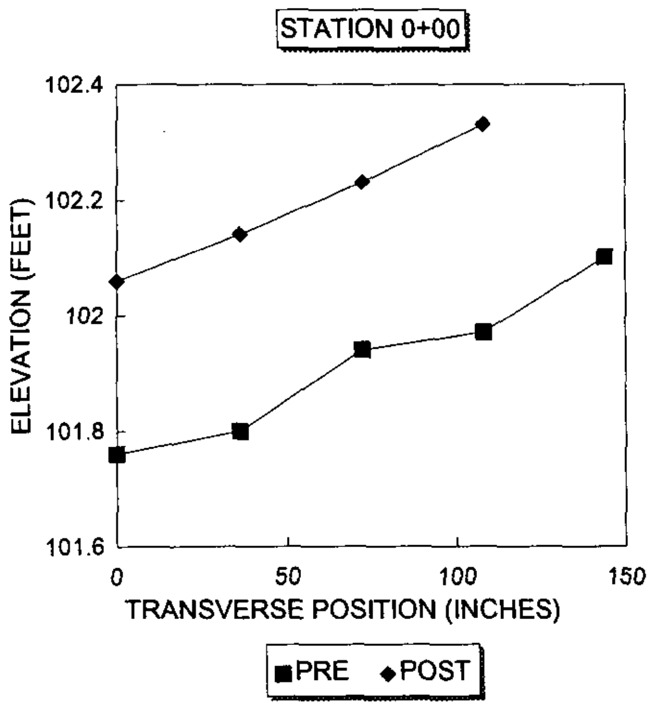

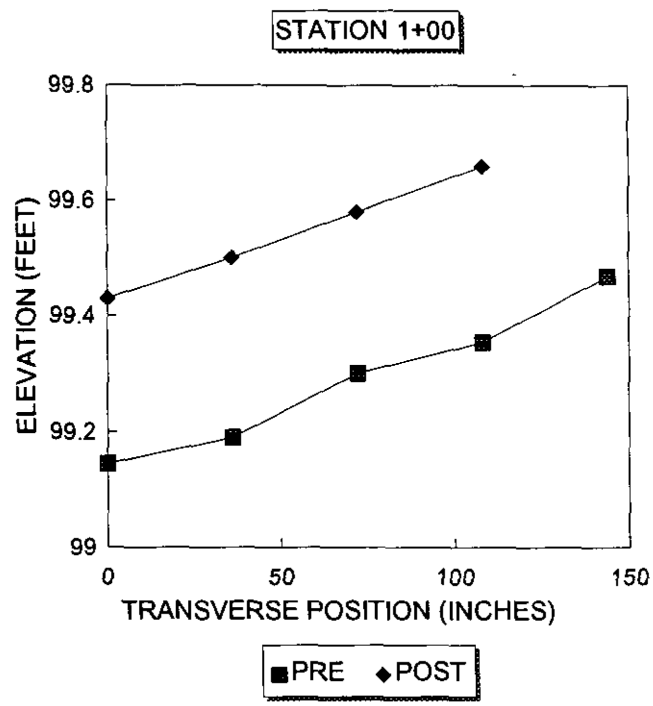

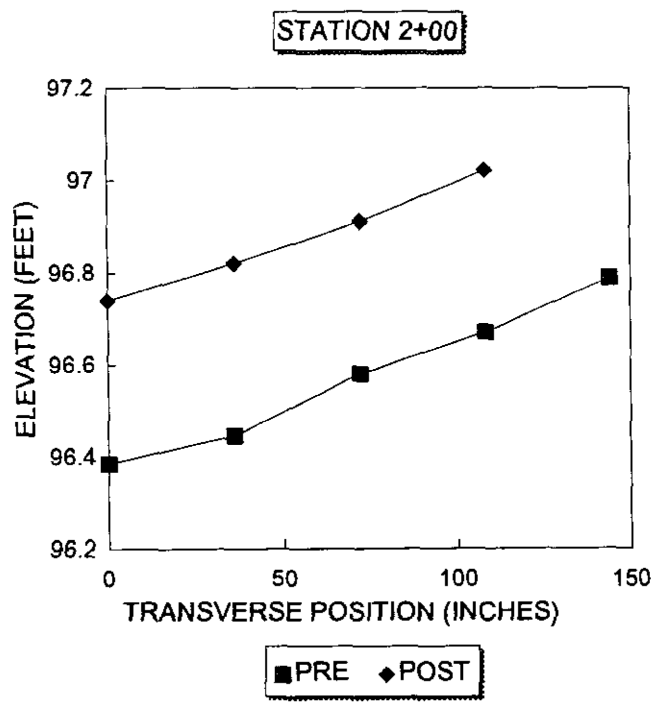

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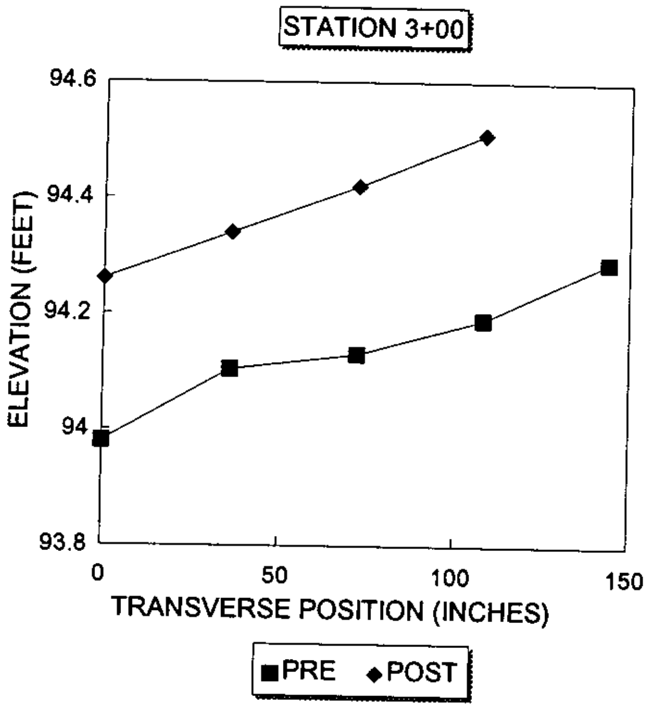

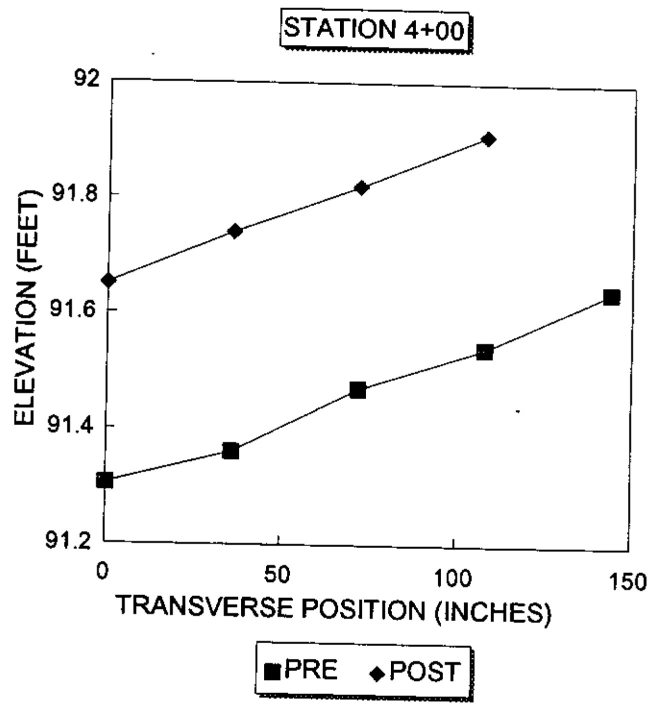

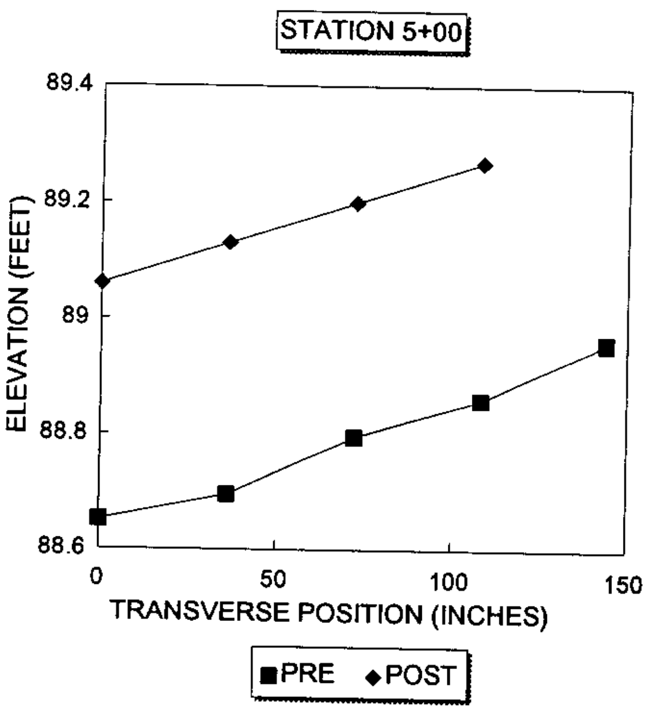

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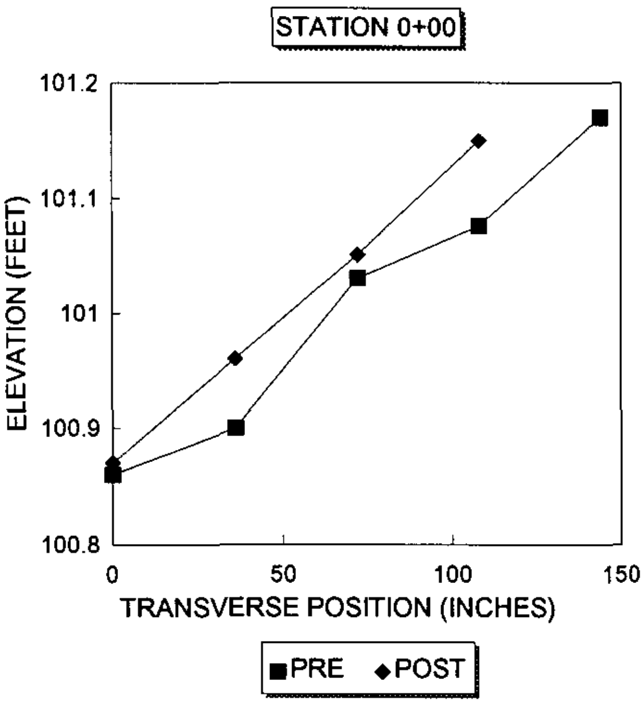

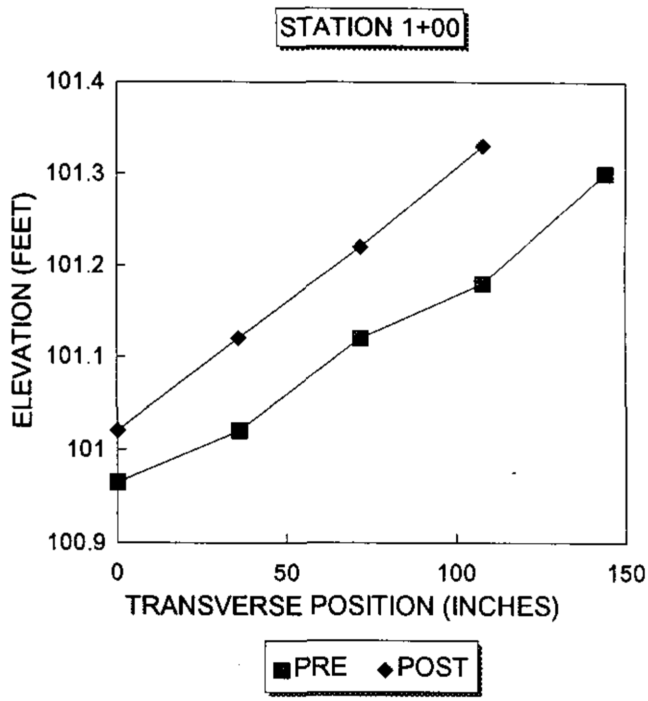

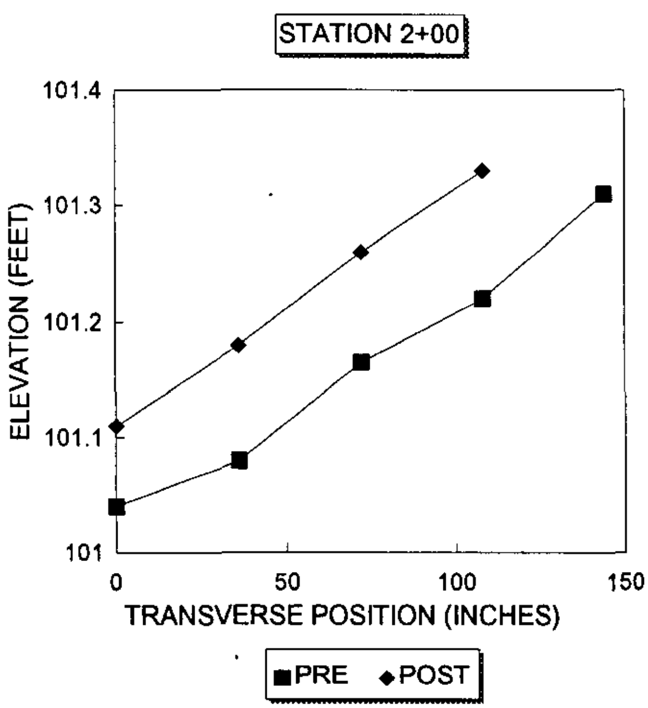

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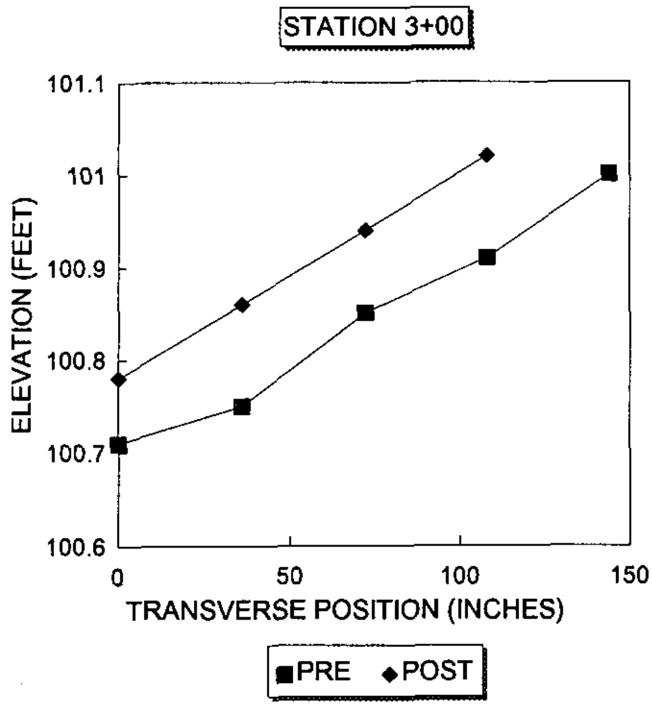

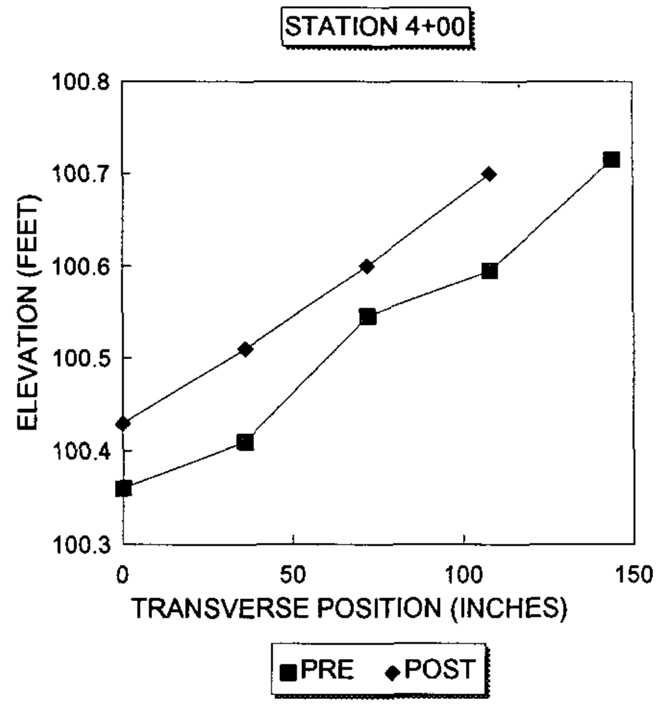

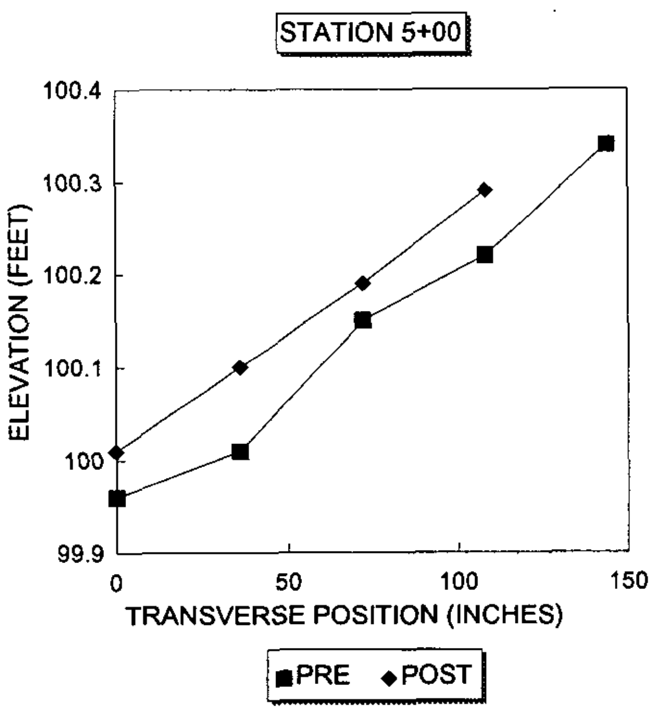

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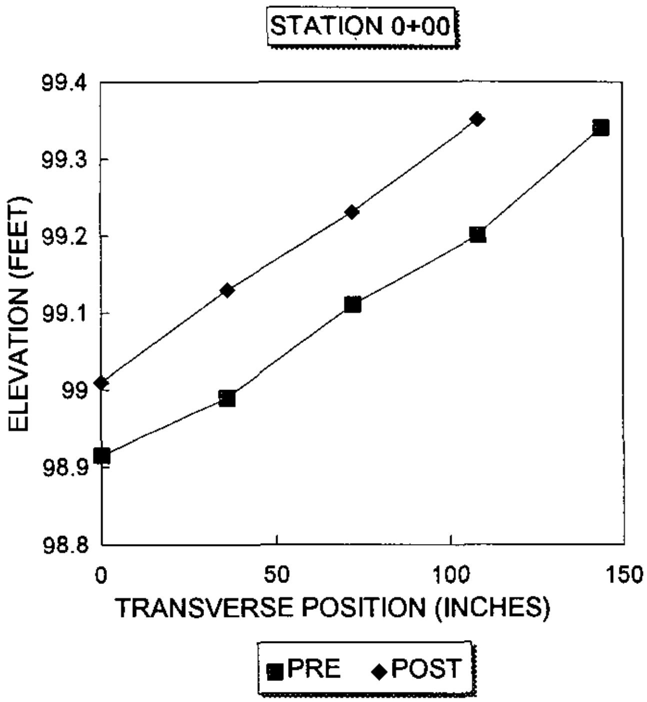

