March 9 – 10, 2017

CPAM Annual Paving Workshop

TH 59: MORRIS TO 10 MILES NORTH

Whitetopping

Graig Gilbertson P.E. District Materials Engineer , MnDOT , Detroit Lakes

Statewide Initiative
Pavement Alternative; 7506-17;
Rehabilitation Option for Thin Concrete

- Cost; LCCA, district investment(first cost), reality check
- Performance; something about taking care of your own
- Life; lots of opinions.
- Maintenance; New concept, contract out or local
- Design; rehabilitation vs start reconstruction.
- Other;

Exception to Alternate Bid

- Fast track to Alternate bid.
- LCCA;
- INITIALS;

- Alternate Bid

Office Memorandum

TO: Curt Turgeon
Pavement Engineer

FROM: Graig Gilbertson
Materials Engineer

DATE: November 19, 2015

SUBJECT: REQUEST FOR AN EXCEPTION FROM THE LOW COST SELECTION

	7506-17
	59
	RP 168+00.063 to RP 178+00.710
	Grading, bituminous mill, concrete overlay, and bituminous surfacing

LCCA Results

2" Mill & 2" HMA Overlay	15	$4,594,088.46	No	100.0
3" Mill, 3" CIR, & 3" HMA	20	$4,756,272.38	No	103.5
1.5" Mill & 4.5" PCC Overlay	20	$7,665,238.76	Yes	166.9

Reason for Request

A plan to deploy more Whitetopping projects across the state were decided at the December 18th Operations Division Managers meeting. On December 23, 2014 a notice was sent out by Glenn Engstrom (OMRR Director) asking each district to lay out a plan to deploy more Whitetopping projects.

This roadway was originally planned for a mill and bituminous overlay and the district decided to change the rehab to a thin Whitetopping project to meet the goals of the Operations Division Managers.

This project was regraded in 1999 with 5" of bituminous, 6" of aggregate base, and 3 feet of select granular material.

This project is an ideal candidate for thin Whitetopping since this project has no bituminous overlays and there is 3 feet of select granular material under the pavement structure.

The district request an exception to the LCCA low-cost alternate and use the thin Whitetopping alternate, to meet the goals the Operations Division Managers.

Pavement Engineer **Date**

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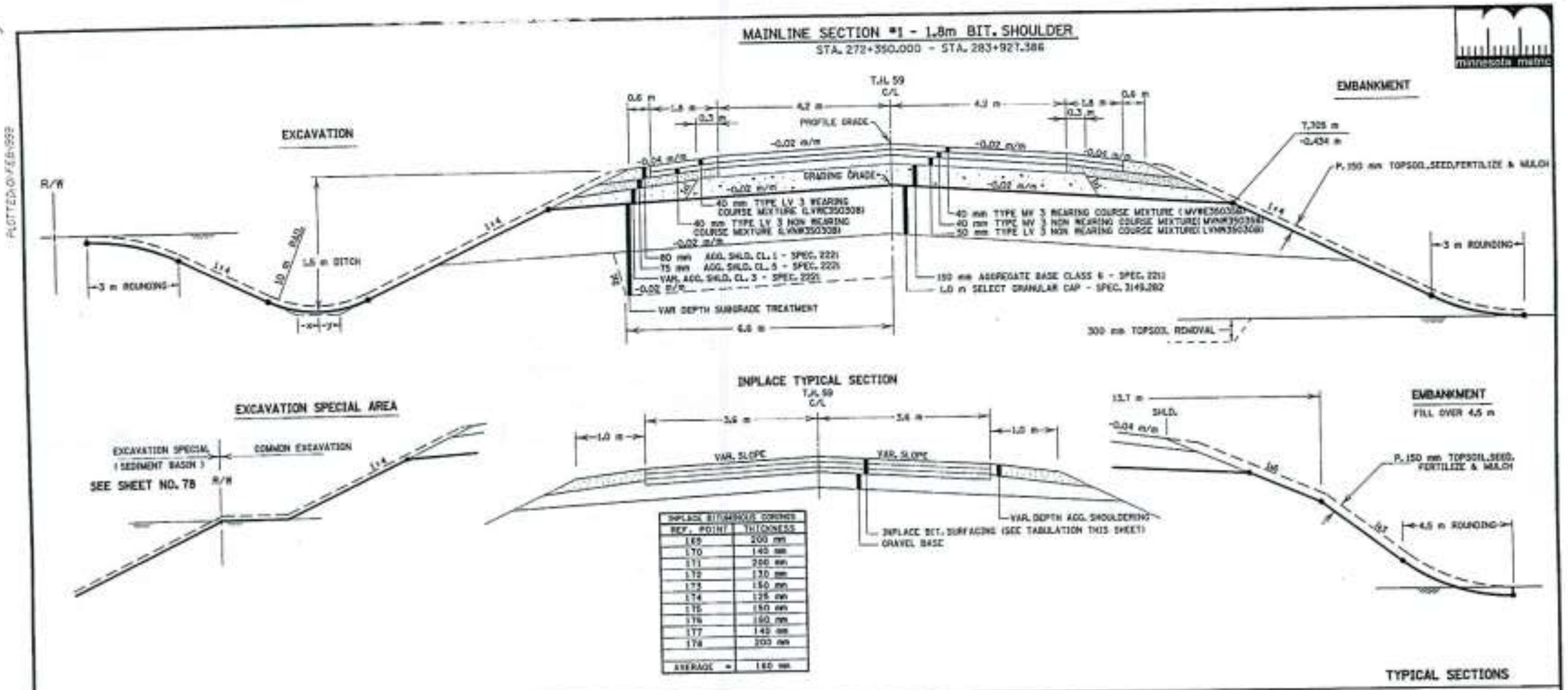
Picking A Job

