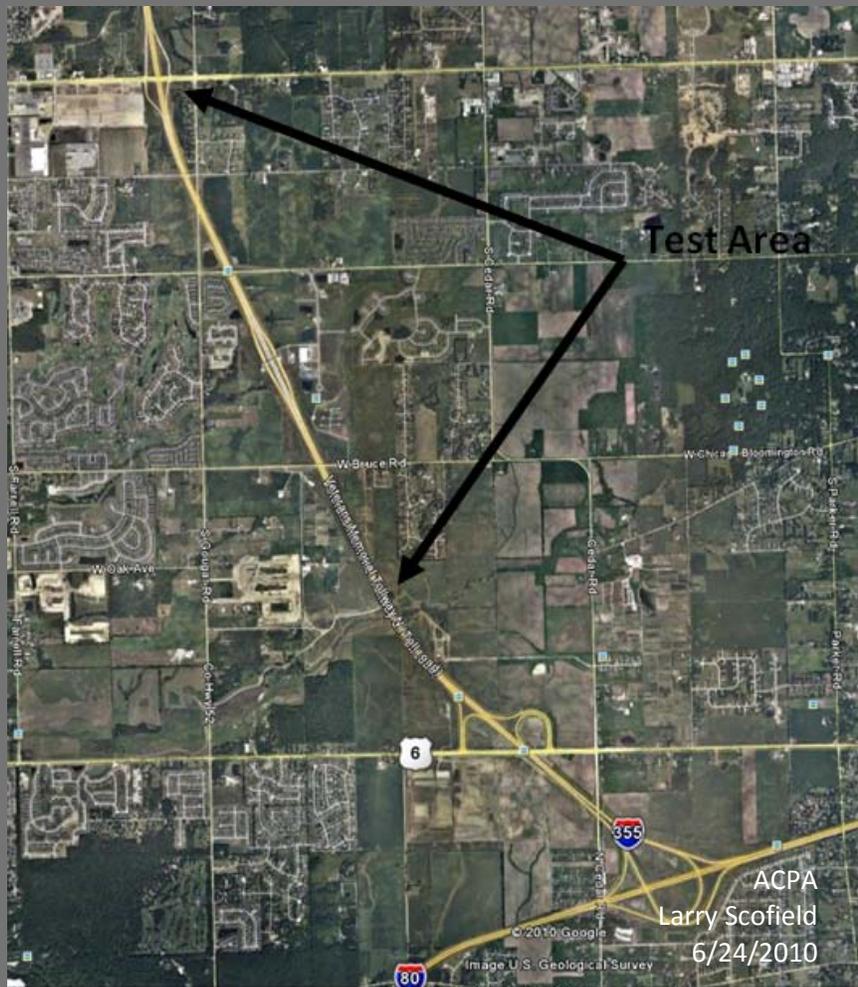


2010

Chicago I-355 Testing of NCHRP 10-67 Site Locations

Preliminary Report

On June 19, 2010 OBSI testing was conducted on 10 of the texture test sections constructed as part of the NCHRP 10-67 research and one additional test section constructed for ACPA. The sections had been in-service approximately 32 months at the time of the testing. The results indicate that the diamond ground surfaces were the quietest, followed by the drag textures, longitudinal tined, and then the transverse tined textures. OBSI values ranged from 100 dBA to 105 dBA.



Introduction

In 2009 the National Cooperative Highway Research Program (NCHRP) published Report 634 “Texturing of Concrete Pavements”. This report was the culmination of a multiyear effort by Applied Research Associates to develop procedures for recommending appropriate concrete textures for specific applications and ranges of climate, site, and traffic conditions. The project, which was intended for new and hardened concrete surfaces, consisted of a review of the literature, conducting field evaluations of textures in 13 states, and constructing texture test sections on a new section of I-355 near Tinley Park, Illinois. The research developed systematic procedures to rank friction, texture, and noise such that promising textures which optimized all three attributes could be readily identified.

In the summer of 2007, thirteen texture test sections were constructed on I-355 between I-80 on the south end and 163st on the north end. The texture types and associated test section numbers are indicated in Table 1. Layouts of the test sections are indicated in Appendix 1.

