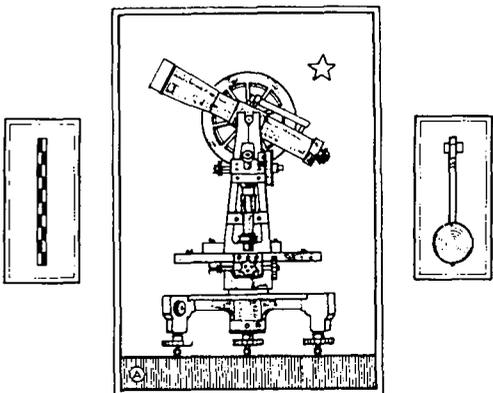


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R. S. PATTON, Director



U. S. Coast and Geodetic Survey
DIVISION OF GEODESY

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G E O D E T I C L E T T E R

Volume 2

MAY, 1935

Number 5

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(A SYMPOSIUM)

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THE USE OF GEODETIC CONTROL FOR BOUNDARY SURVEYS

(A SYMPOSIUM)

Introduction

It is becoming more and more generally recognized that one of the greatest potential values of the national triangulation survey may result from its use to control and perpetuate boundary surveys. In surveys of International and State boundary lines this use has already been fully recognized; but in surveys of private boundaries full recognition through legal status has been given in only one State, Massachusetts, and in one Territory, Hawaii.

Several steps are necessary in the legal development of this use. The first step has already been taken in the establishment of systems of plane coordinates for the various States, and the computation (now in progress) on these systems of the coordinates of the stations of the national triangulation. This makes it possible for the land surveyor to utilize the data which such stations furnish without departing from standard practices - methods and formulae - of plane surveying. It gives him the benefits which come from having the many triangulation stations in a large area serve as witness marks to his surveys, thus insuring the easy replacement of lost corners. It also gives him the great benefit of having accurate positions for well-marked points to which he may adjust his surveys.

The second step in the development of the use of the national triangulation for the control of property surveys is to make such use formally legal, so that a competent engineer who appreciates the values of such use, and adopts it to enable him to make more accurate and lasting surveys, will not find himself at any disadvantage in a court of law because of having done something which is without precedent or beyond the previous knowledge of the court.

The time now seems opportune to at least make a study of this second step. Can not this step most easily be taken by enacting proper statutes legalizing the use of plane coordinates based on the national triangulation system in describing property boundaries? Already in one State, New Jersey, an appropriate bill has been introduced in the State legislature, passed, and enacted into law. Copies of this bill in its various forms and as finally signed by the governor will be found further on in this Geodetic Letter. There will also be found an outline draft for a

bill to take care of those cases where more than one system of plane coordinates has been established over a State.

A satisfactory use of the stations of the national triangulation and of the control stations established by State engineers under the direction of the Coast and Geodetic Survey naturally depends upon the accessibility of such stations. Engineers should have access to them even though they be on private property; the owner of the property should be protected against possible injury resulting from survey operations; and the station marks themselves should be protected against malicious damage. A draft for a bill to accomplish these things will be found also in this Geodetic Letter.

It does not seem desirable at the present time to even consider the question of making the use of the national triangulation and of any plane coordinate system based on it in any State mandatory. To do so would be unwise, premature, and would surely jeopardize the passage of any bill looking in that general direction. It is felt, moreover, that as engineers become familiar with the use of State plane coordinate systems in property surveys they will more and more be convinced of their great value, more and more willing to use such systems themselves, and eager to see them generally adopted for survey purposes. Thus, by educational processes, they themselves will pave the way to the third and final step leading to the complete recognition of the national triangulation and of State coordinate systems - the establishment of State land courts and the mandatory use of the national triangulation and of the State coordinate systems. State land courts are already functioning satisfactorily in Massachusetts and Hawaii, but the establishment of these courts antedate by many years the adoption of State-wide plane coordinate systems, and it is probable that such systems will greatly simplify the engineering work of these courts.

In order to secure a comprehensive view of authoritative weight on this matter, the letter and memorandum which come immediately after this introduction were sent to thirty-three correspondents throughout the country with the request that they give the memorandum their careful consideration, make a study of the papers which were sent with it, and prepare a critical review thereof. The following symposium was prepared from the letter and other papers sent these correspondents, and from the comments received from them.

The entire matter is now laid before the readers of the Geodetic Letter with the hope that each reader thereof will give it his careful consideration, and report any

comments he may desire to make. Constructive criticism is desired; but, as every engineer knows, such criticism should call attention not only to what are considered good points, telling, if possible, how they may be made better; but flaws also should be pointed out, and even where the critic is unable to suggest a means of correction, if the objection be valid, a remedy will surely be found.

Please address all communications to The Editor of the Geodetic Letter.

