ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

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July 15, 2019

Ms. Kenya M. Anderson, MSP
Highlands County Board of County Commissioners
Engineering Department
505 South Commerce Avenue
Sebring, Florida 33870

Subject: Pavement Evaluation
CR 623 (Kenilworth Boulevard)
Between Haywood Taylor Boulevard and Mini Ranch Road
Sebring, Florida

Dear Ms. Anderson:

As requested, ATC has performed a pavement evaluation of CR 623 (Kenilworth Boulevard) between Haywood Taylor Boulevard and Mini Ranch Road (approximately 1.2 miles long) in Sebring, Florida as shown in Figure 1. Our results and recommendations are provided below.

1. Existing Roadway Conditions

In general, the section of roadway studied was found to be in poor but serviceable condition. It is estimated that this portion of roadway is at least 20 years old and cores drilled in the roadway show evidence of at least five overlays, see Photo 6. A variety of problems were found in the roadway resulting from poor drainage and insufficient structural support of the pavement.

For the most part, the studied section of roadway appears to have been built with minor cut and fill sections such that the northern portion of the roadway may have required some fill while the southern portion of the roadway was essentially a cut section. One significant exception to this is the general area of the roadway where cores C-2 and C-3 are located (see Figure 1). This area is characterized by significant fill and is discussed in Section 5.5.

2. Field Testing

On June 26, 2019 ATC obtained six core samples from the Kenilworth Boulevard roadway in Sebring, Florida. The core sample locations are shown in the attached Figure 1. Table 1 provides a summary of asphalt and crushed limestone base thickness at each core location.

Table 1, Asphalt Core Summary

Core No.	Asphalt Thickness (inches)	Base Thickness (inches)	Remarks
C-1	4.0	3.0	This area contains a small amount of fill
C-2	8.5	4.5	Cores 2 & 3 are from an area of roadway that is in fill (soil was placed to attain the current roadway elevation). Long tension cracks are present in the roadway in this area indicating the slope is unstable, see Figure 2.
C-3	8.0	5.0	
C-4	4.5	6.5	This section of roadway was developed by cut
C-5	5.0	6.0	Up to 18-inches of fill was placed to develop this section of roadway
C-6	3.5	5.5	Same as C-5

3. Subsurface Conditions

3.1 Pavement

To aid in characterizing the pavement section, hand auger borings were completed at each asphalt core location. The overall thickness of asphalt, limestone base and subgrade composition is shown in Figure 3. Table 2 provides a summary of shallow subsurface conditions.

Table 2, Summary of Hand Auger Borings

Soil Unit No.	Description of Material	Depth Range (inches)					
		C-1	C-2	C-3	C-4	C-5	C-6
1	Asphalt	0 – 4.0	0 – 8.5	0 – 8.0	0 – 4.5	0 – 5.0	0 – 3.5
2	Limestone Base	4.0 – 7.0	8.5 – 13.0	8.0 – 13.0	4.5 – 11.0	5.0 – 11.0	3.5 – 9.0
3	Subgrade Orange fine SAND (SP)	7.0 – 11.0	13.0 – 20.0	13.0 – 18.0	11.0 – 15.0	NF	NF
4	Subgrade Gray fine SAND (SP)	11.0 – 14.0	20.0 – 22.0	18.0 – 22.0	15.0 – 20.0	11.0 – 24.0	9.0 – 30.0

NF – Not Found

3.2 Groundwater

Groundwater was not observed in the borings. Note that accurate groundwater measurements can only be accomplished by the use of observation wells or piezometers that are monitored for a minimum period of 48 hours. It is expected that groundwater will be found at depths deeper than those used to characterize pavement conditions.

4. Laboratory Testing

Samples of asphalt and subgrade soils were visually classified in the laboratory by a senior geotechnical engineer in general accordance with ASTM D 2488. All subgrade soils consisted of fine sand with trace amounts of silt. No appreciable amounts of clay were found in any of the samples.