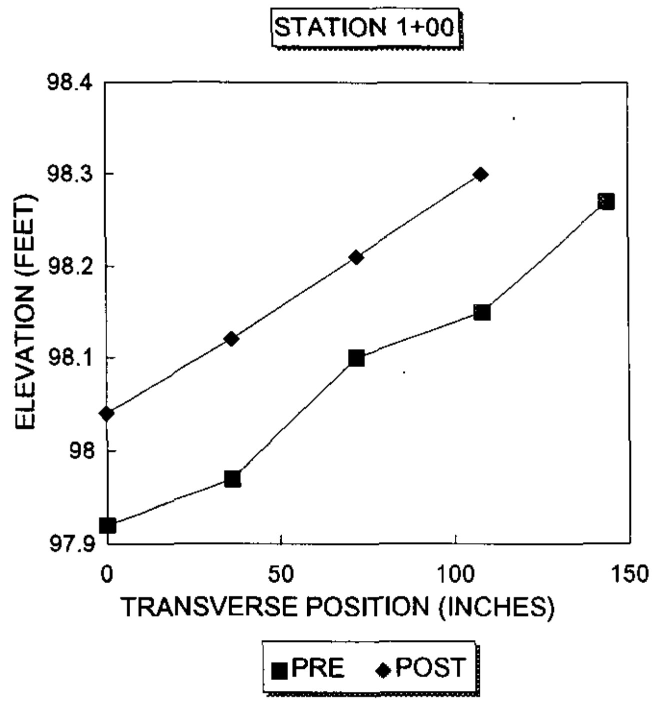

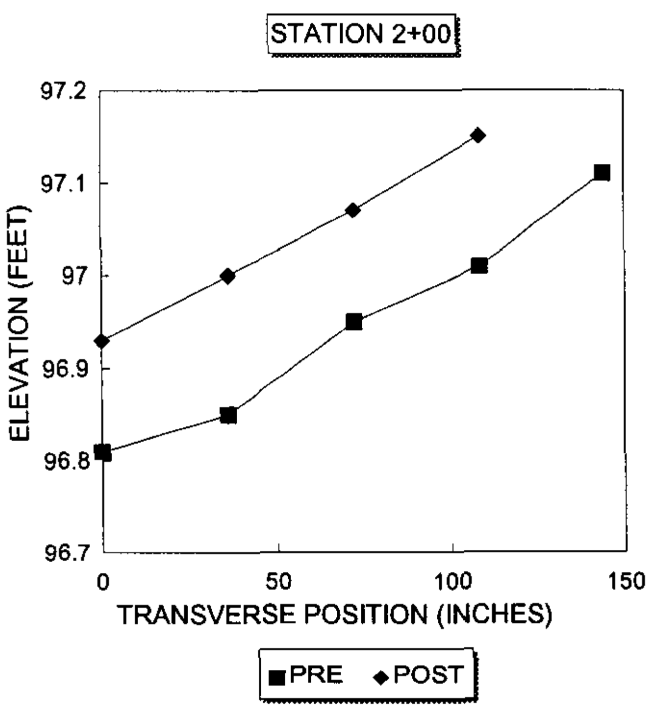

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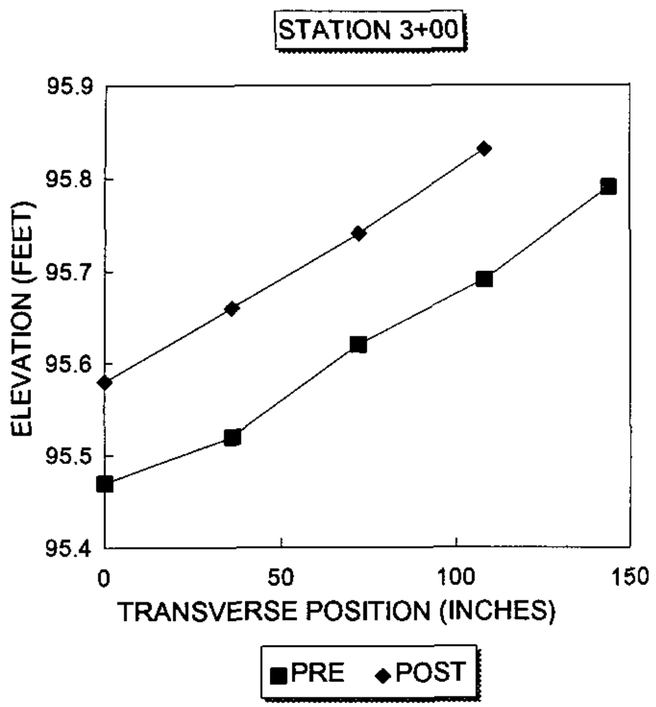

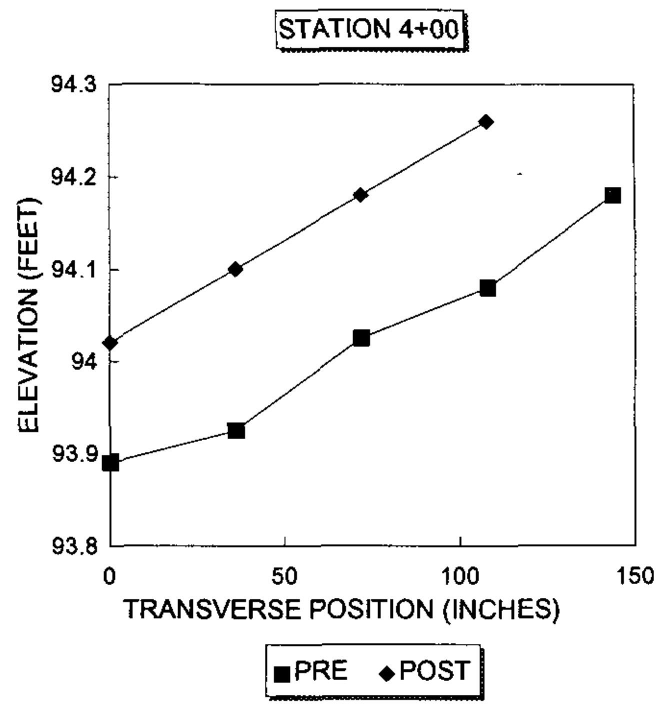

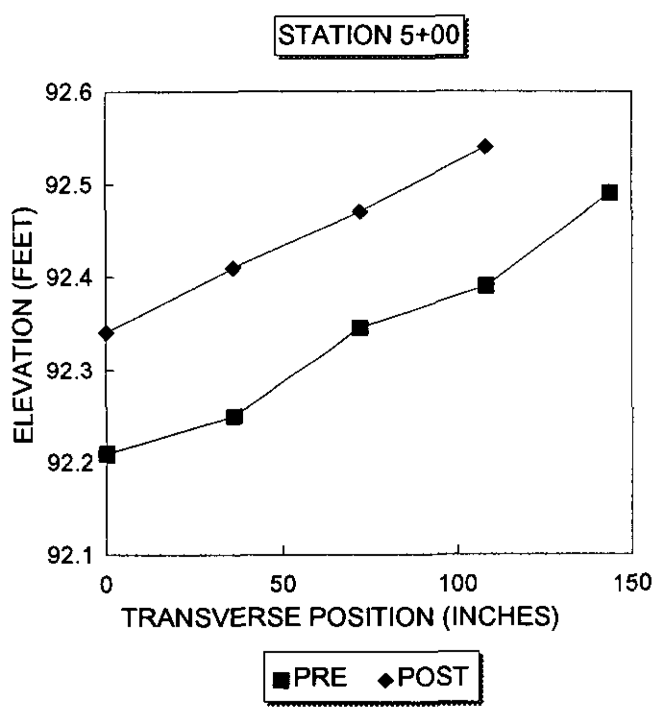

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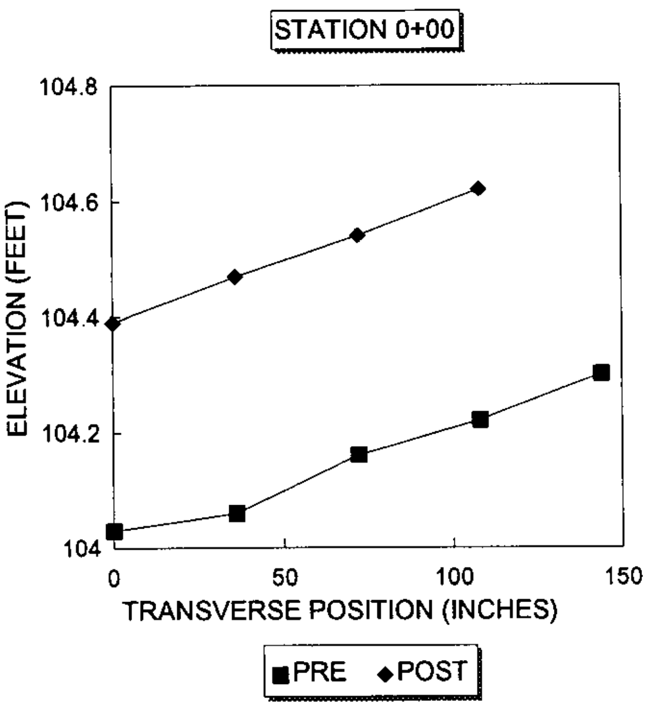

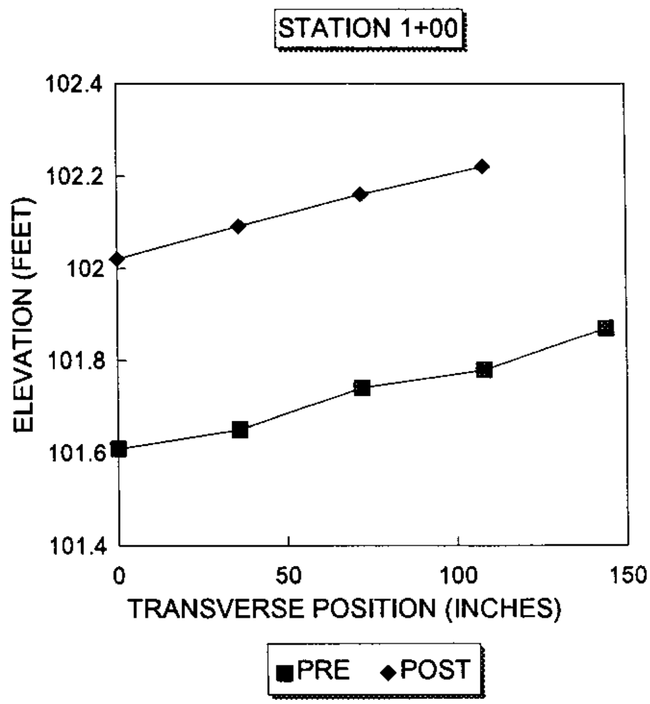

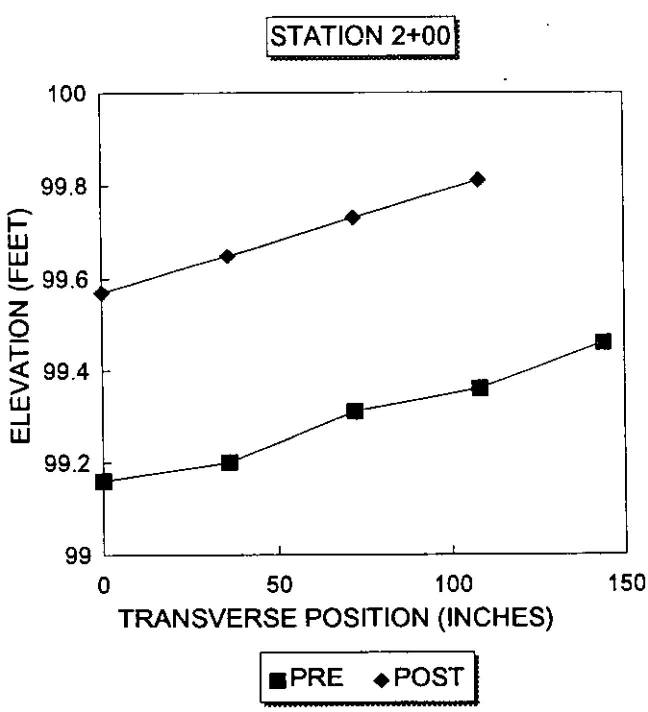

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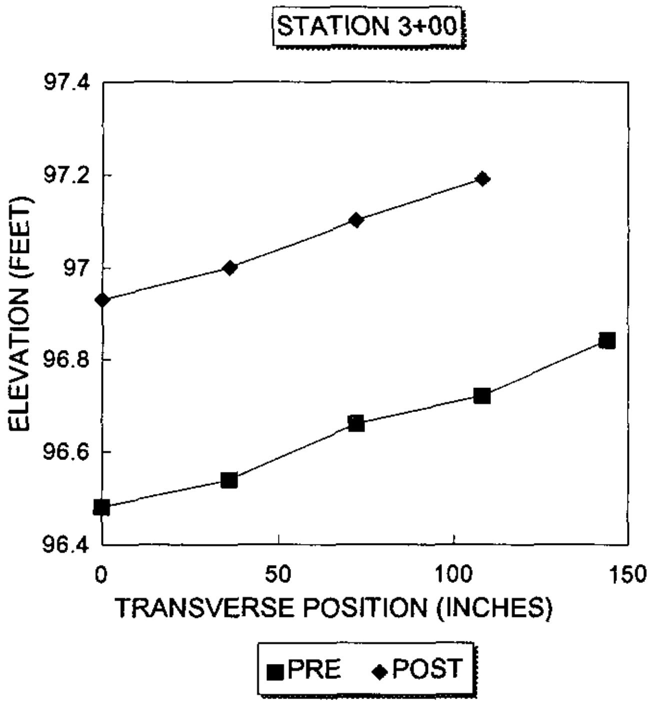

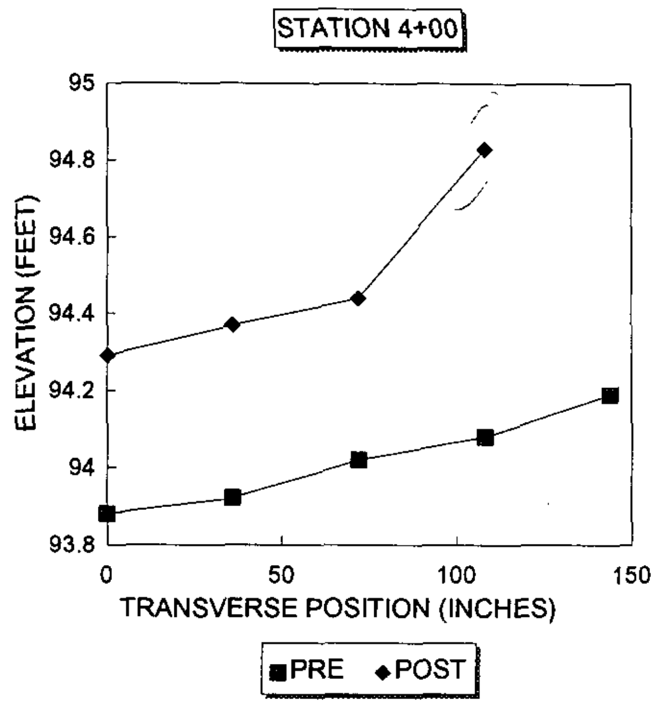

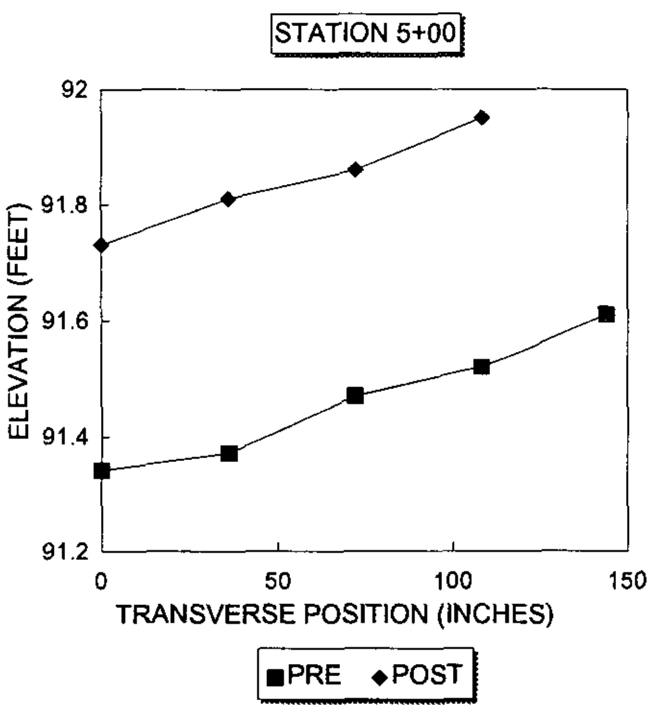

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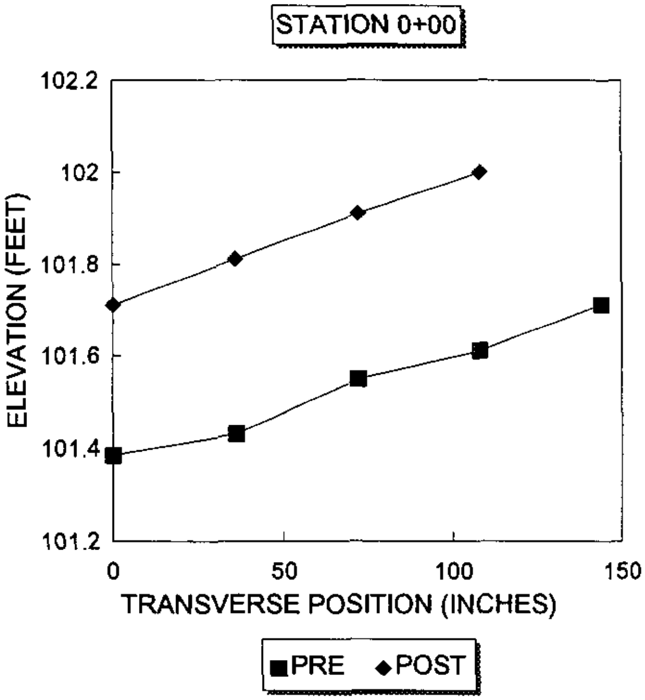