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Editor's Note:

All of the material in this number of the Geodetic Letter has been gathered together and prepared for publication by Hugh C. Mitchell, Senior Mathematician in the Division of Geodesy of the Coast and Geodetic Survey. Mr. Mitchell has had wide experience as a practical engineer, having been a member of the field force of the Coast and Geodetic Survey for a number of years, engaged on geodetic, hydrographic, and astronomical surveys. Later he served as a geodetic computer in the Washington office of the Survey. In 1912-13 Mr. Mitchell was engineer in charge of a precise geodetic survey of the city of Cincinnati, and of an engineering topographic survey based on that control. For the past fourteen years he has been a mathematician in the Division of Geodesy and is deeply interested in all phases of the use of geodetic control surveys.

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March 5, 1935.

(Letter sent to thirty-three correspondents
throughout the country)

Dear Sir:

It is becoming more and more generally recognized that a great potential value of the national triangulation survey lies in its use for controlling and perpetuating boundary line surveys. In international and state boundary surveys this use is already fully recognized, but in private property surveys only recently has it been made practicable through the adoption of systems of plane rectangular coordinates in the various states; it has been further promoted in many areas by the breaking down of the major triangulation through traverse executed by state engineers under the direction of Coast and Geodetic Survey representatives.

For the purpose of finding out what interested persons think of this use of the national triangulation in making private boundary line surveys, and thus providing material for a study of the subject, the accompanying memorandum is being sent to a number of persons throughout the country with the request that they consider its contents carefully and send in any comments which they may care to make. From the material which may thus be gathered together, it is planned to prepare a special edition of the Geodetic Letter, a publication of the Division of Geodesy of this Office, and through this medium place the subject before a large number of persons who already are or may become interested therein.

It will be appreciated if you will give this memorandum your careful consideration, and send any comments you may care to make thereon direct to the signer of this letter. A prompt reply will be appreciated.

Sincerely yours,

Hugh C. Mitchell
Senior Mathematician.

Enclosure.

THE USE OF GEODETIC CONTROL IN PRIVATE BOUNDARY SURVEYS

One of the greatest potential uses of the national triangulation system is the controlling of private boundary surveys, thereby giving that insurance which comes from being able easily to replace a lost corner, with the added advantage of a higher degree of accuracy than is possible with the ordinary methods of land surveying. Until recently the fullest use of the data provided by the national triangulation system required the employment of geodetic formulae and methods, which was impracticable except where the extent and importance of the survey were so great (as of the boundary of a country or of a State), or the interests involved were so large (as the survey of a city), that the employment of experts and the purchase of special equipment were fully justified. For surveys of private boundaries a very limited use of the national triangulation data has been accomplished through the adoption of local systems of plane coordinates.

Now, however, the above limitations no longer prevail, and it is generally possible for any engineer to base his surveys on the national triangulation system by using one of the plane coordinate systems recently adopted for the various States, yet conduct his work according to standard methods of plane surveying.

It is the orderly development of this use of the national triangulation system in the making of private boundary surveys with which this paper is concerned, and in which it is hoped that we may have the benefit of the judgment and experience of those to whom it is being sent.

One thing which in the past has limited the use of the national triangulation for controlling plane surveys and the reduction of the results of such surveys to plane coordinate systems, has been the distance out from an origin or central meridian that computations based on a tangent plane or cylinder may be carried before untenable errors of scale develop. Another limitation has been the distance between stations of the national triangulation, which is sometimes so great that an engineer making a local survey even in an area included within an arc of triangulation has found the expense and technical difficulties incident to connecting his work with the triangulation so great as to be prohibitive, while many areas were so far removed from the national control as to make the desired connection practically impossible to an engineer with ordinary equipment and training.

Notwithstanding these difficulties there has been a slowly developing use of the data afforded by stations of the national triangulation for local surveys. This use has been facilitated by Coast and Geodetic Survey Special Publication No. 71, entitled "Relation Between Plane Rectangular Coordinates and Geographical Positions." But even this use has been unsatisfactory because the area over which a single survey could be accurately projected was limited, making necessary a number of plane coordinate systems in comparatively small areas (the triangulation of New York City executed in 1903-8 was computed on three such systems), and being productive of computational complexities in regions close to the common borders of adjacent systems.

The first obstacle named above has been almost completely removed by the adoption of systems of plane coordinates for the various States, usually consisting of one system, but sometimes of several for a given State; and by the computation and publication of the coordinates of the many triangulation stations of the national control net which is now well under way. Each such system will permit of plane surveys within the area which it covers being adjusted to the national triangulation control, errors arising from projecting the results on a plane being kept within acceptable limits. Where greater accuracy in the computation is desired, the scale error may be reduced through the medium of known scale factors.

The second obstacle, remoteness of local surveys from national control stations, is being rapidly eliminated. It will not be many years before there will be few, if any, points in the United States more than twelve to fifteen miles from a first- or second-order triangulation station. The national control is being further broken down and made more accessible to the local surveyor by the many traverse stations being established by State engineers under direction of the Coast and Geodetic Survey.