- Something that will be good test; minimize cost.
- Subbase ; 3’
- Base 6”
- Bituminous Uniform
  - Core Ave. 5.3”; design 150mm
  - 4.5-6.75”
- Shooting for 4” Bituminous to place concrete on; settled for 3.8 because solid cores.
- Extra Bonus of “saw and seal”problem in many areas.
- graded all the way to daylight

- Old Typical Sections



INPLACE BITUMINOUS COURSES	
REF. POINT	THICKNESS
169	200 mm
170	140 mm
171	200 mm
172	130 mm
173	150 mm
174	125 mm
175	150 mm
176	160 mm
177	140 mm
178	200 mm
AVERAGE =	160 mm

CONSTRUCTION NOTES

GRADING GRADE

GRADING GRADE IS DEFINED AS THE BOTTOM OF THE AGGREGATE BASE AND THE TOP OF THE SELECT GRANULAR CAP. SELECT GRADING MATERIAL SHALL BE USED IN ALL EMBANKMENTS INSIDE OF A 2:1 LINE DOWN AND OUT FROM THE GRADING GRADE P.I. THIS MATERIAL SHALL BE ALL SOILS FREE FROM TOPSOIL, DEBRIS, ORGANIC OR OTHER UNSTABLE MATERIAL.

COMPACTION SUBCUT

EXCAVATE 300 mm ON ALL PUBLIC SIDEROADS FROM THE GRADING GRADE FOR COMPACTION AS SHOWN ON THE PROFILES AND TYPICAL SECTIONS. BACKFILL WITH SELECT GRADING MATERIAL AS DEFINED ABOVE. QUANTITIES INCLUDED IN BALANCES. EXCAVATION INCLUDED AS SUBGRADE EXCAVATION.

SUBGRADE TREATMENT

IN THE AREAS SHOWN ON THE PROFILES AND TYPICAL SECTIONS EXCAVATE ONE(1) METER OR MORE FROM THE GRADING GRADE. BACKFILL WITH SELECT GRADING MATERIAL AS DEFINED ABOVE. THE UPPER 1.0 m SHALL BE BACKFILLED WITH SELECT GRANULAR MATERIAL. QUANTITIES INCLUDED IN BALANCES. EXCAVATION INCLUDED AS SUBGRADE EXCAVATION.

TOPSOIL

THE UPPER 150 mm OF NATURAL SOIL, 300 mm IN UNDISTURBED AREAS. DESIGNATED TOPSOIL, SHALL BE SALVAGED FOR USE AS SLOPE DRESSING. THE WIDTH OF TOPSOIL REMOVAL IN FILL SECTIONS SHALL BE FROM GRADING P.I. TO GRADING P.I. QUANTITIES INCLUDED IN BALANCES. EXCAVATION INCLUDED AS COMMON AND SUBGRADE EXCAVATION.