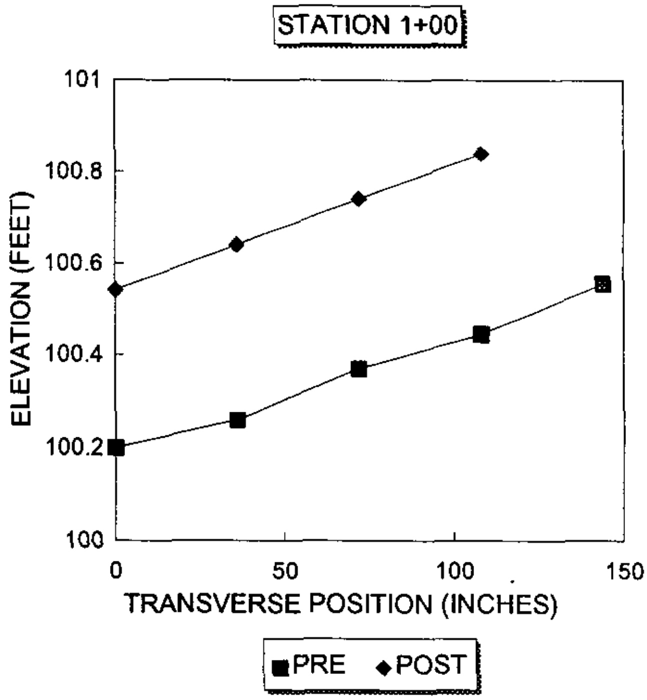

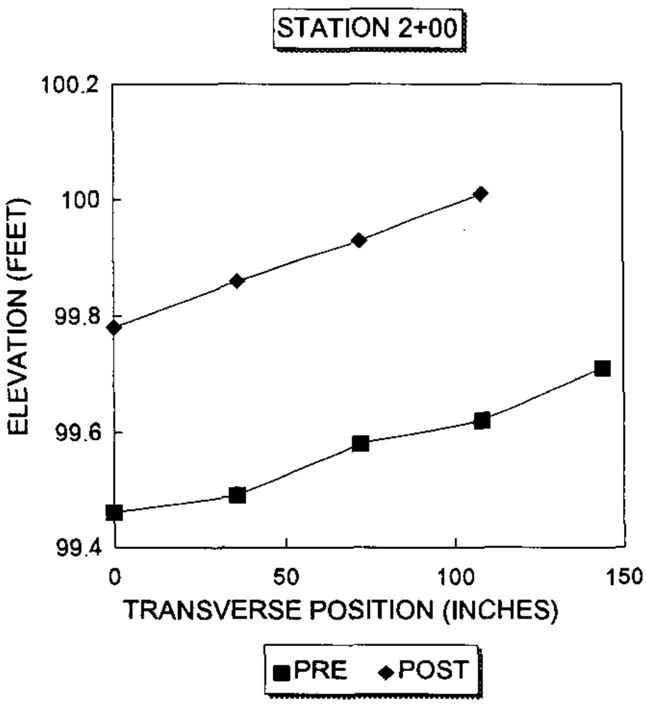

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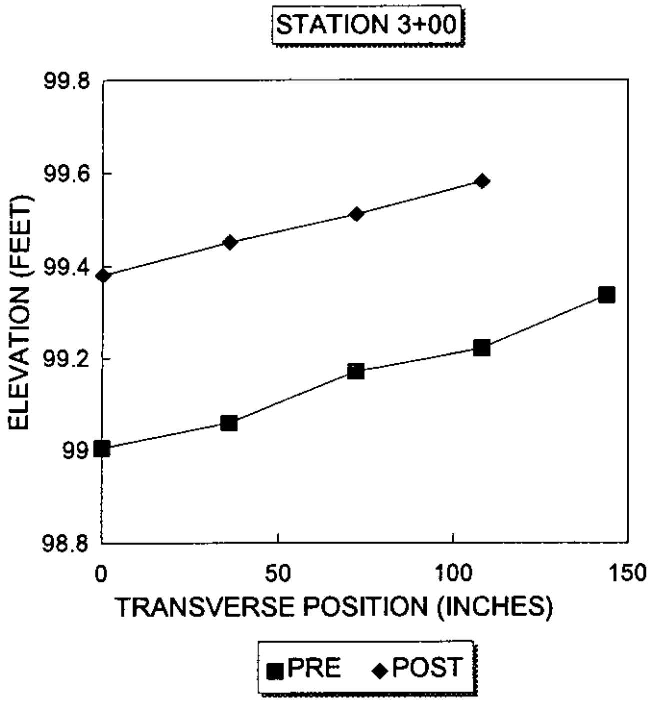

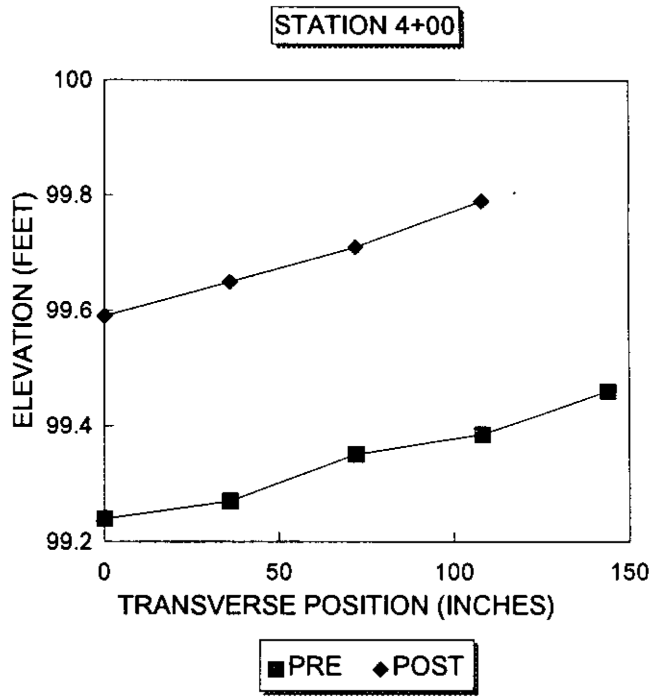

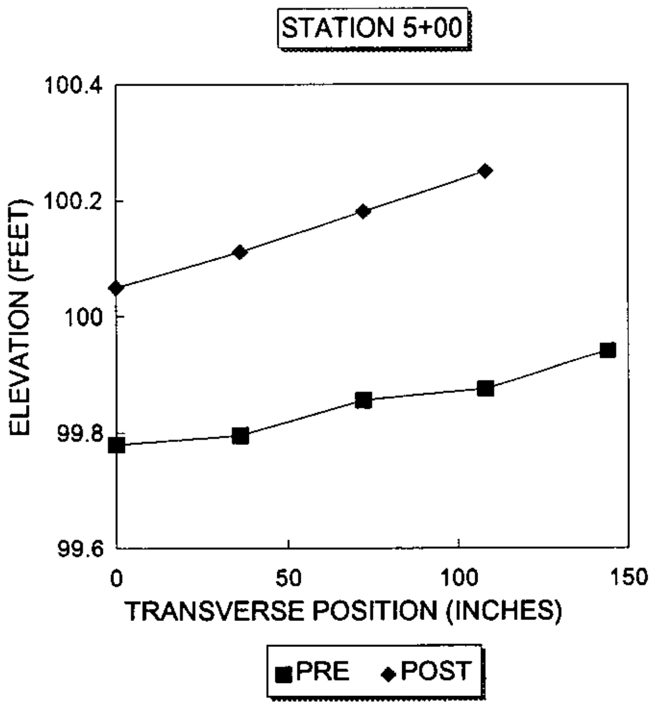

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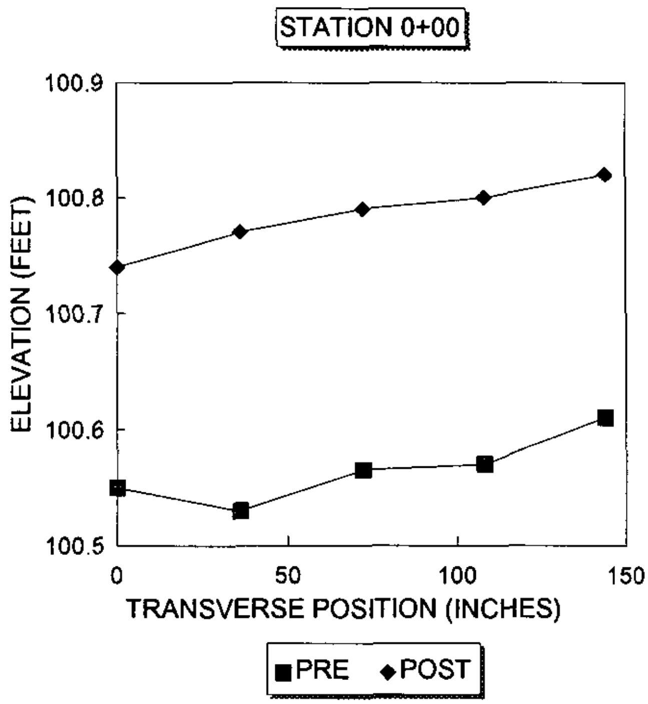

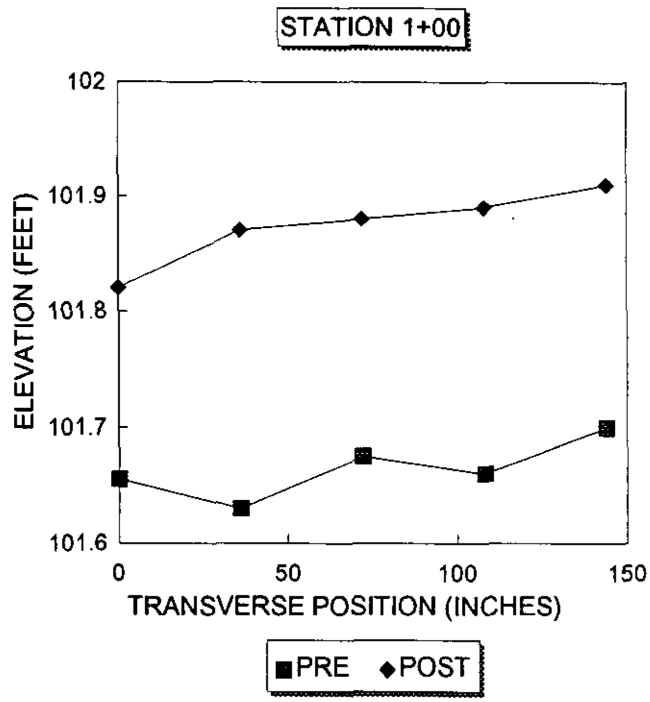

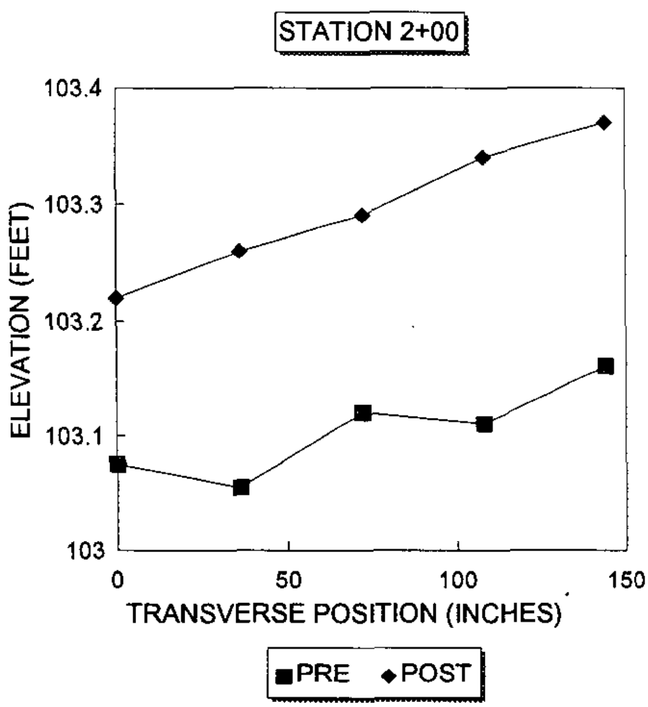

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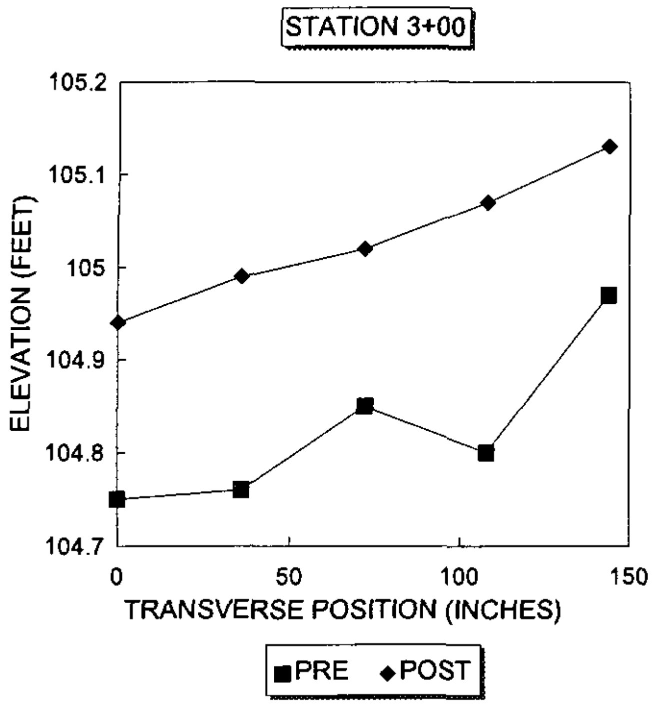

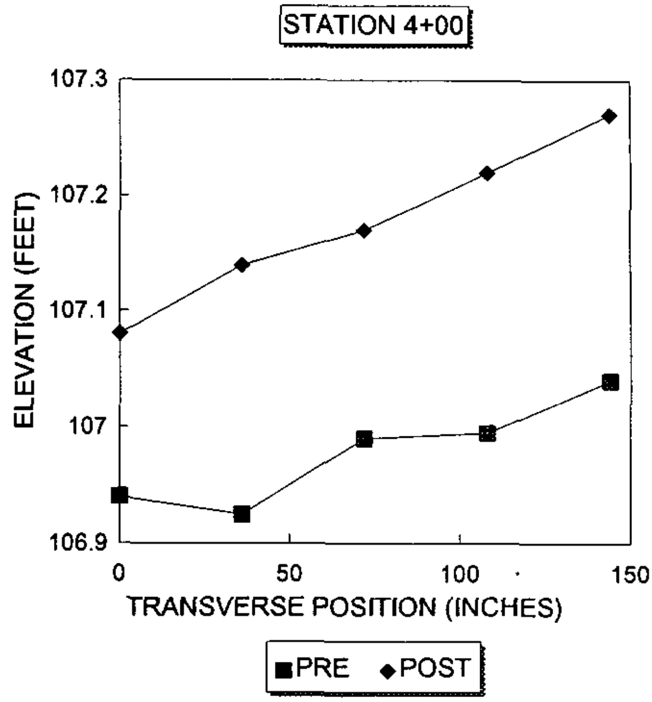

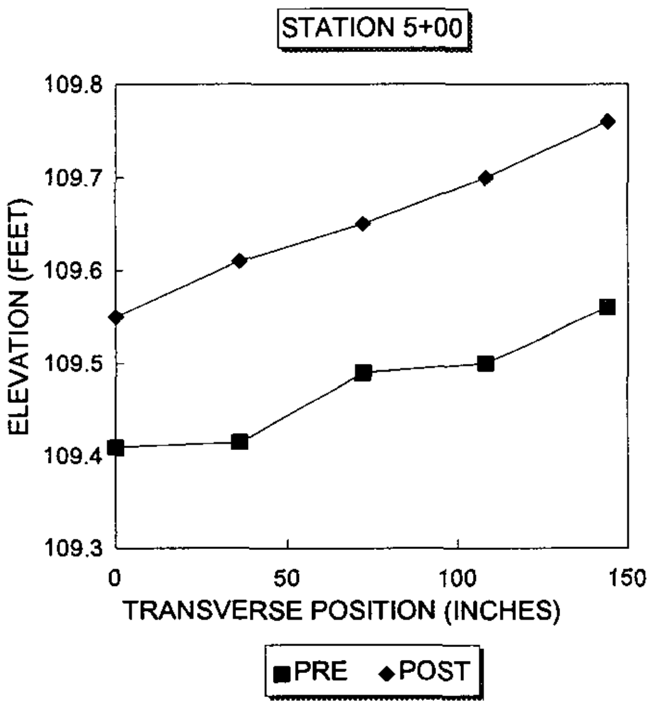

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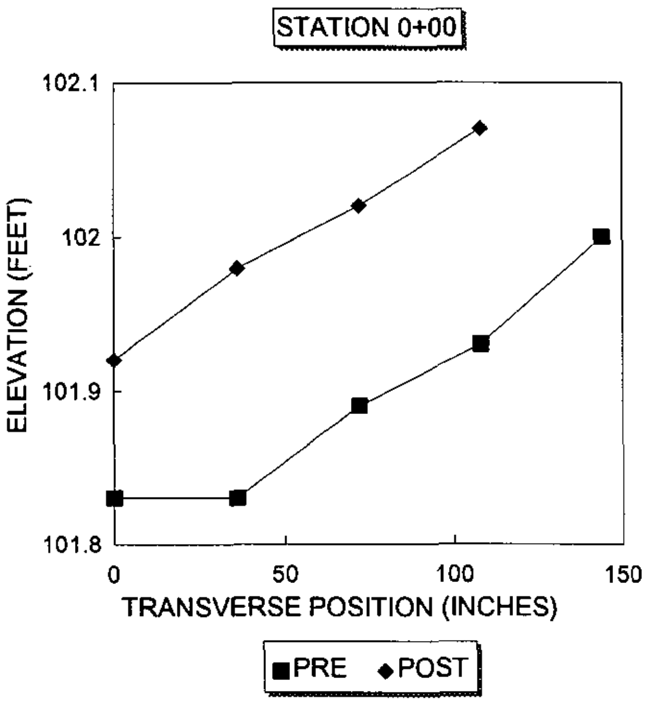