Table 1 Test Section Texture Types and Descriptions

Test Section No.	Texture Pre-Treatment	Final Texture Type	OBSI Testing Conducted (Y= Yes)
1A	None	Heavy Turf Drag	
1B	None	Heavy Turf Drag	
2	None	Long Tine- ¾” by 0.13”	Y
3	None	Diamond Grinding (110 spacers)	Y
4		NOT CONSTRUCTED--COST	
5A	Std Turf Drag	Long Tine- ¾” by 0.13”	Y
5B	Heavy Turf Drag	Long Tine- ¾” by 0.13”	Y
6	Std Turf Drag	Shallow Long Tine—¾” by <0.1”	Y
7	Burlap Drag	Long Groove—¾” by 0.25	
8	Std Turf Drag	Long Groove—¾” by 0.25	Y
9	Burlap Drag	Transverse Tine—0.5” by 0.13” (Georgia)	Y
10	Burlap Drag	Variable Transverse Tine—variable by 0.13”	Y
11	Burlap drag	Transverse Tine—1” by 0.13in	Y
12	Std Turf Drag	Skewed Variable Tine—variable by 0.13”	Y
ACPA	None	NGCS	Y

OBSI testing was conducted on June 19, 2010 between 11 AM and 1 PM with temperatures ranging between 79 and 84° F. Test sections were located by visually observing the texture changes

while driving and by using landmarks such as overpasses etc. In most cases attempts were made to initiate the OBSI testing at the beginning of the section.

OBSI testing was conducted using the ACPA dual probe system and the ACPA 2009 SRTT tire. Testing was conducted at 60 mph and the results analyzed between 500 Hz and 5000 Hz.

OBSI Test Results

During OBSI testing of the southbound roadway it was noted that the pressure to intensity index was not meeting the AASHTO TP76 criteria. Since the northbound readings were unaffected and only the southbound direction affected, this is probably a result of the wind blowing towards the east. When traveling southbound with an easterly wind blowing, the wind directly impacts the microphones. When traveling in the northbound direction the microphones are shielded by the vehicle body. The ACPA sequential test method was used which collects three consecutive (e.g. sequences) five second readings at each test section location. When the test section is shorter than 1320 ft, only the sequences within the section are used. Table 1 indicates the three sequences for each of the test sections and indicates which of the sequences failed the pressure to intensity index and also which sequences were used for the analysis. When only one sequence past the PI criteria it was used, if none passed then the sequences coming closest to passing were used. In most cases, the failed PI values were close to passing. Retests confirmed that until the wind changed the problem would persist and scheduling only allowed for testing at that time.

Table 1 Pressure to Intensity Index Quality Check for Each Test Sequence

South Bound Roadway					North Bound Roadway				
Test Section No.	Sequence Number			Used in Analysis	Test Section No.	Sequence Number			Used in Analysis
	S1	S2	S3			S1	S2	S3	
11	Bad	Bad	Bad		9	Good	Good	Good	All
2	Bad	Good	Good	S2 & S3	10	Good	Good	Good	All
1B	Bad	Bad	Bad	S3	8	Good	Good	Good	All
5A	Bad	Bad	Bad	S1 & S2	3	Good	Good	Good	All
6	Bad	Bad	Good	S3	NGCS	Good	Good	Good	All
12	Good	Bad	Good	S1 & S3		Good	Good	Good	All

Figure 1 indicates the results of the OBSI testing on textures that have been in service for approximately 32 months. As categories, the diamond ground textures are the quietest, the drag textures next quietest, followed by the longitudinal tined surfaces with transverse tined textures exhibiting the highest levels. The exceptions to these categories are the shallow tined long tined pavement that was similar in level to the drag textures and the Georgia 1/2" UTT that was similar to the longitudinal tined textures. The CDG texture exhibited the lowest level of all surfaces.

Figure 2 indicates the one-third octave spectra for the eleven textures. The same color scheme used in Figure 1 was also used in Figure 2. That is, diamond ground surfaces in green, longitudinal tining in yellow, transverse tining in red, and drag textures in brown and longitudinal grooving in light green. The skewed random transverse tining produced the highest levels at all center band frequencies. The

other transverse tined textures exhibited the highest levels at frequencies above 1600 Hz. It is interesting to note that the 1 inch transverse spacing produces a tonal spike at the 1000 Hz level while the 1/2 inch transverse tining produces a tonal spike at 1600 Hz which corresponds to the tread passage frequency for each of the spacings.

