Illinois Department of Transportation

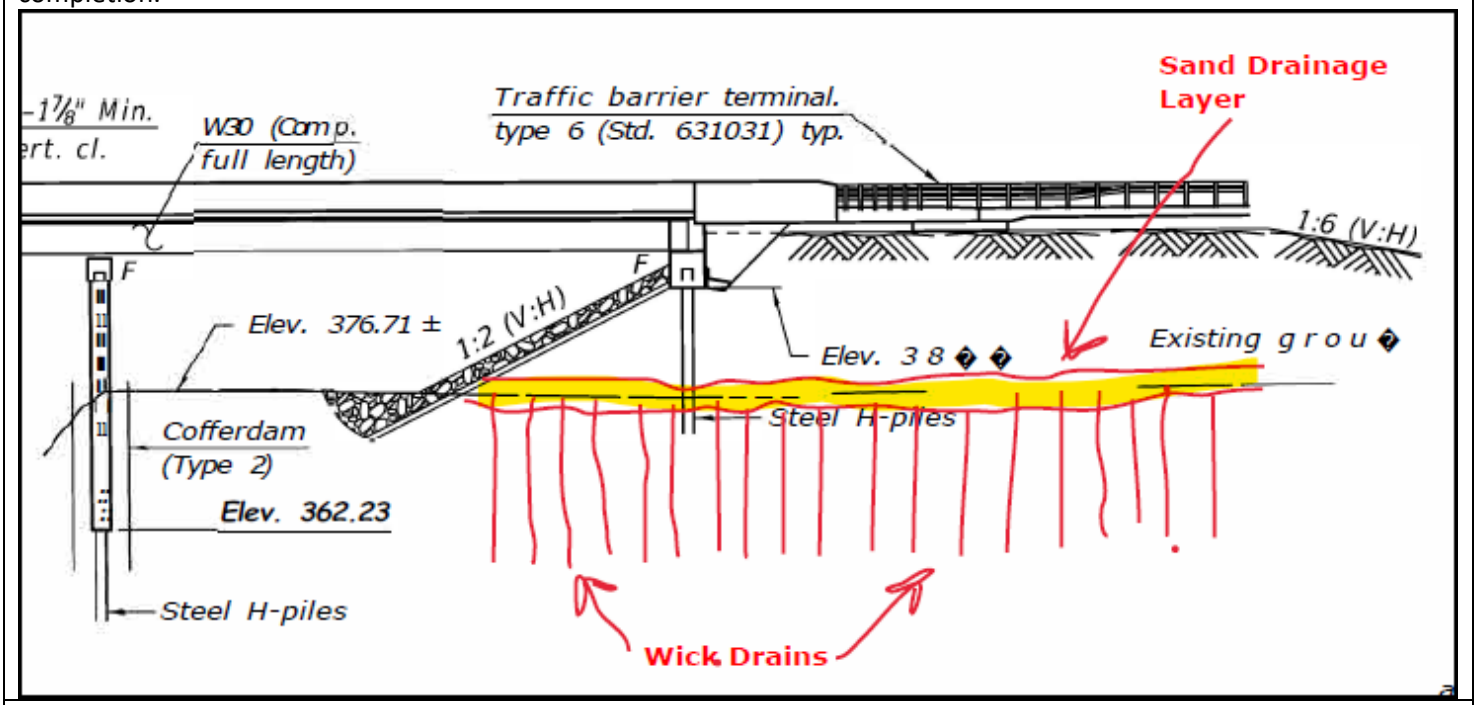
Abbreviated Structure Geotechnical Rep

Original Report Date:	12/23/20	**Proposed SN:**	079-0051	**Route:**	FAP 312
Revised Date:	3/2/21	Existing SN:	079-0005	**Section:**	74BR-2
Geotechnical Engineer:	Bill Kramer			**County:**	Randolph
Structural Engineer:	Josue Ortiz-Varela			**Contract:**	76K25

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure will be on a new alignment and is expected to be a 3-span non skewed wide flange superstructure supported by integral abutments and solid wall encased pile bent piers. The proposed roadway typical section will include 2 – 11 ft. lanes with 3 ft. paved and 4 ft. aggregate shoulder.

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): The existing structure 079-0005 was originally constructed in 1952 as part of S.B.I. Rte. 3, Section 74B-1, Station 577+42.00. The 3-span wide flange beam structure has an out-to-out width of 34-0" and back-to-back of abutments length of 65'-3". The superstructure is supported by solid-wall piers and pile-bent abutments on concrete piles. The existing will continue to carry both lanes of traffic until the new structure construction is completed. No existing soil borings were evaluated since the new borings are adequate.

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: There is almost 18' of new fill being placed to widen the embankment at the North Abutment according to the plan and elevation drawing (attached). Due the soft nature of the soils below the new embankment, we requested testing and settlement analysis by the Central Bureau of Materials. Their analysis indicated about 3.5" of settlement would occur over 40 months but with the installation of wick drains, the time could be reduced to about 3 months. We recommend the final plans plan and elevation show wick drains under the North Abutment. The plans will also require a specific sheet showing the spacing, plan limits (stations and offsets) and depth of the drains as well as details of the sand layer the drains will weep into allowing the water to escape the below the embankment. The designer should contact the foundations unit for these requirements and a copy of the special provision. A settlement plate will need to be added to the special provisions so allow the inspectors determine when the settlement is nearing completion.



Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary: The new fill being placed at the North Abut and the soft nature of the soils below the new embankment, we requested testing and slope stability analysis by the Central Bureau of Materials. Their analysis indicates an adequate factor of safety with the exception of the extreme event I where it is as low as 0.628 FS. A Newmark deformation analysis was performed which indicated 1.824" of

embankment movement down and toward the stream. Discussion with Mark Shafer shown below indicated this amount of movement was acceptable.

Mark Shaffer: The forthcoming Performance-Based Guidelines for seismic design give allowable settlements based off of fractions of the initial heights. The first column (1/50) is for Life-Safety (bridge closed after event). The second column (1/100) is for Operational (bridge only open to emergency vehicles after event). The third column (1/250) is for Fully Operational (bridge open to all traffic after event).

Approach fill settlement limit	1/50	$\leq$1/100	$\leq$1/250

We typically are designing for the center column with structures on the NHS. So, for this structure, a 17.2 ft. tall embankment, would have and allowable settlement under the Operational classification equal to 17.2 ft. * 12 in. / ft. * (1 / 100) = 2.06 in. which is more than the expected embankment settlement.

Indicate at each substructure, the 100-year and 200-year total scour depths in the Hydraulic Report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations: The theoretical 100 year and 500 year scour depths are reported to be 5 feet from a district memorandum. Based on the soil type and strengths, this can be reduced by 50% which puts all scour elevations above the encasement at the piers. In addition, rip rap is being placed complete across the opening to help defend against any scour that might develop.

Event/Limit State	Design Scour Elevations (ft.)				
	South Abut.	Pier 1	Pier 2	North Abut.	Item 113
Q100	387.73	361.75	361.75	386.81	8
Q200	387.73	361.75	361.75	386.81	
Design	387.73	361.75	361.75	386.81	
Check	387.73	361.75	361.75	386.81	

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable: Liquefaction is not an issue at this location due to the consistent cohesive soils which are unable to liquefy. The seismic data required for the TSL plan is provided below:

Seismic Performance Zone (SPZ) = 2
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.293
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.681
Soil Site Class = D

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: End bearing H-Piles are recommended at this location due to the high seismic loads and relatively consistent top of rock elevation across the site. They should be driven to their maximum nominal bearing values shown in bridge manual. Since the borings are not particularly close to the new structure, we recommend two test piles, one at the South Abutment and the second at Pier 2. Shoes will not be required. HP12s or larger are recommend due to the length of the estimated length to avoid pile drift per the bridge manual. The estimated pile length is shown in the table on the following page. Due to the settlement at the site, downdrag on the piles must be either accounted for in the pile design or mitigated by precoring or requiring a waiting period. We recommend mitigation my using a plan note and special provision giving the contactor the option to wait until 90% of the settlement has occurred or if the contactors prefers, they can precore the pile locations to elevation 362' and drive the piles prior to settlement being completed. Our unit can be contacted during final design to develop the note and special provision. As an alternative to the precoring or waiting, the piles can be designed to withstand the downdrag loads. We have attached a table on the following page showing the required nominal required bearing, factored resistance available and estimated lengths for both the precored/waiting period option and the downdrag reduced capacity piles.

Calculate the estimated water surface elevation and determine the need for Cofferdams (Type 1 or 2), and Seal Coat: The estimated water surface elevation (EWSE) is 369.2 feet according to the planning computations. The soils are cohesive, so no seal coat is required. Since the bottom of the concrete encasement for the piers is at elevation 361.75, we have almost 7.5 feet of water to retain which would require a Type 2 Cofferdams at both piers according the Bridge Manual.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Due to the new structure being located on a new alignment, stage construction will not be required.

North Abutment Pile Capacity/Length Table				
Pile Type	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)		Estimated Pile Length (Feet)
		Waiting or Precore	**Downdrag Reduced**	
HP12x53	418	230	169	65
HP12x63	497	273	211	66
HP12x74	589	324	261	66
HP12x84	664	365	302	66
HP14x73	578	318	245	65
HP14x89	705	388	314	66
HP14x102	810	445	371	66
HP14x117	929	511	436	67

South Abutment Pile Capacity/Length Table			
Pile Type	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Feet)
HP12x53	418	230	66
HP12x63	497	273	67
HP12x74	589	324	67
HP12x84	664	365	67
HP14x73	578	318	66
HP14x89	705	388	67
HP14x102	810	445	67
HP14x117	929	511	68

Pier 1 Pile Capacity/Length Table			
Pile Type	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Feet)
HP12x53	418	230	63
HP12x63	497	273	64
HP12x74	589	324	64
HP12x84	664	365	64
HP14x73	578	318	63
HP14x89	705	388	64
HP14x102	810	445	64
HP14x117	929	511	65

Pier 2 Pile Capacity/Length Table			
Pile Type	Nominal Required Bearing (Kips)	Factored Resistance Available (Kips)	Estimated Pile Length (Feet)
HP12x53	418	230	64
HP12x63	497	273	65
HP12x74	589	324	65
HP12x84	664	365	65
HP14x73	578	318	64
HP14x89	705	388	65
HP14x102	810	445	65
HP14x117	929	511	66

Benchmark: Northwest wingwall of Structure Number 079-0005, Elev. 293.49

Existing Structure: S.N. 079-0005 was originally constructed in 1952 as part of S.B.I. Rte. 3, Section 74B-1, Station 577+42.00. The 3 span wide flange beam structure has an out to out width of 34'-1" and back to back abutment length of 165'-3". The superstructure is supported by solid wall piers and pile-bent abutments on concrete piles.
Proposed structure to be built on new alignment while maintaining traffic on existing structure.