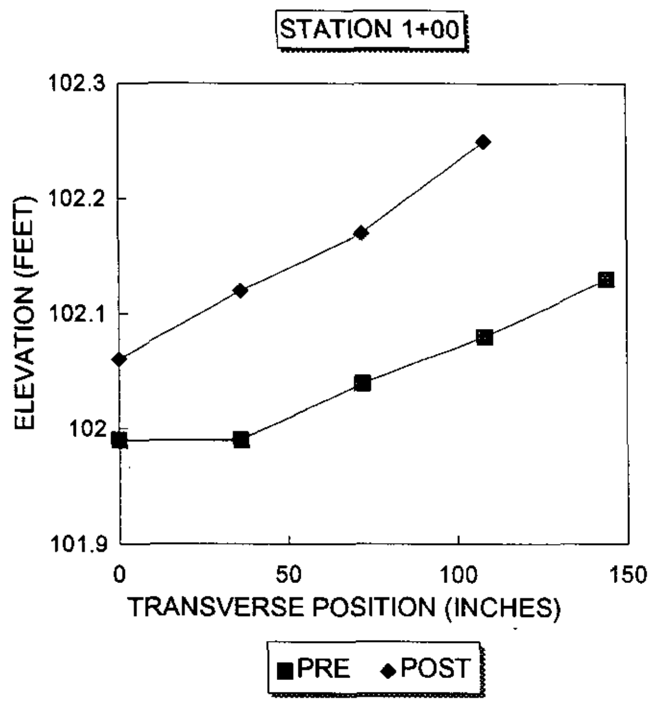

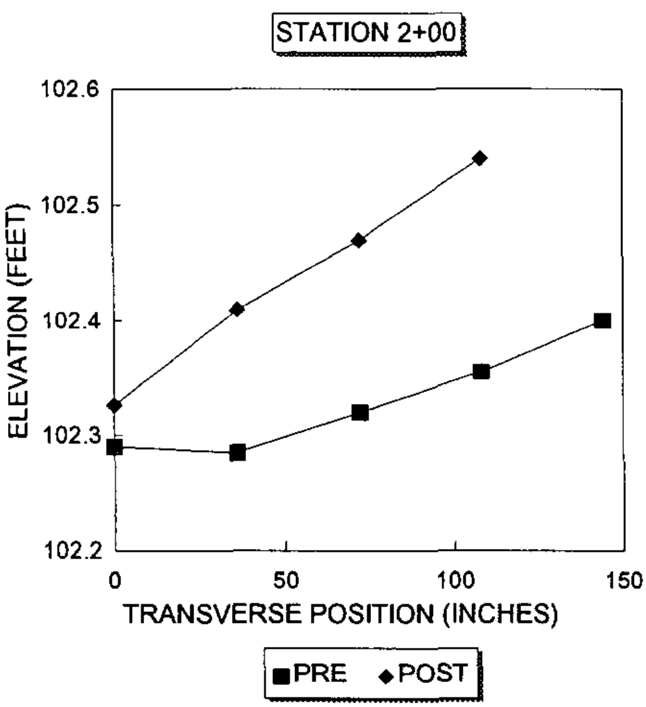

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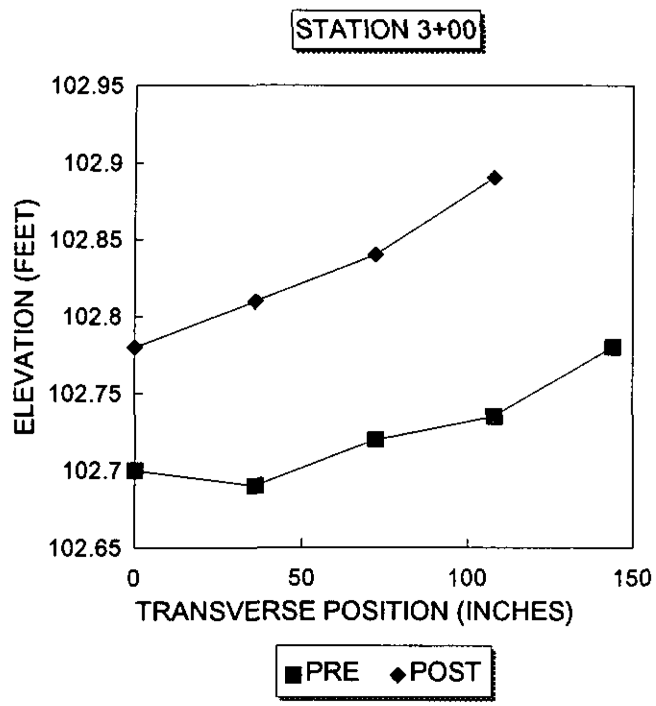

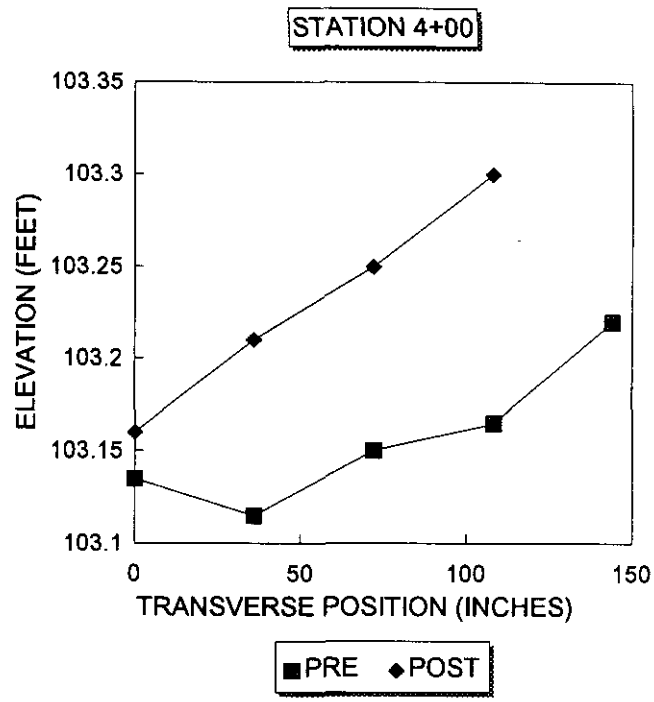

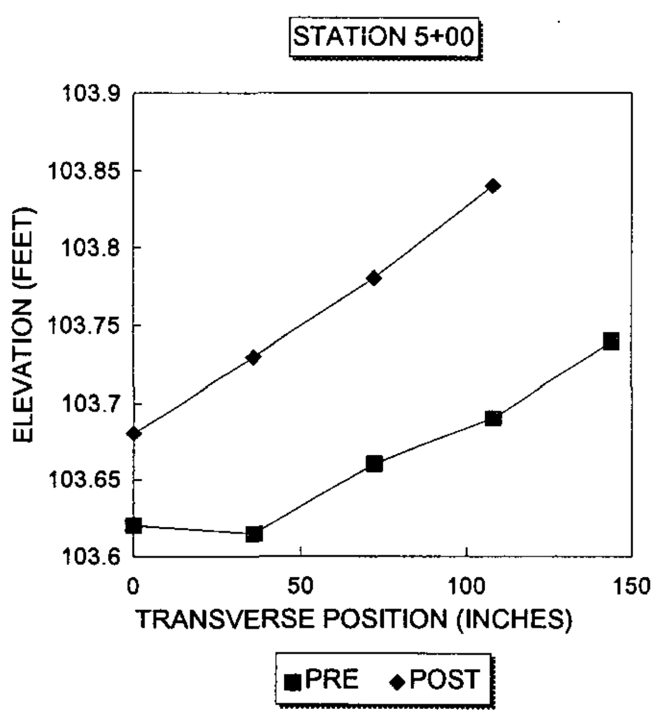

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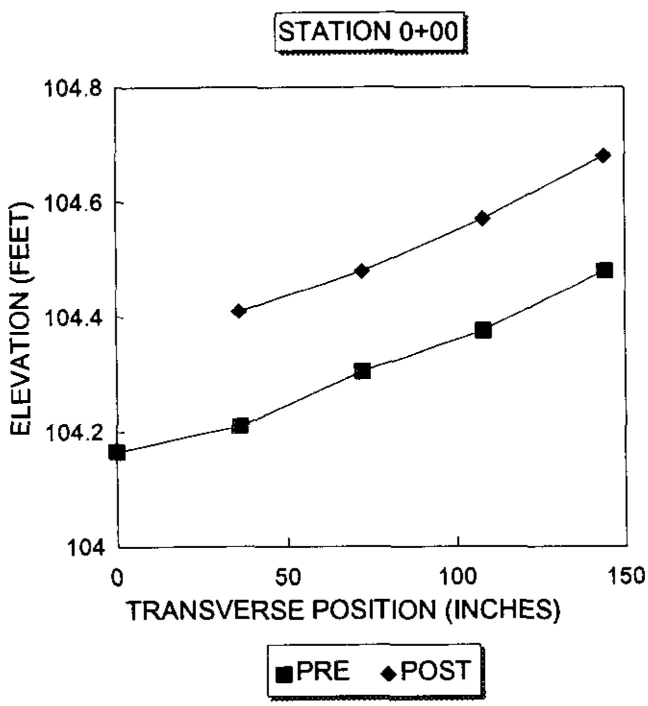

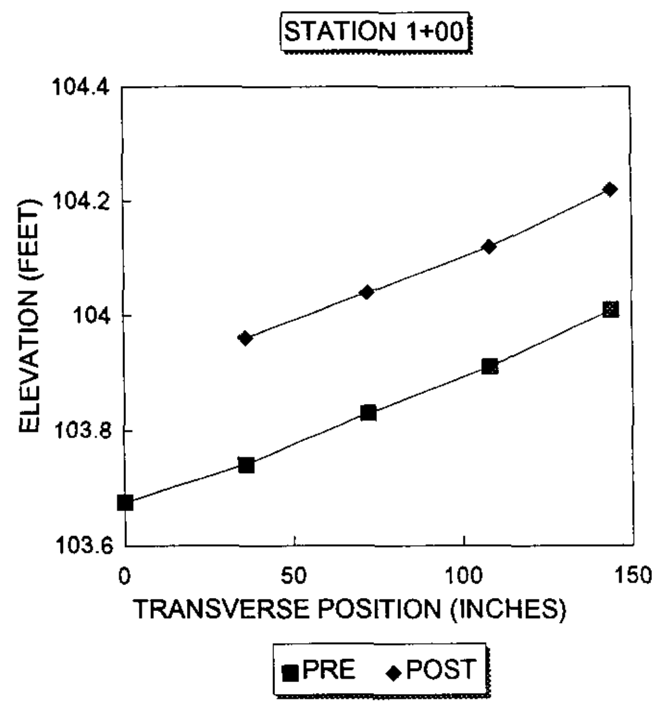

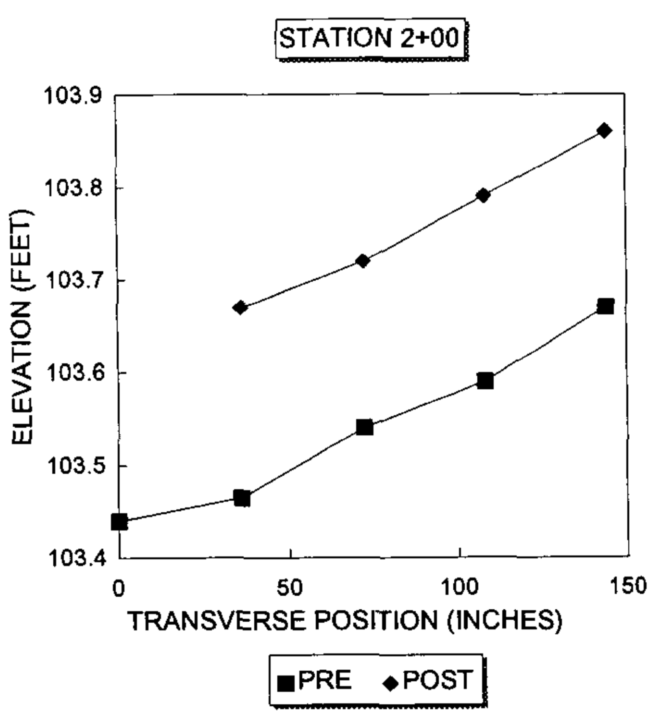

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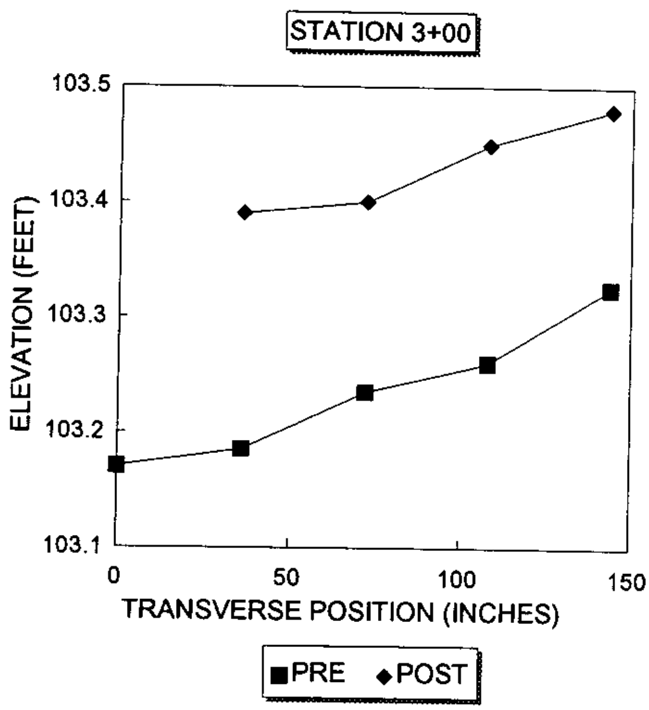

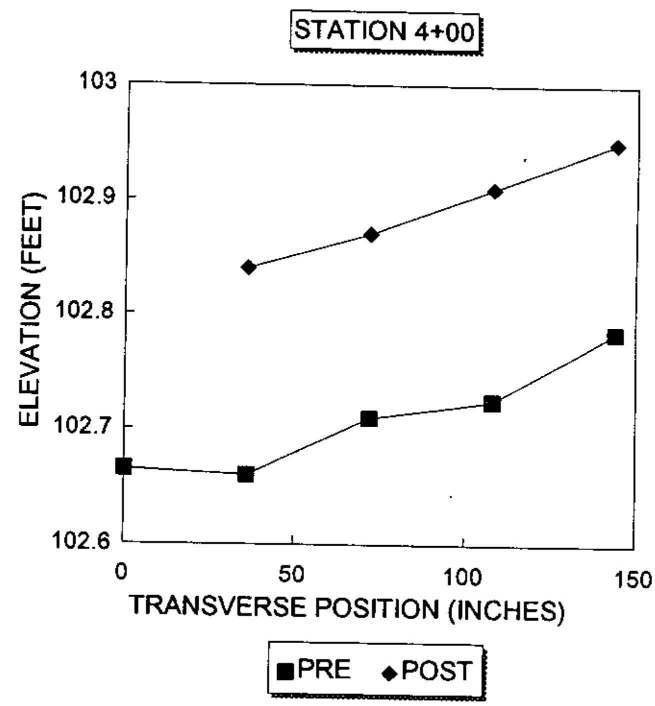

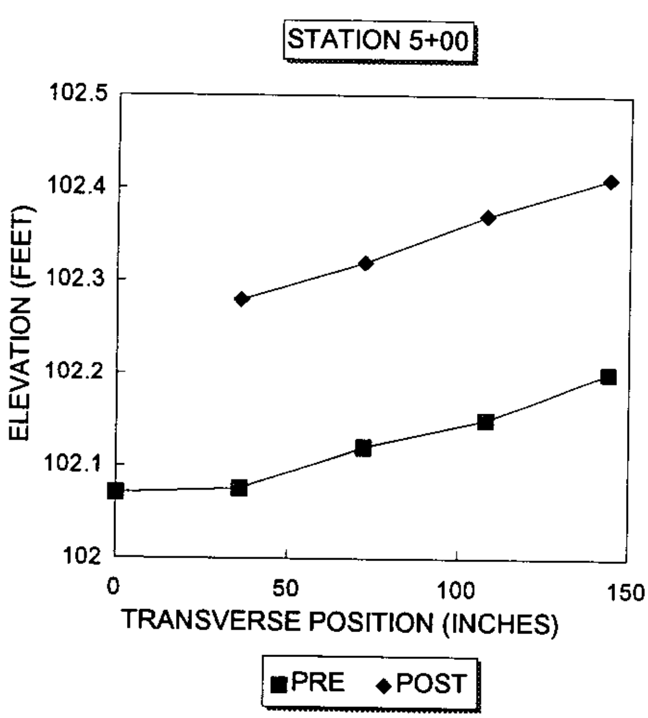

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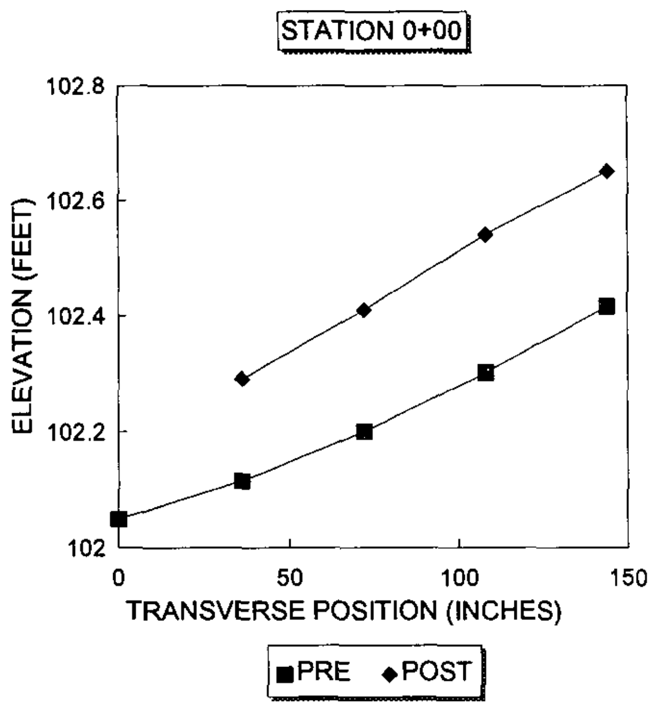