5. Analysis of Roadway

5.1 General

In general, the condition of the roadway surface is dependent on three components: first, the asphalt pavement, second, the base and third, the subgrade. All of these components contribute to the condition of the asphalt wearing surface. If the strength of one or more of these components is compromised the asphalt wearing surface will show signs of distress. Similarly, if all of these components are affected by a global condition such as stability of the overall roadway section, the asphalt wearing surface will similarly show signs of distress.

These factors are discussed in the following sections.

5.2 Asphalt Pavement

5.2.1 Strength

As stated, the pavement in the portion of the roadway studied is in poor but serviceable condition. The asphalt shows multiple signs of distress mostly from strength and permeability deficiencies in underlying asphalt overlays, see attached photos. At least five separate overlays were found in some of the asphalt cores some of these overlays are estimated to be over 20 years old.

The older overlays found in the cores appear to have very low strength. These overlays consist of about 20% shell aggregate in a matrix of weathered asphalt. In contrast, modern-day asphaltic concrete is a combination of approximately 95% stone, sand, or gravel bound together by asphalt cement. In modern-day asphalt, load is spread to the subgrade by grain-to-grain contact. In the older asphalt load is not distributed (reduced) by aggregate interlock resulting in higher non-uniform stresses carried deeper into the roadway pavement. These higher non-uniform stresses result in deterioration of the road surface.

An example of the low strength of the asphalt binder is seen in the low resistance required to advance the core barrel in this asphalt. Photos 9 and 10 show the cuttings during coring of the asphaltic material. The material appeared to have the consistency of a loose sand.

5.2.2 Drainage

Besides strength issues, a major concern with any roadway is drainage. At this site, a significant contributor to roadway deterioration is water infiltrating the asphalt along CR 623. Water is introduced into the pavement by surface cracking and the general high porosity of the asphalt surface. These conditions permit water to enter the pavement section and subsequently forced out of the pavement by high pore pressures created from roadway traffic. The water follows the path of least resistance which is upward through the asphalt to the ground surface, see Photos 11 and 12. This process helps to weaken and degrade the asphalt pavement.

5.2.3 Thickness

The thickness of the asphalt pavement was found to vary from 3.5 to 8.5 inches, see Table 2 and Photo 1. This is a wide range in thickness for a relatively short distance of 1.2 miles of roadway and likely reflects the many repairs that have been performed on the roadway. There is no correlation between the quality of the asphalt and its thickness. As stated earlier, many of the asphalt overlays are a weakly bonded asphaltic matrix with random shell fragments. This asphalt has substandard strength and at some time during the life of the pavement was placed to compensate for roadway settlement indicative of deep seated problems.

5.3 Base Course

The base course found in all cores is crushed limestone. The base course thickness varied from 3.0 to 6.5 inches in thickness. In all cases the base course was found to be dense and is not a cause for roadway distress.

5.4 Subgrade

All hand cone penetrometer test results were indicative of loose to medium dense sand soil conditions. That is, no conditions were found that would result in pavement distress.

5.5 Stability

5.5.1 General

The stability of the pavement is discussed separately in this section since stability effects all three components of the roadway—the pavement, subbase and subgrade.

5.5.2 Unstable Section

Figure 2 provides a typical section of what appears to be occurring in the fill portion of the roadway in the area of Cores 2 & 3 and eastward. It is estimated that the embankment slope in this area is at least a 2H:3V and steeper. Moreover, there appears to be some newly placed fill at the shoulder of the roadway (see photo insert in Figure 2).

The tension cracks shown in the section and photo inserts (Figure 2) are indicative of slope movement as illustrated in the section. If this slope is not stabilized movement will continue and cracking will continue in the new pavement.

6. Recommendations for Remediation

6.1 Stability

For the fill section of roadway at the approximate location of Cores 2 and 3 and eastward, the north side of the roadway should be filled to attain a slope of ideally 1V:2H. This will provide the most cost effective solution to stabilizing the slope. Fill placed on the slope should be compacted by the movement of earthmoving equipment.

