

REPORT OF DIVISION I
ON
DESIGN, RIGHT-OF-WAY AND BORDER CONTROL

INTRODUCTORY STATEMENT

By
Wilbur H. Simonson
Head, Division I

Aerial Surveys for Complete Highway Development - In 1943 the Committee initiated a study of the use of aerial surveys in engineering for complete highway development. A paper on aerial surveys for new highways and roadsides was presented at the 1944 meeting of the Highway Research Board and was published on pages 166-174 of the Proceedings for that year.

This introductory paper gives the historical background in the use of aerial surveys for highways over a 20-year period. In addition, there is given an outline of basic principles, advantages, general relationship of map-scales, contour intervals, topography and land-use. A list of selected references is also included.

Interest in this modern method of obtaining vital and more complete information about topography and land-use is growing. Such survey information, in combination with traffic data, form the major controls of highway location, design and construction. Therefore, the Committee is continuing its activities in this field.

Use of Aerial Survey Methods in Thirty States - More than thirty States have now made use of aerial survey methods in one or more of the stages of highway planning and location. The practices developed thus far are gaining favor rapidly and techniques are being improved as more highway engineers become familiar with the advantages. Among the many advantages are:

1. Wider areas covered with a uniformity of detail and accuracy;
2. Decreased survey costs per unit area;
3. Shortening of time required to prepare plans for contract construction;
4. Better locations and designs, because the team of highway engineers responsible in each stage of the engineering job has ample information of the right kind from beginning to end.

An outstanding example of how aerial surveys expedite highway planning was presented by Samuel Nelson, Deputy Chief Engineer, Palisades Interstate Park Commission, before the Committee on Road Design, American Association of State Highway Officials, November 28-30, 1944, and published in the 1944 Group Meeting Book of the Association.

A summary of the main points of what has been learned regarding the various methods of aerial surveying and types of photogrammetric equipment that now appear to be best adapted for use in the successive stages of highway location will be

found on pages 429 to 447 of the December 1946 issue of **PHOTOGRAMMETRIC ENGINEERING**. This article supplements the introductory paper first mentioned.

In the second published paper a selection of aerial survey methods according to ground coverage, width and scales, is outlined descriptively and graphically. A working system is given for the progressive coordination of all operations in obtaining complete information about topography and land-use governing in each of the stages:

1. Reconnaissance of area
2. Reconnaissance of alternate routes
3. Preliminary location surveys
4. Location surveys and contract plans

A general comparison of unit costs of aerial survey methods is given. Conclusions point out that each type of aerial survey and photogrammetric equipment has a place in attaining the best highway location between terminal points.

Additional Timely References - The use of air photographs in plan making, in plan presentation, and as a periodic record of change and trends is presented in the February 1944 issue of the Department of Commerce, Commonwealth of Pennsylvania Publication Vol. 9, No. 3: **AIR MAPS AND PHOTOGRAPHS IN CITY, COUNTY AND REGIONAL PLANNING**.

Three timely articles on aerial surveys as aids in highway location were published in the February 1947 issue of **CIVIL ENGINEERING**, starting on page 81. These articles were part of a symposium presented at the annual meeting of the American Society of Civil Engineers in New York. Another paper in this symposium was presented by Spencer Miller, Jr., Commissioner, State Highway Department, Trenton, New Jersey: "Highway Location by Aerial Photography in New Jersey."

1. Aerial mapping cuts cost of highway location in New York by Edward T. Gawkins, Deputy Chief Engineer, Division of Construction, Department of Public Works, Albany, New York.
2. Connecticut applies aerial mapping to urban highway planning, by William J. Cox, State Highway Commissioner, State Highway Department, Hartford, Connecticut.
3. Massachusetts adopts aerial photography to highway location, by E. C. Houdlette, Director, Survey Division, Department of Public Works, Boston, Massachusetts.

