

ENGINEERING

From The Director

The year 1969 has been a year of accomplishments and significant change. With a new State Administration, there has been a change in the majority of Department Members. The staff looks forward to the advice and assistance of the new Members.

Late in the year the Headquarters group moved from the various buildings in the Dover area to the newly constructed Administration Center on Route 113. Beneficial results of this move are already evident. Particularly noticeable is a closer working relationship among all the employees, resulting in better efficiency and coordination of related responsibilities.

During the year emphasis has been placed on the advanced planning functions of the Department. The rapid growth of the State requires that our longer range planning be coordinated with the anticipated growth of the State rather than reacting to it.

A continuing "freeze" of Federal Aid funds at less than the apportioned amounts has restricted the level of projects under construction, especially on the Interstate system. It is anticipated, however, that a significant easing of the international situation would result in making frozen funds available quickly for construction purposes. It is, therefore, desirable that projects be available for advertising on short notice.

Federal Highway Legislation during the past has placed new demands on the Department. Primarily among these are the Relocation Assistance Program, the "Double Hearings" requirements, the Equal Opportunity Program, and the TOPICS Program. State Legislation affecting the Department included the Junkyard law and the Billboard Control Law. Legislation is pending to permit the Department to meet Federal requirements for Relocation Assistance.



Ernest A. Davidson
Director of Operations

RECOMMENDATIONS: The following recommendations are offered for consideration:

1. Greater emphasis on the advanced planning function of the Department's operations.
2. Strengthen the professional capabilities of the Department in order to meet the over-increasing complexities of the planning and design processes.
3. Obtain legislation designed to protect proposed rights of way from the period between the approval of alignments and the acquisition of the rights of way.
4. The establishment of a budgetary system designed to permit greater flexibility to the Department in performing its maintenance and operational requirements.
5. The development of a work standardization and cost analysis program for maintenance operations.

Planning

To construct and maintain a comprehensive network of streets, roads, and highways for the State of Delaware requires a great deal of planning and programming of manpower, machinery and money.

Provision of Twenty Year Forecast Traffic Volumes and construction requirements for the state highway system is the principle function of transportation studies which in turn define the need for future roads.

These travel forecasts are provided by means of comprehensive, computer oriented transportation studies, which through examination and analysis of existing travel patterns and habits, permit forecasting of future traffic based on projected land use development patterns.

A basic study usually requires at least three years to complete with a continuing program of updating to keep the information current. From the highway point of view, the initial study produces a forecast of the network of highway that will be required 20 years in the future as well as the traffic volumes on the network.

The New Castle Land Use and Transportation Planning Program has been completed and is now in the updating process.

Three years of work on the initial Kent and Sussex Study will bring those to completion in the very near future.

Upon completion of the initial study in Kent and Sussex, it is intended to merge the two studies into one statewide transportation plan.

The road inventory record of state highways, state maintained streets in suburban developments, and municipally maintained streets were also updated to reflect new additions and changes to existing physical characteristics or system classifications.

The State of Delaware now has a total of 4,372.05 miles of streets and highways in its system with 45.78 miles of interstate, 590.81 miles of primary, 1,358.10 miles of secondary and 2,377.36 miles of tertiary. New Castle County has 1,353.58 miles in its system while Kent County has 1,090.00 miles and Sussex has 1,928.47 miles for the state wide total of 4,372.05.

A road reference index is being created to incorporate all existing highway planning data inventories into one integrated set of data files.

The objective of this is to make the most efficient use of the capabilities of the computer, to reduce the effort required to maintain the inventories, and to disseminate highway related information with greater speed and usefulness.

In the area of safety improvements, hazardous locations were identified and studied to determine the most appropriate corrective action. This was done as participation in the Spot Safety Improvement Program. Safety improvement studies for entire sections of road were made on existing Dover bypass, Maryland Avenue and U.S. 13 from Llangollen Estates to Rogers Corner.

A highway-railroad grade crossing diagnostic team was formed. Inventories were prepared for this team to study in order to develop a criteria for recommending improvements to the crossings. Field trips were conducted to inspect many crossings and to recommend improvements to be incorporated with the general improvement of roadway sections.

The Annual Traffic Summary was completed and published for distribution as well as the Annual Weight Survey.

Reports from all accidents in the State were received, coded, and punched on data processing cards for computer analysis for the purpose of determining particularly hazardous locations on the highway system. All accidents are located to the nearest 0.01 mile with only the data necessary to locate and reconstruct the collision diagram is coded. The other data is available from police and motor vehicle records.

PROJECT SCHEDULING AND CONTROL

Project Scheduling and Control is now in its second year of existence and was developed to meet the Department's need for systematic planning, scheduling and controlling its road building program and the individual projects that comprise that program.