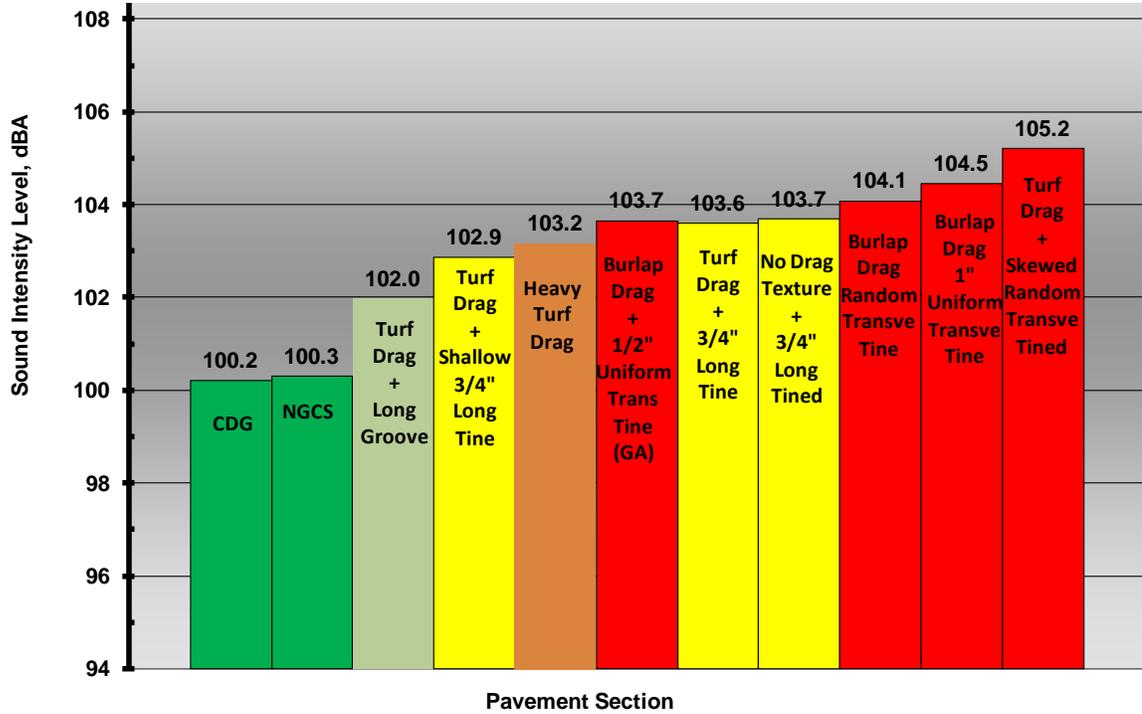


Figure 1 Overall A-weighted OBSI Levels for Test Sections

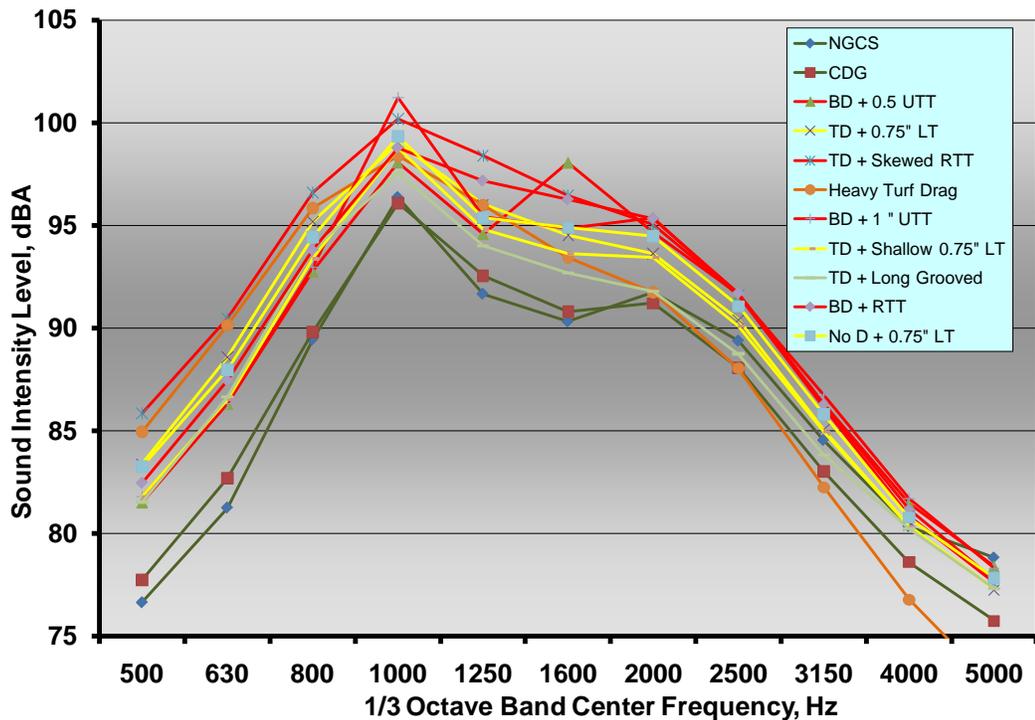


