REPORT OF THE CHIEF ENGINEER

DELAWARE STATE HIGHWAY DEPARTMENT

July 1, 1952 to July 1, 1953

Dover, Delaware

To the Chairman and
Members of the State
Highway Department,
Dover, Delaware

Gentlemen:

It is with considerable pride of accomplishment that I submit to you the following report of the activities of the Delaware State Highway Department for the fiscal year 1952-53.

This has been a year of accomplishment and at the same time disappointment. We have continued our construction program at the high level previously established and expanded our maintenance program as the needs of the people of Delaware and the growth of the State continues.

However, the General Assembly which is now in session has not acted on our requests for the coming year, and at the present time no future program can be described or planned until we are assured of the amount of monies available. The Department is in excellent shape financially, and we will end this year on the credit side of the ledger in all accounts.

The following reports from each of the respective Division Heads are self-explanatory and present the results of cooperative work on the part of every member of the staff.

I would like to especially thank the members of the Commission itself for their help and cooperation over a difficult year in which three members served as Chairman and to express my particular thanks to Mr. J. H. Tyler

McConnell, Mr. Samuel Culver and to Mr. Hugh R. Sharp, Jr. for their patience with me in making the necessary transitions.

I am extremely proud of the place which the Delaware State Highway Department has achieved in the National highway picture and of the service which we have been able to render to the State of Delaware. It can only be done with the full cooperation of every man.

Very truly yours,
RICHARD A. HABER
Chief Engineer

PLANS AND DESIGN DIVISION

Lester W. Novinger, Plans and Design Engineer

The function of the Plans and Design Division is to prepare highway plans and specifications for contract work. Surveys are made by parties from the county in which the project is located. Relocations are approved prior to the survey, while new locations are determined by the use of aerial photographs and United States Geological Survey Maps.

The depth of pavement is determined from soil analyses and profiles furnished by the Testing Laboratory; the California Bearing Ratio method is used as a basis for determining the depth. The width of pavement is based on the estimated and actual volume of traffic from statistics furnished by the Traffic and Planning Division. At each major intersection, special studies are made to provide adequate turning radii and channelization and to consider the possibility of placing signals to keep traffic moving with the least interference to the traveling public.

Grades and grade lines are designed in accordance with the physical features of the ground, clearance needed for structures, damage to properties, and the bearing capacity of soils. The designed speed is higher than the minimum speed recommended by the American Association of State Highway Officials and in keeping with the State speed regulations. It is desirable to have 475 feet of non-passing sight distance on all vertical curves, or a sight distance safe for a speed of 60 miles per hour. There are few, if any, vertical curves with a passing sight distance less than 400 feet, which is safe at a speed of 55 miles per hour.

It is the policy to have all horizontal curves 1° 30′ or less in the rural areas. This is not possible in the city or urban areas. Curves are super-elevated by revolving the pavement around the centerline.

The work load has not been as heavy in the past year because of the completion of the program for the biennium. No overtime work was necessary. Some work previously committed was completed by Consulting Engineers.

Plans were completed for 23.02 miles of highway placed under contract during the year as follows:

Concrete	Asphaltic Concrete	Resurfacing and Widening
4.71 miles	10.92 miles	7.39 miles

Plans were completed for 17.46 miles of highway to be placed under contract after July 1, 1953, as follows:

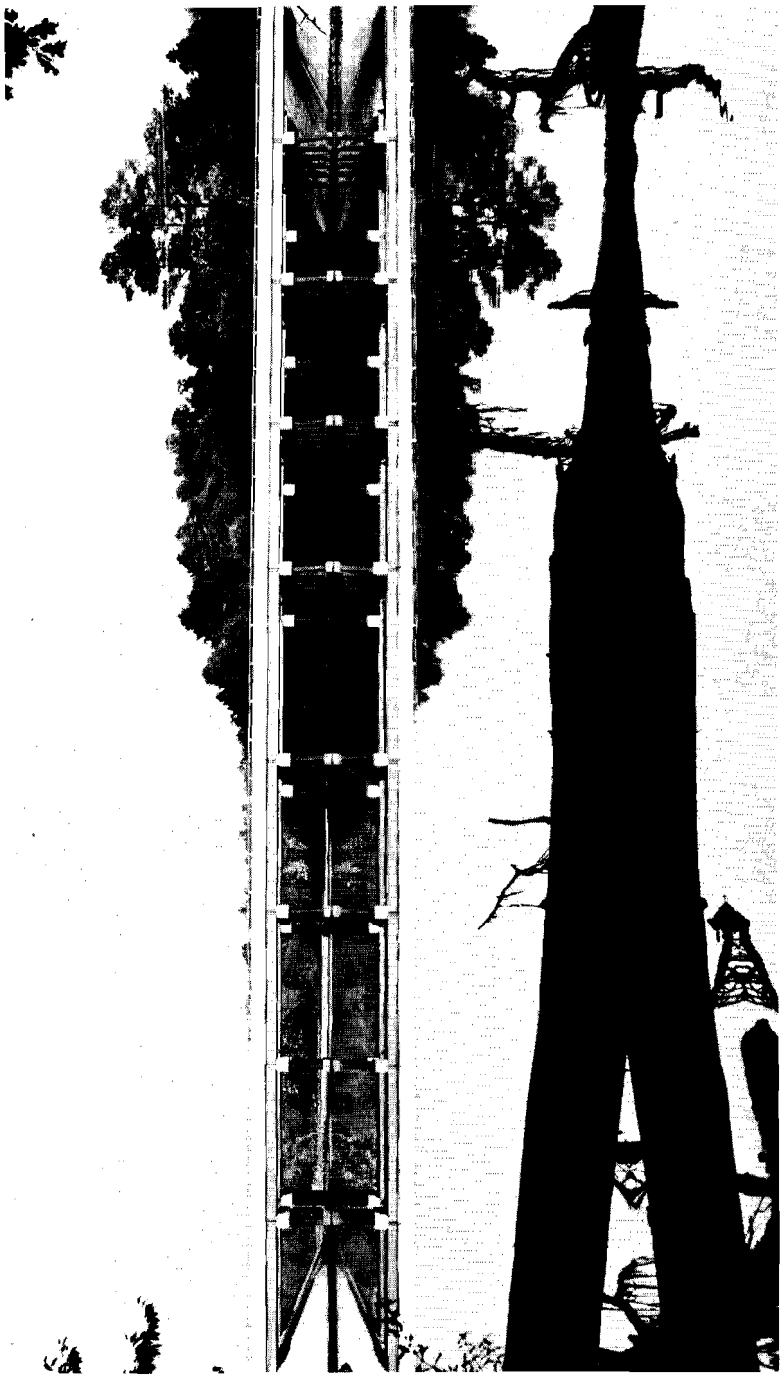
Flexible Pavement	Surface Treated	Resurfacing	Widening and Resurfacing
0.26 Miles	4.39 Miles	9.56 Miles	1.77 Miles

The following plans have been partially completed during the past year but are not programmed:

Contract #1192—Holloway Terrace	1.13 Miles
Contract #1176—Broom Street (Front Street to 7th)	0.35 Miles
Contract #1169—Court Street (Dover)	0.48 Miles
Contract # 892—Route #9—Little Creek Road	3.97 Miles
Total	5.93 Miles

Plans nearly completed and ready for advertising within the next few months are:

Contract #1223—Concord Pike—(Murphy Road to Talleyville)—Plan prepared by Consulting Engineers	1.91 Miles
Contract #1208—White Clay Creek Bridge and Approach	0.44 Miles
Contract #1287—U. S. 13 Northbound Lane—(Fieldsboro to McDonough)—Widening and Resurfacing	5.18 Miles
Contract #1192—Harvey Road Bridge and Approaches	0.41 Miles
Contract #1247—Greenville School Sidewalks	0.32 Miles
Contract # 915—U. S. 13—Canterbury to Harrington—Northbound lane of Dual Highway	7.59 Miles
Contract #1152—Five Points to Rehoboth—Extra Lane for Dual Highway—Widening and Resurfacing	5.50 Miles
Contract # 925—Greenwood to Farmington—U. S. 13 Northbound Lane of Dual Highway	5.20 Miles
Total	26.55 Miles



CONTRACT 1104, NANTICOKE RIVER BRIDGE, SUSSEX COUNTY

Projects under contract during the year required the following materials:

302,400 C.Y. Excavation
117,200 C.Y. Borrow
108,000 C.Y. Selected Borrow
65,000 Tons Waterbound Macadam
39,000 Tons Hot-Mix Asphaltic Concrete
32,000 C.Y. Cement Concrete Pavement
1,400 S.Y. Pavement Patching
11,014 Squares Wire Mesh Reinforcement
164,300 S.F. Concrete Sidewalk
72,500 S.Y. Removal
32,300 Tons Screenings
44,000 Gals. R.C.-1 and R.C.-3 Asphalt

In addition to the work outlined in this report, miscellaneous work performed was as follows:

Final Cross-Sections Plotted and Completed	66.6 Miles
Typical Sections	73
Miscellaneous Drawings	110
Preliminary Borrow Pits	55
Final Borrow Pits	51

29,700 Prints were processed in the blue print room during the course of the year.

BRIDGE DESIGN DIVISION

Joe S. Robinson, Bridge Engineer

The principal function of the Bridge Division is to design and prepare plans and specifications for bridges, culverts, retaining walls, highway drainage, and other structural projects which are constructed by the State Highway Department. In addition, its duties include the preparation of designs and plans for special projects, such as shore protection, dams, and special drainage projects.

During the report period, this Division performed the necessary engineering work on the following projects:

Drainage and structure plans for approximately 20 road projects
Plans and specifications for approximately 9 bridges
Plans and specifications for approximately 9 special projects
Studies and reports for approximately 12 special projects

Data regarding the projects involved are listed elsewhere in this annual report.

Recommendations

It is recommended that the following structures be considered for extensive repairs, or replacement, in the near future:

Replacement—Seventh Street Bridge, Wilmington
Replacement—Bridge over Red Clay Creek, Marshallton
Replacement of numerous small steel bridges throughout the State
Reflooring—Broadkill Bridge (Sussex County)
Lewes Bridge (Sussex County)
Rehoboth Bridge (Sussex County)
Replacement—Taylors Bridge (New Castle County)
Replacement—North Approach—Charles W. Cullen Bridge (Sussex County)

The need for replacement of several of the above-listed is primarily due to neglect in the painting of the steel members of the superstructures. With these as examples, it is strongly urged that additional funds be made available for replacement and for painting and other maintenance work on bridges throughout the State.

DIVISION OF TESTS

Ernest A. Davidson, Testing Engineer

The Division of Tests is charged with the responsibility of insuring that all materials used by the Highway Department or the Department's contractors meet the specifications covering the work concerned. Furthermore, the Division follows these materials and advises on their handling and use from the point of manufacture or origin to their incorporation into the finished project. The Division must strive constantly to improve the end result of construction by keeping abreast of the best practices in the use of materials, in improving the quality of materials, and in changing and improving specifications to get the best product possible within the range of economic limitations.