Project Scheduling and Control shows a graphic display of each designated project by use of the Critical Path Method network (CPM). Starting with eleven design projects in July 1968, the master schedule of projects grew to as many as twenty-one at one time during the year. During 1969, a total of twenty-seven different projects

were placed on the master schedule and calendar dated schedules were prepared for the use of the Sections and Divisions of the Department taking an active part in the design and associate activities for each project. Thirteen projects were located in New Castle County while Kent and Sussex Counties had seven each. It was recognized from the beginning that there were many obstacles, pitfalls and problems associated with the operation of the Critical Path Method as a management tool for project scheduling and control. Many of these were handled by education of the personnel using them, others by careful and repeated study of the activities of the network as to their need and as to their logical sequence within the network and some by more reasonable assignment of time durations to the activities.

CONTRACT ADMINISTRATION

Contract administration, handled by the Office Manager, includes advising the Department when

projects are ready for advertising, advertising of contracts, preparing requests for Department action on awards writing of award letters, checking contract documents for execution, and liaison with the Department Attorney for matters concerning contract documents and various agreements.

The public advertisement required by State Law for the purchase of materials, equipment, supplies and performance of work is prepared and submitted for publication in newspapers as well as mailed to a list of prospective bidders in an effort solicit the most competitive bids possible. Bid proposals, consisting of specifications and all the specific contract documents necessary to provide a valid contract are assembled and made available to prospective bidders.

Department representatives conduct public bid openings for all contracts, verify the accuracy of all submissions and prepare and distribute tabulations.

A SUMMARY OF THE CONTRACTS ADVERTISED FISCAL YEAR 1969

<u>TYPE</u>	<u>NUMBER</u>	<u>CONTRACT AMOUNT</u>
Construction		
Federal Participating	16	\$ 8,196,341.69
Toll Road	6	6,115,744.35
100% State	47	5,003,820.13
Mosquito Control	2	219,806.00
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Total Construction	71	\$19,535,712.17
Materials & Supplies	64	\$ 1,224,329.41
Equipment	29	707,689.15
Mosquito Control Spraying	4	72,014.60
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TOTAL	168	\$21,539,745.33
No. Proposals Prepared	8,921	
No. Proposals Sold	1,252	
Total Receipts	\$8,267.40	

Traffic

Traffic engineering activities of the Highway Department include signing and signals, pavement markings, and accident analysis for improved safety on Delaware highways.

All traffic signs used in the state are manufactured by the Department's sign shop which include those sold to cities and towns. The Department sign shop sold a total of \$29,206.65 worth of signs this past fiscal year of which \$6,073.34 was received as payment for signs and signals damaged in automobile accidents and \$23,133.31 was received for signs, signals and services to other governmental agencies.

Traffic also issues special permits for vehicles to travel Delaware highways which exceed the legal limits of size and weight. There were 2,928 such permits issued in New Castle County, 15,199 issued in Kent County and 1,851 issued in Sussex County.

The pavement marking effort was increased this year over last with 1,975 miles covered with 26,801 gallons of paint. The mileage does not include special markings such as railroad crossings, schools arrows, crosswalks, and similar markings.

Traffic has been working on a major safety and capacity improvement program on two of the states most heavily traveled highways. The benefits to Maryland Avenue and Kirkwood Highway in New Castle County are evident. Traffic has installed in conjunction with improved intersections and left turn storage lanes a fully coordinated and integrated traffic control system.

This year the Department was able to analyze one of these Safety Improvement Projects from both a safety and operational point of view.

Kirkwood Highway between Wilmington and New-

ark is one of the most heavily traveled arteries in the state. Peak traffic volumes during the rush hours reached capacity limits during 1965. Subsequently, the accident rate had become quite high with marked increases each year. As the increase in the number of vehicles using this particular stretch of road continued to mount, the left turn traffic entering the Kirkwood Highway from the unsignalized intersections were being subjected to a high degree of risk and difficulty of movements. In addition, there was a high number of rear end collisions occurring at crossover locations. The most critical stretch of Kirkwood Highway was located between Greenbank Road and St. James Church Road. It was decided to submit this area for safety and capacity improvements under the Safety Improvement Program.

The improvements used to upgrade this highway consisted of the addition of a third travel lane on both the eastbound and westbound sides and the installation of additional approach lanes on the major side streets. Signalization was introduced or improved at the intersections where required and many crossovers were removed and left or U-turns from Route 2 were moved to the signalized intersections.

In 1965, the last full year prior to these improvements, there were 193 accidents which occurred along this stretch of Route 2 resulting in a total of 53 personal injuries and an estimated \$56,000.00 in damage to vehicles. During 1968, the first full year following this improvement program's completion, total accidents were reduced to 115 resulting in only 15 personal injuries and an estimated vehicle damage of \$131,000.00. Upon reviewing the types of accidents, it was discovered that right angle collisions had been reduced more than four times and rear end collisions were reduced to half.