TOPSOIL SHALL BE PLACED ON INSLOPES, DITCH BOTTOMS AND BACKSLOPES AS SHOWN ON THE TYPICAL SECTIONS. 300 mm SHALL BE PLACED ON ALL DISTURBED AGRICULTURAL AREAS.

SALVAGABLE MATERIAL

EXISTING BITUMINOUS PAVEMENT MAY BE SALVAGED AND USED AS RECYCLED BITUMINOUS MIXTURE.
ALL INPLACE BITUMINOUS PAVEMENT BELOW THE GRADING GRADE SHALL BE REMOVED.
INPLACE AGGREGATE BASE AND SHOULDER MATERIAL MAY BE SALVAGED AND USED IN LIEU OF CLASS 3 & CLASS 1 SHOULDER AGGREGATE PROVIDED IT MEETS THE GRADATIONS AND IS APPROVED BY THE ENGINEER.
QUANTITIES ARE INCLUDED AND PAID FOR AS COMMON OR SUBGRADE EXCAVATION.

ROUNDING OF SLOPES

THE DITCH BOTTOMS, TOE OF FILL SLOPE AND THE TOP EDGE OF BACKSLOPES SHALL BE ROUNDED AS SHOWN, ON THE TYPICAL SECTIONS AND EROSION CONTROL SHEETS, REGARDLESS OF WHAT IS SHOWN ON THE CROSS SECTION SHEETS. SEE TECHNICAL MANUAL 5-292.622 FOR DIMENSIONS OF X AND Y.

BITUMINOUS

APPLY BITUMINOUS TACK COAT BETWEEN ALL LAYERS OF BITUMINOUS MIXTURE, ON ALL EXISTING BITUMINOUS SURFACES BEING OVERLAYED, IN ACCORDANCE WITH THE PROVISIONS OF SPEC. 2357.
BITUMINOUS TAPERS SHALL BE MILLED AT THE ENDS OF ALL BITUMINOUS COURSES AS DIRECTED BY THE ENGINEER.

CONSTRUCTION NOTES

CERTIFIED BY ______ PROFESSIONAL ENGINEER REG. NO. 21204 NOV. 1 1998 | STATE PROJ. NO. 3504-19 (TH 28=28) 3506-16 (TH 59=44) | SHEET NO. 8 OF 457 SHEETS