Another task of the Division of Tests is the operation of a consulting service for various Divisions of the Department. This might include such diversified activities as deep foundation investigations for the Bridge Division, investigations of subgrade conditions for use in pavement design by the Plans and Design Division, subsurface water investigation for maintenance personnel, or a pavement condition survey for the general use of the Department.

For purposes of organization, the Division of Tests is formed into two sections, the Soils Laboratory and the Materials Laboratory. A description of the activities of each follows:

CONTRACT NO. 755, LANCASTER PIKE GRADING, NEW CASTLE COUNTY,
LOOKING NORTH, ABOVE GAP ROAD

Soils Laboratory

The Soils Laboratory, under the supervision of a Soils Engineer, has two general responsibilities: (1) to locate, test, make recommendations on the approval of, and supervise, the excavation, placement, and compaction of all selected and common borrow used in roadway construction; (2) to survey, sample, test, and make recommendations for treatment of foundations for pavements and structures.

1. Borrow sources investigated are tabulated as follows:

	Investigated	Approved	Disapproved
Proposed selected borrow pits for maintenance and future contract use	28	8	20
Common borrow proposed for use on designated contracts	53	34	19
Selected borrow proposed for use on designated contracts	23	8	15
Total	104	50	54

Material excavated from the above-listed approved pits involved the following approximate quantities:

1.	Selected borrow and other subbase materials	381,459 cubic yards
2.	Common borrow (from pit excavation only)	1,093,400 cubic yards
3.	Excavation (excavated from job site)	684,135 cubic yards
	Total	2,158,994 cubic yards

To maintain effective control of the placing of the above yardage and to see that specification requirements were met, the following were required:

39 laboratory density moisture investigations

540 field density determinations

538 pit checks of the quality of material placed

The above quantities are greatly in excess of any previous year's quantities for earthwork and reflect the construction of dual highways in the southern half of the State.

2. Surveys and Investigations

A total of 32.6 miles of proposed highway alignment, including 10 contracts, was investigated for soil characteristics and its influence upon highway problems.

Investigations for structures, including culverts, earth embankments, small dams, buildings, and bridges, required

1,286 lineal feet of borings made by personnel of the Division. In addition, the Laboratory furnished inspection for 654 lineal feet of foundation borings made under contract.

Ground water and subdrainage control surveys were made at 8 different locations, with recommendations made for corrections.

For all of the above, including the borrow requirements, some 3000 routine soil analysis and classification tests were made. In addition, a total of 52 other specialized tests were made in connection with soil strength characteristics for evaluation of subgrade support to aid in pavement design. Other tests included consolidation settlement determinations and permeability tests.

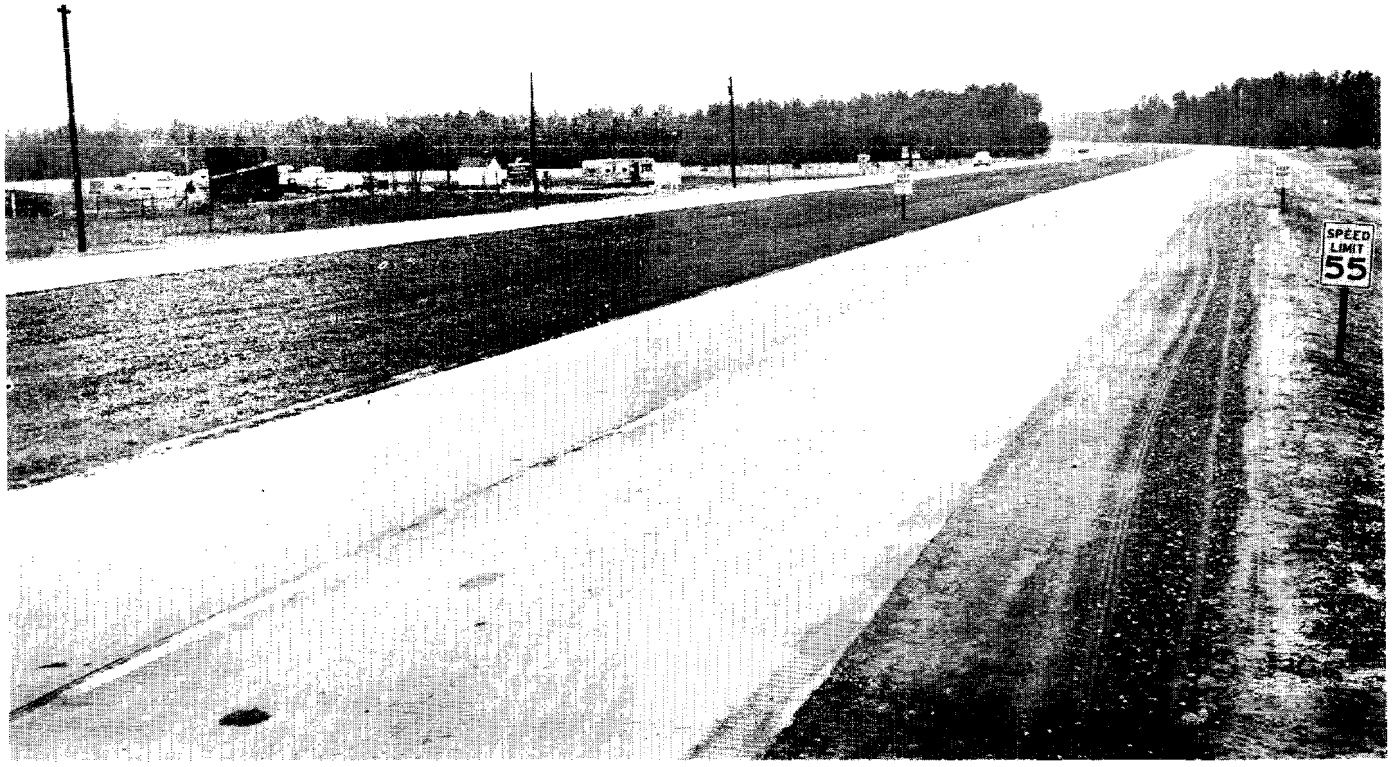
3. **Suburban Development Investigations:**

During the past year the Suburban Development Division has undertaken a large portion of the investigative work in this category. The Division of Tests now performs testing and makes recommendations only on samples furnished for suburban work under private Development, but continues full investigation of Suburban Development contract work under Highway Department supervision. Work of both types totalled 68 projects for the year.

Materials Laboratory

The Materials section of the Division of Tests is responsible for the inspection and testing of all materials used in highway construction, with the exception of soils. In addition, this section furnishes the inspection at the plants for the manufacture of hot-mixed asphaltic concrete, with all mix designs having been furnished or approved by the laboratory prior to their use on the contract.

The Division's policy is to sample and make preliminary tests of materials at the sources of supply. This permits corrections or rejections before shipment is made and insures against non-specification materials reaching the project. Coarse aggregates are inspected at the quarry, sand at the pit, cement at the mills, asphalt at the refineries, piling in the forest, lumber or posts at the point of treatment, and concrete pipe at the plant.



CONTRACT NO. 1148, THE DUAL HIGHWAY NORTH OF NANTICOKE RIVER, SUSSEX COUNTY.

The following tabulation shows the number of tests made during the past year for various materials and the approximate quantity of the material represented:

Material	No. of Tests	Quantity Represented
Fine Aggregate (Sand)	408	88,500 tons
Cement	54	278,023 bbls.
Gravel	339	63,585 tons
Crushed Rock	2475	237,891 tons
Slag	442	22,600 tons
Asphalt	368	2,895,460 gals.
Central-mixed concrete (production control)		29,714 cu. yds.
Concrete cylinders	2147	
Concrete beams	448	
Concrete cores	647	
Hot-mix asphaltic concrete	510	70,446 tons
Asphalt Adhesion tests	79	
Timber piling (inspection)		121,462 feet
Lumber, treated		1,240 fbm
Concrete Pipe	124	121,462 feet
Brick	16	
Galvanizing of metal	2	
pH measurements of water	20	
Water for use in concrete	35	
Specific Gravities of aggregates	32	
Creosote Oil	3	
Motor Oil	14	
Gasoline	5	

A task of major proportions undertaken by the administrative personnel of the Division this year was the rewriting of the Department's **Standard Specifications.** This work is now completed and is expected to be printed in time for the 1954 Construction Season.

TRAFFIC AND PLANNING DIVISION

William J. Miller, Jr., Traffic and Planning Engineer

The Traffic and Planning Division collects, analyzes, and evaluates many types of data which are concerned with the Delaware highway system. From these studies reports and recommendations are derived which are intended to assist the highway engineers and administrators in planning and building better roads.

The studies and the work involved can properly be broken down into three basic categories: the Highway

Planning Survey Studies, the Traffic Engineering Studies, and Traffic Services. Details concerning these functions are described below.

Road Inventory

The State Highway Department has a network of 3974.2 miles of roads and streets in its four systems. Table I shows this information, as of January 1, 1953, by mileage of streets and highways by surface type by county. A comparison with the previous year will show a definite change in the mileage of certain types of highways. This is attributed to the construction and maintenance program carried on through the calendar year 1952. The biggest change took place in the reduction of mileage of gravel, soil-surfaced, and graded and drained earth roads. This was brought about by the bituminous surface treatment program during the year, which increased the mileage of that type by nearly 138 miles.

Table II shows the existing road and street mileage for the four systems which are controlled by the State Highway Department. The Urban mileage as listed is the extension of Primary Rural roads within cities of 5,000, or more, population. These cities include Wilmington, Elsmere, Newark, New Castle, Dover, and Milford. The Primary System includes the main arterial routes through the State, with the exception of those described in the Urban mileage. It is also the same as the Federal Aid Primary System. The Secondary System includes the intermediate roads of the State and is identical with the Federal Aid Secondary System. The Tertiary System includes all other roads within the State which are on the highway system, other than those described in the three systems above. The Tertiary System includes 230.89 miles of Suburban Development roads. Of this mileage the State Highway Department maintains 144.8 miles. Again, mileage was transferred from the Tertiary system to the Secondary System. However, additional suburban development has added mileage to keep the Tertiary System comparable to last year.

A complete set of road inventory tables is available in this office showing mileages by types, by surface widths, and by traffic volumes.