Figure 2 One Third Octave Spectra for the Test Sections

References

1. Hall, J.W., et al, "Texturing of Concrete Pavements," NCHRP Report 634, 2009

Appendix 1 Layout of NCHRP 10-67 Test Sections

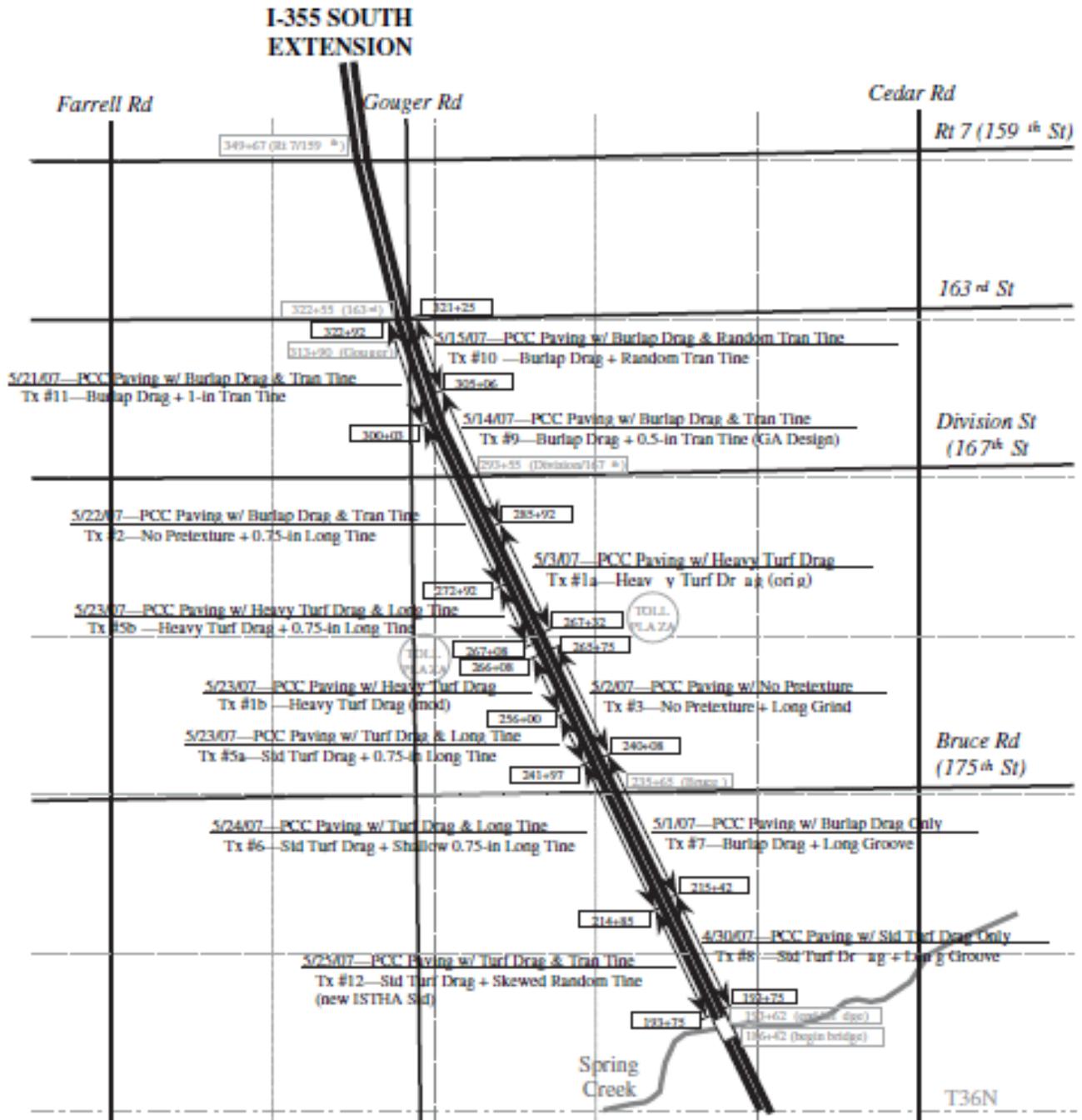


Figure 1-1 Overall View of All Sections¹

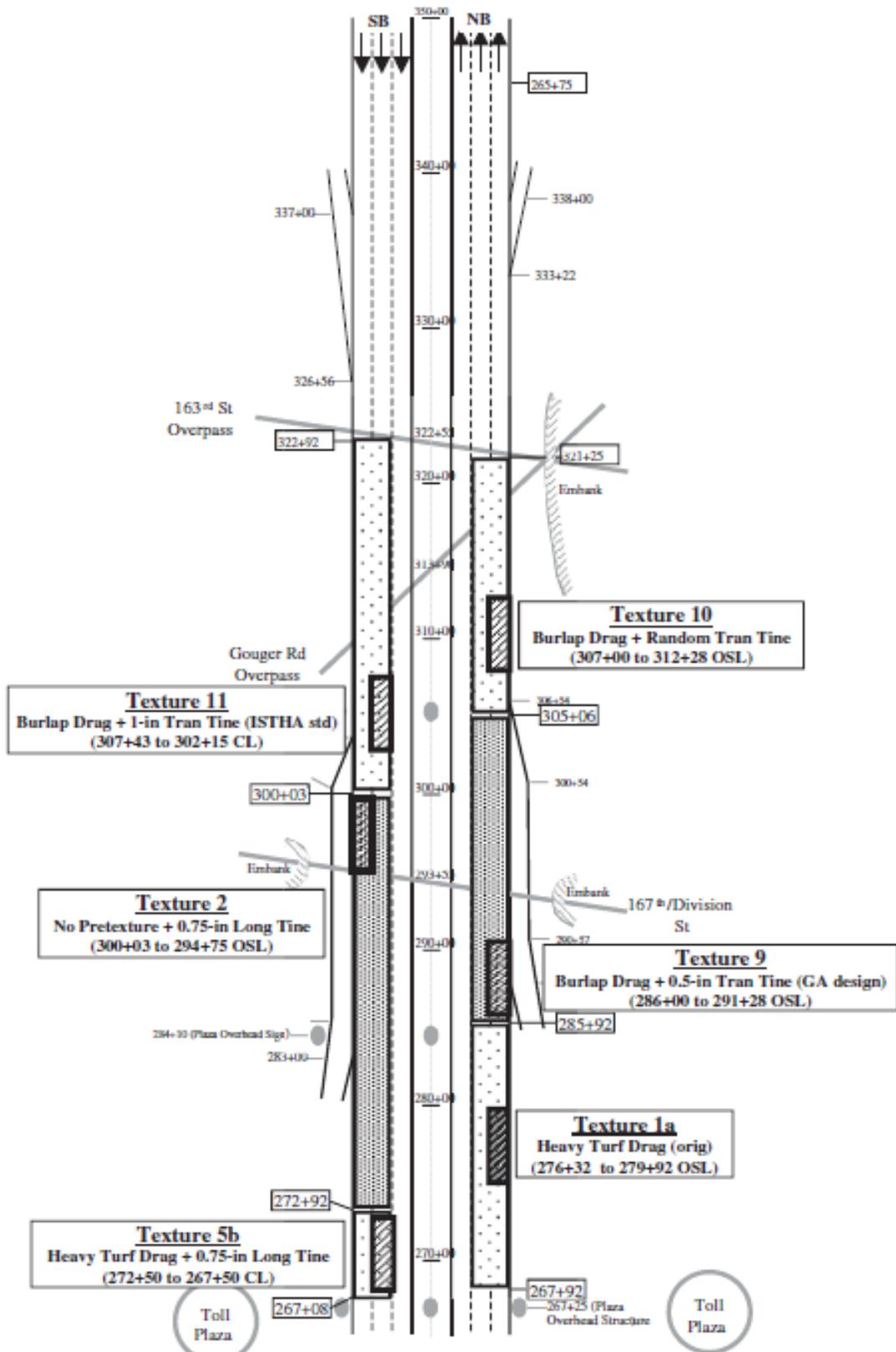