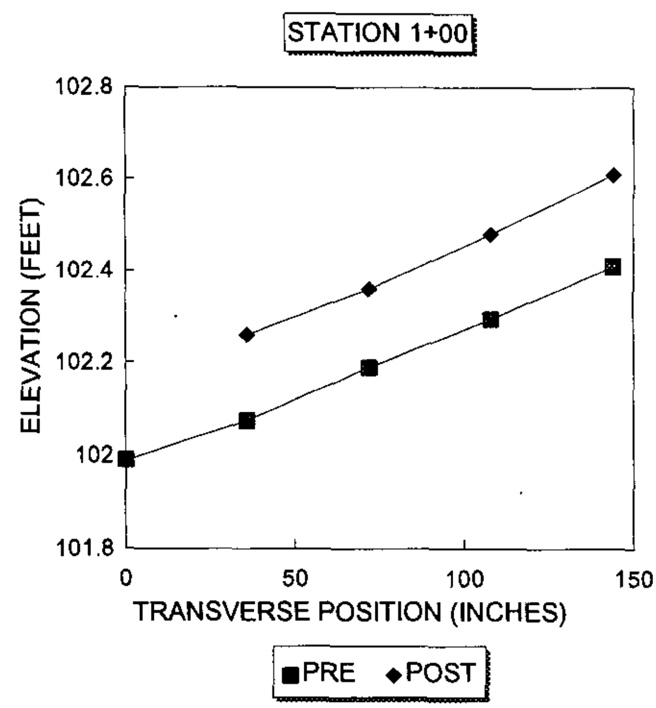

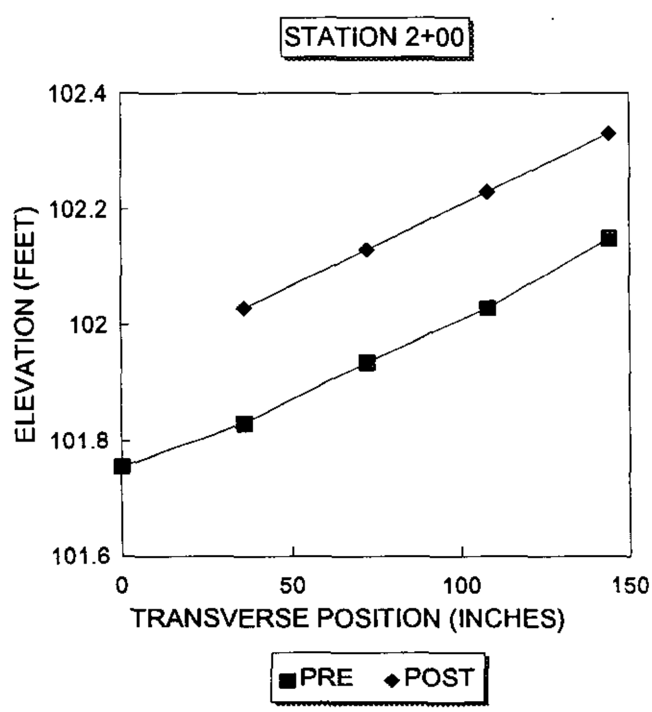

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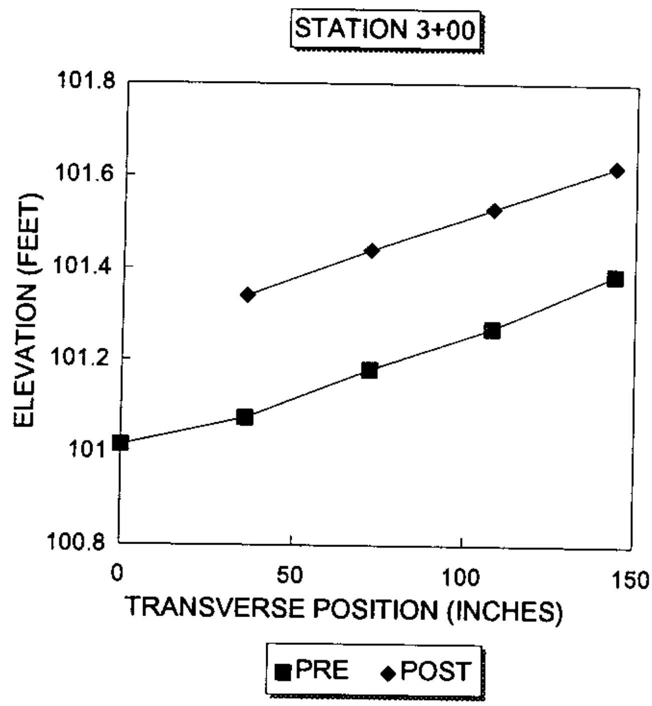

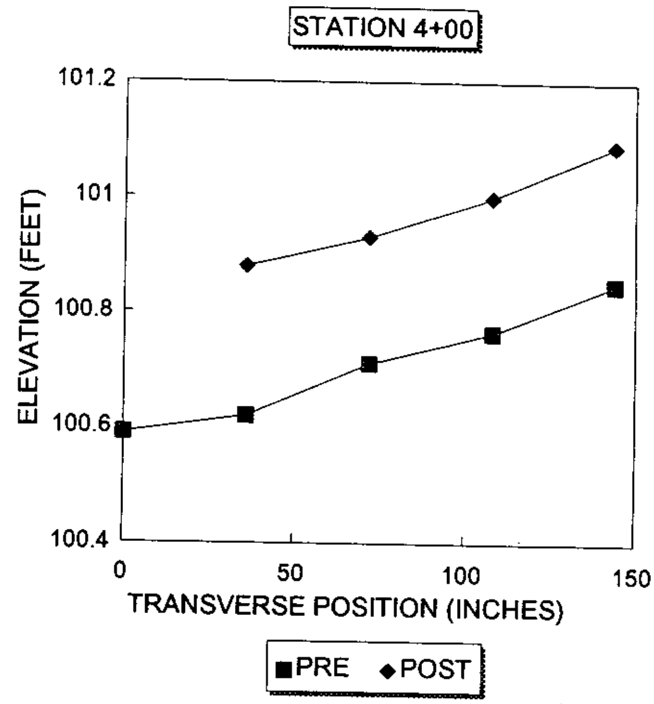

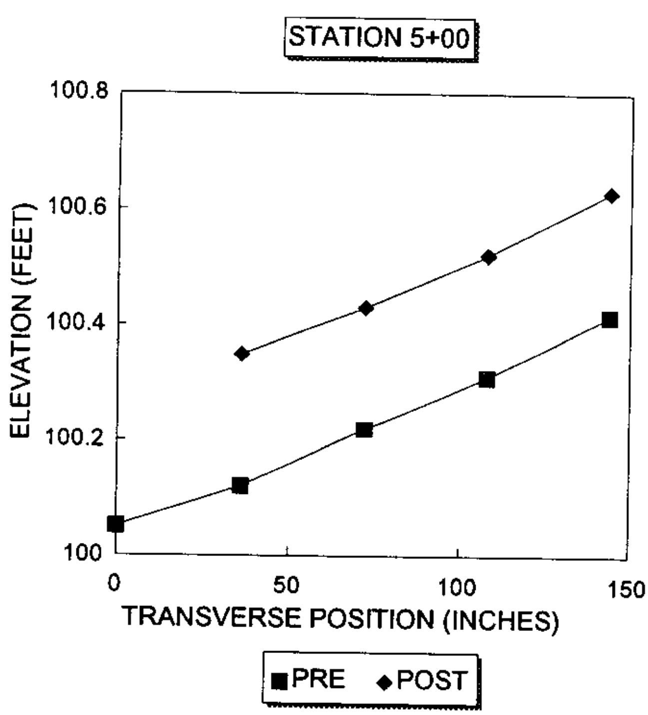

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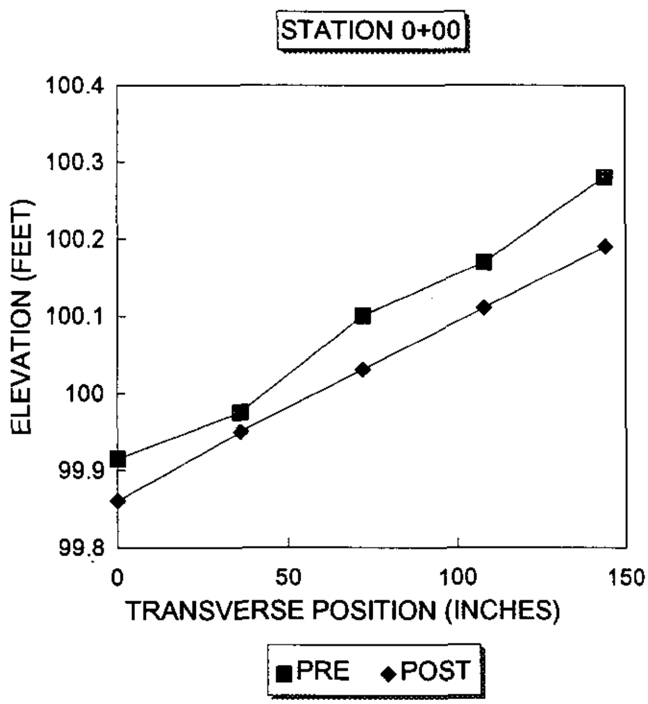

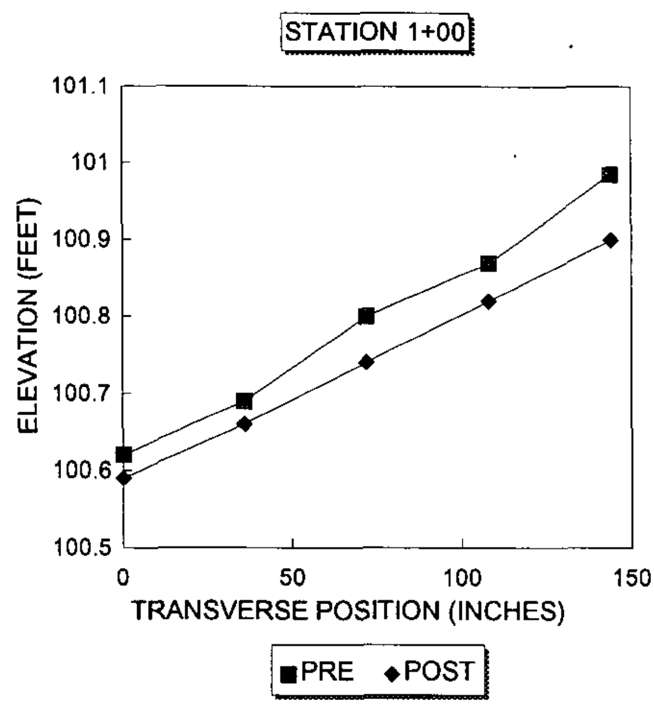

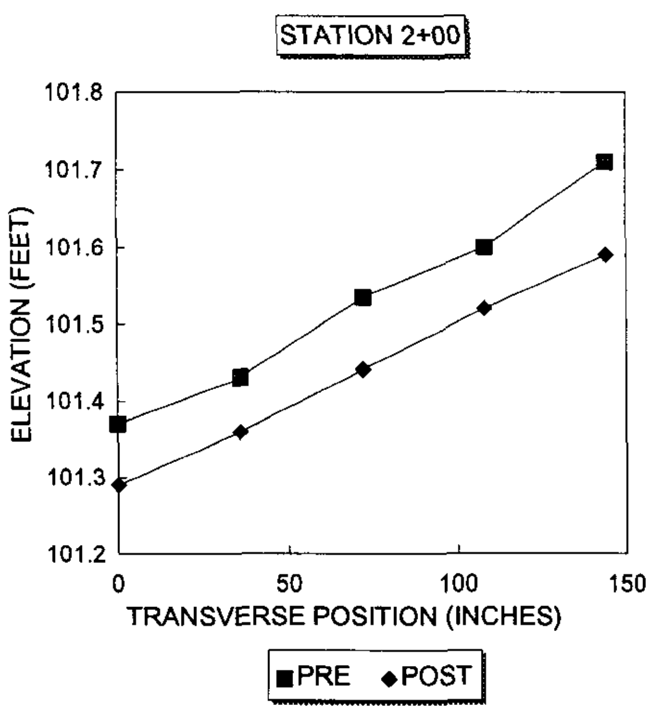

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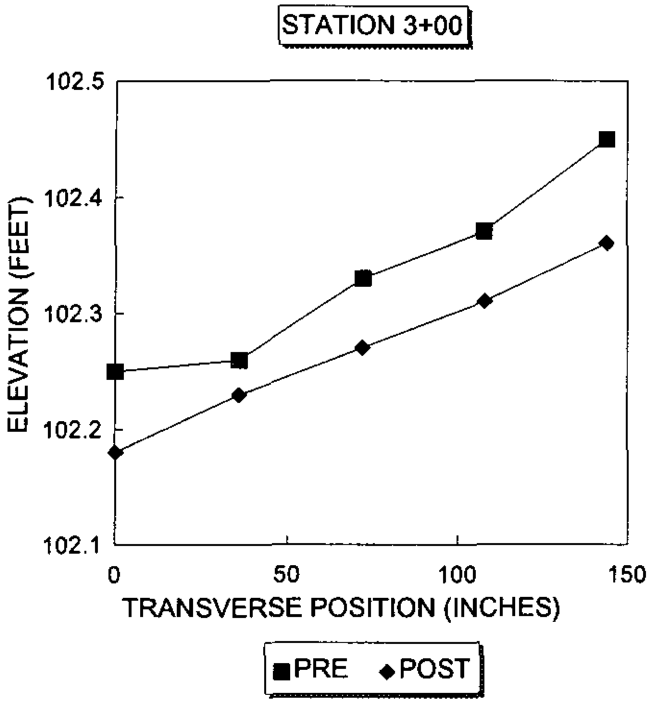

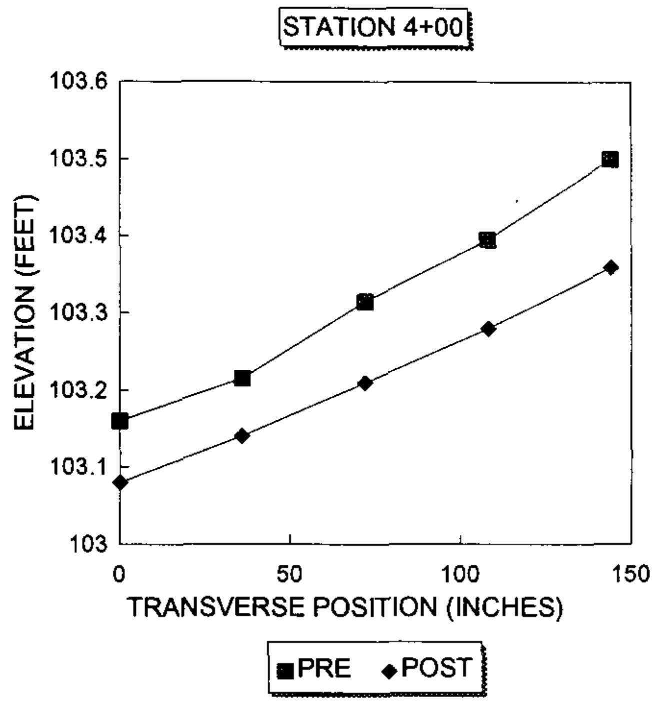

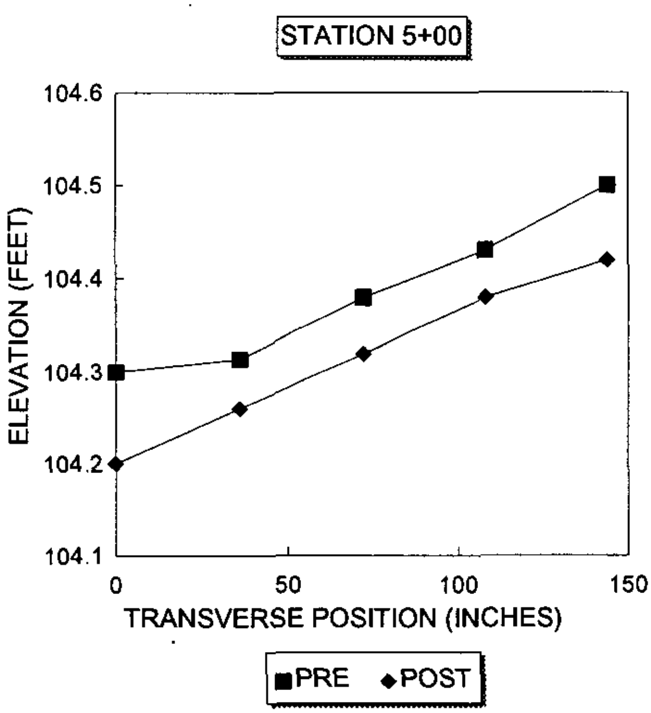

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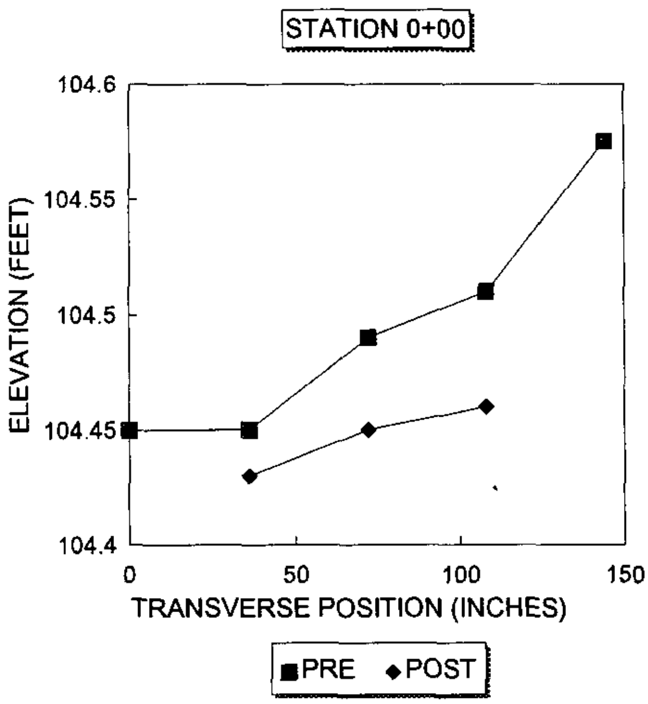

