Conclusions

The well-established turf cover on the Indian Head Road was of appreciable value in resistance to rutting.

On the Shirley Highway, where all but two of the several designs had at least 38 percent of the material retained on a No. 10 sieve, no particularly significant difference in resistance to rutting was found between the designs. In most cases, the rutting under the first application of the wheel load was $\frac{1}{2}$ in. or less. In no case, after repeated runs, was there any indication that a breakthrough of the shoulder structure was incipient.

The considerable variation in design of the shoulders tested indicates that stable shoulders of adequate bearing capacity, and able to support turf, can be constructed with considerable latitude in the materials used, permitting economical construction with available materials. The tests indicate that for the climatic conditions of Washington, D. C., materials should prove stable if conforming to the requirements of Grading F of A.A.S.H.O. Designation M 147-49, with a maximum liquid limit of 35 and a plasticity index range of 4 to 9, assuming adequate compaction. They also show that it should be possible to secure a satisfactory stand of turf where use by traffic is not excessive.

Indian Head Road

Kind - 1-in. topsoil mixed with 2-inch gravel
Root penetration - 4 to 7 inches
Natural moisture, top portion - 8 to 11 percent
Moisture at time of test, top portion
Bottom of rut - 15.7 percent)
Side of rut - 42.6 percent) average of 3 stations
After test runs, top portion
L.L. - 25
P.I. - 7
Dry Density - 122.

Rutting - after 30 runs - 0.16 ft.

LOUISIANA DEPARTMENT OF HIGHWAYS
HAMMOND MAINTENANCE DISTRICT
HAMMOND, LOUISIANA

TRAFFIC TEST ON TURF SHOULDER

Baptist, Louisiana

This is a report on traffic tests on a turf shoulder conducted May 5, 1953, by the Louisiana Department of Highways in accordance with suggestions from the Committee on Stabilized Turf Shoulders of the Highway Research Board. The shoulder is located on US 190 at Baptist, La.

The shoulder selected for the experiment has given excellent service and is

completely covered with turf. The present stand of grass is good and is composed of approximately 70 percent Bermuda, 28 percent white dutch clover, and 2 percent weeds. The soil pH is 5.5.

The test shoulder adjoins a 24-ft. concrete highway which was completed in July, 1950. Regular maintenance operations were resumed at this time. Traffic volume over the highway at the point of the test averages 3,520 vehicles per 24 hours. Automobiles comprise approximately 60 percent of the traffic and trucks 40 percent.

On May 3 the area had 4.75 in. of rainfall and ½ in. of rainfall on May 4. It is probable that the soil moisture content was high enough to consider the shoulder in the worst condition of the year in respect to stability. On April 22, 1953, soil samples were taken to determine texture, density, and plastic index. Soil samples for determining moisture content were taken the day the actual test was run. Soil data are given in Table 1.

The required 18,000-lb. axle load was obtained by using a 3-ton dump truck with dual rear wheels and loaded with 5 yd. of sand clay gravel. The truck made 31 passes over the test shoulder, which was considered sufficient to determine the degree of stability. Results are shown in Table 2.

To facilitate measuring the depressions of the truck track, 21 stakes were set on grade with the concrete slab and at 10-ft. intervals. The first stake was set 225 ft. west of the Natalbany River bridge on the south shoulder.

The stakes were numbered consecutively through 21 in a westerly direction. Soil samples were taken at stakes 1, 5, 9, 13, 17, and 21. It was thought that the samples taken at these stakes would give a uniform and accurate report of the underlying materials. A calibrated 2x4 was laid across the truck track. One end rested on the concrete slab, the other on top of a stake. (See photo) Thus it was possible to measure the depression from the same place and elevation each time.

Soil samples for determining moisture content were taken from 0-to-3-inch and 3-to-7-inch depths. Soil samples for determining texture density, and plastic index were taken from 0-to-3-ft. depth. Analyses are shown in the attached laboratory reports.

TABLE 1

SOIL DATA

Station No.	1			
Sample No.	1	2	3	4
% Coarse sand			Trace	
% Fine sand	38	18	19	20
% Silt	55	49	52	52
% Clay & colloids	7	33	29	28
% Colloids	3	25	21	21
% Pass No. 40 sieve	100	100	100	100
% Pass No. 200 sieve	96			
% Pass No. 270 sieve	95			
Liquid limit		29	29	31
Plastic limit	nonplastic	20	19	19
Plasticity Index	"	9	10	12
Shrinkage limit	"	17	18	18
Shrinkage ratio	nonplastic	1.73	1.71	1.73
Group Classification	A-4 silty loam	A-4 lt. silty clay	A-4 silty clay loam	A-4 silty clay loam
Depth	*0.0-0.3 ft.	0.3-1.0 ft.	1.0-1.3 ft.	1.3-3.0 ft.

* This is a sample of mulch sod and is found as the top 0.3 ft. at each station.