TABLE I

MILEAGE OF STREETS AND HIGHWAYS BY SURFACE TYPE BY COUNTY
Delaware 1/1/53

Surface Type	Kent	New Castle	Sussex	Totals
Concrete	211.83	159.91	266.29	638.03
Bituminous Concrete	54.77	149.94	106.97	311.68
Brick	.68	4.45		5.13
Belgian Block		.51		.51
Bituminous Penetration	1.05	326.79	51.46	379.30
Total Paved	268.33	641.60	424.72	1334.65
Other Low Type Bituminous	21.73	25.08	107.11	153.92
Bituminous Surface Treated	217.05	149.83	325.88	692.76
Gravel or Stone	48.83	12.13	9.17	70.13
Soil-Surfaced	419.77	138.58	383.59	941.94
Total Surfaced	707.38	325.62	825.75	1858.75
Graded and Drained Earth	70.58	6.65	594.04	671.27
Unimproved	1.73	7.66	16.74	26.13
Primitive	1.46	.12		1.58
Total Unsurfaced	73.77	14.43	610.78	698.98
Total Two and Four Laned Highways	1049.48	981.65	1861.25	3892.38

DIVIDED HIGHWAYS

Concrete	8.49	19.70	.68	28.87
Bituminous Concrete	6.47	37.75	7.26	51.87
Low Type Bituminous		.11		.11
Bituminous Surface Treated		.60	.68	1.28
Soil-Surfaced		.12		.12
Total Divided Highways	14.96	58.28	8.62	81.86
Total All Types	1064.44	1039.93	1869.87	3974.24

Table II
MILEAGE OF STREETS AND HIGHWAYS BY SYSTEM CLASSIFICATION BY COUNTY

Urban (Over 5,000 Population)	10.11	38.27	2.56	50.94
Primary (F.A.P.)	115.18	145.82	205.14	466.14
Secondary (F.A.S.)	316.56	314.51	635.31	1266.38
Tertiary (No F. A.)	622.59	541.33	1026.86	*2190.78
Total	1064.44	1039.93	1869.87	3974.24

* 86.09 MILES NOT STATE MAINTAINED

Traffic

As a part of the overall Traffic Density Survey and the collection of traffic data on a statewide basis, six automatic counter stations, located at certain strategic points throughout the State, were installed in 1940. Table III shows the results of four of these stations which have been in constant operation for a 13-year period. For the fiscal year 1952-53, a 4.61 per cent increase in traffic volumes was recorded at these four stations over fiscal year 1951-52. There was also an increase of 88.53 per cent over traffic for fiscal year 1941-42.

In addition to the six automatic counter stations maintained on a permanent basis, the annual traffic counting program, which includes the use of portable control counters as well as manual classification counts at predetermined major and minor stations, continued during fiscal year 1952-53. The information thus obtained makes it possible to plot traffic volumes on all roads in the State, outside the limits of incorporated towns and cities.

Table III

TRAFFIC VOLUMES AT FOUR AUTOMATIC COUNTER STATIONS BY YEAR BY MONTH WITH RELATED PERCENTAGES

	AVERAGE DAILY TRAFFIC 1941 1942	1951 1952	1952 1953	PERCENT CHANGE 1952-53 1941-42	1952-53 1951-52
July	22,721	32,910	36,702	+ 61.53	+11.52
August	22,328	35,456	37,066	+ 66.01	+ 4.54
September	19,902	32,635	33,587	+ 68.76	+ 2.92
October	17,491	29,489	31,469	+ 79.92	+ 6.71
November	17,056	28,142	28,078	+ 64.62	— 0.23
December	16,174	25,571	28,013	+ 73.20	+ 9.55
January	13,421	24,592	25,429	+ 89.47	+ 3.40
February	13,736	26,758	27,731	+101.89	+ 3.64
March	14,065	26,315	29,678	+111.01	+12.78
April	15,583	30,015	31,919	+104.83	+ 6.34
May	14,744	32,790	32,892	+ 123.09	+ 0.31
June	13,810	37,628	36,425	+163.76	— 3.20
TOTAL	201,031	362.301	378,989	+ 88.52	+ 4.61

Mapping

During the fiscal year the County Maintenance Maps were revised and brought up to date. A new printing was made and an adequate supply is on hand for distribution.

The Official State Tourist Map was revised and an additional printing of 65,000 copies was made for free distri-

bution. A total of 30,000 copies were distributed during the year.

The 1941 County General Highway Maps are in process of revision. These maps show all houses, farms, businessess, and other details on all the roads in Delaware, as well as road types, drainage, towns, State and Federal Route Numbers, and other pertinent details.

The following number of County, State, and Incorporated Town Maps were sold during the past four years:

Fiscal Year	Total Maps Sold	Total Receipts
1950	747	$258.75
1951	622	226.25
1952	781	301.35
1953	718	295.90

Loadometer Survey

The Loadometer Survey was continued on a seasonal basis during the fiscal year. In the study, all traffic was counted, and trucks were weighed, at specified locations in the State four times. From the information obtained, tables were compiled for the U. S. Bureau of Public Roads for use locally and nationally in the study of road surface failures caused by persistent increases in the frequency of heavy vehicles with excessive gross weights and axle loads. In addition, the annual Summer Loadometer Survey was conducted at the usual locations and tables were compiled for comparative purposes over the previous year.

Road Life Study

The Road Life Study has been completed for the fiscal year. The costs of all new construction, reconstruction, and resurfacing of roads on the Primary and Secondary System done under Contract and the retirements have been recorded. The primary objective of this study is to determine, at all times, the amount of investment in our highway system.

Fiscal Study

For the 6th consecutive year a fiscal study has been made to show the receipts and expenditures, as well as the bonded indebtedness, of the fifty incorporated areas and the three counties of Delaware. This study is made in cooperation with the Bureau of Public Roads, U. S. Department of Commerce, and is part of a nationwide study compiled and analyzed by the Bureau of Public Roads. The primary purpose of this study is to show the expenditures of the

various towns and counties with relation to the streets and highways.

After data are obtained through field work, the information is entered on worksheets, totaled, and transcribed to table forms, which, along with a descriptive narrative, constitute the report.

The following table, extracted from previous reports from 1948 to 1952, shows comparisons of amounts expended by incorporated areas under three size groups. It is interesting to note that with one exception there has been a steady increase in such expenditures during the five-year period.

TOTAL STREET EXPENDITURES OF INCORPORATED AREAS OF DELAWARE BY POPULATION GROUPS FROM 1948 TO 1952

Year	Areas Under 1,000	Areas 1,001—2,500	Areas Over 2,500
1948	$35,961.14	$ 64,733.80	$215,500.21
1949	82,687.02	128,102.95	455,837.39
1950	60,104.71	149,178.47	453,406.79
1951	58,870.27	158,502.93	829,136.51
1952	70,857.36	223,714.58	914,169.17

A recent addition to the fiscal report has been a report regarding the number of parking meters and parking lots maintained by individual incorporated areas and the receipts and disbursements in parking meter funds.

By 1952 twelve incorporated towns in Delaware had installed parking meters and five of these maintain free parking lots. One other town, which has no meters, operates a free parking lot. None operates revenue parking lots, nor does any town in Delaware operate a public parking garage.

The following 1952 table shows the number of meters and parking lots operated by each town and the approximate parking spaces available in the parking lots.

Town	Number of Parking Meters	Number of Free Lots	Total Approximate Spaces
Delmar		2	135
Dover	170	2	100
Georgetown	45		
Harrington	100		
Laurel	80	1	60
Lewes	109		
Milford	100	1	125
Milton	40	1	60
Newark	164		
Rehoboth	400		
Seaford	137		
Smyrna	127	1	40
Wilmington	620		

Motor Vehicle Use Study

The Motor Vehicle Use Study is designed to furnish information showing the character of highway travel and the extent that people living in various population groups use the several highway systems of the State and the local streets of the cities and towns, and to show how essential is the role of highway transportation in our economy.

This study was initiated in 1952 and is progressing by use of the home interviewer method of obtaining the information. The study was planned to include 2,520 carefully selected dwelling-unit interviews. As of July 1, 1953, a total of 1,632 had been completed. It is anticipated that the field work will be completed March 1, 1954.

The knowledge gained through this survey can be important in the solution of problems of highway finance and in planning the future development of our highway system. It will also be used by U. S. Bureau of Public Roads, in combination with similar studies in other States, to determine the same answer on a national basis.

Sufficiency Study

During fiscal year 1952-53, the Sufficiency Study of the Primary System, which was first inaugurated in Delaware during fiscal year 1950-51, was brought up to date through an intensive field study and a re-evaluation of the system on the basis of changes due to increased traffic volumes, general conditions, and annual construction programs.

Briefly, the object of the study is to provide a numerical rating for each section of roadway. The best highways are assigned the highest ratings and the least sufficient the lowest ratings. The elements which are considered in arriving at the individual ratings are condition, safety, and service. 100 points are allocated for the total of the three elements, with condition receiving 40 points; safety 30; and service 30.

Each element is further divided into sub-elements for more detailed evaluation. For example, condition consists of evaluation of type, dependency on traffic volumes carried by the road, thickness, surface condition, drainage, remaining life, and maintenance economy. The safety element is divided into sub-headings of shoulder and surface widths, stopping, sight distances and consistency of alignment. Service is broken down to show horizontal curvature, passing opportunity, surface width, and rideability.

Arbitrarily using the numerical rating of 70 as a basis for comparison, it was found that with a total mileage of 582.39, counting divided highways as double mileage, 16 per cent, or 91.47 miles, fell below this rating. In order to bring this 16 per cent of the total mileage up to standard, it would necessitate resurfacing 32.57 miles with hot-mix at an estimated cost of $1,200,000; the reconstruction of 27.24 miles at an estimated cost of $2,300,000; the addition of 4' widening on 57.19 miles of present roads at an estimated cost of $1,800,000; and the construction of a new 24' lane making a 4-lane or a divided highway of 30.81 miles at an estimated cost of $2,800,000. The estimated total cost, then, to bring this 16 per cent of Delaware's Primary System up to standard, would be $8,100,000.

Table IV groups the adjusted sufficiency ratings by counties of mileage and per cent of total on the Primary System.

TABLE IV

Adjusted Sufficiency Rating	Kent County		New Castle County		Sussex County		TOTAL	
	Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent
Under 50	.....	.....	5.85	3.0	.....	.....	5.85	1.0
50- 54	.11	0.1	2.76	1.5	.....	.....	2.87	0.5
55- 59	.66	0.5	10.94	5.5	2.55	1.0	14.15	2.5
60- 64	.57	0.4	12.21	6.0	9.38	4.0	22.16	4.0
65- 69	15.53	11.0	9.15	5.0	21.76	9.0	46.44	8.0
70- 74	25.82	18.0	34.80	18.0	74.52	30.0	135.14	23.0
75- 79	31.14	22.0	19.59	10.0	23.28	10.0	74.01	13.0
80- 84	5.45	4.0	31.91	16.0	5.34	2.0	42.70	7.0
85- 89	27.50	19.5	23.27	12.0	22.35	9.0	73.12	13.0
90- 94	7.35	5.5	18.82	10.0	31.64	13.0	57.81	10.0
95-100	27.01	19.0	25.49	13.0	55.64	22.0	108.14	18.0
TOTAL	141.14	100.0	194.79	100.0	246.46	100.0	582.39	100.0

Permits

The attached table shows the activity during the past year in handling Special Permits for oversize and overweight vehicles.