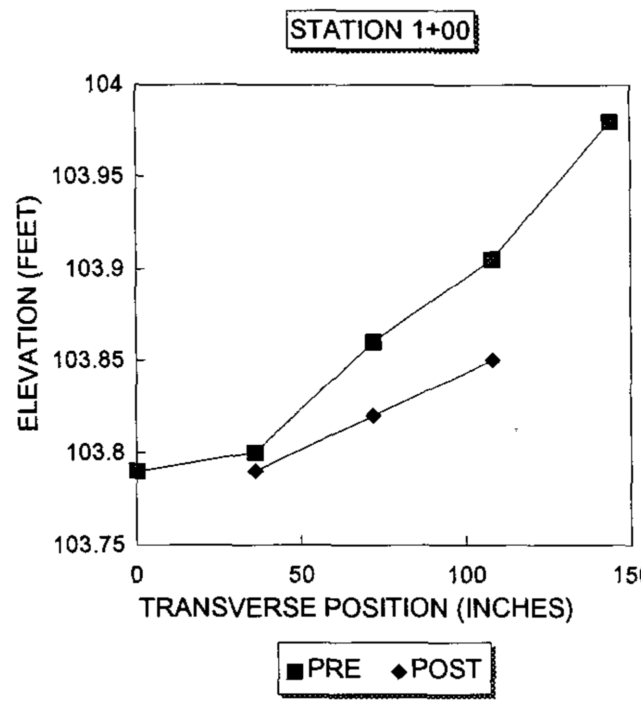

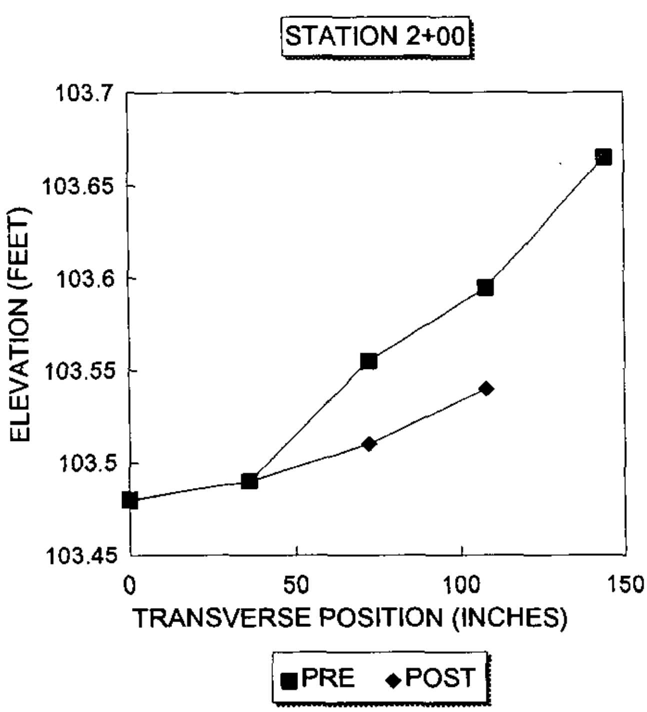

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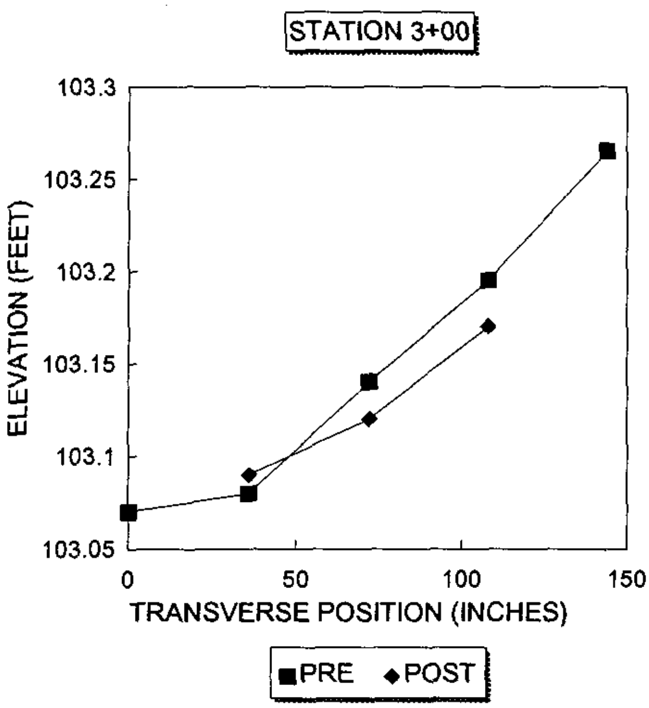

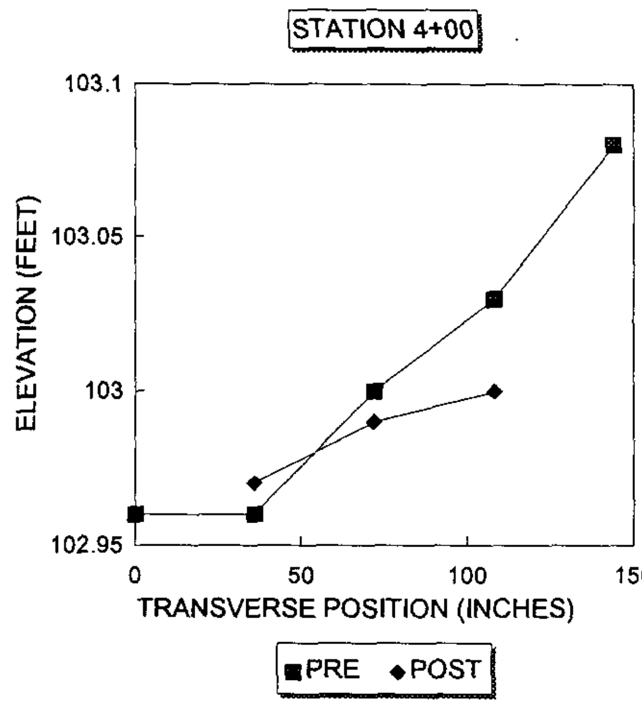

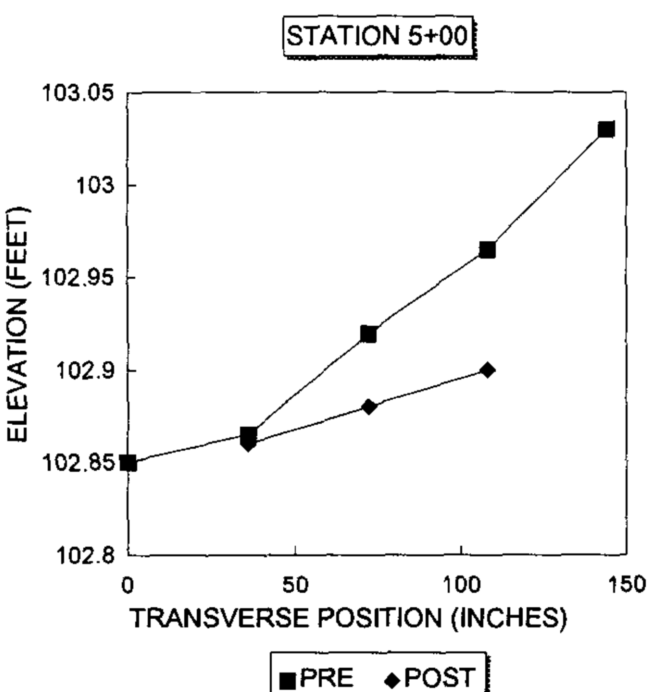

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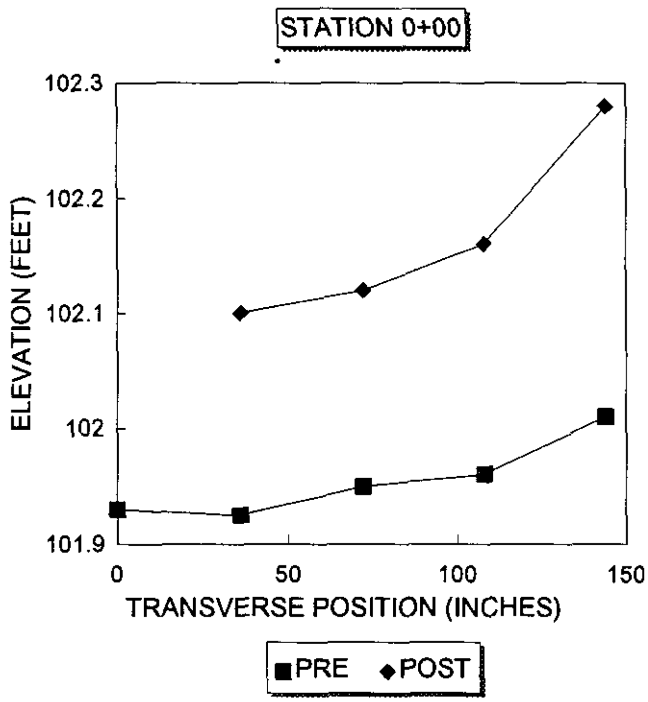

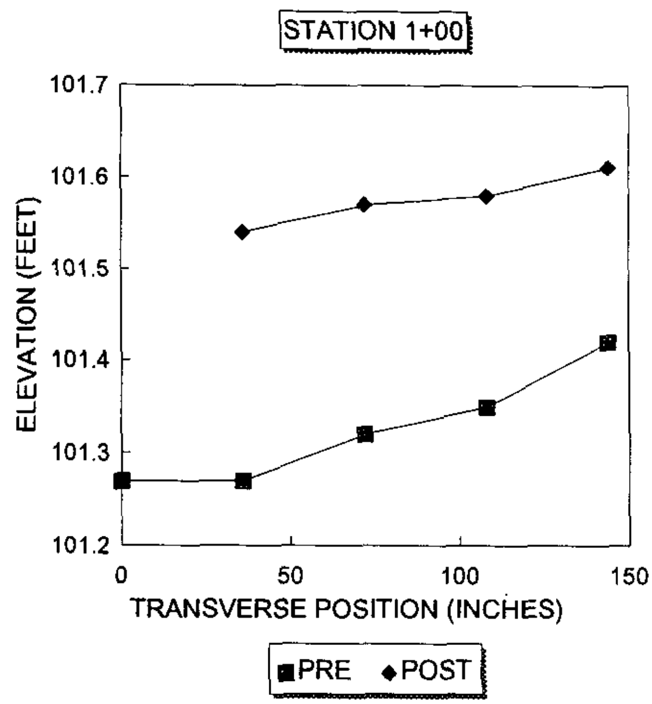

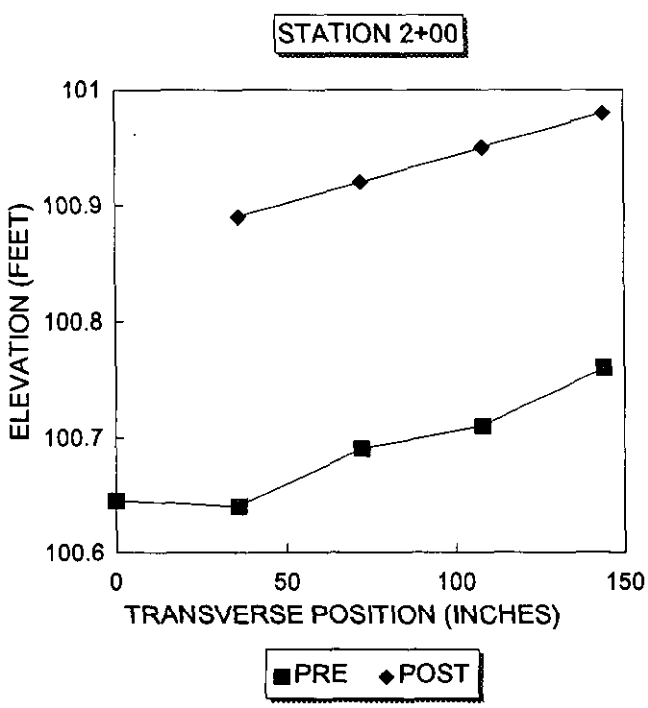

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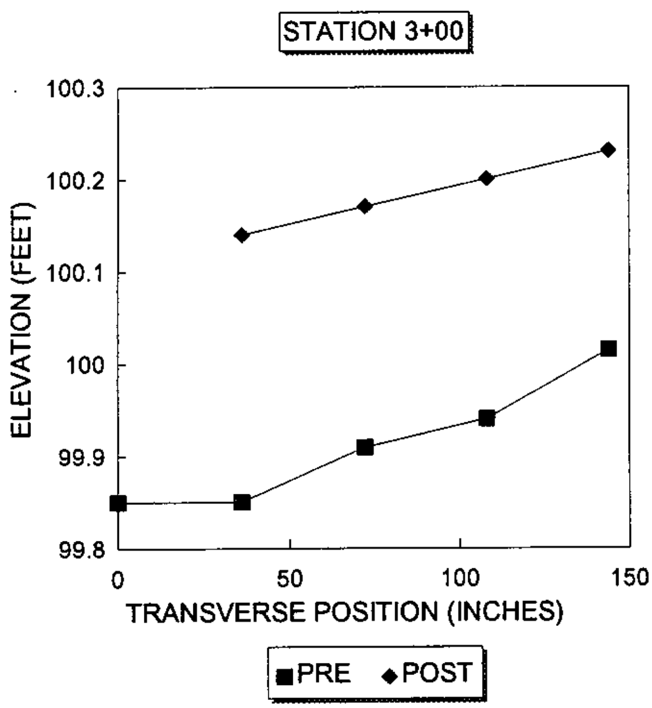