Dry density of material tested	110.0 #/cu. ft.
Percent of maximum density	97.7
Optimum moisture content	14.4%
Moisture content (taken at time of test)	
1-to-3-in.	18.9%
3-to-7-in.	17.5%

TABLE 1 Cont'd.

SOIL DATA

Station No.	5		9	
Sample No.	5	6	7	8
% Coarse sand			5	
% Fine sand	20	21	17	20
% Silt	58	50	51	50
% Clay & colloids	22	29	27	30
% Colloids	11	21	18	24
% Pass No. 40 sieve	100	100	95	100
% Pass No. 200 sieve		91		
% Pass No. 270 sieve		90		
Liquid limit	25	32	22	29
Plastic limit	19	21	18	19
Plasticity Index	6	11	4	10
Shrinkage limit	17	15	17	14
Shrinkage ratio	1.70	1.77	1.71	1.77
Group	A-4	A-4	A-4	A-4
Classification	silty clay loam	silty clay loam	silty clay loam	silty clay loam
Depth	0.3-1.3 ft.	1.3-3.0 ft.	0.3-1.2 ft.	1.2-3.0 ft.
Dry density of material tested	106.4 #/cu. ft.		104.0 #/cu. ft.	
Percent of maximum density	95.9		94.1	
Optimum moisture content	14.4%		14.4%	
Moisture content (Taken at time of test)				
1-to-3-in.	19.4%		18.5%	
3-to-7-in.	19.9%		18.1%	

TABLE 1 Cont'd.

SOIL DATA

Station No.	13		17	21
Sample No.	9	10	11	12
% Coarse sand	Trace			Trace
% Fine sand	20	20	21	22
% Silt	55	49	51	51
% Clay & colloids	25	31	28	27
% Colloids	18	21	22	19
% Pass No. 40 sieve	100	100	100	100
% Pass No. 200 sieve			93	
% Pass No. 270 sieve			90	
Liquid limit	25	35	30	28
Plastic limit	20	22	22	19
Plasticity Index	5	13	8	9
Shrinkage limit	17	17	17	16
Shrinkage ratio	1.71	1.74	1.71	1.72
Group Classification	A-4 silty clay loam	A-4 lt. silty clay	A-4 silty clay loam	A-4 silty clay loam
Depth	0.3-1.7 ft.	1.7-3.0 ft.	0.3-3.0 ft.	0.3-3.0 ft.
Dry Density of material tested	109.1 #/cu. ft.		103.8#/ cu. ft.	103.7#/ cu. ft.
Percent of maximum density	98.9		92.1	93.2
Optimum moisture content	14.4%		14.4%	14.4%
Moisture content (Taken at time of test)				
1-to-3-in.	17.6%		18.5%	21.1%
3-to-7-in.	17.4%		19.2%	17.7%

TABLE 2

DEFLECTIONS IN INCHES

Site	Number of Passes						
	0	1	5	8	13	20	31
1	0	0	0	1/8	1/8	1/8	3/8
2	0	0	0	0	1/8	1/8	1/2
3	0	1/8	1/8	1/2	1/2	5/8	5/8
4	0	1/4	3/8	1/2	1/2	5/8	7/8
5	0	0	1/4	1/4	1/4	1/4	5/8
6	0	0	1/4	1/2	1/2	1/2	7/8
7	0	0	1/8	1/4	5/8	3/4	1-1/8
8	0	0	1/8	1/8	1/4	3/8	3/8
9	0	0	1/8	1/8	3/8	3/8	5/8
10	0	0	1/8	1/4	3/8	1/2	3/4
11	0	1/8	1/4	1/4	5/8	5/8	3/4
12	0	1/8	1/4	3/8	3/8	3/8	1/2
13	0	0	1/8	1/4	1/4	3/8	3/4
14	0	0	1/4	3/8	5/8	5/8	5/8
15	0	1/8	3/8	3/8	1/2	1/2	1
16	0	0	1/4	1/4	1/2	5/8	7/8
17	0	1/8	3/8	3/8	3/8	1/2	3/4
18	0	3/8	3/4	7/8	7/8	7/8	7/8
19	0	1/8	3/8	3/8	3/8	1/2	5/8
20	0	0	1/4	3/8	1/2	1/2	5/8
21	0	0	1/4	1/4	3/8	3/8	1/2

TRAFFIC TEST on STABILIZED SHOULDER and on UNSTABILIZED TURF

The site chosen for the test is on Camp Road, S.H. 1067, Route 75, 200- to 500 ft. south of Soules Road in Erie County near the City of Buffalo. This site was chosen because of a wide shoulder where it is possible to contrast a bare well-compacted silt-clay with a trace of gravel shoulder, with a turf silt-clay uncompacted backslope.

The tests were run on April 16, 1953. The weather was rainy for the previous day and night and rain continued before and during the test. The shoulder area was very wet and had taken up all the moisture its degree of density would permit.

Four test locations were chosen as indicated on the accompanying sketch. Sites T.H. 1 and T.H. 4 were on the bare compact silt-clay shoulder with a trace of gravel; sites T.H. 2 and T.H. 3 were in the sodded silt-clay backslope.