No salvage.

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

SEISMIC DATA

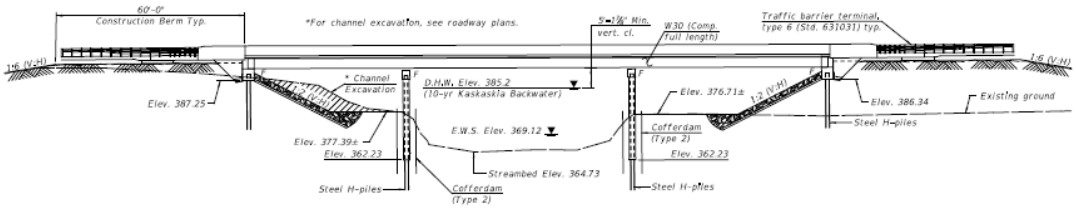
Seismic Performance Zone (SPZ) = 2
Design Spectral Acceleration at 1.0 sec. (SD1) = 0.293g
Design Spectral Acceleration at 0.2 sec. (SDS) = 0.681g
Soil Site Class = D

DESIGN SPECIFICATIONS

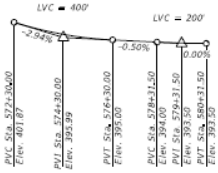
2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

FIELD UNITS
f'c = 3,500 psi
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

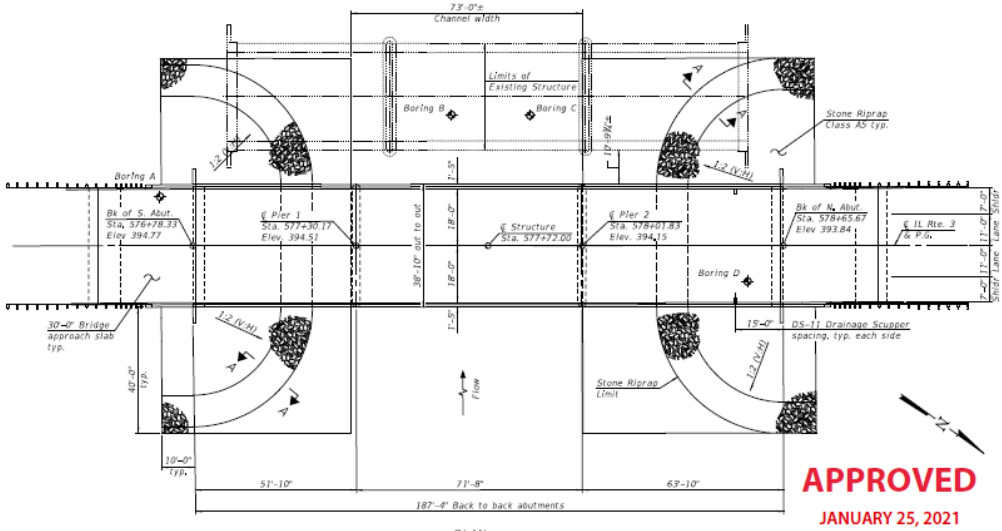


ELEVATION



PROFILE GRADE

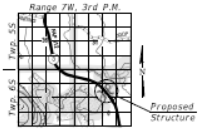
(Along ℄ Proposed IL Rte. 3)



PLAN

HIGHWAY CLASSIFICATION

F.A.P. Rte. 312 (IL 3)
Functional Class: Other Principal Arterial
ADT: 2,700 (2022); 3,100 (2042)
ADTT: 345 (2022); 396 (2042)
DHV: 238 (2042)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50



LOCATION SKETCH

APPROVED
JANUARY 25, 2021
AS A BASIS FOR
PREPARATION OF DETAILED PLANS

GENERAL PLAN & ELEVATION
IL RTE. 3 OVER NINE-MILE CREEK
F.A.P. RTE. 312 - SEC. 74BR-2
RANDOLPH COUNTY
STATION 577+72.00
STRUCTURE NO. 079-0051

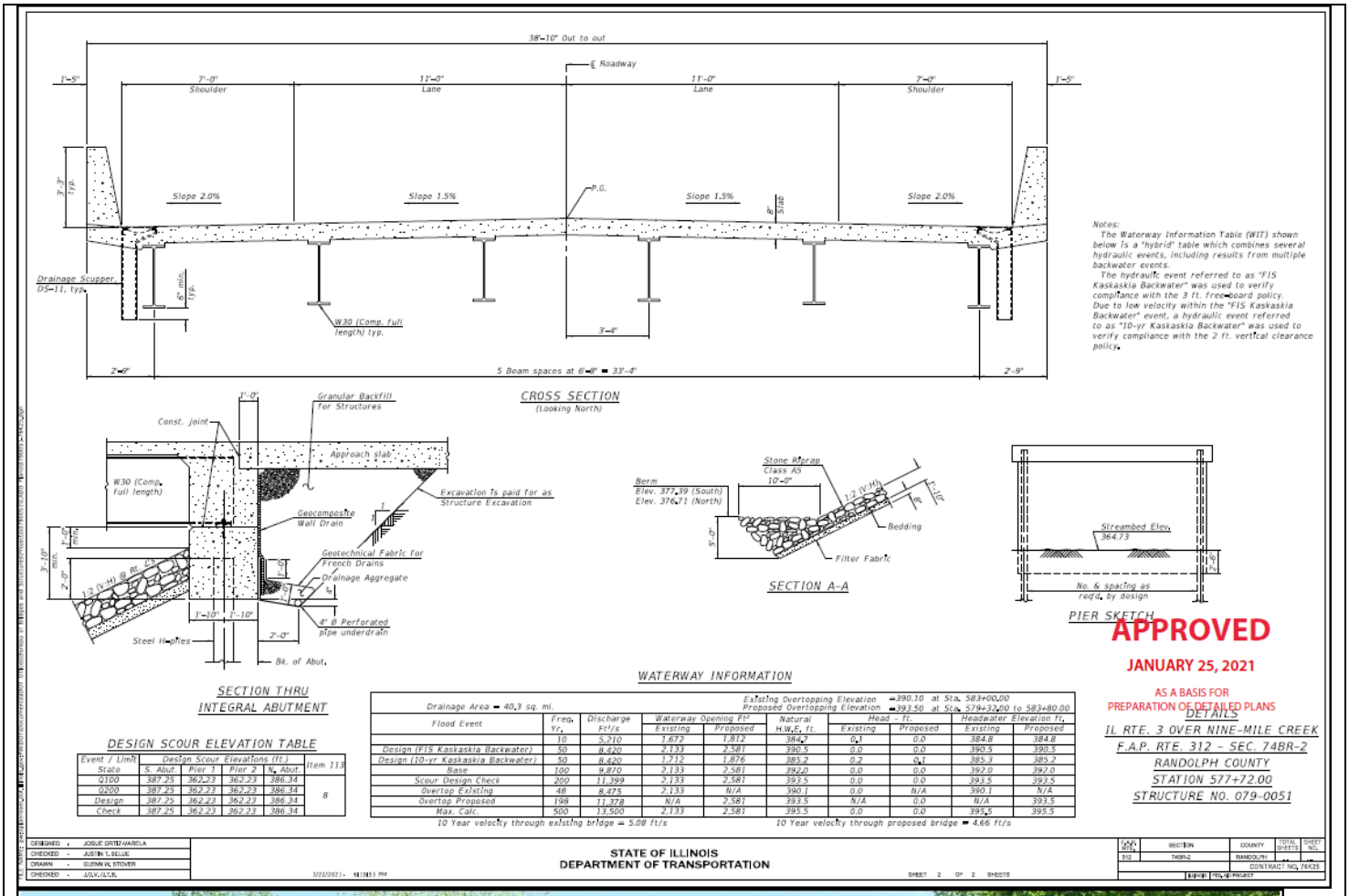
DESIGNED	JOSUE ORTIZ-VARELA
CHECKED	JUSTIN T. BILLUE
DRAWN	GLENN W. STOVER
CHECKED	AWARD

1/22/2021 - 01:39:26 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

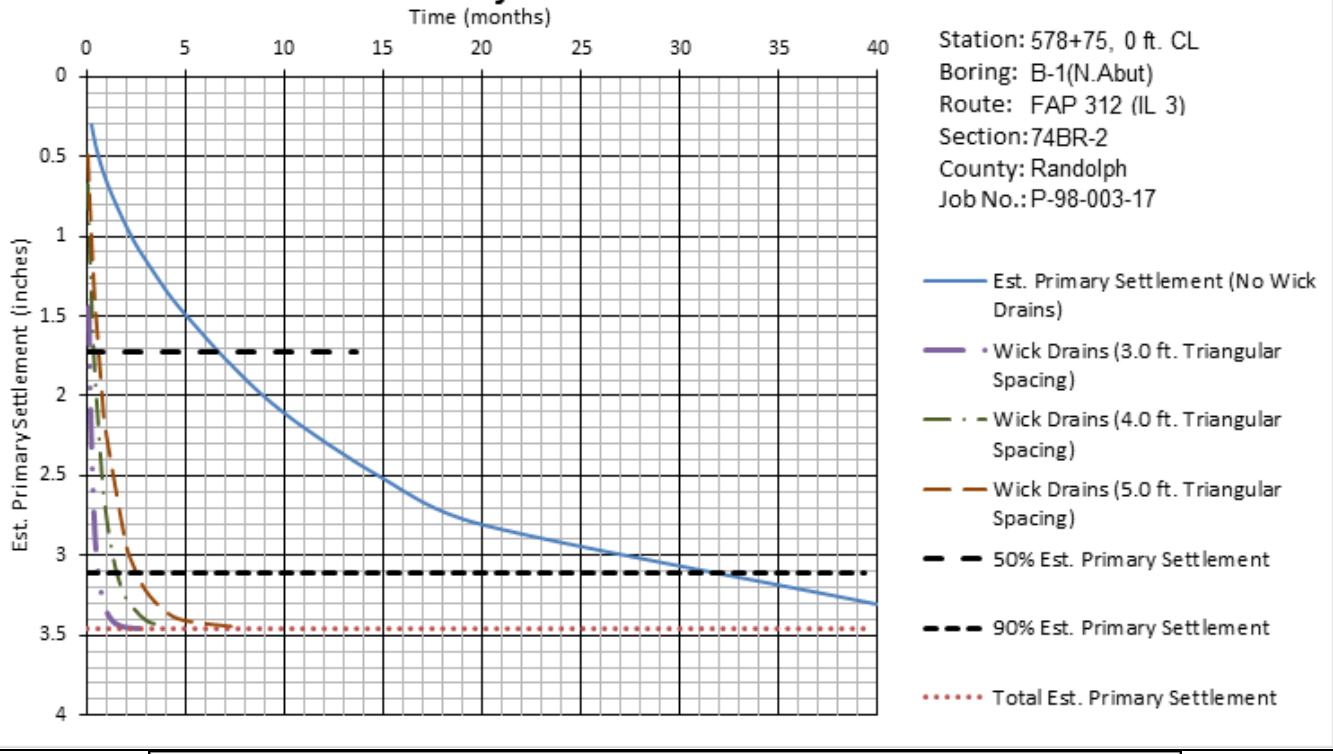
SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
312	74BR-2	RANDOLPH		
		CONTRACT NO. 79425		
	ILLINOIS FED. AID PROJECT			