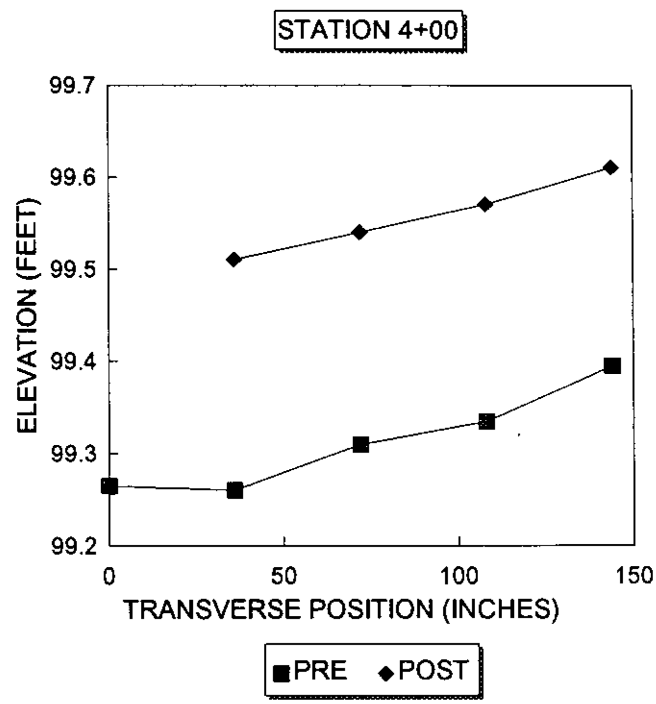

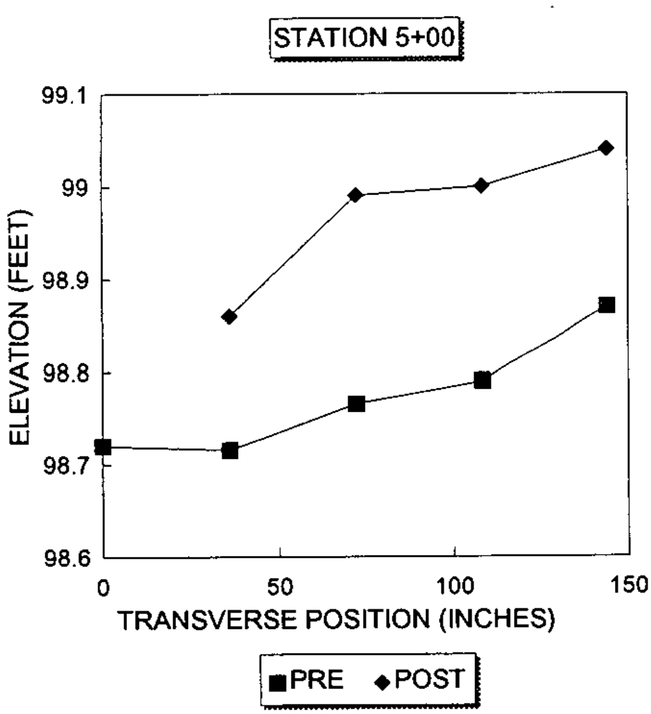

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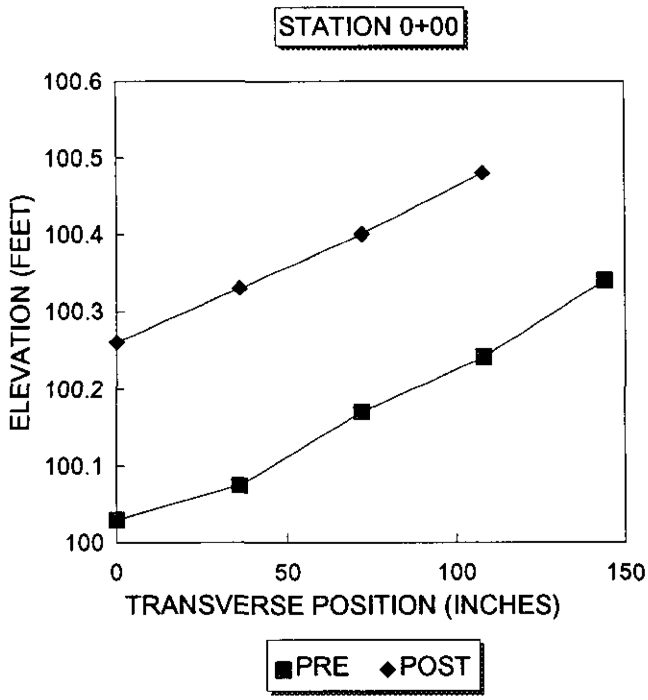
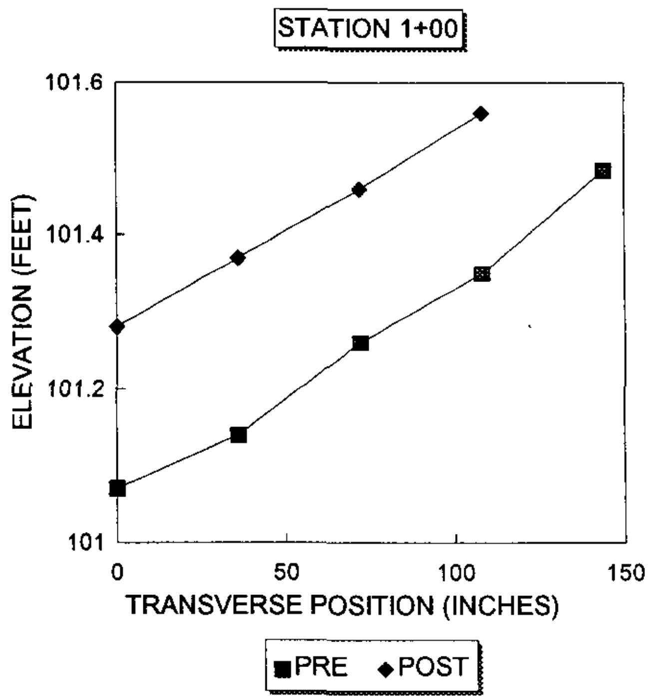
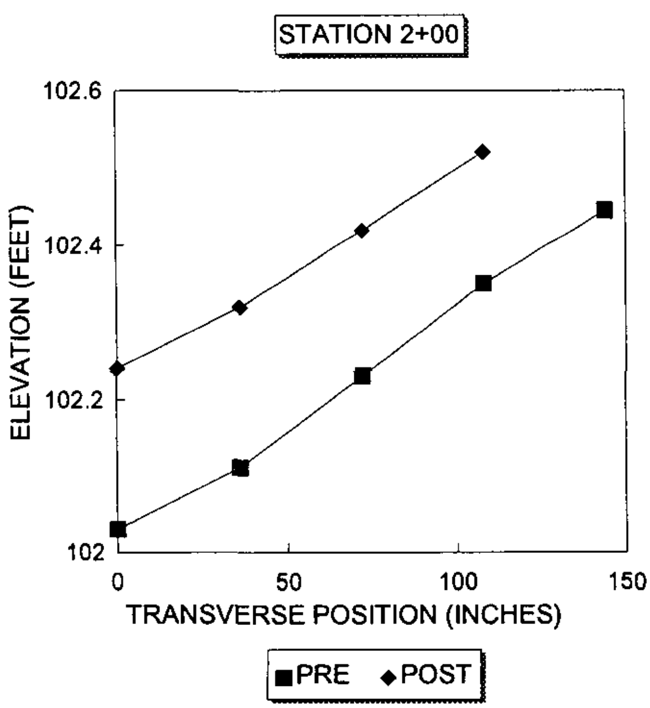
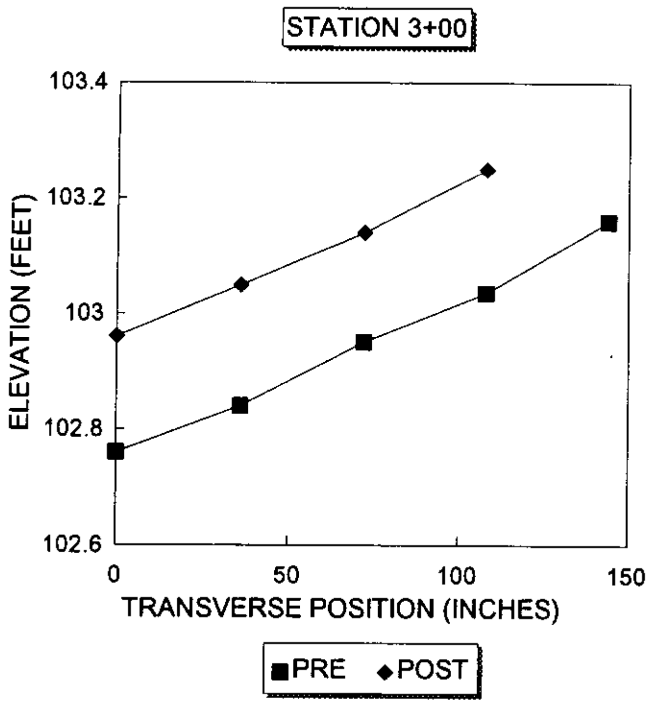
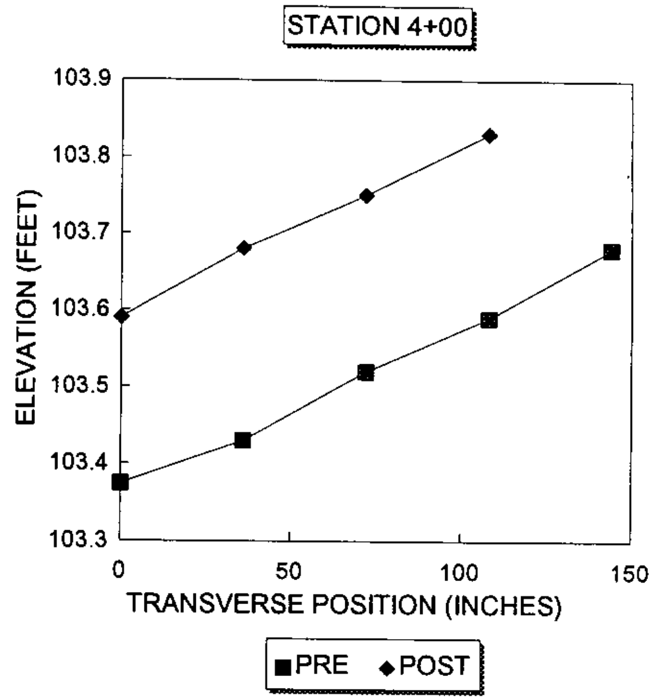


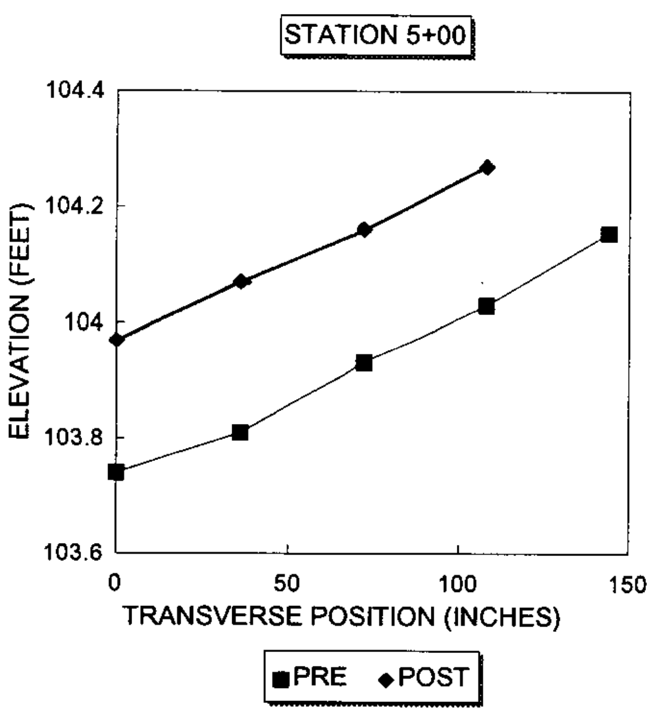




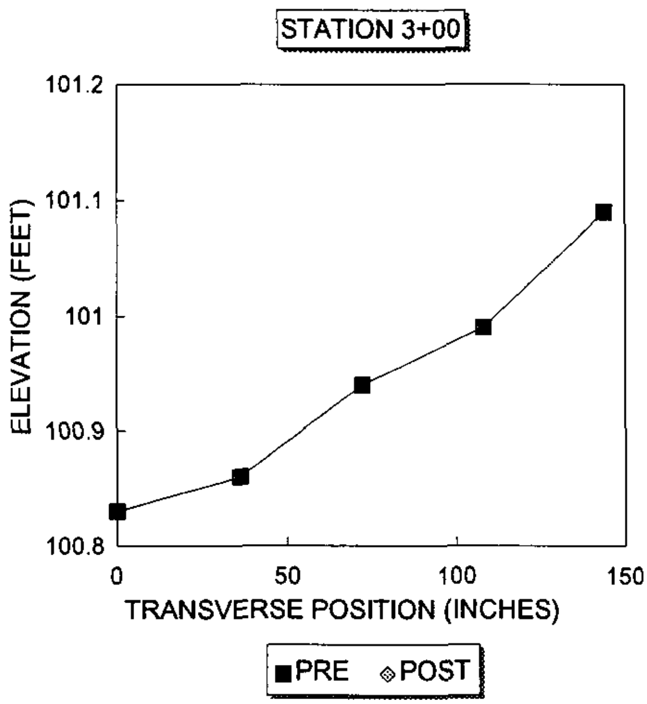
SECTION 130566

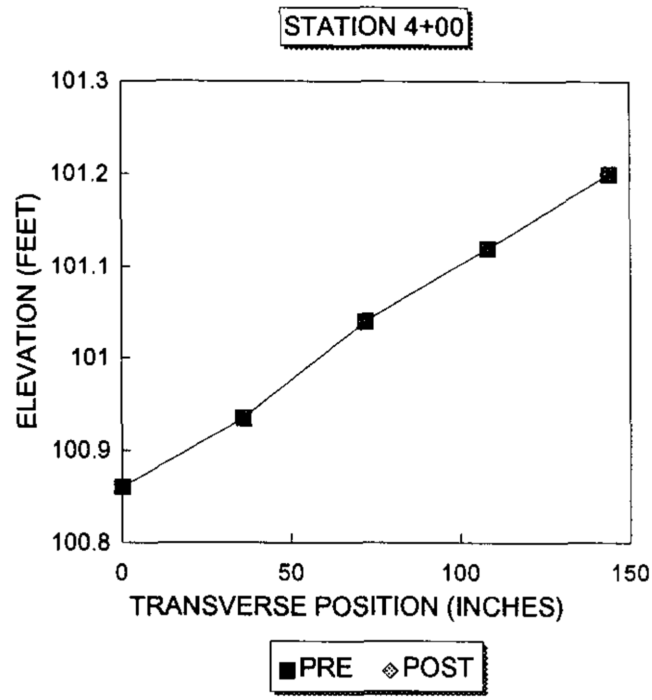


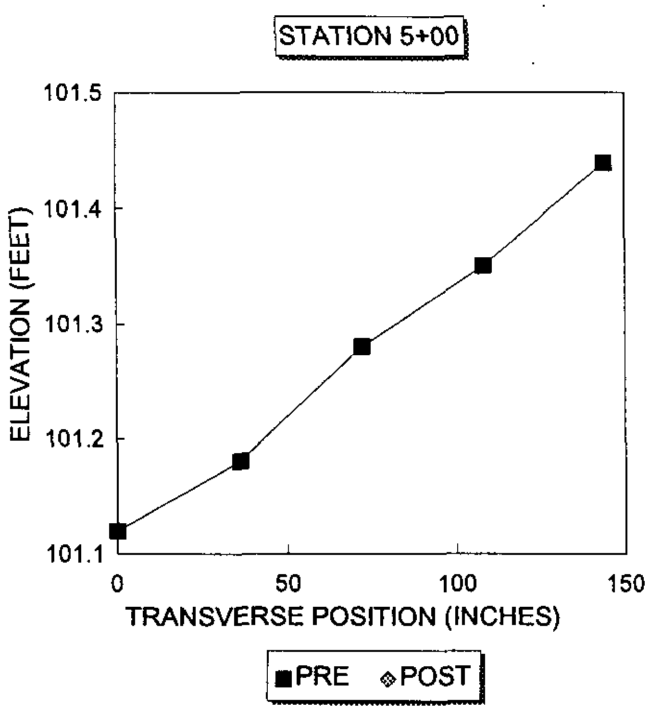




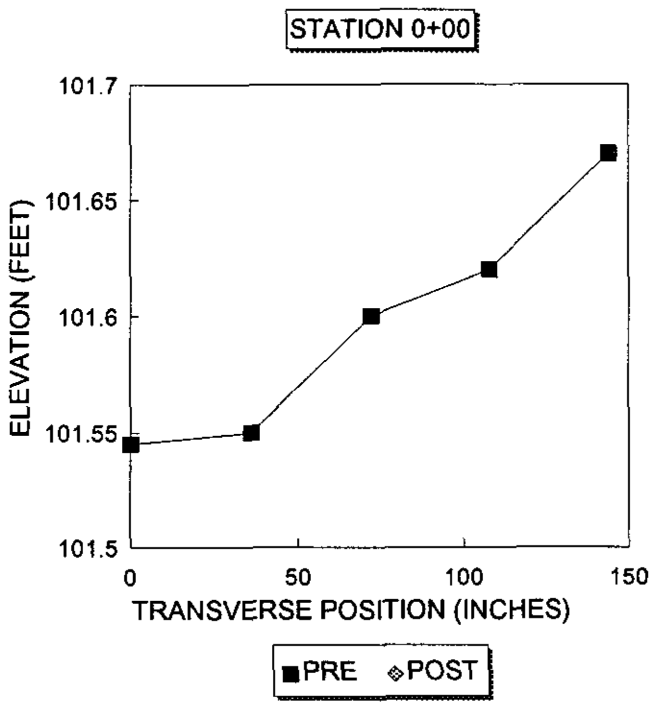
SECTION 130567

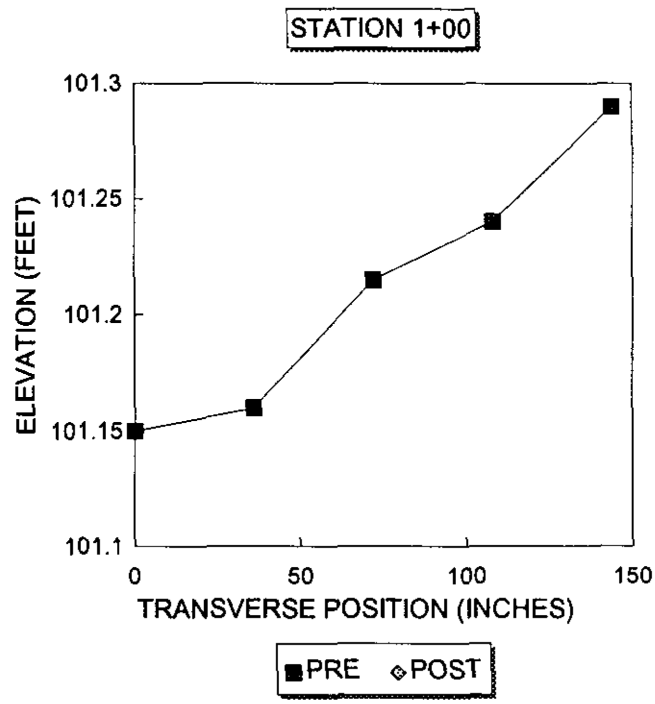


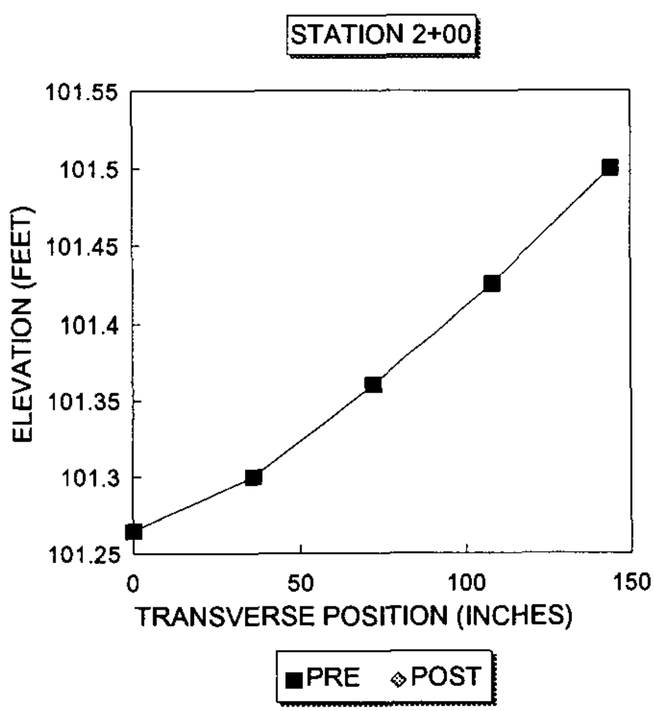




SECTION 130567







APPENDIX E

AVERAGE OVERLAY THICKNESSES

SECTION 130505 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	100.86	0.1	100.9	0.7	101.03	0.2	101.08	0.8	101.17	
	POST	100.87		100.96		101.05		101.15			
1+00	PRE	100.97	0.6	101.02	1.2	101.12	1.2	101.18	1.8	101.3	
	POST	101.02		101.12		101.22		101.33			
2+00	PRE	101.04	0.8	101.08	1.2	101.17	1.1	101.22	1.3	101.31	
	POST	101.11		101.18		101.26		101.33			
3+00	PRE	100.71	0.8	100.75	1.3	100.85	1.1	100.91	1.3	101	
	POST	100.78		100.86		100.94		101.02			
4+00	PRE	100.36	0.8	100.41	1.2	100.55	0.6	100.6	1.2	100.72	
	POST	100.43		100.51		100.6		100.7			
5+00	PRE	99.96	0.6	100.01	1.1	100.15	0.5	100.22	0.8	100.34	
	POST	100.01		100.1		100.19		100.29			