6.2 General Roadway

The most economical method of remediation is to mill the existing asphalt surface a minimum of 1.5 to 2.0 inches and place a minimum of the thickness removed. Known problem areas should be filled with at least 1.5 times the thickness milled.

6.3 Maintenance

It is recommended that once a year all cracks in the roadway be sealed to extend the life of the asphalt. Sealing the cracks will divert water to the edge of the roadway rather than allowing the water into the asphalt to accelerate erosion of the asphalt.

Should you have any questions please do not hesitate to call.

Sincerely,

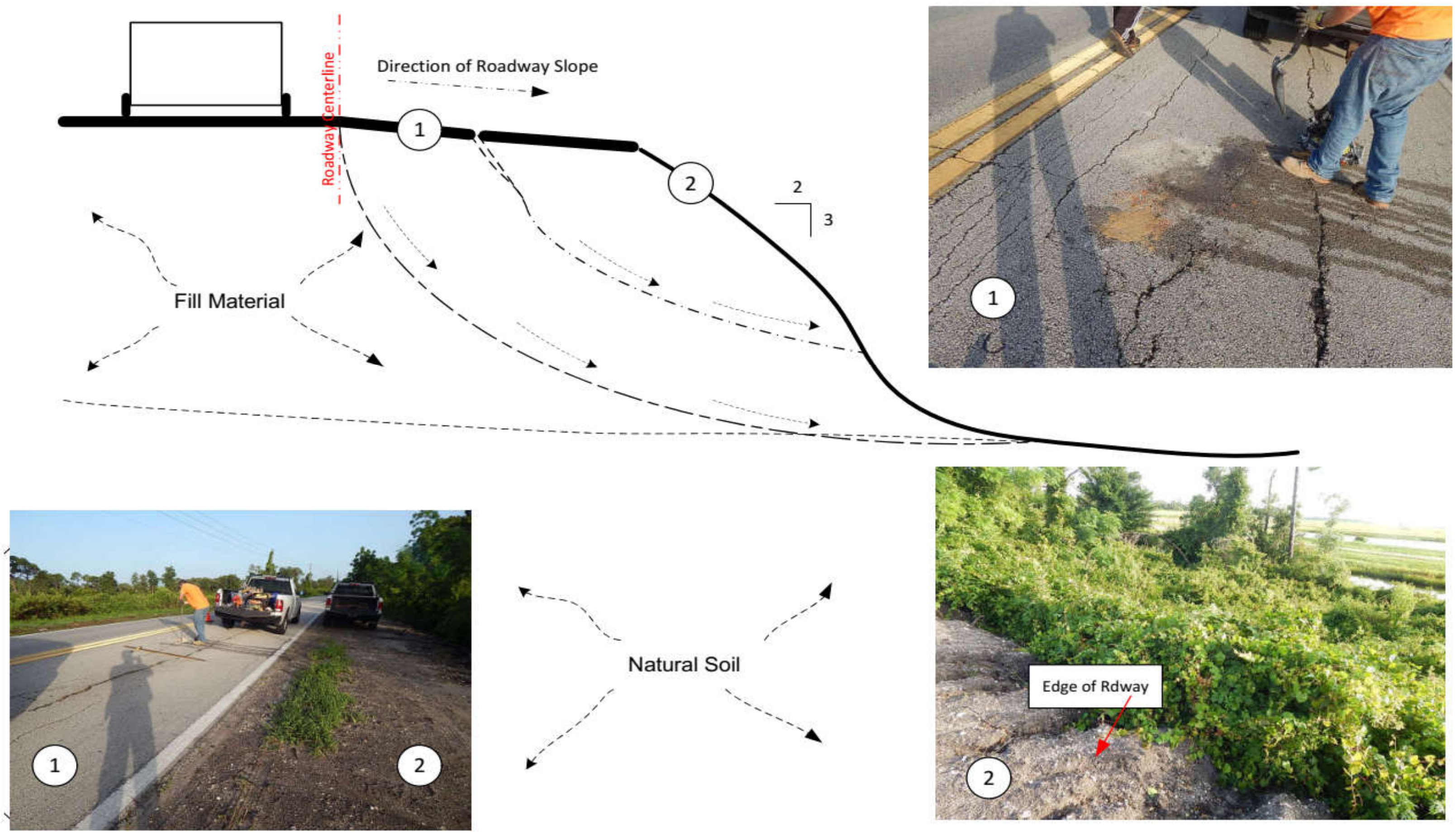
Ed Zisman
Jul 22 2019 2:10 PM

E. D. Zisman, P.E., S.I., P.G.
Geotechnical Division Manager
Florida Registration No. P.E. 53451

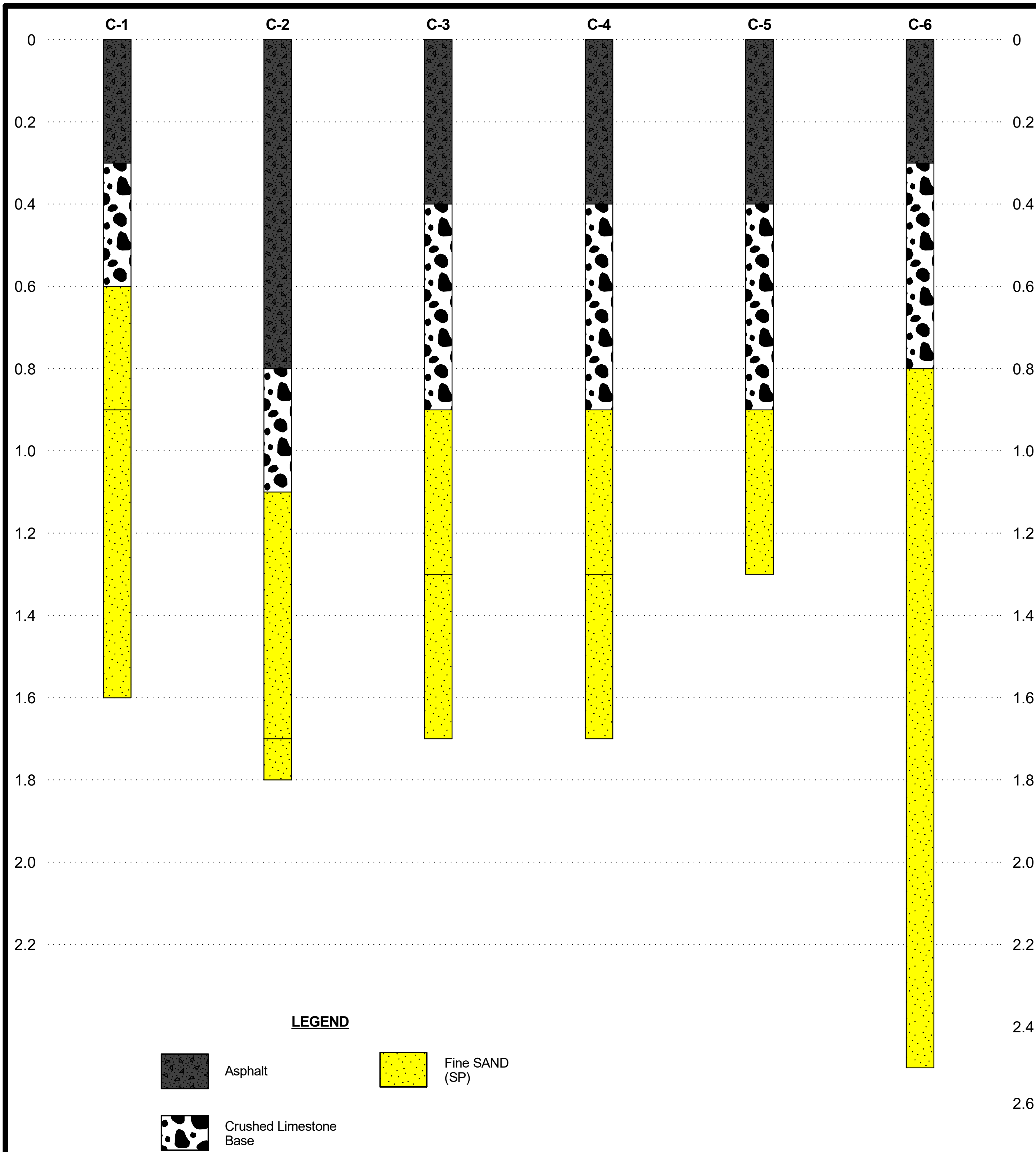
C-1 = Core Hole Number