Bureau of Materials: The settlement for a 2:1 side slope is about 3.5 inches. It will be a little higher for 3:1 and 4:1 embankment side slopes, but I have not run those scenarios yet. I am assuming that, at the very least, wick drains will be needed to meet the construction schedule. A spacing of about 5 ft in a triangular pattern should be able to achieve 90% primary consolidation in about 3 months (please refer to the graph below).

Figure X. North Approach Embankment & Abutment Estimated Primary Settlement verses Time



ILLINOIS DEPARTMENT OF TRANSPORTATION
CBM Geotechnical Sub-Unit

Settlement Analysis Report

District	8	BMPR lab number	20202
County	Randolph	Boring ID	B-1(N.Abut)
Route	FAP 312 (IL 3)	Boring Station	578+23.98
Section	74BR-2	Boring Offset	58.6 ft RT of CL
Job Number	P-98-003-17	G.S.E. at boring	376.6 ft
Structure Number	079-0005(EX)/079-0051(PR)	G.S.E. for analyses	376.6 ft
Contract number	76K25	G.W.E. at boring	368.6 ft

Settlement Analysis results @ Sta. 578+75, 0 ft. CL

Soil layer	Sample number	Sample depth (ft)	Sample elevation (ft)	Layer height (ft)	Bottom of layer elev. (ft)	Settlement (inches)	t_{50} (months)	t_{90} (months)	Drainage condition
1	3-1	4.6	371.9	6.0	370.6	0.3	6.7	28.7	single
2	4-2	7.0	369.6	4.0	366.6	1.4			
3	6-2	10.9	365.7	6.0	360.6	1.5			
4	10-4	20.0	356.6	4.0	356.6	0.2			
Total Settlement, t_{50} & t_{90} --- (t_{50} & t_{90} are weighted averages)						3.5	6.7	28.7	

Settlement analysis calculation data

Soil layer	C_{vf} X 10^{-4} ($in.^2$/min.)	P_o (tsf)	P_f (tsf)	P_c (tsf)
1	577	0.176	1.250	1.507
2	542	0.477	1.546	1.027
3	194	0.632	1.683	1.004
4	669	0.783	1.804	4.402

Bureau of Materials: Below is the summary table of the slope stability analyses run so far. Because the high seismic load in this area is resulting in FOS less than 1, I ran Newmark Analyses to estimate the deformations. To do this I had to pick example earthquakes that appeared to be close to the site's peak horizontal ground acceleration of 0.343. The Imperial Valley quake had a PGA of 0.313 which is just slightly

below the site's 0.343, and the Mammoth Lakes quake is at the higher end of the range with a PGA of 0.416. So, vertical deformations at this site should be slightly higher that the Imperial Valley quake loading deformation values.

Slope Stability Analysis Summary North Approach Embankment & Abutment Using Borings D and B-1ST at Station 578+24

Location of Analyses and Assumptions [2]	Embank. Height (feet)	Slope (H:V)	Critical Failure Surface Elev. (feet)	Failure Surface Circular/ Block	FOS (Bishop/ Janbu simplified Method)		Seismic [1]			
							Critical Failure Surface Elev. (feet)	Failure Surface Circular/ Block	FOS (Bishop/ Janbu simplified Method)	
Undrained (Short Term) Condition [3]										
End Slope **(North Abut.)**	17.2	Var.	370.7/ 370.7	Circular	**1.445**	**1.497**	370.7/370.7	Circular	**0.640**	**0.628**
Sta. 578+75, Right side (PR)	17.2	2:1	370.7/ 370.7	Circular	**1.542**	**1.589**	370.7/370.7	Circular	**0.747**	**0.734**
Sta. 578+75, Right side (PR)	17.2	3:1	370.7/ 370.7	Circular	**1.782**	**1.784**	370.7/370.7	Circular	**0.772**	**0.758**
Sta. 578+75, Right side (PR)	17.2	4:1	370.7/ 370.7	Circular	**2.117**	**2.101**	370.7/370.7	Circular	**0.834**	**0.815**
Drained (Long Term) Condition [3]										
End Slope **(North Abut.)**	17.2	Var.	372.0/ 343.6	Circular	**2.305**	**2.129**	343.6/343.6	Circular	**0.813**	**0.766**
Sta. 578+75, Right side (PR)	17.2	2:1	371.6/ 370.9	Circular	**2.314**	**2.235**	343.6/343.6	Circular	**1.152**	**1.046**
Sta. 578+75, Right side (PR)	17.2	3:1	370.7/ 370.7	Circular	**2.732**	**2.609**	343.6/343.6	Circular	**1.120**	**1.016**
Sta. 578+75, Right side (PR)	17.2	4:1	343.6/ 343.6	Circular	**3.162**	**2.879**	343.6/343.6	Circular	**1.102**	**0.995**

Note 1: A peak horizontal ground acceleration of 0.343 was used for the seismic analyses.
Note 2: A preliminary cross section for Station 578+75 was not available and an existing ground elevation of 376.7 ft. was assumed for the side slope analyses. The profile and scoured streambed profile were used for the existing ground surface elevations of the end slope analyses. Both Janbu simplified and Bishop simplified methods were performed for circular failure.
Note 3: Soil strength parameters used for the Undrained (Short Term) condition and Drained (Long Term) condition are available from the Bureau of materials upon request

Newmark Analysis Seismic Slope Stability Estimated Vertical Deformation Summary for North Approach Embankment & Abutment Borings D and B-1ST at Station 578+24 (PR)

Location of Analyses and Assumptions [2]	Embank. Height (feet)	Slope (H:V)	Imperial Valley Earthquake Estimated Newmark Vertical Displacement (in.) [1]			Mammoth Lakes Earthquake Estimated Newmark Vertical Displacement (in.) [1]				
			Critical Failure Surface Elev. (feet)	Failure Surface Circular/ Block	(Bishop/ Janbu simplified Method)		Critical Failure Surface Elev. (feet)	Failure Surface Circular/ Block	(Bishop/ Janbu simplified Method)	
Undrained (Short Term) Condition [3]										
End Slope	17.2	Var.	370.7/	Circular	0.904	0.993	370.7/	Circular	1.664	1.824

(North Abut.)			370.7				370.7			
Sta. 578+75, Right side (PR)	17.2	2:1	370.7/ 370.7	Circular	0.369	0.401	370.7/ 370.7	Circular	0.754	0.838
Sta. 578+75, Right side (PR)	17.2	3:1	370.7/ 370.7	Circular	0.095	0.124	370.7/ 370.7	Circular	0.408	0.464
Sta. 578+75, Right side (PR)	17.2	4:1	371.1/ 371.1	Circular	0.028	0.043	370.7/ 370.7	Circular	0.169	0.203
Drained (Long Term) Condition [(3)]										
End Slope **(North Abut.)**	17.2	Var.	343.6/ 343.6	Circular	0.062	0.125	343.6/ 343.6	Circular	0.158	0.243
Sta. 578+75, Right side (PR)	17.2	2:1	N/A		N/A	N/A	**N/A**		N/A	N/A
Sta. 578+75, Right side (PR)	17.2	3:1	N/A		N/A	N/A	**N/A**		N/A	N/A
Sta. 578+75, Right side (PR)	17.2	4:1	N/A	Circular	N/A	0.000	344.5	Circular	N/A	0.015

Note 1: Imperial Valley 1940 example quake uses a peak ground acceleration (PGA) of 0.313 for a magnitude 7 earthquake with a 24.1 second duration. The Mammoth Lakes-1 1980 example earthquake uses a PGA of 0.416 for a magnitude 6.1 earthquake with a 9.2 second duration.

Note 2: A preliminary cross section for Station 578+75 was not available and an existing ground elevation of 376.7 ft. was assumed for the side slope analyses. The profile and scour analysis streambed profile were used for the existing ground surface elevations of the end slope analyses. Both Janbu simplified and Bishop simplified methods were performed for circular failure.

Note 3: Soil strength parameters used for the Undrained (Short Term) condition and Drained (Long Term) condition are available from the Bureau of Materials upon request.