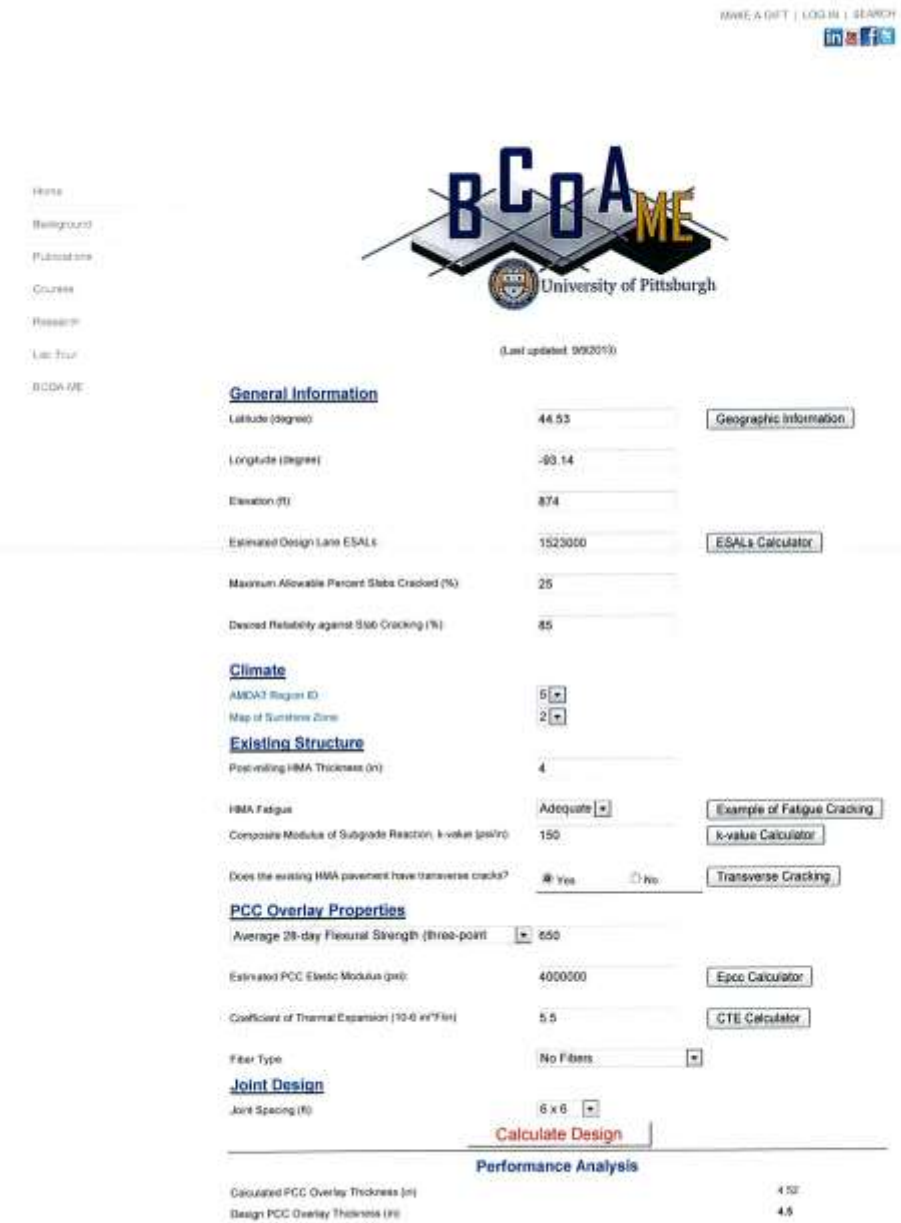
Road Condition

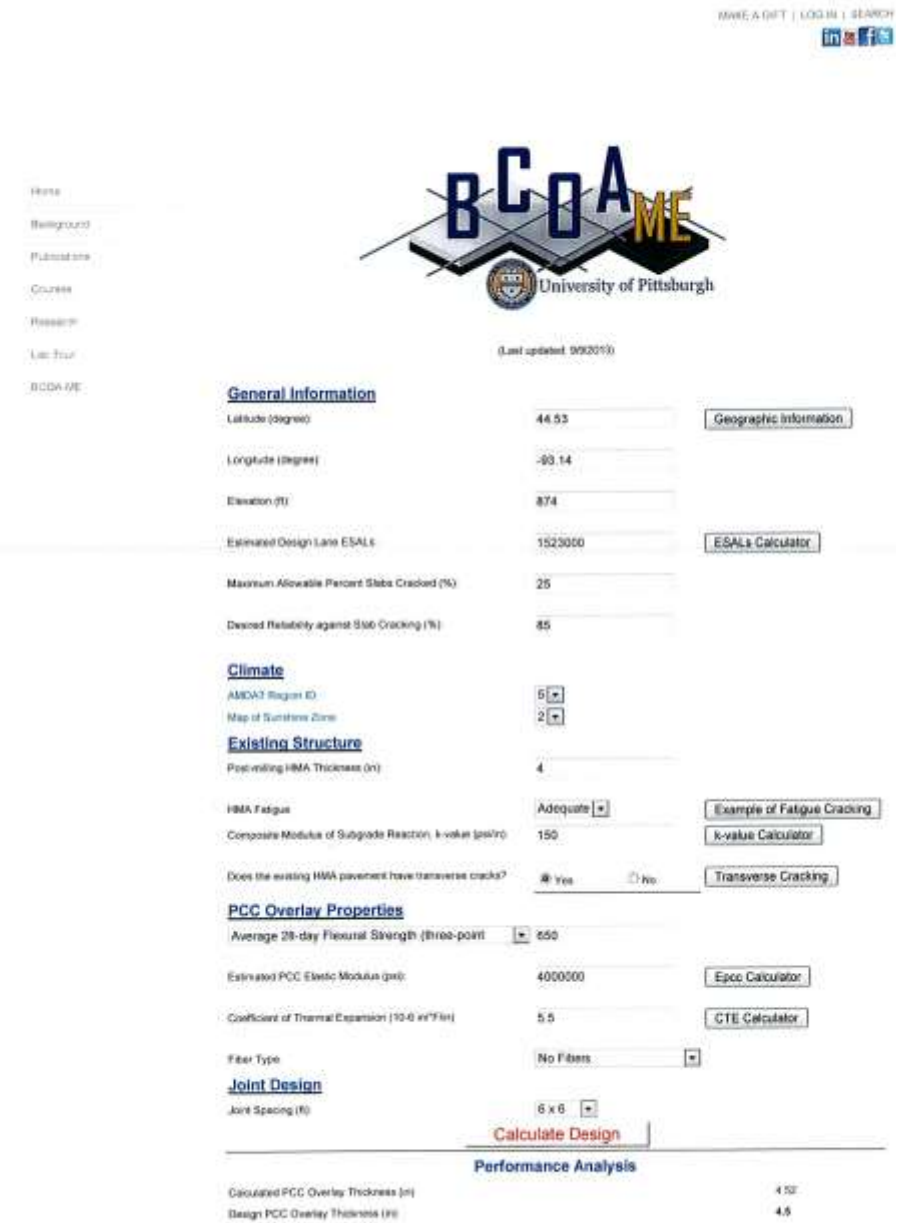
- Saw and Seal; 7 meters
- Uniform
- RQI 2.9 with regular filling cracks
- Solid Surfacing
- Good Drainage
- Relatively New 1999