1. Delaware Route 896 and Turnpike Ramp
2. Marsh Road and Naamans Road (Fire Signal)
3. U. S. Route 13 and State Road (Fire Signal)
4. Delaware Route 5 and Delaware Route 24
5. Basin Road and William Penn High School
6. Stein Highway and Shipley Street - Seaford
7. Marsh Road and 1-95 Ramp
8. Marsh Road and 1-95 Ramp
9. Harvey Road and 1-95 Ramp
10. Basin Road and Airport Road (Flasher)
11. U. S. Route 202 and Whitby Drive
12. U. S. Route 13 and Charles Polk Road
13. New Churchmans Road and Delaware Route 7
14. Naamans Road and Shipley Road
15. Naamans Road and Peachtree Road
16. U. S. Route 202 and Entrance to Almart
17. U. S. Route 202 and Entrance to Almart
18. U.S. Route 13 and Entrance to Dover Downs
19. U.S. Route 113 and Blue Hen Mall
20. U.S. Route 113 and Blue Hen Mall
21. U.S. Route 113 and Blue Hen Mall
22. U.S. Route 202 and Brandywine Raceway
23. Naamans Road and Brandywine Raceway
24. New Castle Avenue and Rodney Drive
25. 1-95 and Naamans Road Exit (Southbound)
26. 1-95 and Naamans Road Exit (Northbound)



Striping the State's thousands of miles of roadway is a continuous project even with this efficient machine.

Roadside Development

Roadside Development is concerned with insuring that the plant material along the state's highways is preserved, enhanced, and displayed in a manner which will contribute to the realization of an economical, safe, well engineered, and aesthetically pleasing highway.

The addition of plant material to the roadsides with specific functions; such as, screening, headlight glare, providing a crash barrier, delineating change of direction, screening unsightly views and acting as a dirt or noise abatement screen, represent the utility of such plantings.

Some of the outstanding projects completed this year include the landscaping of U.S. 113 from south of Milford to the Murderkill River Bridge which was completed on December 22, 1968; landscape planting in the Christina Interchange on May 16, 1969, and the Smyrna Safety Rest Area was officially dedicated on May 12, 1969 with a landscaping contract soon to be advertised.

Semifinal plans for I-95 from Maryland Avenue to Pennsylvania Line have been prepared and are being reviewed for construction to begin in the spring of 1970. The plans for landscape plantings along Delaware Avenue in Wilmington have been reviewed and will be advertised for construction during the fall of 1969. The Highway Department's beautification forces coordinated efforts to salvage plant material located in the way of current expansion along the Delaware Turnpike which was utilized in creating additional scenic enhancement throughout the state.

Throughout the year, the Department has been engaged in the activation and continuation of several cooperative and experimental projects such as: 1) during the spring planting season, Everblooming Landscape Roses were added to existing plantings sponsored by the Delaware Home Economics Extension Service along Route 13 by Rodney Village Shopping Center; 2) initial spring plantings were established around the Middletown Garage, Laurel Maintenance Yard, and Ellendale Maintenance Yard; 3) evergreens were planted in May along the headlight screen at Drawyer's Creek to create a total or 12 months effect; 4) scenic plots were created this spring at the Newport Triangle and the junction of Route 896 and U.S.

13; 5) additional Crownvetch test plots were planted this spring adjacent to Drawyer's Bridge on U.S. 13, along Route 7, north of Route 2, on the embankments by the Lebanon Road Bridge, and new variety was introduced adjacent to Barlow's Bridge at the junction of Road 460 and Road 36 all in New Castle County; 6) the grass growth retardant program was expanded this summer with the introduction of a new chemical called Maintain CF-125, which was applied together with MH-30T, on four test plots along U.S. 13 and 113 in Sussex, Kent and New Castle Counties, with excellent results on two of the plots; 7) experimental 38-0-0 organic fertilizer plots have been established in all three counties; 8) continued excellent results from the application of casoron are being observed; 9) only 4% of a total 390 first year hybrid poplars were added to the program; 10) experiments with two spray thickeners, Dacamine and Emulsifier-D, were conducted to establish utility and cost comparison; 11) upright beach plums were introduced this spring as a part of the section's dune stabilization involvement on the Indian River Inlet Bridge approaches; 12) dune stabilization projects with Weeping Lovegrass conducted jointly by the U.S. D.A. Soil Conservation Service and the Department are being carried out along Route 14 at Dewey Beach in an effort to ascertain the usefulness of an indigenous warm season grass as a median-type turf grass for future highway construction in that general area. The experimental use of Japanese Sedge and Dune Panicgrass on critical sand areas subject to heavy traffic is also anticipated along with shrubs such as Bayberry, Wax Myrtle, Flameleaf Sumac, Rugosa Rose, and Scotch Broom.