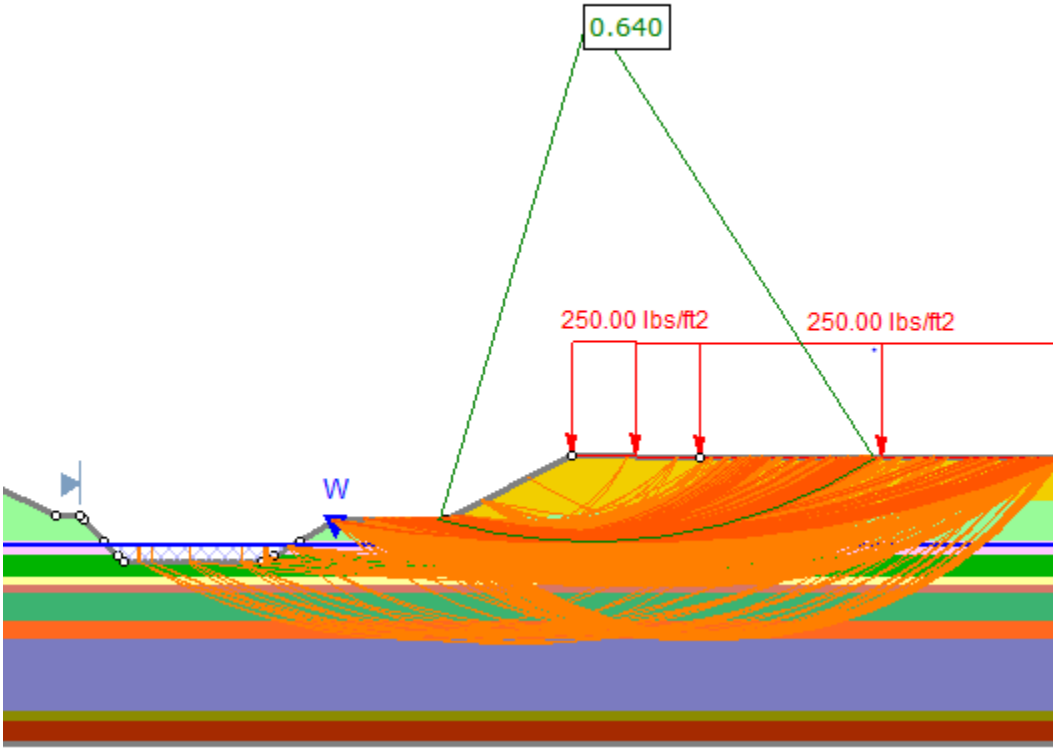


Figure of end slope failure surfaces with FOS < 1.0 (Bishop simplified method) for seismic load of 0.343 for undrained condition.

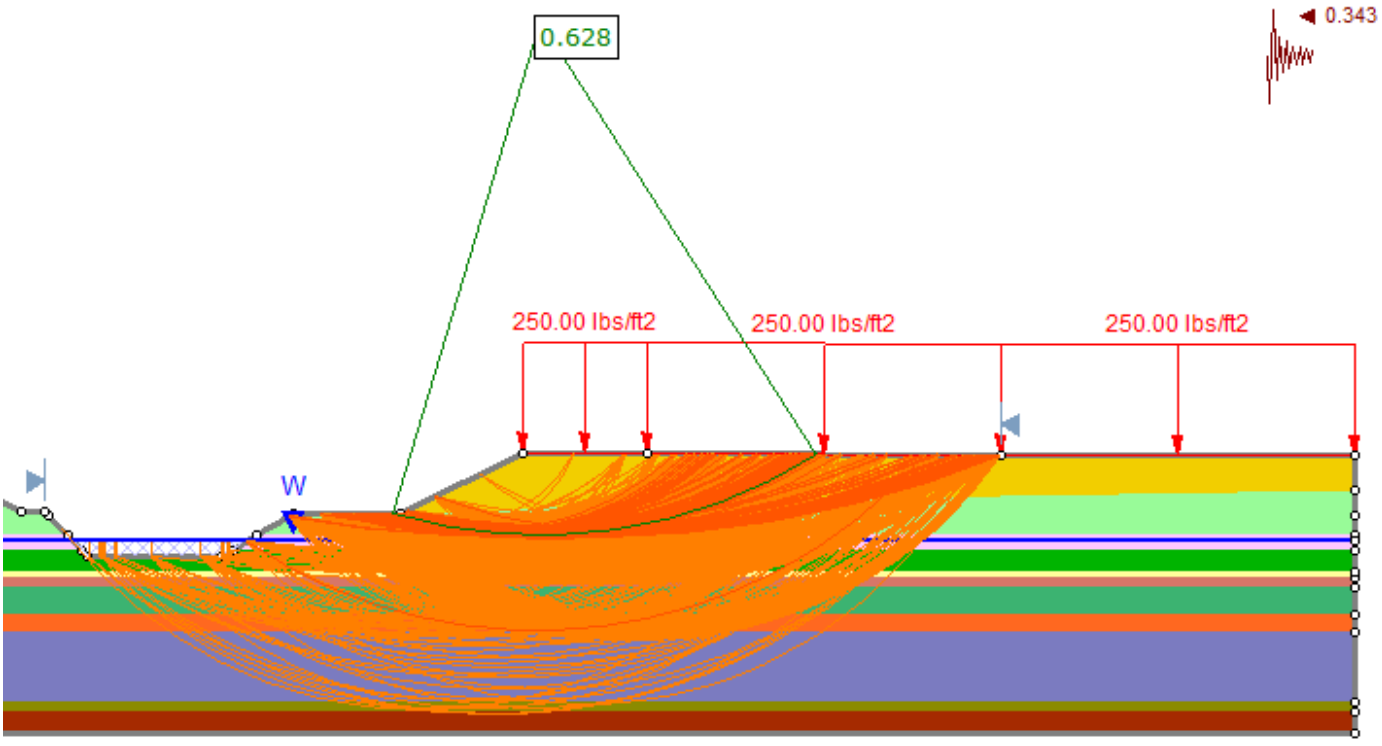


Figure of end slope failure surfaces with FOS < 1.0 (Janbu simplified method) for seismic load of 0.343 for undrained condition.

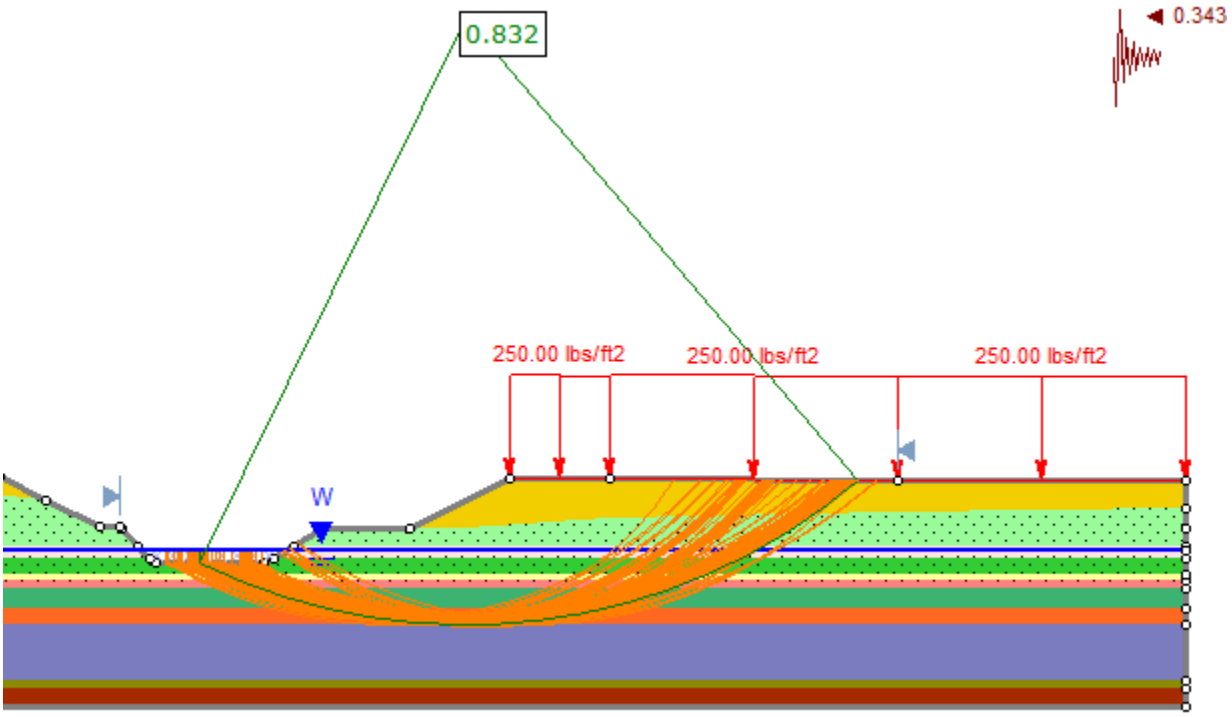


Figure of end slope failure surfaces with FOS < 1.0 (Bishop simplified method) for seismic load of 0.343 for drained condition. (Note that the orange soil layer is a soft layer (c=500 psf undrained) encountered in the soil boring below the depth of the Shelby tube boring, so it is modeled in the undrained condition. The layers with the dots are modeled in the drained condition.)

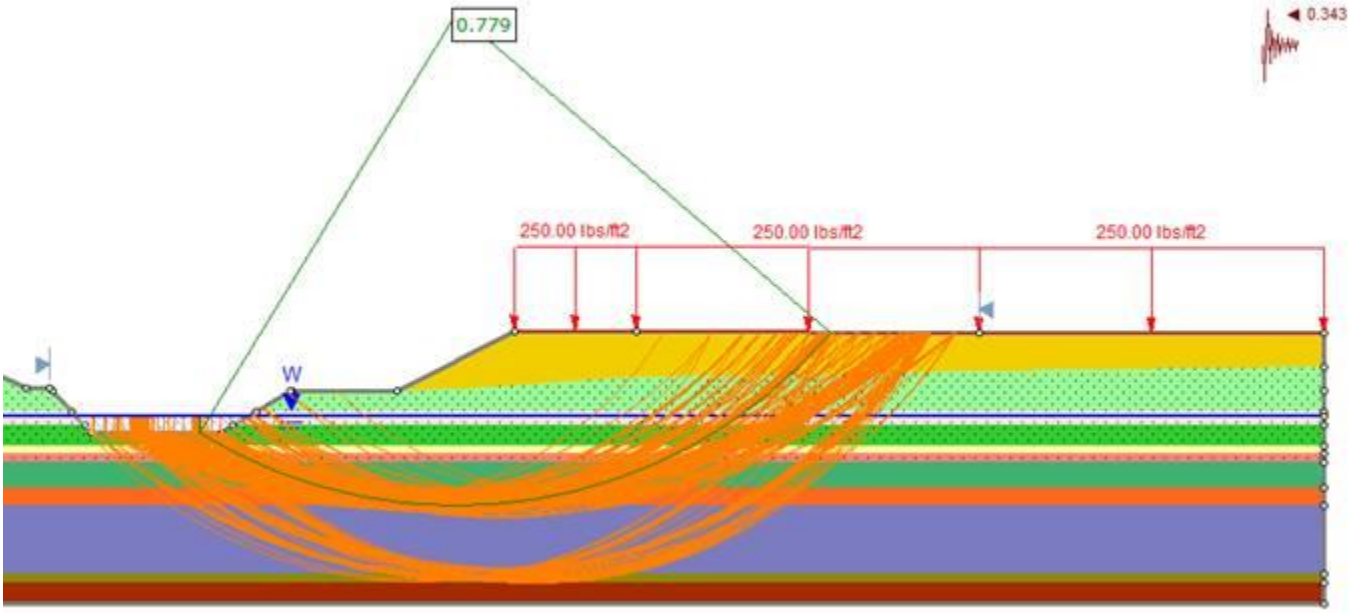


Figure of end slope failure surfaces with FOS < 1.0 (Janbu simplified method) for seismic load of 0.343 for drained condition. (Note that failure surfaces are occurring in soil layers derived from the soil boring data below the depth of the Shelby tube boring, so they are modeled in the undrained condition. The layers with the dots are modeled in the drained condition.)