Design

- Solid 4” Bituminous Left;
- Had wider bit to work with. Full width;
- Traffic; actual forecast
- Soil; good feel for it.
- Good profile to start with; Follow existing
- Minimum variables ;

- BCOA


MAKE A GIFT | LOG IN | SEARCH
Home
Background
Publications
Courses
Research
Lab Tour
BCOA-ME
BCOA ME
University of Pittsburgh
(Last updated: 9/8/2015)
General Information
Latitude (degree)
44.53
Geographic Information
Longitude (degree)
-93.14
Elevation (ft)
874
Estimated Design Lane ESALs
1523000
ESALs Calculator
Maximum Allowable Percent Slabs Cracked (%)
25
Desired Reliability against Slab Cracking (%)
85
Climate
AMDAT Region ID
5
Map of Sunshine Zone
2
Existing Structure
Post-milling HMA Thickness (in)
4
HMA Fatigue
Adequate
Example of Fatigue Cracking
Composite Modulus of Subgrade Reaction, k-value (psi/in)
150
k-value Calculator
Does the existing HMA pavement have transverse cracks?
Yes
No
Transverse Cracking
PCC Overlay Properties
Average 28-day Flexural Strength (three-point
650
Estimated PCC Elastic Modulus (psi)
4000000
Epcc Calculator
Coefficient of Thermal Expansion (10-6 in/°F/in)
5.5
CTE Calculator
Fiber Type
No Fibers
Joint Design
Joint Spacing (ft)
6 x 6
Calculate Design
Performance Analysis
Calculated PCC Overlay Thickness (in)
4.52
Design PCC Overlay Thickness (in)
4.5



Estimated Design Lane ESALs: 1523000 — ESALs Calculator

Maximum Allowable Percent Slabs Cracked (%): 25

Desired Reliability against Slab Cracking (%): 85

Climate

AMDAT Region ID: 5

Map of Sunshine Zone: 2

Existing Structure

Post-milling HMA Thickness (in): 4

HMA Fatigue: Adequate — Example of Fatigue Cracking

Composite Modulus of Subgrade Reaction, k-value (psi/in): 150 — k-value Calculator

Does the existing HMA pavement have transverse cracks? (•) Yes ( ) No — Transverse Cracking