Figure 1-2 Test Sections Located North of the Toll Plaza¹

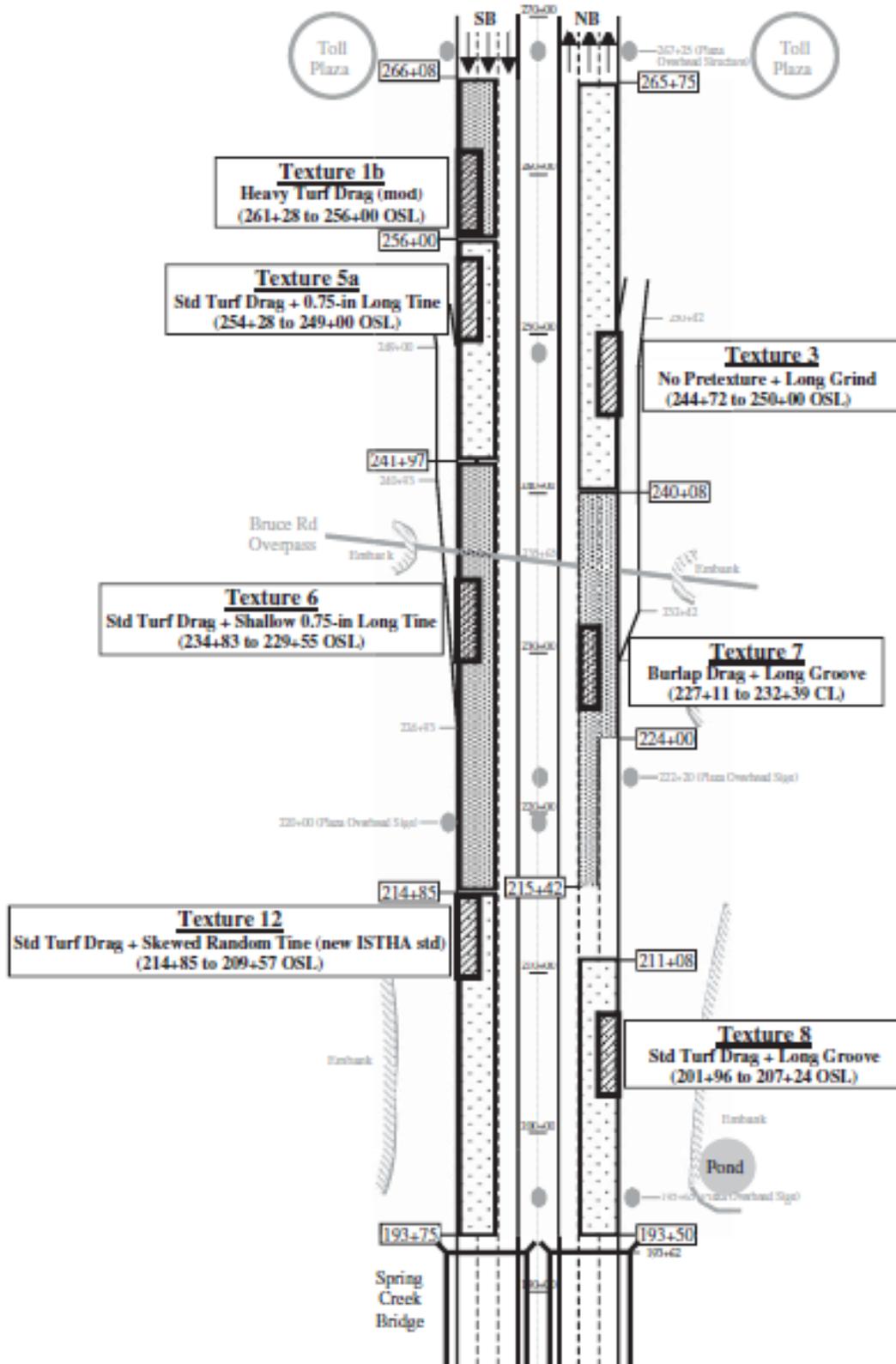


Figure 1-3 Test Sections Located to the South of the Toll Plaza¹