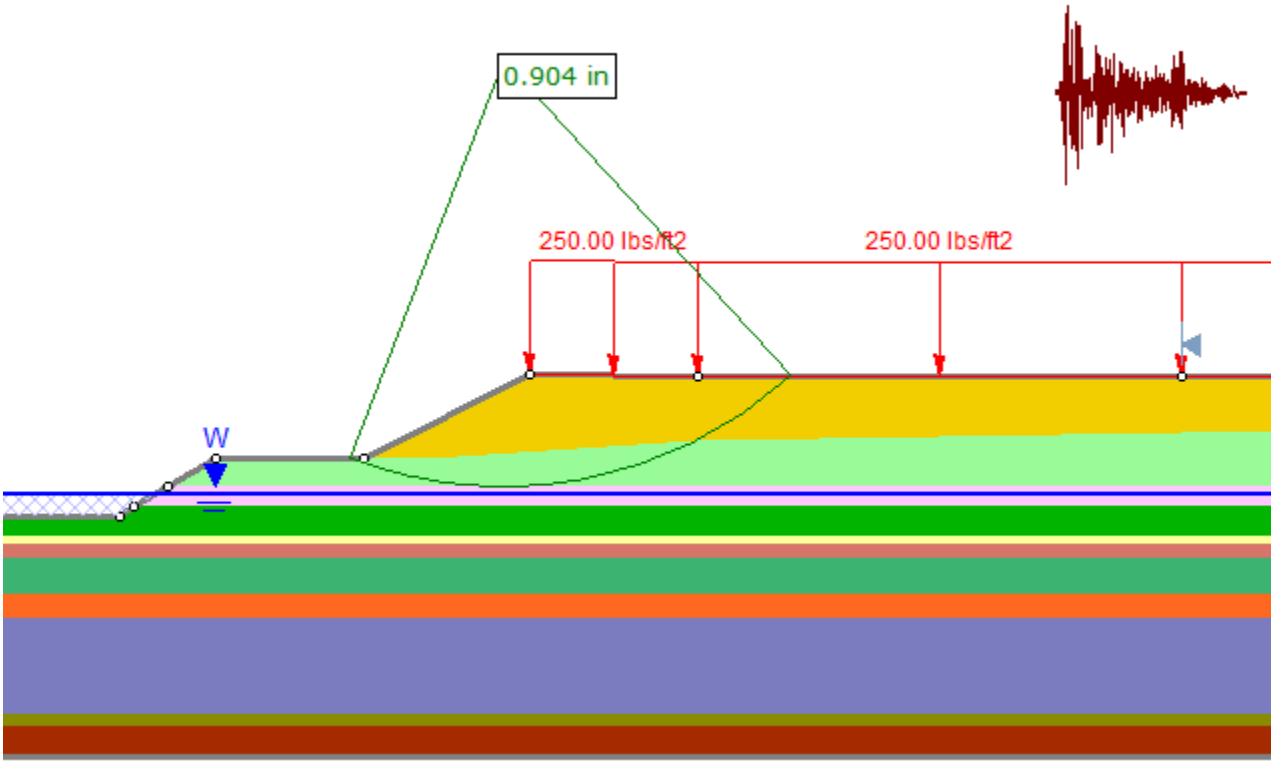


Figure of end slope failure surface (Bishop simplified method) for Newmark Analysis with the Imperial Valley earthquake loading for undrained condition.

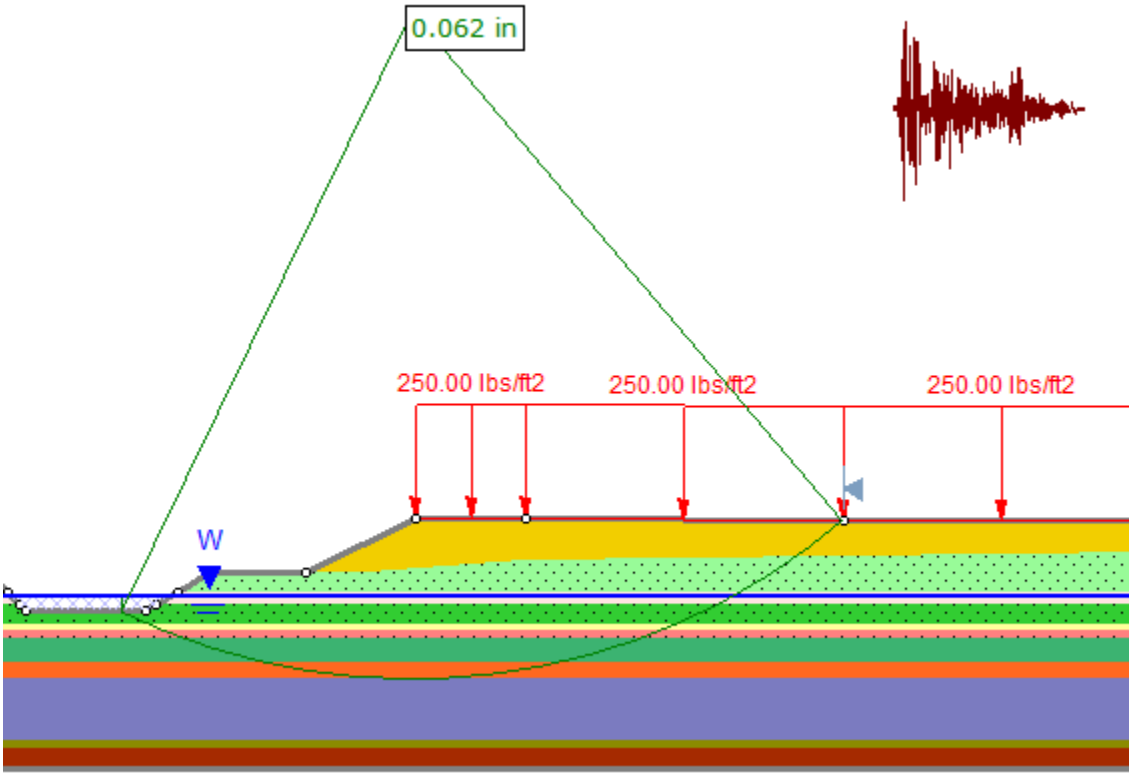


Figure of end slope failure surface (Bishop simplified method) for Newmark Analysis with the Imperial Valley earthquake loading for drained condition. (Note that the orange soil layer is a soft layer (c=500 psf undrained) encountered in the soil boring below the depth of the Shelby tube boring, so it is modeled in the undrained condition.)

Benchmark: Northwest wingwall of Structure Number 079-0005, Elev. 293.49

Existing Structure: S.N. 079-0005 was originally constructed in 1952 as part of S.B.I. Rte. 3, Section 74B-1, Station 577+42.00. The 3 span wide flange beam structure has an out to out width of 34'-0" and back to back abutment length of 165'-3". The superstructure is supported by solid wall piers and pile-bent abutments on concrete piles. Proposed structure to be built on new alignment while maintaining traffic on existing structure.

No salvage.

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

SEISMIC DATA

Seismic Performance Zone (SPZ) = TBD
Design Spectral Acceleration at 1.0 sec. (SD1) = TBD
Design Spectral Acceleration at 0.2 sec. (SDS) = TBD
Soil Site Class = TBD

DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

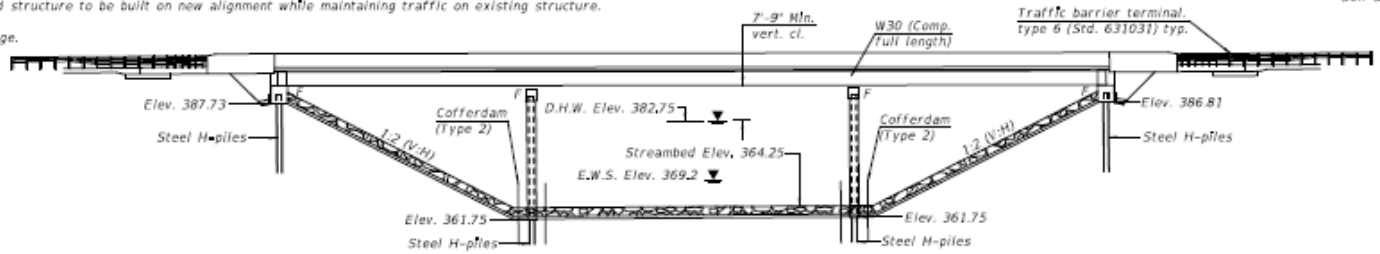
DESIGN STRESSES

FIELD UNITS

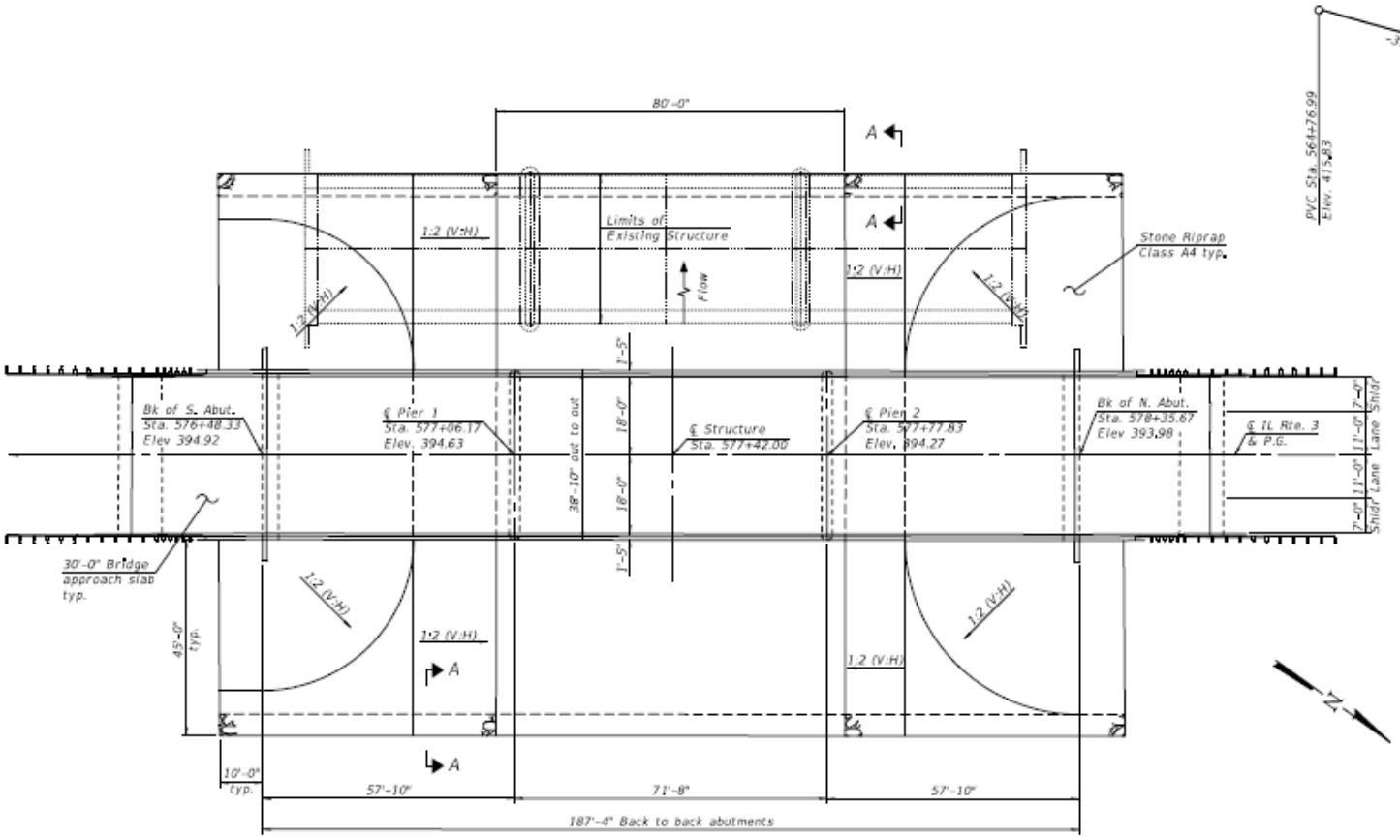
f'c = 3,500 psi
f'c = 4,000 psi (Superstructure)
fy = 60,000 psi (Reinforcement)
fy = 50,000 psi (M270 Grade 50)

HIGHWAY CLASSIFICATION

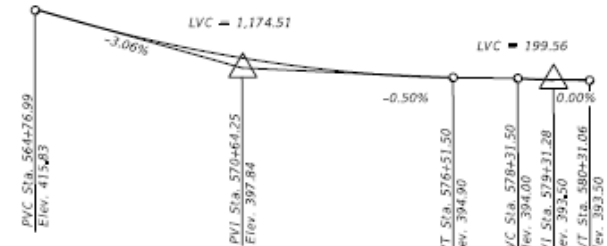
F.A.P. Rte. 312 (IL 3)
Functional Class: Other Principal Arterial
ADT: 2,700 (2022); 3,100 (2042)
ADTT: 345 (2022); 396 (2042)
DHV: 238 (2042)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
Two-Way Traffic
Directional Distribution: 50:50



ELEVATION

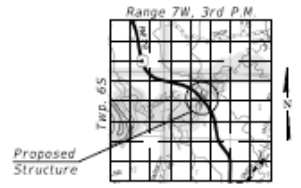


PLAN



PROFILE GRADE

(Along ℄ IL Rte. 3)



LOCATION SKETCH

GENERAL PLAN & ELEVATION
IL RTE. 3 OVER NINE-MILE CREEK
F.A.P. RTE. 312 - SEC. 74BR-2
RANDOLPH COUNTY
STATION 577+42.00
STRUCTURE NO. 079-0051

DRAFT

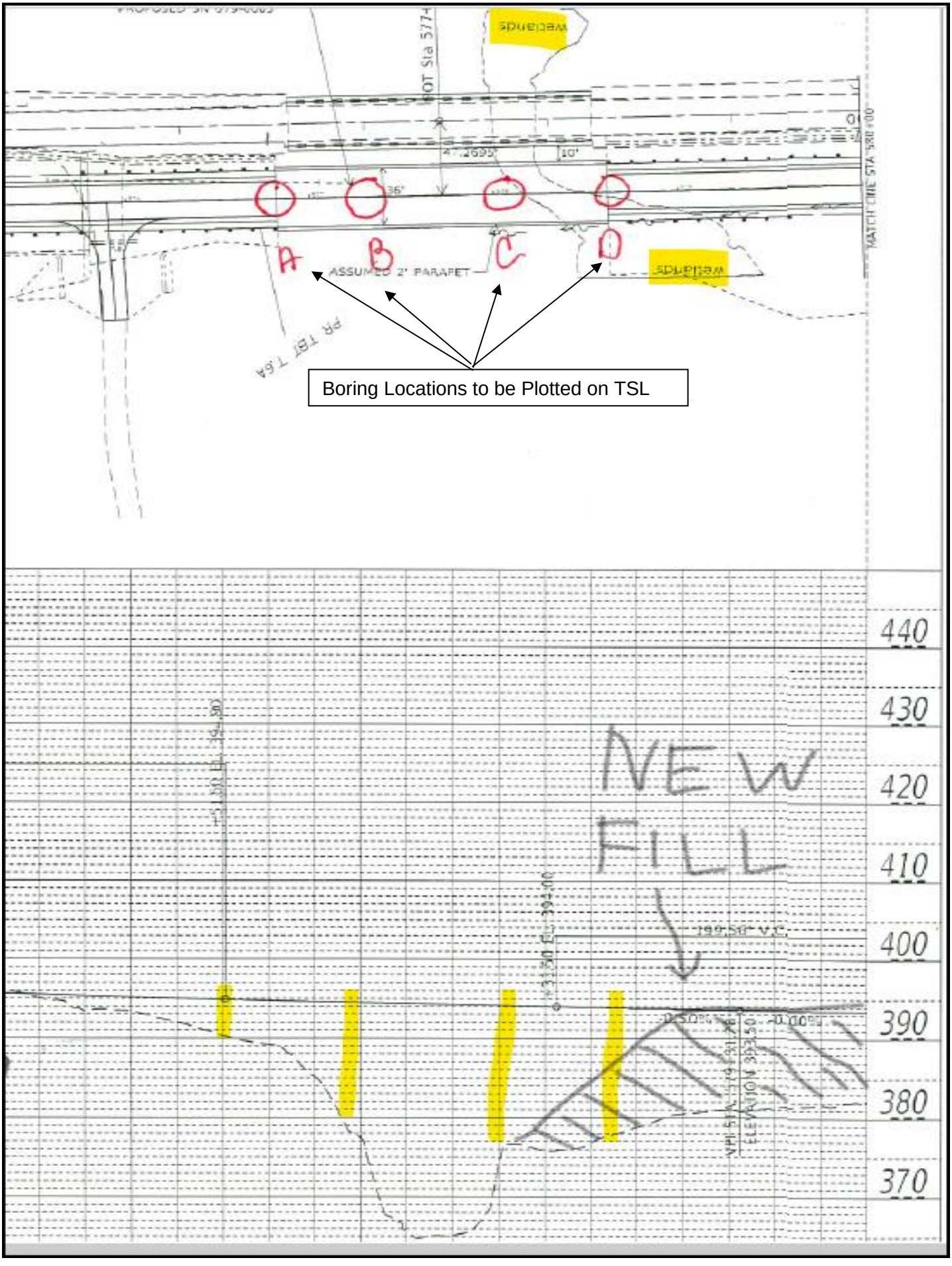
DESIGNED	JOSUE ORTIZ-VARELA
CHECKED	JUSTIN T. BILLUE
DRAWN	GLENN W. STOVER
CHECKED	ADAMATA