Increasing Interest of Engineering Colleges in Aerial Survey Methods - Experience through 1947 has strengthened the appreciation of highway officials and engineers in the benefits of aerial surveys in highway location and development. There is no question that aerial surveys strengthen their judgment in making rapid decisions. The essential facts are obtained in sufficient detail at the psychological time from the beginning to the end of the highway location and construction job.

Educational institutions are also alert to the benefits of aerial survey methods. These include Cornell University, Massachusetts Institute of Technology,

Ohio State University, Pennsylvania State College, Purdue University, Syracuse University and other leading schools mutually interested in furthering the application of aerial survey methods to all phases of highway engineering and development.

Chapters on aerial surveying are now included in the latest editions of Civil Engineering and Surveying Handbooks, such as:

1. American Civil Engineers' Handbook
2. Breed and Hosmer's Higher Surveying
3. John Clayton Tracy's Surveying, Theory and Practice (1947)

An Outline of Aerial Surveying for Highways - The Committee is continuing to encourage improvement in procedures in aerial surveying and photogrammetric mapping for highway engineering purposes.

Selected charts of an exhibit by Public Roads Administration are included to show the orderly sequence and relationship of processes in highway planning and development. The successive stages of highway location and construction are shown. Photography, ground control surveys, photogrammetry and mapping procedures are correlated for the guidance of the engineer in the respective highway stages. The outline chart shows the kinds of aerial photographs, completed pictures, and types of maps useful in location surveys and in project plans for improvement and reconstruction of highways, including highway maintenance and betterments and highway condition and inventory surveys.

Airview Studies for the Complete Highway - A few examples of the presentation of airview studies are shown in one of the charts of the exhibit series of photographs. These are practical presentations of three-dimensional drawings prepared by use of aerial photographs and the various photographic processes. Such drawings are needed to show others the elements of design that are essential for the complete highway. With this method difficult problems of right-of-way development may be presented, decisions made, and prompt action taken. In this way everyone concerned can actually see and understand what is needed and decide what is to be included in the final plans for the complete highway.

Roadside Improvement and Complete Highway Development - We are now in the third phase of roadside improvement as an integral part of Federal-aid highway construction.

Before the War the regulations for unemployment relief provided that at least a certain amount of roadside improvement be undertaken in each State.

During the War emergency this requirement was waived. Instead of separate projects for roadside improvements, the basic principles of roadside improvement -- grading, drainage and erosion control -- were incorporated in the original highway design to the extent practicable for construction.