The past year shows an increase over the previous year in number of permits issued and cash receipts. A large increase has been noted in heavy hauling permits, which offsets the decrease in piling and house-moving. The decrease in piling permits has been due to a greater demand for short piling, which did not require permits. House-moving shows a decline which has been due to an abnormal number of buildings moved from 1951 to 1952, which was caused by right-of-way being secured for new roads which did not exist during the past year.

The increase in free permits was due to increased activities of the United States Second Army in connection with an intensive training program.

Further increases should be noted for the coming year due to an increase in permit fees by an Act of Legislature which became effective July 15, 1953.

	July 1, 1951 to June 30, 1952		July 1, 1952 to June 30, 1953		Per Cent Change	
	Number	Dollars	Number	Dollars	Number	Dollars
Heavy hauling permits	3,332	$11,385.36	4,155	$14,916.26	+ 24.70	+31.01
30-day piling permits	407	4,070.00	283	2,830.00	— 30.47	—30.47
Trip piling permits	345	690.00	168	336.00	— 51.30	—51.30
House moving permits	335	670.00	319	638.00	— 4.78	— 4.78
Free permits	168	. . .	402	. . .	+139.29	. . .
TOTAL	4,587	$16,815.36	5,327	$18,720.26	+ 16.13	+ 11.33

Petitions

Each year there is a marked increase in the number of petitions received by the State Highway Department requesting improvements or alterations to roads, streets, and bridges; construction and relocation of crossovers; and the installation of traffic signals. During the past fiscal year, the 91 petitions which were investigated by the Traffic and Planning Division represent 9 per cent increase over fiscal year 1952, and 23 per cent over fiscal year 1951.

The compilation of factual data required for each petition includes the investigation of existing conditions at each location, a field visit in company with the Division Engineer concerned, and detailed sketches of the roads or intersections involved. This information is reviewed by the State Highway Department and constitutes the basis upon which the merits of these requests are evaluated.

In addition to rural and suburban areas, petition investigations were made in Bethany Beach, Dover, Elsmere, Houston, Leipsic, Milford, Milton, Newark, New Castle, Odessa, Rehoboth, Seaford, and Wilmington.

Accident Reports

For the period from July 1, 1952 up to and including June 15, 1953, 106 more reports were received than for the year previous.

All reports received from the State Police have been filed numerically and card-indexed, as well as being pinned at proper location by counties on maps for ready reference.

The demand is greater daily for the use of these reports by the Investigating Staff, who handle petitions for requests of change and improvements to certain roads on the highway system.

Traffic Engineering Studies

The need for additional traffic engineering studies to determine the most efficient methods for the movement of motorists and commodities from origin to destination is further evidenced by the increasing traffic volumes on our highways and streets in all areas. Regardless of the fact that the traffic accident situation continues to be a problem of major importance, indications point toward some satisfactory results from designing and effecting highway safety regulations throughout the State.

The Traffic and Planning Division, within the past fiscal year, conducted 68 studies and investigations pertaining to traffic signalization, parking, speed zoning, road and street marking and lighting, and vehicular turning movements at intersections. This number of traffic engineering studies is an increase of 28 per cent over the previous fiscal year.

Of these, 36 included a detailed study of existing traffic signalization at intersections to determine if any changes should be effected in the present lay-out of traffic signals, to greater facilitate the movement of traffic, and to provide more adequate safety measures. Sketches of these signalized intersections in each county are furnished to the Division Engineer concerned, and copies are retained by the Traffic and Planning Division for further studies.

The incorporated cities and towns in Delaware in which traffic engineering studies were conducted include Bethany Beach, Claymont, Dover, New Castle, Seaford, Smyrna, Townsend, and Wilmington. Additional studies and investigations were conducted in a number of unincorporated suburban developments and in rural areas.

Traffic Maintenance

Because of increasing traffic volumes, phenomenal growth of business and amusement establishments along our main highways, and constant demands by the public for traffic signals and other forms of traffic controls, a study was made prior to July 1, 1952 to determine the feasibility of transferring the responsibility of all traffic services from the Division Engineer in each county to the Traffic and Planning Division.

As a result of the study, the conclusion was drawn that the Traffic and Planning Division could render these services on a more efficient and, at the same time, less costly basis, since many of the functions performed are closely allied with the traffic engineering studies made by this Division.

Therefore, beginning July 1, 1952, the Traffic Division operations in each county were placed under the direction of the Traffic and Planning Division so that maintenance functions coincidental to traffic in each county would be controlled through the County Traffic Divisions. This has done much to insure uniformity in the erection of signs, signals, and pavement markings.

During the year it became necessary to install additional traffic-actuated signals at 12 intersections, fixed-time sig-

nals at 8 intersections, and flashing beacons at 2 intersections. Two fixed-time installations were converted to the traffic-actuated type due to changes in traffic conditions. Also, two installations were renovated and three removed due to reconstruction.

Also during the year, another overhead direction sign of the type used at the Farnhurst Interchange was installed. This sign was erected on the southbound lane of the DuPont Parkway just north of State Road.

A step forward was taken during the fiscal year in the methods used to put down the painted pavement markings. All letters, numbers, and arrows were redesigned and templates were fabricated in such a way that spraying methods will now replace the hand painting methods.

When discussing traffic maintenance by counties, it is necessary to point out existing conditions in each county, since they differ greatly.

Sussex County is the largest of the three counties, having 48 per cent of the total area and 48 per cent of the total miles of public road in the State. However, it has only 20 per cent of the total population. Therefore, it might be said that Sussex is composed of many miles of feeder roads serving an area of agriculture, lumbering, and fishing. A large amouunt of mileage means that much maintenance is required for signs and centerline painting. It is in Sussex County that most progress in signing and painting has been made during the year.

New Castle County is the smallest in area and has only 25 per cent of total highway mileage. However, it is an industrial and construction area with highways that carry large volumes of local and out-of-state traffic. There are 61 traffic signals in this county which require much attention. Also, the heavier volumes mean that signs and pavement markings must be renewed at more frequent intervals.

Kent County comprises 30 per cent of the land area and 27 per cent of the total highway mileage. It is an average county, with an average amount of maintenance requirements when compared with either New Castle or Sussex. Due to its central location, however, Kent County makes the ideal location for the main sign shop. The function of this shop is to repair and refinish the damaged signs and to make as many new signs as time will permit. 3,435 signs were brought in and refinished, and new signs made in the shop totaled 1,620. The shop continues to show an increased tempo from year to year.

CONTRACT NO. 799, CONCORD PIKE, NEW CASTLE COUNTY,
LOOKING NORTH BETWEEN FOULK ROAD AND MURPHY ROAD

FEDERAL AID AND ESTIMATING DIVISION

Robert C. Densten,
Federal Aid and Estimating Engineer

The primary duty of this Division is the liaison with the Bureau of Public Roads in the conduct of the Department's business with those offices. These functions include all the necessary stages from the Federal Highway System approvals, programming of projects, preparation and presentation of projects for approval, through the various operations which finally terminate in vouchering for reimbursement.

The other duties of the Division include project estimating, preparation of advertisements and the proposal forms necessary for bidding and contract purposes, checking and itemizing tabulations of received bids, the processing and checking of all estimates for payment on contracts, and the maintenance of records pertinent to the conduct of the business of the Division.

Advertising

During the period covered in this report the Department authorized 13 advertisements. There were 49 contracts contained within these advertisements, and 2 contracts which had been advertised near the close of the previous fiscal year.

This schedule of contracts required the preparation of 2,235 proposal forms for bidding, contract, and departmental use.

Contracting organizations submitted a total of 226 bids on the contracts, with total bid prices in amount of $3,270,308.34.

Contract Classification

Contracts awarded during the report period are classified as follows:

Federal Aid Primary, 1; Federal Aid Secondary, 4; Federal Aid Urban, 2; State Primary, 2; State Secondary, 8; Incidental Construction, 8; Maintenance and Materials contracts (including fuels), 22; Highway Planning, 2; Pest Control, 2.

Contract Payments

Progress and final payments on active projects required the preparation and processing of 247 estimates. The total value of the estimates paid through the Division for the fiscal year was in the amount of $9,329.755.16, the Federal share of which is estimated to be $2,201,039.00. At the beginning of the fiscal year there were 38 active contracts, and at the close of the period there were 27.

Federal Aid

A total of 39 reimbursement vouchers was processed through the division for the period, consisting of 29 progress and 10 final. Total receipts from the Bureau of Public Roads on these submissions were in amount of $2,483,798.95.

As of June 30, 1953, all Federal funds which were required by law to be obligated under agreement had been so protected. The unprogrammed and unobligated balances in the Federal Aid Allotments at the close of the fiscal year totalled $2,819,946.27, and are classified Primary, $982,180.96; Secondary, $1,152,203.98; Urban, $564,311.33; Interstate, $121,250.00.

Federal Aid Accounts Receivable on current projects, as of June 30, 1953, were in amount of $403.360.81.

SUBURBAN DEVELOPMENT DIVISION

Chauncey O. Simpson, Suburban Development Engineer

The Suburban Development Division is responsible for implementing the obligations of the State Highway Department relative to the Suburban Road Laws, as defined under fined under Title 9, Chapter 5 of the Delaware Code of 1953.

The Suburban Road Laws provide that the freeholders of unincorporated communities may petition the Levy Court to construct or reconstruct their streets. If the Levy Court decides that the community is eligible for assistance, the Highway Department prepares plans, specifications, and estimates according to the streets named in the petition. The Levy Court, after being apprised of the estimated cost of the project, notifies the freeholders of the expense and how it will affect their taxes. The freeholders then accept or reject the project by a referendum. If the project is accepted, it is advertised by the Levy Court and bids are received. Bonds are then issued on the basis of the price of the

successful bid, plus servicing charges. The work is done under the direct supervision of the Highway Department.

The Suburban Development Division is also responsible for supervising the construction of streets in private housing projects where the developer is desirous of turning the streets over to the Highway Department when the job is completed.

The developer must post a 10% performance bond for each street to guarantee that the construction will be in conformance with Highway Department rules and regulations. This procedure is defined in the Delaware Code of 1953 under Title 17, Chapter 5.

The plans for proposed construction of streets in subdivisions are examined thoroughly with regard to drainage, grades, entrances to highways, and other requirements. When these items are found to be unsatisfactory, the developer is advised to correct the plans so as to meet the requirements of the Department.

During the fiscal year one street construction project, SD-38 in Old Deerhurst, was completed under the provisions of the Suburban Road Laws. This added 0.262 miles of streets to the State Highway system.

Below is a tabulation of the street mileage accepted in various communities by resolution of the State Highway Department.