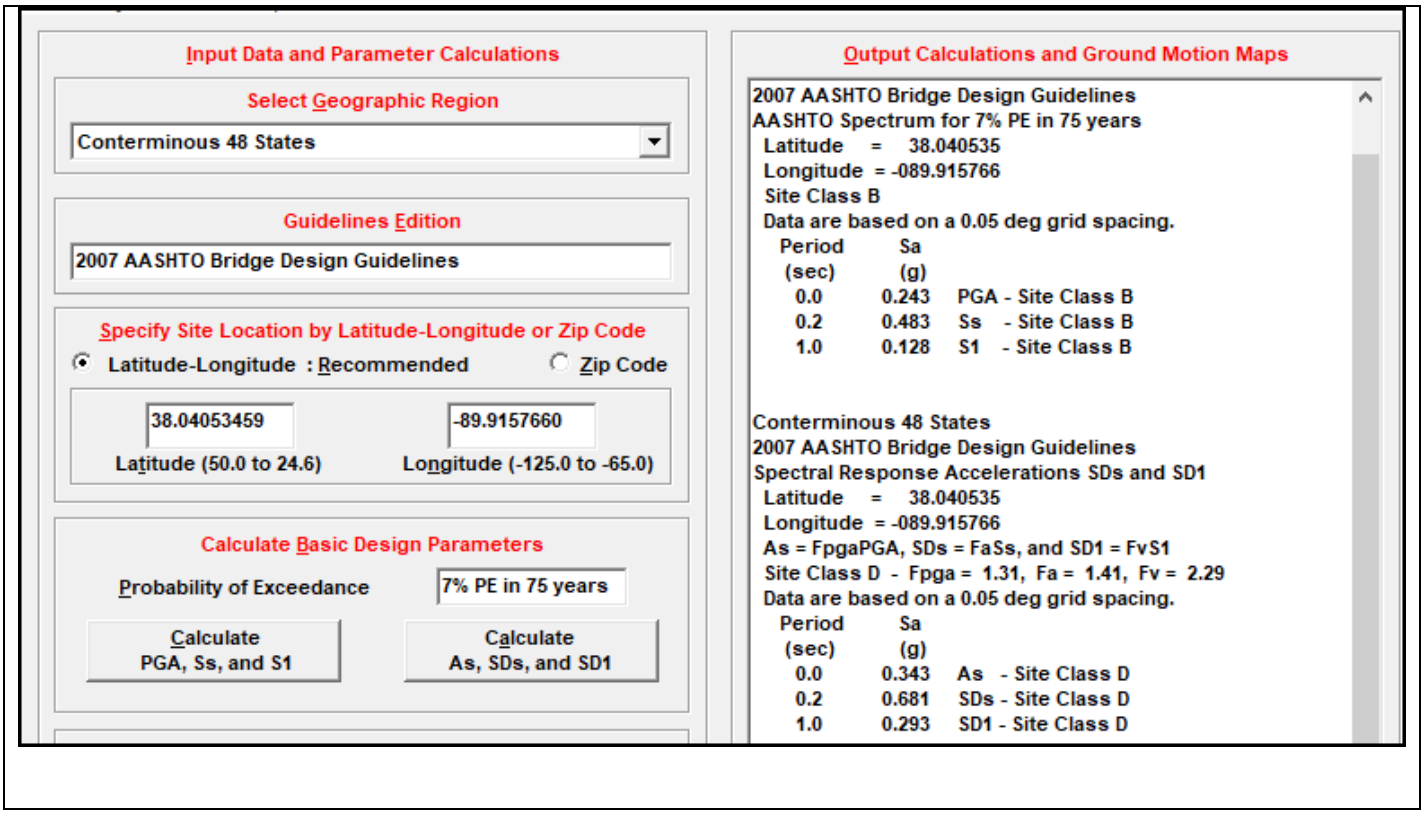
8/25/2020 2:28:22 PM

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
312	74BR-2	RANDOLPH	...	...
		CONTRACT NO. 76K75		
	ILLINOIS	FED. AID PROJECT		


wetlands
OT Sta 577+
A
B
C
D
ASSUMED 2' PARAPET
wetlands
MATCH LINE STA 580+00
Boring Locations to be Plotted on TSL
NEW
FILL
440
430
420
410
400
390
380
370


Input Data and Parameter Calculations
Select Geographic Region
Conterminous 48 States
Guidelines Edition
2007 AASHTO Bridge Design Guidelines
Specify Site Location by Latitude-Longitude or Zip Code
Latitude-Longitude : Recommended
Zip Code
38.04053459
-89.9157660
Latitude (50.0 to 24.6)
Longitude (-125.0 to -65.0)
Calculate Basic Design Parameters
Probability of Exceedance
7% PE in 75 years
Calculate PGA, Ss, and S1
Calculate As, SDs, and SD1
Output Calculations and Ground Motion Maps
2007 AASHTO Bridge Design Guidelines
AASHTO Spectrum for 7% PE in 75 years
Latitude = 38.040535
Longitude = -089.915766
Site Class B
Data are based on a 0.05 deg grid spacing.
Period (sec) Sa (g)
0.0 0.243 PGA - Site Class B
0.2 0.483 Ss - Site Class B
1.0 0.128 S1 - Site Class B
Conterminous 48 States
2007 AASHTO Bridge Design Guidelines
Spectral Response Accelerations SDs and SD1
Latitude = 38.040535
Longitude = -089.915766
As = FpgaPGA, SDs = FaSs, and SD1 = FvS1
Site Class D - Fpga = 1.31, Fa = 1.41, Fv = 2.29
Data are based on a 0.05 deg grid spacing.
Period (sec) Sa (g)
0.0 0.343 As - Site Class D
0.2 0.681 SDs - Site Class D
1.0 0.293 SD1 - Site Class D

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/25/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500262.546, 369130.578, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , **Longitude**

COUNTY RANDOLPH **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. A
Station 576+37.55
Offset 31.7 ft Right
Ground Surface Elev. 390.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 364.9 ft ▼
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Brown Silty Clay w/Trace Organics
	1			Poor Recovery
	3	2.0	17	
	4	P		See Classification at 1 ft
	2			
	3	1.6	21	
-5	3	B		
385.40				
	1			Brown & Gray Clay Loam
	2	0.6	35	
	2	B		
381.90	1			
	3	0.9	34	
-10	3	S		Red & Gray Clay
	-			
	-	2.0	25	At 11 ft- Pushed Shelby Tube
	-	P		Recovery: 24"
				6/25/2020- See Classification
377.90				
	11			Gray Sandy Clay
	2	0.7	28	
-15	3	B		
375.40				
	2			Gray & Brown Silty Clay Loam Till
	4	0.9	27	
	7	B		At 19 ft- 1" of Brown Limestone Fragments
	12			
	50/3"	1.0	16	
-20		P		
370.40				
	5			Brown Clay w/ Limestone &
	8	1.0	10	Sandstone Fragment
	19	P		
367.90				
	50~1"			Brown Sandy Clay w/ Limestone
			18	Fragment
365.90 -25				Poor Recovery
	5			Brown & Gray Silty Clay Loam Till- ▼
	11	0.9	17	Wet
	17	B		
	2			
	5	2.5	27	
-30	7	S		
357.90				
	3			Gray Clay- Wet
	5	2.3	24	
-35	6	B		See Classification at 33.5 ft
	4			
	4	1.7	27	
-40	4	B		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/25/20

ROUTE FAP 312 (IL 3) DESCRIPTION IL 3 over Nine Mile Creek J034769.02 LOGGED BY KEG

SECTION 74B-2 LOCATION 500262.546, 369130.578, SEC. 6, TWP. 6S, RNG. 7W, 3rd PM,
Latitude , Longitude

COUNTY RANDOLPH DRILLING METHOD HSA HAMMER TYPE Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. A
Station 576+37.55
Offset 31.7 ft Right
Ground Surface Elev. 390.90 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 364.9 ft ▼
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Gray Clay- Wet See Classification at 33.5 ft *(continued)*				
347.90				
Gray Silty Clay- Wet		3		
		2 4	1.0 B	27
	-45			
342.90				
Gray Coarse Sand- Wet		3		
		4 7	3.5 B	21
340.90	-50			
Gray Clay- Stiff				
		1		
		2 5	1.6 B	28
	-55			
		5		
		7 10	2.0 B	30
	-60			
Gray Clay- Stiff *(continued)*				
		6		
		7 8	2.8 B	29
	-65			
322.40				
		8		
Gray Clay Till		10 17	2.2 B	20
	-70			
319.90				
No Recovery At 71 ft- Boring Terminated on Limestone Bedrock End of Boring				
	-75			
	-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/29/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02 -Pier 1 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500316.479, 369051.150, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , **Longitude**

COUNTY RANDOLPH **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. B
Station 577+30.02
Offset 5.8 ft Right
Ground Surface Elev. 392.41 ft

Surface Water Elev. 363.50 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
392.24 *Note*-Boring drilled through bridge deck.			
391.83 2" Asphalt			
5" Concrete Pavement			
Blind Drilling to 35'			
-5			
-10			
-15			
-20			
Blind Drilling to 35' *(continued)*			
-25			
-30			
357.41 -35			
Brown Clay	4		
See Classification at 36 ft	5 5	1.8 B	24
354.41			
Turns Gray	4		
-40	5 4	1.5 B	22

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/29/20

ROUTE FAP 312 (IL 3) DESCRIPTION IL 3 over Nine Mile Creek J034769.02 -Pier 1 LOGGED BY KEG

SECTION 74B-2 LOCATION 500316.479, 369051.150, SEC. 6, TWP. 6S, RNG. 7W, 3rd PM,
Latitude , Longitude

COUNTY RANDOLPH DRILLING METHOD Mud Rotary HAMMER TYPE Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. B
Station 577+30.02
Offset 5.8 ft Right
Ground Surface Elev. 392.41 ft

Surface Water Elev. 363.50 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Turns Gray *(continued)*			
	4		
	7 10	1.2 B	26
	5		
-45	4 4	1.5 B	28
	4		
	4 6	1.9 B	28
344.41			
Gray Silty Clay	3		
-50	3 5	1.1 B	25
341.91			
Gray Silty Clay Loam	2		
	2 4	1.1 B	25
339.41			
Gray Clay	7		
-55	10 16	3.3 S	28
See Classification at 56 ft	6		
	7 8	2.4 B	37
	4		
-60	4 5	1.7 S	25
Gray Clay	5		
	7 12	0.8 B	28
See Classification at 56 ft *(continued)* At 62 ft- 1in Sand Seam- Coarse, Gray	6		
-65	7 13	1.9 B	27
	6		
-70	10 16	2.3 B	24
Borehole continued with rock coring.			
-75			
-80			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 6/29/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02 -Pier 1 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500316.479, 369051.150, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , Longitude

COUNTY RANDOLPH **CORING METHOD** Mud Rotary

STRUCT. NO. SN 079-0005 **CORING BARREL TYPE & SIZE** Wireline NQ2
Station

Core Diameter 2 in
Top of Rock Elev. 317.91 ft
Begin Core Elev. 317.91 ft

BORING NO. B
Station 577+30.02
Offset 5.8 ft Right
Ground Surface Elev. 392.41 ft

		DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
Gray Clay Loam Till- w/ Limestone Fragments *(continued)*	317.41	-75	1	96	21	3.5	
Hard Gray & Brown Limestone- Moderate Weathering							
At 76.5 ft- 2in Gravel seam w/ Limestone Fragments	315.91						
			2	95	33	6.6	876.4
At 79.2 ft- 4" Soft Clayey Shale Seam	312.41	-80					
Moderately hard to soft gray shale							
			3	77	25	7	27.4
		-85					
	305.11		4	100	0	56.4	27.9
			5	68	44	13.9	35.3
Brown Clay-Soft : 16 in Seam	303.81						
Modertely Hard Gray Shale		-90					
	301.41						
No Recovery on Run 6			6	0	0	13	
End of Boring							

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 7/2/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02- Pier 2 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500335.588, 369035.073, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , **Longitude**

COUNTY RANDOLPH **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. C
Station 577+55.00
Offset 5.9 ft Right
Ground Surface Elev. 392.28 ft