PLANNING AERIAL HIGHWAY SURVEYS

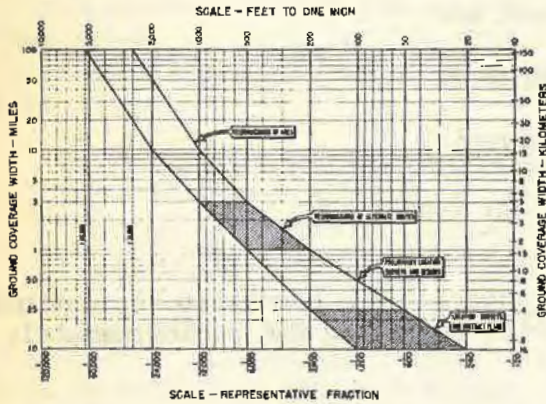


FIGURE 1- STAGES IN THE LOCATION OF A HIGHWAY

1.- DETERMINE THE WIDTH OF THE GROUND COVERAGE AND THE SCALE

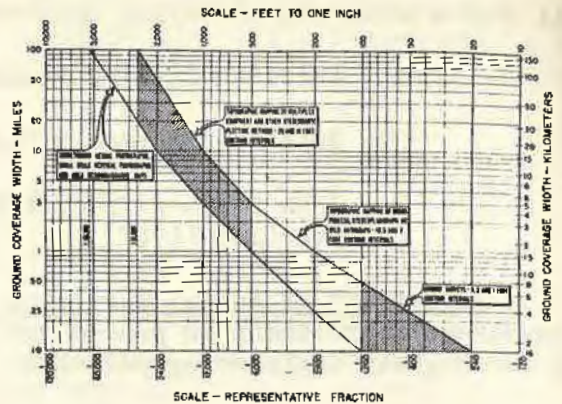


FIGURE 2- SELECTION OF SURVEY METHODS

2.- SELECT THE SURVEY METHOD

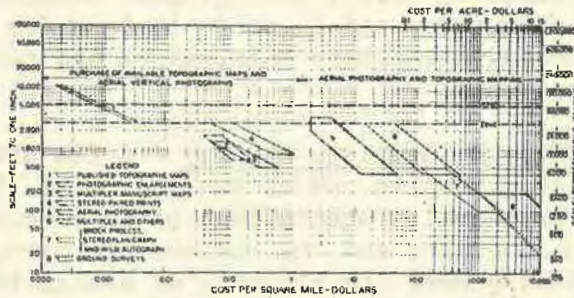
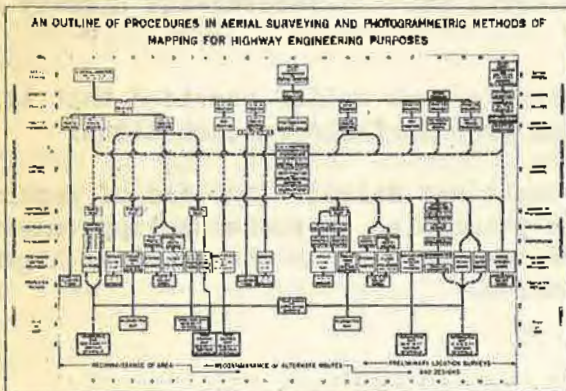
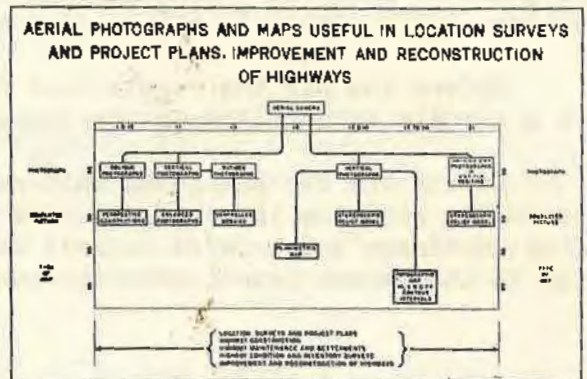