PCC Overlay Properties

Average 28-day Flexural Strength (three-point: 650

Estimated PCC Elastic Modulus (psi): 4000000 — Epcc Calculator

Coefficient of Thermal Expansion (10-6 in/°F/in): 5.5 — CTE Calculator

Fiber Type: No Fibers

Joint Design

Joint Spacing (ft): 6 x 6

Calculate Design

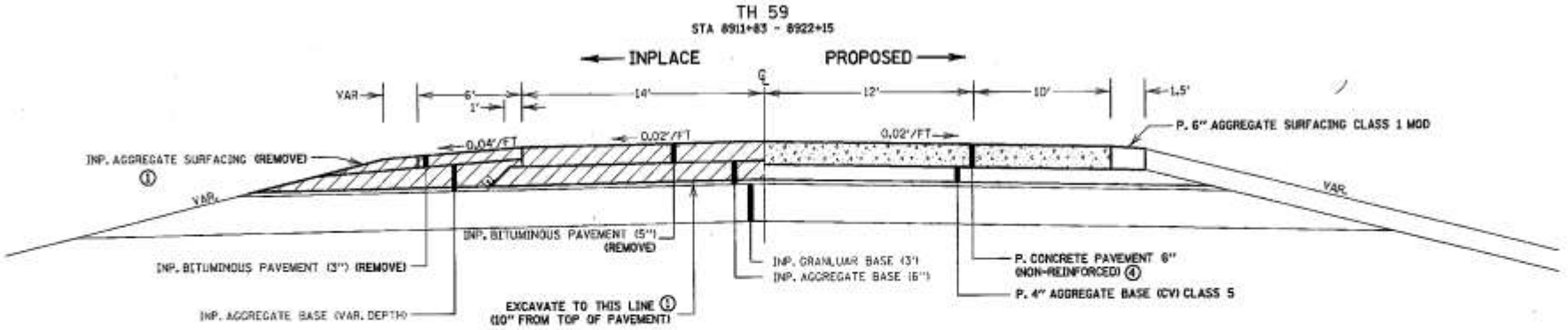
Performance Analysis

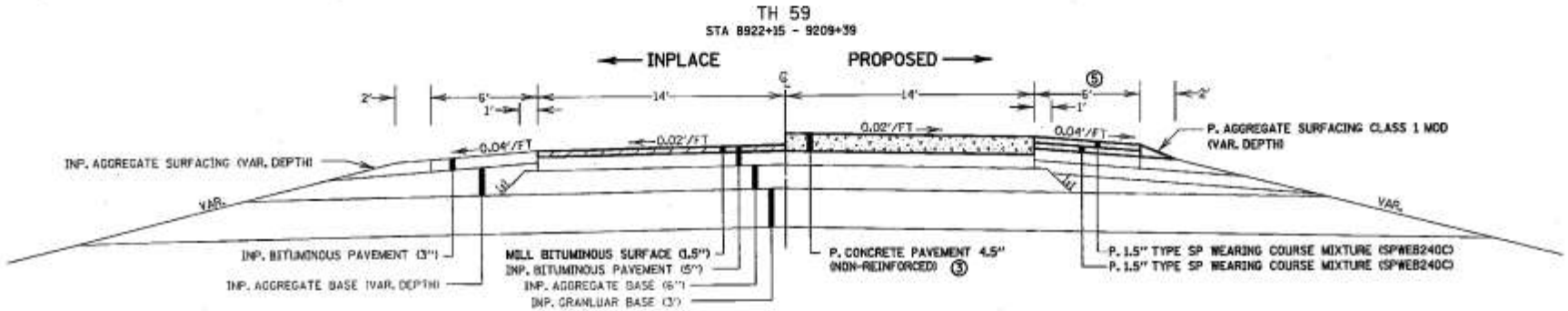
Calculated PCC Overlay Thickness (in)	4.52
Design PCC Overlay Thickness (in)	4.5