SECTION 130506 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	98.92	1.1	98.99	1.7	99.11	1.4	99.2	1.8	99.34	
	POST	99.01		99.13		99.23		99.35			
1+00	PRE	97.92	1.4	97.97	1.8	98.1	1.3	98.15	1.8	98.27	
	POST	98.04		98.12		98.21		98.3			
2+00	PRE	96.81	1.4	96.85	1.8	96.95	1.4	97.01	1.7	97.11	
	POST	96.93		97		97.07		97.15			
3+00	PRE	95.47	1.3	95.52	1.7	95.62	1.4	95.69	1.7	95.79	
	POST	95.58		95.66		95.74		95.83			
4+00	PRE	93.89	1.6	93.93	2.0	94.03	1.8	94.08	2.2	94.18	
	POST	94.02		94.1		94.18		94.26			
5+00	PRE	92.21	1.6	92.25	1.9	92.35	1.4	92.39	1.8	92.49	
	POST	92.34		92.41		92.47		92.54			

SECTION 130507 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	104.03	4.3	104.06	4.9	104.16	4.6	104.22	4.8	104.3	
	POST	104.39		104.47		104.54		104.62			
1+00	PRE	101.61	4.9	101.65	5.3	101.74	5.0	101.78	5.3	101.87	
	POST	102.02		102.09		102.16		102.22			
2+00	PRE	99.16	4.9	99.2	5.4	99.31	5.0	99.36	5.4	99.46	
	POST	99.57		99.65		99.73		99.81			
3+00	PRE	96.48	5.4	96.54	5.5	96.66	5.3	96.72	5.6	96.84	
	POST	96.93		97		97.1		97.19			
4+00	PRE	93.88	4.9	93.92	5.4	94.02	5.0	94.08	5.4	94.19	
	POST	94.29		94.37		94.44		94.53			
5+00	PRE	91.34	4.7	91.37	5.3	91.47	4.7	91.52	5.2	91.61	
	POST	91.73		91.81		91.86		91.95			

SECTION 130504 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.76	3.6	101.8	4.1	101.94	3.5	101.97	4.3	102.1	
	POST	102.06		102.14		102.23		102.33			
1+00	PRE	99.15	3.4	99.19	3.7	99.3	3.4	99.36	3.6	99.47	
	POST	99.43		99.5		99.58		99.66			
2+00	PRE	96.39	4.2	96.45	4.4	96.58	4.0	96.67	4.2	96.79	
	POST	96.74		96.82		96.91		97.02			
3+00	PRE	93.98	3.4	94.11	2.8	94.13	3.5	94.19	3.8	94.29	
	POST	94.26		94.34		94.42		94.51			
4+00	PRE	91.31	4.1	91.36	4.6	91.47	4.2	91.54	4.4	91.64	
	POST	91.65		91.74		91.82		91.91			
5+00	PRE	88.65	4.9	88.7	5.2	88.8	4.8	88.86	4.9	88.96	
	POST	89.06		89.13		89.2		89.27			

SECTION 130503 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	102.14	3.7	102.17	4.2	102.28	3.8	102.32	4.3	102.43	
	POST	102.45		102.52		102.6		102.68			
1+00	PRE	99.49	3.8	99.53	4.3	99.64	4.1	99.71	4.3	99.81	
	POST	99.81		99.89		99.98		100.07			
2+00	PRE	96.71	4.1	96.74	4.6	96.83	4.2	96.88	4.6	96.98	
	POST	97.05		97.12		97.18		97.26			
3+00	PRE	94.14	5.2	94.17	5.6	94.28	5.4	94.33	5.9	94.43	
	POST	94.57		94.64		94.73		94.82			
4+00	PRE	91.79	3.7	91.82	4.2	91.94	3.8	91.98	4.4	92.08	
	POST	92.1		92.17		92.26		92.35			
5+00	PRE	89.67	4.0	89.7	4.3	89.78	4.2	89.82	4.4	89.91	
	POST	90		90.06		90.13		90.19			

SECTION 130508 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.39	3.8	101.43	4.6	101.55	4.3	101.61	4.7	107.71	
	POST	101.71		101.81		101.91		102			
1+00	PRE	100.2	4.1	100.26	4.6	100.37	4.4	100.45	4.7	100.56	
	POST	100.54		100.64		100.74		100.84			
2+00	PRE	99.46	3.8	99.49	4.4	99.58	4.2	99.62	4.7	99.71	
	POST	99.78		99.86		99.93		100.01			
3+00	PRE	99.01	4.4	99.06	4.7	99.17	4.1	99.22	4.3	99.34	
	POST	99.38		99.45		99.51		99.58			
4+00	PRE	99.24	4.2	99.27	4.6	99.35	4.3	99.39	4.8	99.46	
	POST	99.59		99.65		99.71		99.79			
5+00	PRE	99.78	3.2	99.8	3.7	99.86	3.8	99.88	4.4	99.94	
	POST	100.05		100.11		100.18		100.25			

SECTION 130509 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	100.55	2.3	100.53	2.9	100.57	2.6	100.57	2.8	100.61	2.5
	POST	100.74		100.77		100.79		100.8		100.82	
1+00	PRE	101.66	1.9	101.63	2.9	101.68	2.4	101.66	2.8	101.7	2.5
	POST	101.82		101.87		101.88		101.89		101.91	
2+00	PRE	103.08	1.7	103.06	2.4	103.12	2.0	103.11	2.8	103.16	2.5
	POST	103.22		103.26		103.29		103.34		103.37	
3+00	PRE	104.75	2.3	104.76	2.8	104.85	2.0	104.8	-62.4	104.97	1.9
	POST	104.94		104.99		105.02		99.6		105.13	
								105.07			
4+00	PRE	106.94	1.7	106.93	2.5	106.99	2.2	101.05	71.4	107.04	2.8
	POST	107.08		107.14		107.17		107		107.27	
								107.22			
5+00	PRE	109.41	1.7	109.42	2.3	109.49	1.9	109.5	2.4	109.56	2.4
	POST	109.55		109.61		109.65		109.7		109.76	

SECTION 130502 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.55	0.8	101.57	1.1	101.63	0.7	101.66	1.0	101.73	0.6
	POST	101.62		101.66		101.69		101.74		101.78	
1+00	PRE	104.51	1.0	104.52	1.3	104.57	1.3	104.6	1.4	104.65	1.4
	POST	104.59		104.63		104.68		104.72		104.77	
2+00	PRE	107.34	0.8	107.35	1.4	107.43	1.0	107.45	1.4	107.52	1.2
	POST	107.41		107.47		107.51		107.57		107.62	
3+00	PRE	110.42	0.2	110.43	0.6	110.47	0.6	110.49	0.8	110.54	0.8
	POST	110.44		110.48		110.52		110.56		110.61	
4+00	PRE	113.5	0.7	113.53	0.8	113.6	0.7	113.65	1.0	113.73	0.7
	POST	113.56		113.6		113.66		113.73		113.79	
5+00	PRE	116.58	0.2	116.59	0.7	116.64	0.7	116.68	1.0	116.73	1.1
	POST	116.6		116.65		116.7		116.76		116.82	

SECTION 130567 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.55		101.55		101.6		101.62		101.7	
	POST										
1+00	PRE	101.2		101.2		101.2		101.2		101.3	
	POST										
2+00	PRE	101.27		101.3		101.36		101.43		101.5	
	POST										
3+00	PRE	100.73		100.86		100.94		100.99		101.1	
	POST										
4+00	PRE	100.86		100.94		101.04		101.12		101.2	
	POST										
5+00	PRE	101.12		101.18		101.28		101.35		101.4	
	POST										

SECTION 130563 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	99.92	-0.7	99.98	-0.4	100.1	-0.8	100.17	-0.7	100.28	-1.1
	POST	99.86		99.95		100.03		100.11		100.19	
1+00	PRE	100.62	-0.4	100.69	-0.4	100.8	-0.7	100.87	-0.6	100.99	-1.1
	POST	100.59		100.66		100.74		100.82		100.9	
2+00	PRE	101.37	-1.0	101.43	-0.8	101.54	-1.2	101.6	-1.0	107.71	-73.4
	POST	101.29		101.36		101.44		101.52		101.59	
3+00	PRE	102.25	-0.8	102.26	-0.4	102.33	-0.7	102.37	-0.7	102.45	-1.1
	POST	102.18		102.23		102.27		102.31		102.36	
4+00	PRE	103.16	-1.0	103.22	-1.0	103.32	-1.3	103.4	-1.4	103.5	-1.7
	POST	103.08		103.14		103.21		103.28		103.36	
5+00	PRE	104.3	-1.2	104.32	-0.7	104.38	-0.7	104.43	-0.6	104.5	-1.0
	POST	104.2		104.26		104.32		104.38		104.42	

SECTION 130566 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	100.03	2.8	100.08	3.0	100.17	2.8	100.24	2.9	100.34	
	POST	100.26		100.33		100.4		100.48			
1+00	PRE	101.07	2.5	101.14	2.8	101.26	2.4	101.35	2.5	101.49	
	POST	101.28		101.37		101.46		101.56			
2+00	PRE	102.03	2.5	102.11	2.5	102.23	2.3	102.35	2.0	102.45	
	POST	102.24		102.32		102.42		102.52			
3+00	PRE	102.76	2.4	102.84	2.5	102.95	2.3	103.04	2.5	103.16	
	POST	102.96		103.05		103.14		103.25			
4+00	PRE	103.38	2.5	103.43	3.0	103.52	2.8	103.59	2.9	103.68	
	POST	103.59		103.68		103.75		103.83			
5+00	PRE	103.74	2.8	103.81	3.1	103.93	2.8	104.03	2.9	104.16	
	POST	103.97		104.07		104.16		104.27			

SECTION 130562 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	102.05		102.12	2.0	102.2	2.5	102.3	2.9	102.42	2.8
	POST			102.29		102.41		102.54		102.65	
1+00	PRE	101.99		102.08	2.2	102.19	2.0	102.3	2.2	102.41	2.4
	POST			102.26		102.36		102.48		102.61	
2+00	PRE	101.76		101.83	2.4	101.94	2.3	102.03	2.4	102.15	2.2
	POST			102.03		102.13		102.23		102.33	
3+00	PRE	101.02		101.08	3.1	101.18	3.1	101.27	3.1	101.39	2.8
	POST			101.34		101.44		101.53		101.62	
4+00	PRE	100.59		100.62	3.1	100.71	2.6	100.77	2.8	100.85	2.9
	POST			100.88		100.93		101		101.09	
5+00	PRE	100.05		100.12	2.8	100.22	2.5	100.31	2.5	100.42	2.5
	POST			100.35		100.43		100.52		100.63	

SECTION 130561 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	104.17		104.21	2.4	104.31	2.0	104.38	2.3	104.48	2.4
	POST			104.41		104.48		104.57		104.68	
1+00	PRE	103.68		103.74	2.6	103.83	2.5	103.91	2.5	104.01	2.5
	POST			103.96		104.04		104.12		104.22	
2+00	PRE	103.44		103.47	2.4	103.54	2.2	103.59	2.4	103.67	2.3
	POST			103.67		103.72		103.79		103.86	
3+00	PRE	103.17		103.19	2.4	103.24	1.9	103.26	2.3	103.33	1.8
	POST			103.39		103.4		103.45		103.48	
4+00	PRE	102.67		102.66	2.2	102.71	1.9	102.73	2.2	102.79	1.9
	POST			102.84		102.87		102.91		102.95	
5+00	PRE	102.07		102.08	2.4	102.12	2.4	102.15	2.6	102.22	2.3
	POST			102.28		102.32		102.37		102.41	

SECTION 130565 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.93		101.93	2.0	101.95	2.0	101.96	2.4	102.01	3.2
	POST			102.1		102.12		102.16		102.28	
1+00	PRE	101.27		101.27	3.2	101.32	3.0	101.35	2.8	101.42	2.3
	POST			101.54		101.57		101.58		101.61	
2+00	PRE	100.65		100.64	3.0	100.69	2.8	100.71	2.9	100.76	2.6
	POST			100.89		100.92		100.95		100.98	
3+00	PRE	99.85		99.85	3.5	99.91	3.1	99.94	3.1	100.02	2.5
	POST			100.14		100.17		100.2		100.23	
4+00	PRE	99.27		99.26	3.0	99.31	2.8	99.34	2.8	99.4	2.5
	POST			99.51		99.54		99.57		99.61	
5+00	PRE	98.72		98.72	1.7	98.77	2.6	98.79	2.5	99.87	-10.0
	POST			98.86		98.99		99		99.04	

SECTION 130564 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	104.45		104.45	-0.2	104.49	-0.5	104.51	-0.6	104.58	
	POST			104.43		104.45		104.46			
1+00	PRE	103.79		103.8	-0.1	103.86	-0.5	103.91	-0.7	103.98	
	POST			103.79		103.82		103.85			
2+00	PRE	103.48		103.49	0.0	103.56	-0.6	103.6	-0.7	103.67	
	POST			103.49		103.51		103.54			
3+00	PRE	103.07		103.08	0.1	103.14	-0.2	103.2	-0.4	103.27	
	POST			103.09		103.12		103.17			
4+00	PRE	102.96		102.96	0.1	103	-0.1	103.03	-0.4	103.08	
	POST			102.97		102.99		103			
5+00	PRE	102.85		102.87	-0.1	102.92	-0.5	102.97	-0.8	103.03	
	POST			102.86		102.88		102.9			

SECTION 130510 GEORGIA

Trans.	Offset	0'	Overlay Depth (in.)	3'	Overlay Depth (in.)	6'	Overlay Depth (in.)	9'	Overlay Depth (in.)	12'	Overlay Depth (in.)
0+00	PRE	101.83	1.1	101.83	1.8	101.89	1.6	101.93	1.7	102	
	POST	101.92		101.98		102.02		102.07			
1+00	PRE	101.99	0.8	101.99	1.6	102.04	1.6	102.08	2.0	102.13	
	POST	102.06		102.12		102.17		102.25			
2+00	PRE	102.29	0.5	102.29	1.4	102.32	1.8	102.36	2.2	102.4	
	POST	102.33		102.41		102.47		102.54			
3+00	PRE	102.7	1.0	102.69	1.4	102.72	1.4	102.74	1.8	102.78	
	POST	102.78		102.81		102.84		102.89			
4+00	PRE	103.14	0.2	103.12	1.1	103.15	1.2	103.17	1.6	103.22	
	POST	103.16		103.21		103.25		103.3			
5+00	PRE	103.62	0.7	103.62	1.3	103.66	1.4	103.69	1.8	103.74	
	POST	103.68		103.73		103.78		103.84			

APPENDIX F

PHOTOGRAPHS

Page Nº.

Photo 1. Overview of 130500 Prior to Preconstruction Sampling

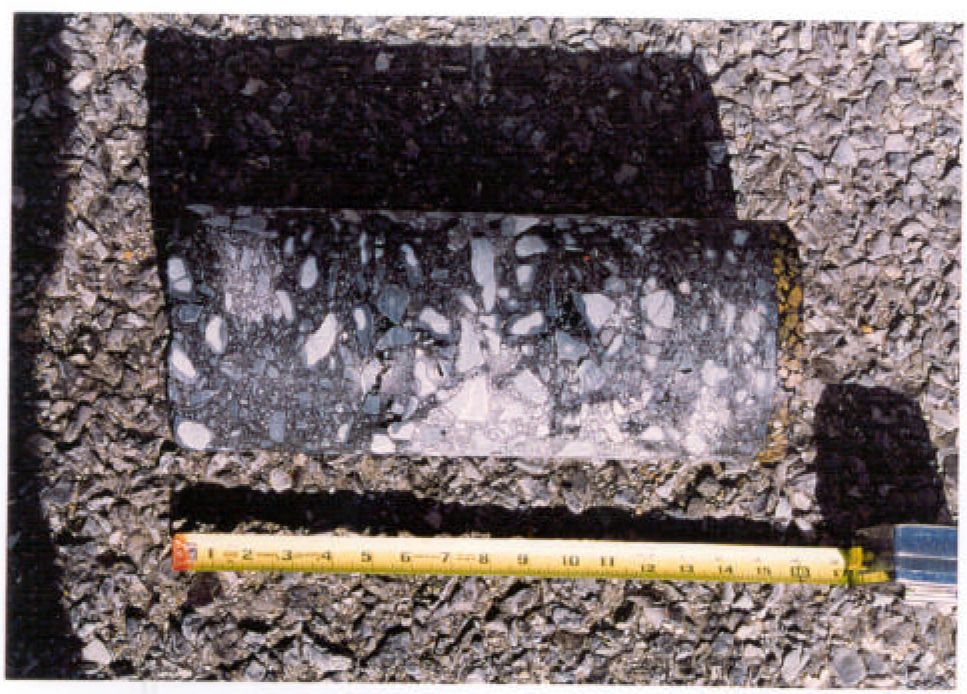


Photo 2. Core Sample Obtained During Preconstruction Sampling

Photo 3. Close-up of Milling Operation

Photo 4. Brooming Effort Following Milling Operation

Photo 5. ROADTEC Paver Placing First Lift on a Tacked Surface Prior to Test Section 130561

Photo 6. Breakdown Compaction with an Ingram Triple-Drum Roller

Photo 7. APAC Construction Co. Batch Plant
Located in Kennesaw, GA

Photo 8. Aggregate Bins - APAC Construction Co., Kennesaw, GA

Photo 9. Postconstruction Sampling and Testing Efforts

Photo 10. Postconstruction Core Samples