FIGURE 3- UNIT COSTS IN HIGHWAY LOCATION SURVEYS

3.- COUNT THE COST

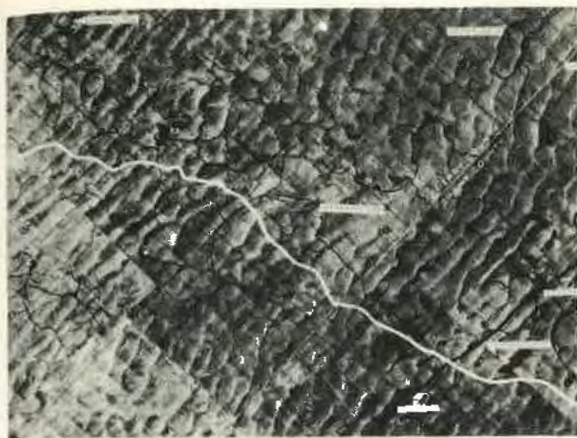


4.- SURVEY PROCEDURES

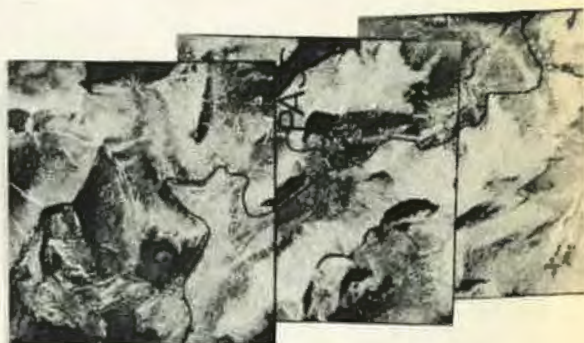


5.- USES OF THE AERIAL MAPS

MAKING AERIAL HIGHWAY SURVEYS



1.—RECONNAISSANCE ROUTE OUTLINED UPON THE PHOTOGRAPH INDEX



2.—RECONNAISSANCE ROUTE OUTLINED BY A SHORT-CUT METHOD USING ALTERNATE PICTURES OF A SEQUENCE



3.—RECONNAISSANCE ROUTE ALONG A RIDGE OUTLINED UPON A SINGLE PHOTOGRAPH BY STEREOSCOPIC PROCESSES



4.—STUDYING THE RECONNAISSANCE TO DETERMINE THE ROUTE TO BE SURVEYED



5.—MAKING THE PRELIMINARY SURVEY BY CORRELATING THE PHOTOGRAPHS WITH THE TOPOGRAPHIC MAP

AERIAL SURVEYS CAN HELP TO DESIGN OUR NATIONAL SYSTEM OF INTERSTATE HIGHWAYS



1.- URBAN NATIONAL INTERSTATE HIGHWAY



2.- RURAL NATIONAL INTERSTATE HIGHWAY



3.- SECONDARY ROAD THROUGH MOUNTAINOUS TERRAIN



4.- PROPOSED BRIDGE APPROACH ON THE NATIONAL INTERSTATE HIGHWAY SYSTEM

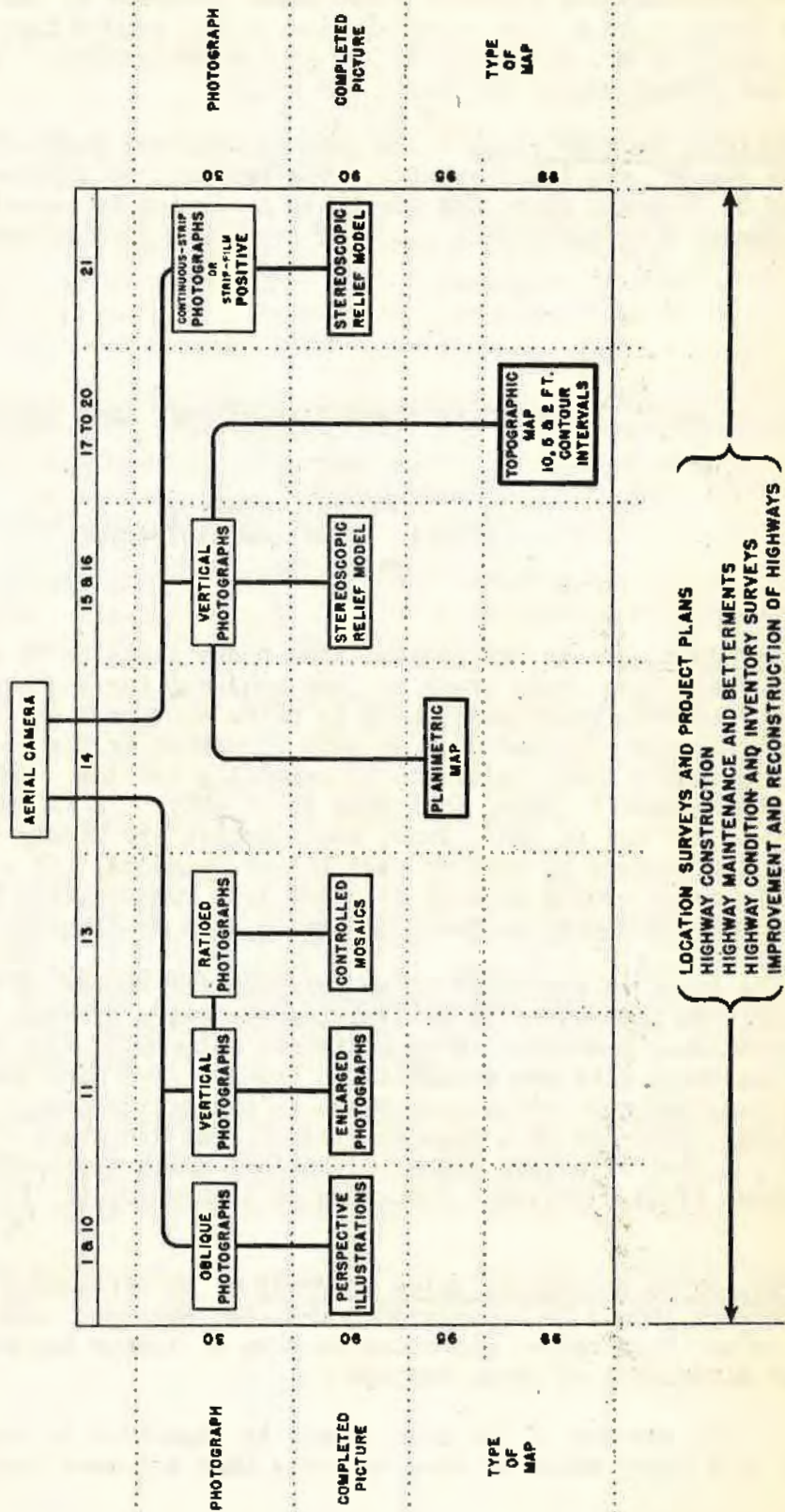


5.- STUDY FOR AN URBAN NATIONAL INTERSTATE HIGHWAY



6.- PROPOSED RURAL NATIONAL INTERSTATE HIGHWAY

AERIAL PHOTOGRAPHS AND MAPS USEFUL IN LOCATION SURVEYS AND PROJECT PLANS, IMPROVEMENT AND RECONSTRUCTION OF HIGHWAYS



Since the War the regulations for carrying into effect the provisions of the Federal-aid Highway Act of 1944 have placed administrative emphasis on the relationship of right-of-way and roadside improvement problems in the several States. Trees are often found to be a cost consideration in the acquisition of highway right-of-way. The paper by Mr. George G. Holley on the evaluation of trees as an element in highway land damage should be timely and useful.

Building Setback Lines - The right-of-way and roadside improvement problems, as already stated, are inter-related. The two must go together. The paper on Highway Zoning in Virginia shows how one State is trying to coordinate local county zoning of highways with State-wide planning for the mutual interest of all.