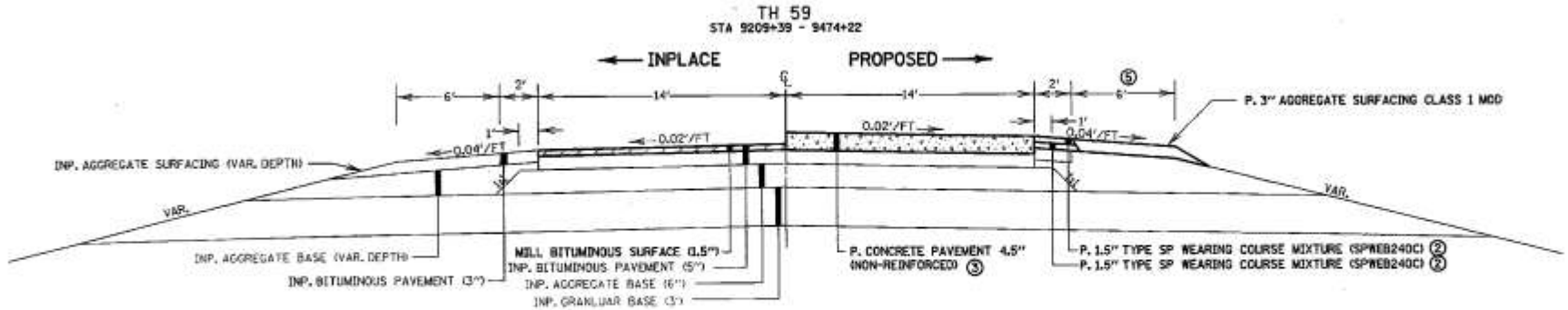
Typical Section

- Grading all the way out
- Panel size;
- Widened Mainline
- Uniform
- Shoulder Variable;6’and 2’, milling
- Plan was to Follow Existing
- Profile Mill
  - Mill 1.5 and Place 4.5
  - Net Grade Raise 3”

New Typical Sections







TH 59 ⑤
RIGHT TURN & BYPASS LANES

STA 8956+96 - 8962+93 RT
STA 8967+08 - 8973+06 RT
STA 8978+20 - 8984+09 RT
STA 9002+33 - 9008+28 RT
STA 9011+98 - 9017+90 RT
STA 9028+73 - 9034+88 RT
STA 9031+43 - 9037+41 LT
STA 9071+00 - 9077+25 RT
STA 9073+50 - 9079+65 LT
STA 9099+68 - 9105+83 RT
STA 9124+34 - 9130+35 RT
STA 9203+33 - 9209+39 RT
STA 9207+22 - 9213+32 LT
STA 9254+77 - 9260+82 LT
STA 9256+22 - 9262+37 RT
STA 9310+31 - 9316+31 RT
STA 9314+23 - 9320+84 LT
STA 9365+82 - 9371+81 LT
STA 9415+85 - 9421+90 RT
STA 9419+82 - 9425+80 LT

CONSTRUCTION NOTES

① PAID FOR AS EXCAVATION-COMMON.
② BITUMINOUS SAFETY EDGE REQUIRED. SEE SHEET 19 FOR DETAILS
③ SEE SHEET 17 FOR JOINT TYPE AND LAYOUT
④ SEE SHEET 18 FOR JOINT TYPE AND LAYOUT
⑤ OVERLAY TURN & BYPASS LANES FULL WIDTH, SAFETY EDGE NOT REQUIRED

CERTIFIED BY Brodgt Miller LIC. NO. 43947 SEPT. 10, 2015
LICENSED PROFESSIONAL ENGINEER

TYPICAL SECTIONS (2 OF 2)
STATE PROJ. NO. 7506-17 (TH 59) SHEET NO. 7 OF 62 SHEETS

PLOTTED/REVISED: (3-JUL-2015)
DISTRICT 4, DISTRICT 4
PLOT NAME: 7506P.tbl
PATH & FILENAME: (P_PWx\65740\7506P_tb.dgn

Traffic

- Wanted something we could believe in

- Traffic Forecast

CUMULATIVE ESALS WORKSHEET **SEGMENT A**

SP#: 7506-17
ROUTE: US TRUNK 59 # LANES: 2 DATE: 08/21/14
LOCATION: TH 28 to 175th Street
VCL SITE #: 7151

	YEAR	AADT	INIT CALC HCADT	CONSTRN HCADT	INIT CALC 5AX TST	CONSTRAIN 5AX TST
VEH.CLASS YR.:	2011	2500	290	0.0%	---	---
BASE YEAR:	2016	2650	310		158	
FORECAST YEAR:	2036	3250	380		194	