Brack-Ex	0.998 Miles	Lyndalia	0.105 Miles
Cedars	0.152 "	Masonicville	0.057 "
Claymont Addition	0.887 "	McDaniel Heights	0.698 "
Claymont Heights	0.675 "	Minquadale	0.393 "
Concord Manor	0.227 "	North Hills	0.406 "
Cranston Heights	0.227 "	Newport Heights	0.529 "
Delaplane Manor	0.276 "	Penn Rose	0.057 "
Elmhurst	0.307 "	Phillips Heights	0.474 "
Flinnview	0.125 "	Richardson Park	0.193 "
Glynrich	0.099 "	Silview	0.313 "
Gwinhurst	0.853 "	Tuxedo Park	0.246 "
Holly Oak	0.080 "	Wilmont	0.008 "
Holly Oak Terrace	0.284 "		
		Total	8.669 Miles

The following is a tabulation of the street mileage accepted into the State Highway system from commercial developers:

Bellevue Hills	0.168 Miles	McDaniel Crest	0.097 Miles
Cedar Heights	0.517 "	McDaniel Crest	1.565 "
Chelsea Estates	2.338 "	McDaniel Heights	0.186 "
Cooper Farm	0.358 "	Morris Estates	0.193 "
Deerhurst	0.259 "	Pembrey	0.155 "
Delwood	0.156 "	Swanwyck Gardens	0.196 "
Doverbrook Gardens	0.398 "	Villa Monterey	0.135 "
Dunleith	0.642 "	West Cedar Heights	0.201 "
Garfield Park	1.752 "	Westover Hills	0.320 "
Greenville	0.421 "	Willow Run	4.302 "
Kiamensi Gardens	0.164 "	Wilmington Manor	0.051 "
Leedom Estates	0.090 "		
Manor Park, Sec. A.	0.728 "	Total	15.392 Miles

During the past fiscal year, the Suburban Development Division has carried on work in the following 24 suburban communities. The status of each project is shown below as of June 30th, 1953.

Projects being constructed are as follows:

Contract	Development	Mileage	Bid Price
SD-39	DuRoss Heights	1.660	$ 52,002.55
SD-40	Westwood Manor	0.374	33,104.25
SD-41	Maplewood	0.174	19,331.20
SD-42	Blue Rock Manor	0.358	23,601.00
SD-43	Woodcrest	0.449	6,137.50
SD-46	McDaniel Heights	0.150	11,095.50
SD-47	Roseville Park	1.061	32,824.65
SD-49	McDaniel Crest	0.336	23,763.50
SD-50	Woodcrest	0.089	6,994.85
SD-51	Woodcrest	0.195	16,144.35
SD-52	Woodcrest	0.123	7,666.25
	TOTALS	4.969	$232,665.60

Projects rejected by vote of freeholders are as follows:

Contract	Development	Mileage	Bid Price
SD-4	Roosevelt Avenue	0.401	$ 24,791.50
SD-9	Blue Rock Manor	0.425	32,591.50
SD-48	Brack-Ex	0.296	26,630.50
	TOTALS	1.122	$ 84,013.50

The Suburban Development Division has been in very close cooperation with the Regional Planning Commission of New Castle County and with all consulting engineers planning new subdivisions or constructing streets in locations where plats have been previously recorded. The Division has examined all the listed plats for drainage. Engineers are required to submit drainage plans with calculations for our review. This Diviison will not approve plans submitted to the Regional Planning Commission until the drainage requirements are satisfactory.

In addition, soil tests are made and the owner of the subdivision or his engineer is informed of the pavement design which will be required if the subdivision is constructed.

All other items of the subdivision streets are checked against our regulations.

Preliminary and final plans reviewed for the New Castle Regional Planning Commission and consulting engineers are as follows:

Development	Acreage	Miles of Street
Ashbourne Hills	27.2	0.568
Bestfield	29.9	1.136
Brookmont	140.0	3.466
Brookside Park, Sec. K.	87.8	2.651
Capitol Green (Dover)	38.0	1.458
Capitol Trail Farms	11.0	0.398
Carrcroft Crest	107.0	2.405
Carrcroft, Section C.	41.7	1.326
Castle Hills	170.0	4.091
Cedar Knoll	12.3	0.330
Chelsea Estates, Sec. 3	46.0	1.182
Chestnut Hill Estates	138.8	3.845
Clearfield	9.8	0.506
Cleland Heights	50.6	2.595
Concord Manor Addition	20.8	0.625
Deerhurst	13.6	0.256
Dunlinden Acres	83.7	2.917
Fairfax Addition	32.9	1.148
Fairfax Apartments	7.0	0.439
Fairfax Extension	20.5	1.061
Faulkland Woods Extension	3.7	0.095
Galewood	6.9	0.227
Georgian Terrace	18.7	0.436
Glen Berne Estates	13.0	0.303
Glendale	63.0	1.856
Holly Hill	10.0	0.182
Landers Park	12.1	0.227
Liftwood, Section A	45.0	1.379
Limestone Acres	71.0	1.373
Lynnfield	53.1	1.742
Mayfield	19.9	0.591
Milford Meadows	11.4	0.110

Development	Acreage	Miles of Street
Morris Estates, Section 2	17.6	0.398
North Star	161.0	2.670
Oak Lane Manor	57.0	1.544
Penndrew Manor	17.9	0.672
Pennrock	21.5	0.788
Redmont	11.7	0.295
Rolling Green	9.2	0.208
Rosehill Gardens	16.0	0.436
Silver Springs	5.6	0.227
Staffordshire	36.5	1.108
Stonehaven	7.9	0.347
Swanwyck Gardens Extension	5.9	0.108
Villa Monterey	35.0	1.023
Windybush	71.2	2.216
Woodbrook	25.0	1.042
Woodland	79.1	1.989
TOTALS	1,994.5	55.995

Average 0.0281 miles of street per acre.

This figure will vary depending on the size of lots within the subdivision.

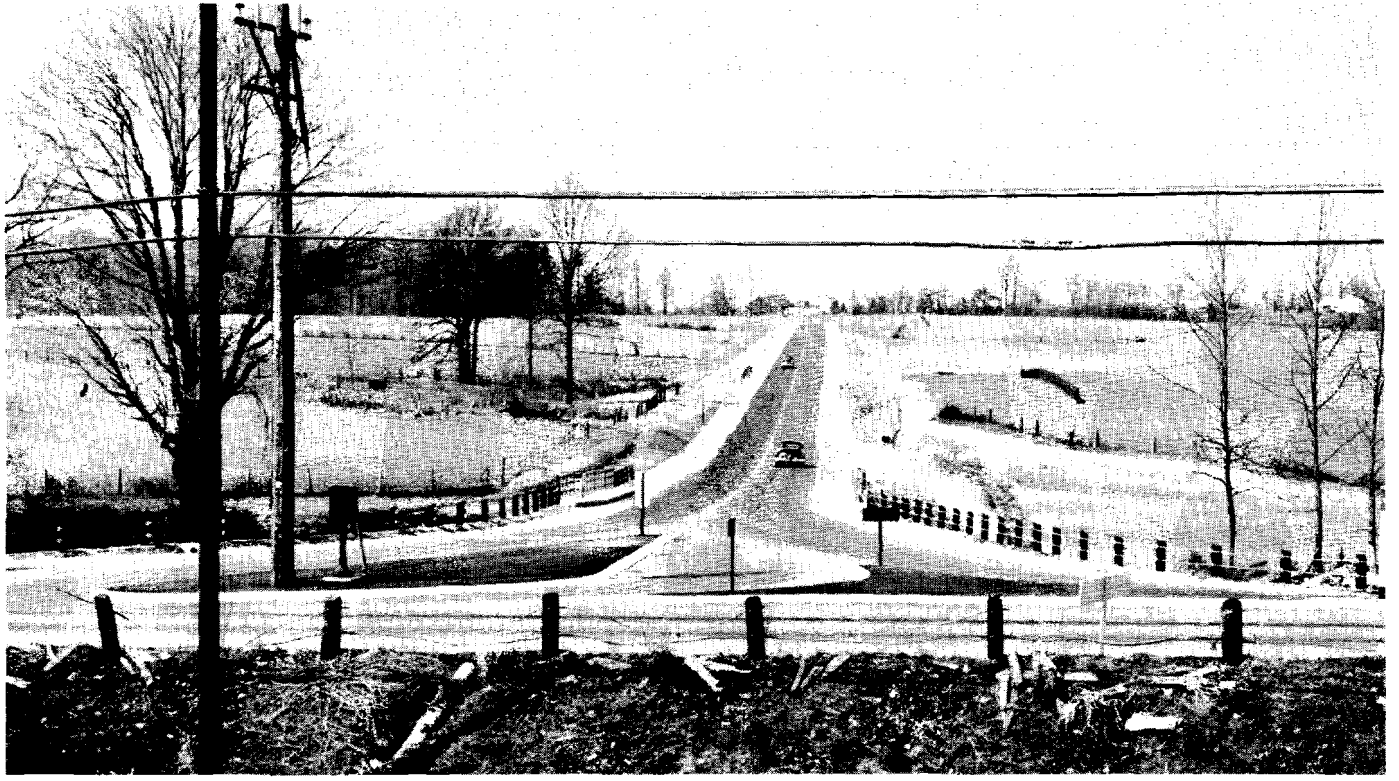
As the amount of work submitted next year with regard to proposed plans will be similar to this year's, it can be said that the potential of new streets to be constructed is 56 miles, more or less.

The area of the subdivisions in the above list is equal to three-tenths of the size of the City of Wilmington, which is 10.58 square miles.

The potential value of the streets on the plans submitted is $3,400,000.00.

Summary of amount of streets handled this year.

Accepted by Department	24.273 miles
Suburban Development Law	11.092 miles
Bonded by law, not accepted	24.564 miles
Proposed Plans	56.412 miles
TOTAL	116.341 miles



CONTRACT NO. 1181, POSSUM PARK ROAD, NEW CASTLE COUNTY
LOOKING NORTH FROM CAPITOL TRAIL

RIGHT OF WAY DIVISION

Howard W. Jones, Chief Right of Way Agent

The heavy construction program of this report period is reflected in the amount of work accomplished by this Division. The tabulation below illustrates this in detail.