ATC	Pavement Evaluation			
	CR 623 from Haywood Taylor Blvd to Mini Ranch Rd Sebring, Florida	ATC Project No. Z520840001	Figure 1 Pavement Core Location Plan	Locations are approximate

Typical Stability Section in Area of Cores 2 & 3



Pavement Evaluation			
CR 623 from Haywood Taylor Blvd to Mini Ranch Rd Sebring, Florida	ATC Project No. Z520840001	Figure 2	Locations are approximate



NOTE:
Groundwater not observed in any cores/hand auger borings

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Pavement Evaluation, Kenilworth Blvd, Sebring, FL

Highlands County Engineering Department	SUBSURFACE PROFILE	Figure 3
	ATC Project No: Z520840001	Drill Date: 6/26/2019

Pavement Evaluation Photos

CR 62 from Haywood Taylor Boulevard to Mini Ranch Road

Sebring, Florida

Photo 1: Six cores obtained in the drilling (arranged consecutively one on right six on left)

Photo 2: Location of Core No. 2 looking west (note porous longitudinal crack allowing water to enter asphalt pavement)

Photo 3: Location of Core No. 2 looking east

Photo 4: Close-up of Photo 3

Photo 5: Looking North from location of Core No. 3. Note: new fill and large change in elevation to north

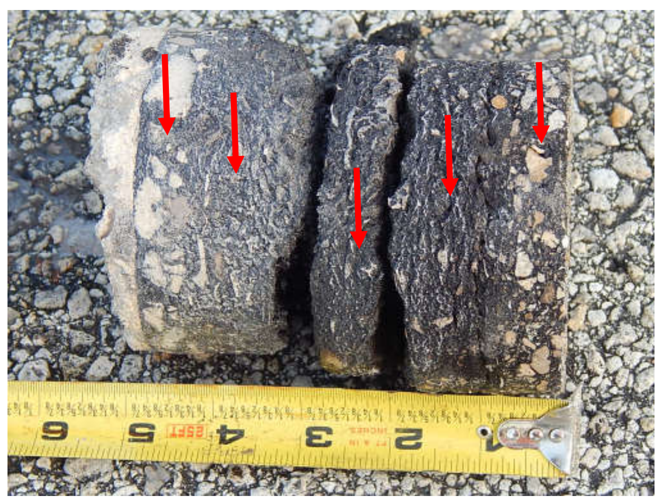

Photo 6: Close-up of Core No. 4, note that the five overlays present in the core.

Pavement Evaluation Photos
CR 62 from Haywood Taylor Boulevard to Mini Ranch Road
Sebring, Florida

Photo 7: Core drill equipment

Photo 8: Patched asphalt

Photo 9: Weak asphalt matrix washing out of core hole C-4

Photo 10: Weak asphalt matrix washing out of core hole C-4

Photo 11: Release of water trapped between lifts causes uplift of asphalt

Photo 12: Close-up of Photo 11, note porous surface of asphalt