BASE YEAR PROPORTIONS		BASE YR. VOLUME	% TREND	FORECAST %	FUTURE VOL.
2AX-6TIRE SU	3.0%	79	1	3.0%	97
3AX+ SU	1.7%	44	1	1.7%	54
3AX TST	0.2%	5	1	0.2%	7
4AX TST	0.4%	10	1	0.4%	13
5AX+ TST	0	0	1	0.0%	0
(5AX+ TST MAX)	2.8%	74	1	2.8%	91
(5AX+ TST OTH)	3.2%	84	1	3.2%	103
TR TR, BUSES	0.4%	10	1	0.4%	12
TWIN TRAILERS	0.1%	3	1	0.1%	4

SUMMARIES:		AADT	HCADT	HCADT %	20 YR DESIGN LANE CUMULATIVE ESAL	
2011	COUNT:	2500	290	11.6%	|	|
2016	FORECAST:	2650	310	11.7%		
2036	FORECAST:	3250	380	11.7%		
					FLEXIBLE	RIGID
DESIGN LANE FACTOR:		0.5			1,523,000	2,405,000

ADDITIONAL OUTPUTS:	BASE %	FORECAST %	ESAL FACTORS FLEXIBLE	RIGID
2AX-6TIRE SU	3.0%	3.0%	0.25	0.24
3AX+ SU	1.7%	1.7%	0.58	0.85
3AX TST	0.2%	0.2%	0.39	0.37
4AX TST	0.4%	0.4%	0.51	0.53
5AX+ TST	0.0%	0.0%	1.13	1.89
(5AX+ TST MAX)	2.8%	2.8%	2.40	4.07
(5AX+ TST OTH)	3.2%	3.2%	0.87	1.44
TR TR, BUSES	0.4%	0.4%	0.57	0.74
TWIN TRAILERS	0.1%	0.1%	2.40	2.33

Notes:

CUMULATIVE ESALS WORKSHEET **SEGMENT A**

SP#: 7506-17
ROUTE: US TRUNK 59 # LANES: 2 DATE: 08/21/14
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VCL SITE #: 7151

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TR TR, BUSES	0.4%				
TWIN TRAILERS	0.1%				

SUMMARIES:
2011 COUN
2016 FORECA
2036 FORECA

DESIGN LANE FACTOR:

ADDITIONAL OUTPUTS:

	BASE
2AX-6TIRE SU	3.0%
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3AX TST	0.2%
4AX TST	0.4%
5AX+ TST	0.0%
(5AX+ TST MAX)	2.8%
(5AX+ TST OTH)	3.2%
TR TR, BUSES	0.4%
TWIN TRAILERS	0.1%

Notes:

SUMMARIES:

		AADT	HCADT	HCADT %
2011	COUNT:	2500	290	11.6%
2016	FORECAST:	2650	310	11.7%
2036	FORECAST:	3250	380	11.7%

DESIGN LANE FACTOR: 0.5

20 YR DESIGN LANE CUMULATIVE ESAL

	FLEXIBLE	RIGID
	1,523,000	2,405,000

0.2%	0.2%	0.39	0.37
0.4%	0.4%	0.51	0.53
0.0%	0.0%	1.13	1.89
2.8%	2.8%	2.40	4.07
3.2%	3.2%	0.87	1.44
0.4%	0.4%	0.57	0.74
0.1%	0.1%	2.40	2.33

Other Parts to Consider

- Jct with TH 28 and what to do with intersection; 6” approx. 1100’ on 59 and 1400’ on TH 28 with steel
- Right turns.
- Shoulders Variable width
- Ups and Down on roadway, minimal
- other

Mix Design

- Mix Designs
- Standard procedure thru Maplewood

- Mix Design

4.5 Inch During Construction

4.5 Inch During Construction

4.5 Inch During Construction

4.5 Inch During Construction

Curing

Sawing

Post Sawing Result

Post Construction

Post Construction (Access)

During Construction

One Month After Open to Traffic

Conclusion

- 2016 Ride; RQI is 4.3!; SR is 4.0; PQI is 4.1
- Cost; 500,269$/mile
- Profile milling
- As representative as we could get
- Bring on the next one !
- Suggestions.
- Questions?