Options Obtained	269	
Trespass Agreements Executed	2	
Drainage Agreements Executed	15	
Slope Easements	4	
Deeds Executed	357	
Deeds Recorded	364	
Miscellaneous Agreements Executed	228	
Mortgage Releases Executed	46	
Judgment Releases Executed	20	
Descriptions	501	
Condemnations Heard	5	
Condemnations Appealed	0	
Plats Prepared	36	
Parcels of State Land Sold	6	
State Buildings Sold	12	
Borrow Pits Purchased	2	
TOTAL EXPENDITURES		$661,239.65
TOTAL AMOUNT RECEIVED FROM SALE OF BUILDINGS AND LAND		$ 17,231.00

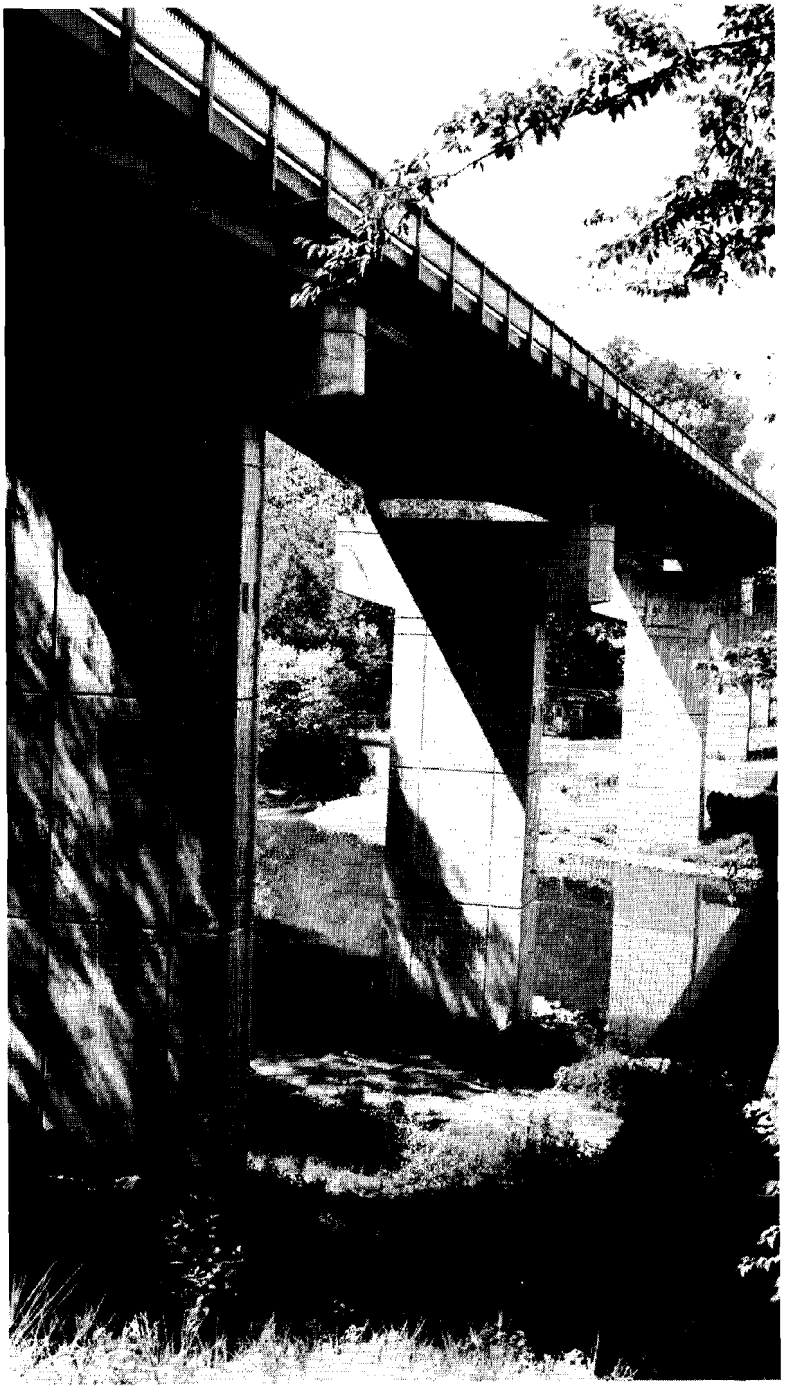
At this point, it should be noted that the condemnation law passed by the 1951 Legislature has been of great assistance in Right-of-Way proceedings. In one instance a savings of $116,000 is directly attributed to this law.

Experience during the past year indicates that further savings could be effected in the manner of dealing with property owners on new alignments. Where buildings exist in new right-of-way, the cost of moving them to the satisfaction of the owners is excessive. If the buildings were purchased outright and resold, the savings in some cases should be considerable. Such is the situation illustrated by transactions for Contract 915, Harrington to Canterbury.

There has been no appreciable change in the cost of lands needed for right-of-way over the past two years.

CONSTRUCTION

The construction activities during this report period were centered upon the completion of the highway construction program initiated at the beginning of the 1952-1953 biennium.



CONTRACT NO. 1082, BRANDYWINE RIVER CROSSING,
NEW CASTLE COUNTY, AT NEW BRIDGE

Sixty-five projects, with a value of $13,027,566.00, were active during this fiscal year. Of these, 38 contracts with an unfinished value of $8,715,713.00 were let during the previous period, most of which were completed during this current fiscal year. The 27 contracts awarded during fiscal 1953 at a bid value of $3,831,294.00 completed the construction program for the biennium.

Thirty-four contracts were 100% completed. These, plus the contracts partially completed during fiscal 1953, represented a construction value of $8,914,859.00.

Thirty-one contracts, having an unfinished value of $4,-112,707.00, were uncompleted at the end of this period.

One hundred twenty-nine miles of highways were under construction or reconstruction during this period.

Notwithstanding the record construction performance of this biennium (1952-1953), the improvement of the highway system must be continued.

Since World War II all major improvements to the highways have depended upon the issuance of Highway Improvement Bonds. This is deficit financing, and sometime in the very near future the saturation point will be reached. It seems important that government officials and the citizens themselves give the problem of highway financing some very serious thought. Some method of greater participation in the highway costs by all who benefit by an adequate highway system must be forthrightly devised.

Continually mounting debt charges on bond issues can quickly reach a point where they are decidedly out of proportion to the yearly income of the State Highway Department. Improvement Bonds totalling $25,386,000 were outstanding at the close of this report period. An additional $12,000,000 was approved by the 117th General Assembly for the 1954-1955 biennium. These bonds probably will be issued by the end of 1954, so at that time highway bonds approximating $37,386,000 will be outstanding obligations of the State.

What makes this matter of highway financing such a serious problem is that if, over a period of four years, funds for highway construction were not made available, the progress made during the past six years would be cancelled.

Without continual improvement the highway system would fall hopelessly behind the demands of the constantly-increasing traffic load.

The status of the construction contracts active during fiscal 1953 is indicated by the following tabulation.

TABULATION OF ACTIVE CONSTRUCTION CONTRACTS

JULY 1, 1952 — JULY 1, 1953

Contract No.	% Fed. Aid	Location	Active 7-1-52 Remaining Value	Awarded During F/Y 1953 Award Amount	Award Date	Constructed During F/Y Value	Active At End of F/Y 1953	Mileage
425	47	Leipsic Bridge	$ 35,736	$	Sept. 1952	$ 74,670	$	0.436
720	St.	Georgetown to Hardscrabble	225,209	.....	Oct. 1952	267,561	.....	6.729
755	47	Lancaster Pike	.....	171,205	Sept. 1952	120,493	50,712	2.138
769	47	Federal and Union Streets, Milton	13,122	.....	.....	13,122	.....	0.132
798	St.	Maryland Ave.—Boxwood to Broom	481,805	.....	May 1953	538,250	3,515	1.395
799	St.	Concord Pike	.....	869,077	July 1952	471,024	398,053	2.436
843	47	Canterbury to Camden	1,192,904	.....	March 1953	1,200,935	22,315	5.850
855	St.	Maryland Ave.—Broom St. to Lancaster Ave.	.....	300,529	Sept. 1952	62,059	238,470	0.846
880	47	Philadelphia Pike—(30th Street)	81,434	.....	.....	56,316	.....	3.321
913	47	Dover By-pass (US 13)	8,914	.....	June 1953	59,576	11,000	4.464
924	St.	Browns Church to Jacobs School	54,075	.....	.....	54,075	.....	2.374
977	95	Carpenters Bridge and Approach	172,063	.....	.....	104,428	67,634	0.303
993	47	Brandywine Boulevard	99,566	.....	.....	69,311	.....	1.733
1037	St.	Marydel to Pearson's Corner	165,844	.....	.....	165,844	.....	6.219
1057	47	New Castle Avenue Overpass	28,069	.....	.....	.....	28,069	0.365
1068	47	Stein Highway	90,807	.....	.....	90,807	.....	6.719
1073	47	Maryland Line to State Road	264,266	.....	Nov. 1953	422,577	.....	9.931
1075	47	Felton to Woodside	29,043	.....	.....	29,043	.....	3.835
1076	St.	43rd Street Extension	41,860	.....	Jan. 1953	49,716	.....	0.173
1078	47	Murray's Corner to Lewes	52,658	.....	.....	50,010	.....	2.348
1080	St.	11th Street Bridge Repairs	.....	15,600	Nov. 1952	15,600	.....	.....
1082	St.	Brandywine River Crossing	364,588	.....	.....	349,396	.....	0.166
1085	47	Ocean View to Bethany	68,167	.....	.....	55,470	12,697	3.458
1086	47	Greenwood to Andrewsville	54,501	.....	.....	54,501	.....	4.458
1087	47	Co. Road 381 to Co. Rd. 387	102,205	.....	Feb. 1953	117,338	.....	4.798
1088	St.	Hartly to Pearson's Corner	28,640	.....	.....	28,640	.....	3.811
1097	St.	Bethany Shore Protection	13,757	.....	.....	13,757	.....	.....
1098	47	Brandywine Bridge Approach	177,539	.....	.....	152,239	25,300	0.925
1099	St.	Port Penn to Delaware City	48,231	.....	Sept. 1952	83,231	.....	0.390
1103	St.	Records Pond and Nanticoke River Bridges	646,297	.....	.....	474,353	171,944	0.033
1123	St.	Dagsboro Streets	33,257	.....	.....	33,257	.....	0.991
1148	47	Georgetown—Laurel Road	1,856,641	.....	.....	1,654,025	202,616	8.385
1149	47	Delmar to Georgetown	1,638,322	.....	.....	298,241	1,340,081	7.956
1154	47	Chrysler Plant to Ogletown	.....	240,312	Nov. 1952	33,106	207,206	3.261
1156	47	Little Creek Bridge Approach	.....	56,179	Aug. 1952	39,289	16,890	0.641

TABULATION OF ACTIVE CONSTRUCTION CONTRACTS—(Continued)