Surface Water Elev. 363.50 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
2" Asphalt 392.11 / 5" Concrete Pavement 391.70 / Blind Drilling to 27.5'				
	-5			
	-10			
	-15			
	-20			
Blind Drilling to 27.5' *(continued)*				
	-25			
365.28 Soft Gray Silty Clay- Wet		WH		
		WH	0.0	33
	-30	WH	P	
361.78 Gray Clay w/Sand & Gravel		3		
		3	1.3	17
359.78 No Recovery		1	P	
		7		
		9	-	
	-35	10		
356.78 Gray Silty Clay		4		
		6	2.2	30
		6	B	
354.28 Brown Clay		2		
		3	1.3	26
	-40	3	B	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 7/2/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02- Pier 2 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500335.588, 369035.073, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , **Longitude**

COUNTY RANDOLPH **DRILLING METHOD** Mud Rotary **HAMMER TYPE** Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. C
Station 577+55.00
Offset 5.9 ft Right
Ground Surface Elev. 392.28 ft

Surface Water Elev. 363.50 ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Brown Clay *(continued)*
	3			
	8 7	1.5 B	26	
	3			
	5 6	2.0 B	28	
-45				
346.78				
	1			Brown Silty Clay w/ Trace Sand
	2 3	0.4 B	27	
	2			
	3 3	0.7 B	23	
-50				
341.78				
	4			Gray Clay At 52 ft- 2 in Sand Seam- Coarse, Gray
	8 12	3.3 B	23	
	4			See Classification at 53.5 ft
	6 9	1.7 B	32	
-55				
	5			
	8 9	1.1 B	32	
-60				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
331.78	6			
	10 14	4.4 B	28	Becomes Stiff
-65				
326.78				
	12			Gray Clay Loam Till w/ Limestone Fragments Poor Recovery
	10 36	2.0 P	18	
-70				
321.78				
				No Recovery
320.28				*Note*-Boring drilled through bridge deck. 2 in Asphalt pavement, 5 in Concrete pavement (see pavement core C). 27.5 in from top of soil.
				Borehole continued with rock coring.
-75				
-80				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Department of Transportation
Division of Highways
IDOT

ROCK CORE LOG

Date 7/2/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02- Pier 2 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500335.588, 369035.073, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM**,
Latitude , Longitude

COUNTY RANDOLPH **CORING METHOD** Mud Rotary

STRUCT. NO. SN 079-0005 **CORING BARREL TYPE & SIZE** Wireline NQ2
Station

Core Diameter 2 in
Top of Rock Elev. 318.28 ft
Begin Core Elev. 318.28 ft

BORING NO. C
Station 577+55.00
Offset 5.9 ft Right
Ground Surface Elev. 392.28 ft

	DEPTH (ft)	CORE (#)	RECOVERY (%)	R.Q.D. (%)	CORE TIME (min/ft)	STRENGTH (tsf)
2 in Gray Clay Hard Gray Limestone- Moderately Weathered	-75	1	94	28	4	736.4
316.78 At 75 ft -3 in Clayey Shale Seam	-80	2	63	20	13.2	
311.78 Gray Shale- Soft		3	80	38	14.4	13.2
307.78 Becomes Moderately Soft	-85	4	100	53	25	10.4
305.28 At 87 ft-Rock Core Terminated Due to Time End of Boring	-90					

Color pictures of the cores Yes
Cores will be stored for examination until
The "Strength" column represents the uniaxial compressive strength of the core sample (ASTM D-2938)

BBS, form 138 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/26/20

ROUTE FAP 312 (IL 3) **DESCRIPTION** IL 3 over Nine Mile Creek J034769.02 **LOGGED BY** KEG

SECTION 74B-2 **LOCATION** 500422.264, 369030.723, **SEC.** 6, **TWP.** 6S, **RNG.** 7W, 3rd **PM,**
Latitude , Longitude

COUNTY RANDOLPH **DRILLING METHOD** HSA **HAMMER TYPE** Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. D
Station 578+23.98
Offset 58.6 ft Right
Ground Surface Elev. 376.56 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Brown Silty Clay w/ Trace Organics		1		
		2	0.2	23
		2	B	
	373.56			
Soft Brown Clay- Wet		12		
At 3.6 ft- 2 in Gravelly Clay Seam		0	0.0	30
	-5	1	B	
At 6 ft- Pushed Shelby Tube		-		
Recovery: 26 in				
See Classification		-	0.0	27
		-	B	
		WH		
	367.06	WH	0.0	23
	-10	WH	B	
Gray Sandy Clay- Soft & Wet		1		
		4	0.0	22
		6	B	
	362.56	3		
		4	1.2	27
Gray Clay Loam Till- Wet	-15	8	B	
	361.06			
Brown Silty Clay- Wet		4		
		6	2.4	30
		8	B	
		3		
		3	2.2	27
	-20	5	B	
	356.06			
Brown Clay- Stiff & Wet		3		
		4	2.4	29
		6	B	
See Classification at 23.5 ft				
		7		
		14	4.2	21
	-25	16	B	
		3		
		5	2.4	26
		7	B	
	348.56			
Becomes Soft		5		
		5	0.5	25
	-30	5	B	
	343.56			
Becomes Stiff		3		
		4	2.4	26
	-35	10	B	
		6		
		9	3.1	28
	-40	16	B	

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
IDOT

SOIL BORING LOG

Date 6/26/20

ROUTE FAP 312 (IL 3) DESCRIPTION IL 3 over Nine Mile Creek J034769.02 LOGGED BY KEG

SECTION 74B-2 LOCATION 500422.264, 369030.723, SEC. 6, TWP. 6S, RNG. 7W, 3rd PM,
Latitude , Longitude

COUNTY RANDOLPH DRILLING METHOD HSA HAMMER TYPE Auto

STRUCT. NO. SN 079-0005
Station

BORING NO. D
Station 578+23.98
Offset 58.6 ft Right
Ground Surface Elev. 376.56 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter ft
Upon Completion ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Becomes Stiff *(continued)*				
333.56				
At 44.5 ft- 2 in Sand Seam		2		
		4	2.0	29
	-45	8	B	
		6		
		10	2.6	31
	-50	13	B	
323.56				
Sandy Clay Loam Till		14		
		29	1.8	21
	-55	36	B	
321.06				
At 55 ft- Boring Terminated on Limestone		50~1"		
End of Boring				29
	-60			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, form 137 (Rev. 8-99)

STATE OF ILLINOIS
Department of Transportation

SOIL TEST DATA

STATE JOB NUMBER C-98-165-18 ROUTE FAP 312 (IL 3) CONTRACT 76K25

SECTION 74B-2 COUNTY Randolph

BORING NO.		A	A	A	B	B
LAB. NO.		20S-007	20S-027	20S-007	20S-031	20S-031
STATION		576+37.55	576+37.55	576+37.55	577+30.02	577+30.02
LOCATION		500262.546, 369130.578	500262.546, 369130.578	500262.546, 369130.578	500316.479, 369051.150	500316.479, 369051.150
DEPTH		1'	11'	33.5'	36'	56'
COORDINATES						
ELEVATION	FT	390.899	390.899	390.899	392.409	392.409
HRB CLASSIFICATION & GROUP INDEX		A-7-6 (30)	A-7-6 (36)	A-6 (29)	A-6 (19)	A-6 (19)
GRAIN SIZE CLASSIFICATION		Silty Clay	Clay	Silty Clay	Silty Clay	Clay
GRADATION-PASSING 2" SIEVE	%					
" 1"	%					
" 3/4" (A)	%	100.00	100.00	100.00	100.00	100.00
" 1/2"	%	98.81	100.00	100.00	100.00	100.00
" NO. 4	%	98.68	100.00	100.00	100.00	100.00
" NO. 10	%	98.68	99.42	100.00	99.93	99.96
" NO. 40	%	94.73	98.33	99.71	99.89	98.75
" NO. 100	%	90.50	96.38	99.55	99.78	93.06
" NO. 200	%	87.06	94.25	99.29	99.73	92.26
SAND	%	11.6	5.2	0.7	0.2	7.7
SILT	%	55.9	47.7	54.1	53.8	34.6
CLAY	%	31.2	46.6	45.2	45.9	57.6
LIQUID LIMIT	%	51	55	37	36	39
PLASTICITY INDEX	%	33	36	31	18	20
ORGANIC CONTENT	%					
IN SITU MOISTURE	%	16.7	24.7	24.0	24.30	27.9
STANDARD DRY DENSITY AASHTO T99 (METHOD C) (A)	PCF					
OPTIMUM MOISTURE (A)	%					

REMARKS:

(A) - COARSE CORRECTION FACTOR FROM AASHTO T99 ANNEX & T224 APPLIES WHEN % RETAINED GREATER THAN 5%

STATE OF ILLINOIS
Department of Transportation

SOIL TEST DATA

STATE JOB NUMBER C-98-165-18 ROUTE FAP 312 (IL 3) CONTRACT 76K25

SECTION 74B-2 COUNTY Randolph

BORING NO.		C	D	D		
LAB. NO.		20S-034	20S-033	20S-033		
STATION		577+55.00	578+23.98	578+23.98		
LOCATION		500335.588, 369035.073	500422.264, 369030.723	500422.264, 369030.723		
DEPTH		53.5'	6'	23.5'		
COORDINATES						
ELEVATION	FT	392.275	376.564	376.564		
HRB CLASSIFICATION & GROUP INDEX		A-6 (19)	A-4 (5)	A-6 (19)		
GRAIN SIZE CLASSIFICATION		Clay	Silty Loam	Silty Clay		
GRADATION-PASSING 2" SIEVE	%					
" 1"	%					
" 3/4" (A)	%	100.00	100.00	100.00		
" 1/2"	%	100.00	100.00	100.00		
" NO. 4	%	100.00	100.00	100.00		
" NO. 10	%	100.00	99.95	100.00		
" NO. 40	%	98.56	99.32	99.62		
" NO. 100	%	96.85	88.86	98.21		
" NO. 200	%	96.64	83.75	98.05		
SAND	%	3.4	16.2	2.0		
SILT	%	46.3	69.8	51.1		
CLAY	%	50.4	14.0	47.0		
LIQUID LIMIT	%	38	27	38		
PLASTICITY INDEX	%	18	7	20		
ORGANIC CONTENT	%					
IN SITU MOISTURE	%	31.7	26.9	21.3		
STANDARD DRY DENSITY AASHTO T99 (METHOD C) (A)	PCF					
OPTIMUM MOISTURE (A)	%					

REMARKS:

(A) - COARSE CORRECTION FACTOR FROM AASHTO T99 ANNEX & T224 APPLIES WHEN % RETAINED GREATER THAN 5%

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