TREES AS AN ELEMENT IN HIGHWAY LAND DAMAGE

By
George C. Holley
Public Roads Administration
Washington, D. C.

Introduction - At the present time there seems to be no generally accepted method for evaluating shade trees on land acquired for highway construction. Appraisers for highway departments tend to place too low a value on such trees. Often the trees are considered as so much cord-wood or timber, but unless they are growing on woodland such evaluation is generally too low. On the other hand the property owner tends to value the trees too highly. It is only natural that he should try to get all he can. Thus, both parties are likely to arrive at their respective evaluations by more or less biased opinions. If it is conceded that the property owner should receive fair and just remuneration for his trees—but no more—some method must be found to arrive at a true value.

This paper is presented as an introductory review on the need for improved and more uniform procedures in determining the value of shade trees on land acquired for highway purposes. Nine different methods of tree evaluation are outlined and existing data are assembled in tabular form as a basis for development of a more complete and uniform procedure in estimating damage to trees on highway rights-of-way. The use of a complete formula for appraisal of shade trees is described. A list of native trees in the cool humid northeast portion of the United States is also included for guidance in the use of the tree appraisal formula.

Factors in Estimating Value of Trees - In estimating the value of trees, several factors should be considered: the tree species, size, location, condition, specimen value, land value, and other factors of lesser importance. The following is a brief discussion of these factors.

1. The species of the tree itself is important in fixing its value. A white oak or a sugar maple is more valuable than a common locust or a silver maple