JULY 1, 1952 — JULY 1, 1953

Contract No.	% Fed. Aid	Location	Active 7-1-52 Remaining Value	Awarded During F/Y 1953 Award Amount	Award Date		Constructed During F/Y Value	Active At End of F/Y 1953	Mileage
1158	St.	Dobbinsville Dike Repair	$ 7,394	$			$ 5,942	$ 1,452	
1160	St.	Middletown to Summit Bridge		543,929	Nov.	1952	159,853	384,076	7.388
1161	St.	Summit Bridge to Tybouts Corner	486,363				272,488	213,875	7.042
1164	47	Glenwood Avenue, Smyrna		230,998	Aug.	1952	196,177	34,821	1.106
1167	St.	Governor Printz Blvd.		81,535	July	1952	81,535		0.460
1171	St.	Augustine Sluiceway	26,662		Oct.	1952	31,882		0.028
1172	St.	South Market Street Cutoff	32,343		Sept.	1952	58,128		0.092
1174	St.	Lighting Rogers Corner	12,428				12,428		
1175	47	Broom Street, Wilmington		301,208	Nov.	1952	117,608	183,599	0.677
1180	St.	S.E. Front Street, Milford	34,536				33,447		0.487
1181	47	Possum Park Road		277,000	Jan.	1953	84,483	192,316	1.775
1182	St.	Frederick Douglas School Drainage	14,081				14,081		0.423
1183	St.	Basin Corner Intersection	27,053				27,053		0.200
1187	St.	Churchman Road Relocation		157,987	March	1953	38,443	119,544	2.056
1188	St.	East Cleveland Avenue, Newark		114,430	Aug.	1952	101,651	12,779	0.582
1189	St.	Green Street, Claymont		76,826	March	1953	3,559	73,266	0.700
1190	St.	Krebs School Sidewalks	5,333				5,333		0.119
1193	St.	Westover Hills		20,990	Sept.	1952	20,990		1.260
1195	St.	Elmhurst Drainage		47,044	Sept.	1952	38,472	8,571	0.820
1196	St.	Burnt Mill Road		27,824	Feb.	1953	5,189	22,634	0.464
1221	St.	Directional Sign Frame, State Road		4,304	Nov.	1952	4,304		
1222	St.	Milford Crossroads		99,861	Sept.	1952	78,541	21,319	0.398
1224	St.	Walnut Street Bridge Extensions		8,118	April	1953	8,118		
1226	St.	Jefferson Avenue, Willow Run		29,877	March	1953	8,604	21,272	0.126
1227	St.	Alterations to New Castle Ferry Office, N. C. Co.		4,940	Aug.	1953	4,940		
1228	St.	Painting Administration Building		1,900	Dec.	1952	1,900		
1229	St.	Incidental Construction		52,911	Nov.	1952	47,620	5,291	
1232	St.	Minquadale Drainage		41,109	March	1953	33,942	7,166	0.820
1234	St.	Forest Brook Glen—Drainage		37,339	March	1953	23,115	14,224	0.215
1250	St.	Planing and Leveling Pavement, New Castle Co.		18,262	April	1953	18,262		
			$8,715,713	$3,831,294			$8,914,859	$4,112,707	128.258

Recommendations

For the approaching 1954-1955 biennium, the following funds will be available to the Department for major highway improvements.

Highway Improvement Bonds authorized by the 117th General Assembly for the 1954-1955 biennium	$12,000,000
Estimated Federal Aid	
1954	2,397,000
1955	2,397,000
Total Construction Funds estimated as available for 1954-1955 biennium	$16,794,184

After a careful review of the needs of the highway system, the following projects have been selected as requiring immediate attention. They are herewith recommended for adoption by the Department as the construction program for the approaching biennium.

SUGGESTED CONSTRUCTION PROGRAM BASED UPON FUNDS ESTIMATED TO BE AVAILABLE FOR CONSTRUCTION FOR 1954-1955

NEW CASTLE COUNTY

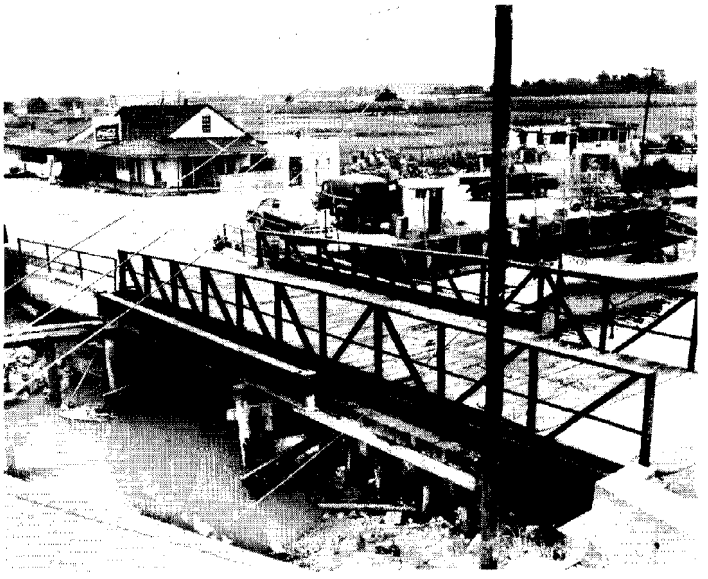
Contract Number	Location	Estimated Mileage	Priority		Estimated Cost
1236	Lancaster Pike (Paving)	2.800	P	1A	$ 300,000
1223	Concord Pike (Murphy Rd. to Talleyville)	1.600	P	3A	700,000
881	Union St. (Viaduct to Sycamore St.)	0.400	P	4A	40,000
1208	White Clay Creek Bridge and Approach	0.750	P	7A	750,000
1299	Heald St. (N. C. Ave. to 3rd St. Bridge)	0.400	P	6B	175,000
1259	Kennett Pike (Pa. State Line to Greenville)				
1271	Kennett Pike (Greenville to Wilmington)	6.000	P	7B	420,000
1260	U.S. 13 (NB) (Basin Cor. to Minquadale)				
1288	U.S. 13 (SB) (Minquadale to Rogers Cor.)	3.500	P	9B	500,000
1287	U.S. 13 (NB) Fieldsboro to Drawyers)	4.333	P	15B	360,000
1301	Gov. Printz (11th St. to 30th St.)	0.800	P	18B	100,000
1163	Newport Pike (Boxwood to Silview)	1.500	P	2A	800,000
1235	Veale Road (Concord to Harvey Road)	2.100	S	1A	225,000
1197	Harvey Road Bridge and Approaches	0.550	S	2A	250,000
	Delaware Ave.—Newark	0.725	S	4A	150,000
1254	River Road (Duncan to Prospect)	0.500	S	5A	70,000
1192	Holloway Terrace (Lambson Lane)	1.130	S	7A	175,000
1262	Road 356 (Wrangel Hill U.S. 13 to U.S. 40)	4.000			250,000
1261	Morrow Road—Newark	2.000	S	2B	160,000
	Center Road (Boxwood to Lancaster Pk.)	2.900	S	1B	700,000
1238	Liberty Ave., Minquadale	1.100	S	8A	130,000
1249	Redding School Sidewalks	0.150	SPEC	A	5,000
	A. I. duPont Sidewalks	0.400	SPEC	A	7,000
	Marshallton School Ext.	0.150	SPEC	C	7,000
	Total New Castle County	37.788			$ 6,274,000

KENT COUNTY

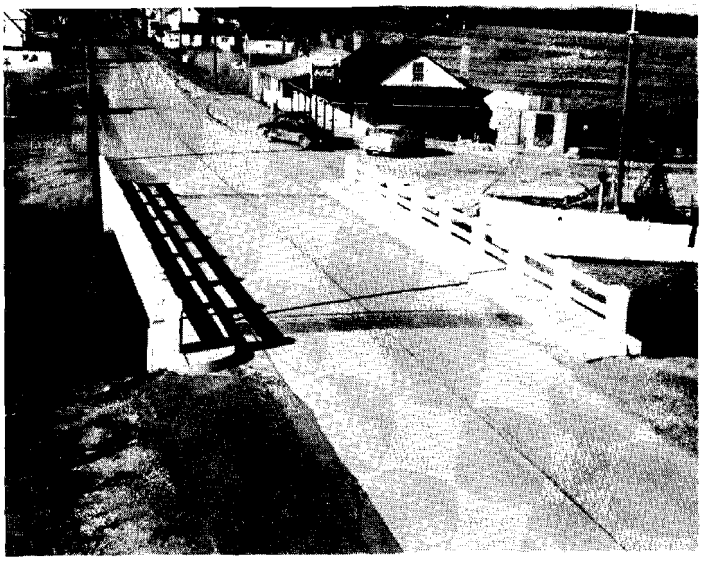
Contract Number	Location	Estimated Mileage	Priority	Estimated Cost
915/916	U.S. 13 (Canterbury to Kent Line)	15.000	P 1A	$ 2,500,000
1219	Route 8 (Pearson's Corner to Dover)	6.000	P 2B	200,000
1263	U.S. 13 (NB) (Dover to Bishop Corner)	4.000	P 4B	360,000
	Route 12 (Felton to Frederica)	6.000	S 1B	510,000
1264	Route 84 (Twin Willows to Whitehalls Cross Road)	3.750	S 4B	150,000
682	Route 6 (Smyrna to Woodland Beach)	8.000	S 2A	180,000
1169	Court St. & Bridge—Dover	0.480	S 3A	600,000
	Viola R.R. Crossing	0.200	S 7A	15,000
1239	Smyrna School Streets	0.300	SPEC A	50,000
1240	Harrington Curbs and Drainage	1.000	SPEC A	30,000
1156	Lebanon Bridge and Approach (Construction contingent upon status determination as a defense access road. If so designated, the entire construction cost would be defrayed from Federal Access Funds.)	0.500	100% Fed. Aid	...
	Total Kent County	45.230		$ 4,595,000

SUSSEX COUNTY

Contract Number	Location	Estimated Mileage	Priority		Estimated Cost
1152	Five Points to Shockley's Corner	5.500	P	1A	$ 1,000,000
925	U.S. 13 (1 mile So. of Greenwood to Sussex-Kent Line)	2.100	P	2A	340,000
1266	Route 14 (Milford to Waples Pond)	6.500	P	1B	625,000
1245	Route 18 (Georgetown to Five Points)	10.000	P	3B	875,000
1268	Route 404 (Bridgeville to Md. Line)	6.250	P	5B	525,000
1063	Line Road East of Delmar	4.400	S	1A	100,000
873	Road 297 (Harmon's School to Oak Orchard)	2.000	S	1B	150,000
1251	Road 381 (Road 384 to Road 58)	2.250	S	3B	80,000
1170	Oak Lane—Laurel	0.800	S	2A	80,000
1256	Swain's Dam Relocation	0.250	SPEC	A	25,000
	High St. (Entrance to Seaford)			C	300,000
	Parts Factory Road	1.00	SPEC	B	10,000
	Total Sussex County	41.050			$ 4,110,000
	STATE WIDE TOTAL	124.068			$14,979,000



BEFORE: CONTRACT NO. 1156, LITTLE CREEK BRIDGE, KENT COUNTY.



AFTER: CONTRACT NO. 1156, LITTLE CREEK BRIDGE, KENT COUNTY.

MAINTENANCE

It is an accepted fact that the very economy of Delaware is dependent upon its highway system. The highway network of our State is not only a comprehensive transportation system in itself, but it also provides terminal extensions to ther transportation facilities—air, rail, and water—to the ultimate consumer; to our agriculture, live-stock, and poultry producers; and to the manufacturers, distributors, and merchants as well. In addition, its primary highways are important to the north-south travel along the eastern seaboard, so much so, that we are placed in the position of being a corridor state.

As a consequence, the traffic over our roads has reached such proportions, particularly in the northern sections of the State, that the theoretical traffic volume for which they were located and designed, has been greatly exceeded.

In spite of the outstanding highway construction accomplishments throughout the State during the past four years, it should be apparent that the preservation of our existing roads continues to be the most important function of this Department.

During the current and preceding fiscal periods, the goal of this Department was to provide the kind of protection to our highway plant that would prevent deterioration from the continually increasing traffic volumes and greater weights of the cargo carriers. It is believed that much progress was made toward the accomplishment of this goal. As a large portion of the highway mileage is of inadequate width to accommodate traffic comfortably, the frequency of the roadway shoulder maintenance operation was greatly increased. To reduce the break-up of the edges of the paved surface, a necessary safety measure, shoulders must be maintained smooth and flush with the roadway.

The prompt adoption of proven modern methods of maintenance, greater frequency of shoulder maintenance, constant blading and grading of earth-type roads, plus extended surface treatment widening and patching programs, have greatly assisted the maintenance operation in reaching an acceptable degree of efficiency.

During fiscal 1953, Delaware became one of the first states to use mechanical equipment for the planing and leveling of rough sections of asphalt roadways. Under a contract awarded to the Universal Road Planer Corporation of Cincinnati, Ohio, a Spears-Wells Heater-Planer planed

and levelled sections of asphaltic highways that had been badly deformed by heavy truck traffic. This equipment performed very well, particularly on a 3-lane northbound section of the du Pont Parkway in New Castle County. This section, between State Route 273 and the State Road Intersection (a distance of nearly 1¼ miles), was in very bad condition, having long stretches of high and low spots that were exceedingly annoying to vehicle drivers. The operation consisted of heating and then cutting or planing high spots.

The finished surfaces were smooth and free from any imperfections. It is estimated that this operation delayed an expensive reconstruction project on this highway for at least eight years.

The material planed off was then collected and used for patching, shoulder stabilization and widening in other areas. The salvaged material amounted to about 50 tons per day.

The demands of the public for services which in prior years were not considered maintenance functions, add to the many problems of the maintenance divisions. Many of these requests pertained to drainage conditions in housing developments and roadside building construction that did not exist prior to the building of the developments. In most cases these conditions were the result of faulty planning on the part of the owners. Because of limited funds, it was impossible to satisfy all these requests. It seems well to quote a statement appearing in the 1952 Annual Report, "It has been difficult for the Department to draw lines of demarcation and, therefore, some undeserved criticism has been directed at its maintenance forces."

Many miles of new suburban streets have been added during this fiscal year to the maintenance responsibility of the Department. These streets and roads are becoming a serious problem, for they require the same attention as other roads. To give them the attention the residents demand taxes the resources of the maintenance divisions. In the 1953 appropriation request to the Legislature, this added maintenance responsibility was very pointedly stressed; nevertheless the estimates of additional requirements were disallowed.

When the new budget requests are submitted in the latter part of 1954, a concerted effort should be made to have additional funds allotted to the Department in sufficient amounts to perform the services that are both necessary and expected by the residents of the suburban communities.

The matter of maintenance costs has been a source of some concern during this period. It must be remembered that estimates of maintenance costs are made nearly three years in advance and legislative appropriations are authorized accordingly. The funds available for maintenance purposes for fiscal 1953 were estimated and submitted to the Permanent Budget Commission during 1950. The upsurge of traffic, material, and labor costs was difficult to forecast. As a consequence, deficits resulted and the budgets had to be supplemented by a transfer of funds from the Construction Account. Labor costs represent over 50% of the maintenance expenditure, and, therefore, the greatest deficiency appeared in the salary and wage accounts. This deficit was accounted for by the necessity of increasing salary and wage rates in order that a sufficient force of competent employees could be retained and obtained to perform maintenance operations adequately. It is believed that this increase of salary and wage rates was not only justified from a Department standpoint, but was very essential to the individuals to meet rising living costs.

The following tabulation shows the maintenance expenditures for fiscal 1953 as compared with the appropriated funds.

	Appropriated	Expended
Salaries and Wages	$1,240,000.00	$1,639,611.88
Office Expense	12,000.00	7,835.01
Operations	400,000.00	327,936.15
Repairs and Replacements	650,000.00	633,683.47
Equipment	73,000.00	48,204.04
TOTALS	*$2,375,000.00	$2,657,270.55

* Appropriations supplemented by transfer of funds from construction and other maintenance accounts.

Snow Removal

The winter season of fiscal 1953 was one of few major snow or ice storms. Notwithstanding such an open winter, certain snow removal expenses were necessary, for the Department had to be prepared for storm emergencies. Snow fences had to be erected, plows and other snow removal equipment had to be repaired and replaced and emergency crews kept available when weather reports indicated the possibility of storm conditions.

Unused funds budgeted for snow removal purposes materially aided the spring maintenance program in that these savings were available for other maintenance purposes.

Fiscal Year	New Castle	Kent	Sussex	Totals
1943-1944	$ 18,383.81	$ 4,432.73	$ 2,671.05	$ 25,487.59
1944-1945	39,443.57	3,266.13	1,244.92	43,954.62
1945-1946	30,553.61	8,318.34	8,062.61	46,934.56
1946-1947	49,578.15	13,007.78	6,775.90	69,361.83
1947-1948	60,866.54	21,797.22	33,069.91	115,733.67
1948-1949	35,913.29	5,879.91	10,748.06	52,541.26
1949-1950	25,260.36	4,405.21	2,798.10	32,463.67
1950-1951	39,363.76	4,841.22	10,679.21	54,884.19
1951-1952	47,221.23	8,145.29	6,904.95	62,271.47
1952-1953	43,063.42	3,533.06	7,147.54	53,744.02
10 yr. cost	$389,647.74	$ 77,626.89	$ 90,102.25	$557,376.88

Traffic Services

Increased traffic and the location along the major highways of new housing developments, merchandise marketing centers, open air theaters, and industrial plants have created demands for additional signs, markers, speed zoning, pavement-striping, and signalization, for the reduction of the accident rate. As of this fiscal year, the Department, in order to meet this demand and for economic purposes, designated "Traffic Services" as a responsibility of the Traffic and Planning Division. Therefore, further discussion of this function of maintenance will appear in the Traffic and Planning Section of this report.

Maintenance costs for fiscal 1953 are detailed in the report of the Department Secretary.

MOSQUITO CONTROL DIVISION

Frank D. Cannon, Mosquito Control Engineer

The discovery of insect resistance to DDT and other chlorinated substances has caused wide research in an endeavor to develop some miracle substance in which resistance is no longer a problem. Unfortunately, there has been no miracle chemical of practical value developed for large-scale operations. Organizations instituted during the war and others which had leanings toward chemical control, now confronted with insect resistance, are placing greater emphasis on permanent measures. It has always been the ambition of this organization to continue its efforts toward

permanent solutions, and to use chemical aid as a control measure whenever and wherever it may seem practicable.

The mosquito program was continued on about the same level as for the past few fiscal periods. The 1952 season was not a season of heavy production since both precipitation and tidal conditions were below normal. The average of females caught per night in the control sections was well below the average figure of 24 except at Bethany Beach. The percentage of nights at each locality during the season when the count was below 24 is as follows: Lewes 100%, Rehoboth 78%, Oak Orchard 98%, and Bethany Beach 45%.

The collections at Bethany Beach indicated that a high percentage of **culex** mosquitoes were present. They breed in contaminated water or in marshes maintaining a high water table. Much of the breeding at Bethany Beach can be attributed to contaminated water caused by the overflow from cesspools, and the fact that many of the cesspool outlet drains and vents are unscreened. Under these circumstances it seems logical to assume that normal aerial applications will not reach the breeding places in lethal proportions. This would indicate that an intensive inspection and ground-spray program, in addition to aerial spraying, is required to minimize their presence.

The sum of $90,000 was appropriated to conduct the maintenance program, including aerial spraying, however, supplementary funds were available which brought the total expended to $104,005.63. This represented the employment of 18 regular employees and 6 inspectors for the summer work. The regular employees are utilized for many purposes, depending upon seasonal demand.

The summer work is largely composed of aerial spraying with a minimum of ground spraying or fog machine work. Our eventual goal is the permanent elimination of breeding either by filling, drainage, or, in some circumstances, by water control. The various sections under control receive treatment on the basis of light-trap counts, and general field inspections. These observations indicated the necessity of treating by air a total of 86,386 acres with the resort sections realizing the major benefits. The contract rate of eighteen cents per acre for the aerial work was established through competitive bidding. The spray was applied at the rate of two quarts of No. 2 fuel oil per acre containing one-tenth pound of BHC (gamma isomer). The cost of application plus mixing amounted to around forty cents per acre.

The amount of permanent control can be increased by putting into effect a year-round machine and hand crew, if funds are available for the purpose. This Division does not have any machinery which will clean or dig a ditch properly without considerable aid from hand labor. Within the past year or so, a number of industrial ditching machines were placed on the market, but none are suitable for our cause without certain modifications. Emphasis will be on the development of such equipment, so that a request for funds for such can be submitted to the next General Assembly for its consideration.

Through the combined efforts of hand and machine work, a total of 991,703 linear feet of ditch was cleaned, averaging about 60.8 feet per manhour. These accomplishments were largely on marshes on the south and north side of Long Neck, leading up to Herring Creek. Other maintenance involved the disking of about 150 acres of hydraulic fill in the upper Indian River section known as Island Creek. In order to keep our ditch systems circulating it was necessary to construct four new outlet boxes through the sand beaches and repair eight others.

The program of research which was started several years ago by this Division and University of Delaware Agriculture Experimental Station is still in effect. The funds are supplied by this Division and technical assistance is provided by Entomology Department headed by Dr. L. A. Stearns. Others presently participating are Research Professors Donald MacCreary and Richard F. Darsie.

Meetings are held by the two agencies during the non-season months and problems of the future are discussed. In this joint arrangement policies on research and maintenance are established.

The research program for the season was designed (1) to check the effectiveness of mosquito control activities through the operation of mosquito traps; (2) investigate factors affecting DDT residue in marsh soils; and (3) to continue studies on the toxity of insecticides to mosquitoes.

The second item of research is not complete at this time and will be presented in a later report. The third subject under study consists of two parts. The first part is to check the effectiveness of a fog machine against adult mosquitoes. This popular device, used in many sections of the country, gives only temporary relief to small communities. It is used both as an aid in regular control work and to give

moderate relief in non-control areas. A series of tests indicates that the fog machine gives a high kill only in the first 100 feet, but with improved weather conditions could extend its effects to, possibly, 200 feet. The second part of this study is relative to the usefulness of Dilan, a new toxicant, as a possible insecticide to be used against DDT and BHC-resistant larvae. The complete results of this can be had through request of Publication 255 and Scientific Article 177 of the Department of Entomology, March 3, 1953. The results indicate that BHC is still an effective spray against DDT-resistant mosquitoes, and that Dilan applied at the rate of 0.4 pound per acre provides a very high degree of control against larvae which have become resistant to DDT and, to a small degree, against BHC. The study also indicates that Dilan at the rate of .2 pound per acre gave kill comparable to the higher dosage. It was also demonstrated that larvae from formerly DDT-resistant areas were being killed readily with DDT by the latter part of 1952. It was also pointed out that such chlorinated substances as DDT, BHC, and others may be re-used after a certain interval of time, but on the subsequent use of these, resistance may again be acquired in much shorter time than originally.