The time is not far distant (for many regions it is already here) when an engineer engaged on surveying and mapping areas of any size will be able to take advantage of the permanence and accuracy resulting from basing his work on the national triangulation, and if it is advantageous to start work on a large project in a number of places at the same time, or desirable to extend and join isolated surveys of separated areas, he will be able to fully coordinate and correlate such surveys, knowing that when junctions of separate surveys are effected, he will not encounter those bug-bears of the ordinary survey and map: overlaps, off-sets, and gaps.

Some engineering maps are already being made in this way, for such uses as State highway planning and construction; this use will be extended as engineers become informed of the existence of the adopted systems of plane coordinates for the various States, and familiar with the use of the national control survey. There is no real obstacle to such use. After all, an engineering map is frequently a means to an end; the engineer may make it according to such methods as seem best to him, though he may often be limited more by poor instrumental equipment than by lack of knowledge of methods. The map is used as a base for the making of plans, the plans grow into engineering structures, and the maps are filed away, perhaps for good - they have served their purpose. But such maps have a possible future utility for additional planning, and if of acceptable accuracy and detail might be used in building up county and state maps.

But the great potential use of the national triangulation and of State traverse systems already referred to, the control of cadastral or property boundary surveys, yet remains to be developed.

The logical way of promoting such use of a State system of plane coordinates would seem to be to provide for its legal recognition before such use occurs, and not to trust its promotion to the uncertain outcome of court tests as a means of educating property owners, title and financing companies, and State and county officials. Can not this be most easily done by an act of legislature, defining an adopted coordinate system, and approving the use of coordinates based thereon for describing property corners and cadastral survey stations? In one State, New Jersey, a bill for this purpose has already been drafted and introduced in the State legislature. Without waiting to profit by such discussion as may possibly attend its consideration by that legislature, would not the present seem an opportune time to at least consider the inauguration of similar measures in other States? To determine if such be the case, and if so, to expedite consideration of this matter, is the purpose of sending this memorandum to a number of persons who, it is felt, are interested in the matter, and willing to give it some constructive study.

There will be attached to this paper a copy of the bill designed to give legal recognition to the State system of plane coordinates as introduced in the New Jersey legislature. There is also attached a copy of that bill as originally prepared in this office; the changes were made by our State representative after consultation with State officials. A third form for a bill to care for the situation in a State having more than one system of plane coordinates is also

attached. This form was prepared before any return was had on the New Jersey bill. It will differ from the form for a State with only one system of coordinates in that Section 2 must be expanded to include a complete description of each of the systems of coordinates it is desired to approve. This will lengthen the section considerably, but not necessarily render it more complex. Perhaps the easiest way to define the area over which any given system may be legally used would be to name the counties in that area.

But in addition to this, there would have to be some way of taking care of surveys of a piece of land which extends into areas covered by two different systems of plane coordinates, and where the line on the ground separating the two systems is not a definite well-recognized line. The survey of such a piece of land would have to be on a single coordinate system, and a legislative act should recognize this and provide a way for taking care of it. One suggestion as to how this may be done is contained among the notes following the third-mentioned form for an enabling act.

Pertaining directly to the satisfactory use of triangulation and traverse stations established by or under the direction of the Coast and Geodetic Survey is the need of authoritative permission for a duly accredited surveyor engaged in the practice of his profession to have access to such stations as he must tie into his work. There should then be a second bill prepared authorizing such entry where the station is on private property; it should provide that no unnecessary damage be done in such entry; and it should also provide means of assessing damages and collecting them where any damage is done. In other words, it should make any such station completely available for the use of the surveyor, and at the same time fully protect the property owner from any resulting damage. The same bill should also carry a clause providing protection for the survey marks themselves. A form for such a bill has also been prepared and is submitted with this letter for your consideration. In studying it the main things to consider are: whether it permits the surveyor to do all necessary things and only necessary things in entering private property for the purpose of using a survey station thereon; whether the property owner is fully protected from damage in such entry; and whether the survey marks are insured as far as possible against malicious destruction. The actual form of this bill, particularly the sections which describe the methods of assessing damages, will have to be written to conform to the statutory requirements and legal practices already existing in the various States. With the desired content fully agreed upon this should not be such a difficult matter.

You are one of a small number of engineers and interested persons to whom this memorandum is being sent with the hope that you will give it and the attached papers careful study, and write fully just what you think of this matter. Consideration is now being given to publishing in one number of the Geodetic Letter a symposium of these various papers and comments thereon, and in this manner placing the matter before some six hundred or more engineers and other interested persons throughout the country, and inviting their study and comment. The basic material thus accumulated should make it possible for interested persons in any State to prepare Bills which would conform to the legislative regulations in that State and at the same time, if enacted, fully accomplish the desired ends.

Your cooperation in this matter is earnestly requested. Any comments which you should make, but are unwilling for the editor of the Geodetic Letter to include in a symposium on this subject, should be so indicated. Your statements may be as broad and as deep as you care to make them, and should take note of the need, values, form, content, etc. of the proposed Acts.

It will be appreciated if you will send your reply, as requested in the letter which accompanies this memorandum, direct to Hugh C. Mitchell, Senior Mathematician, U. S. Coast and Geodetic Survey, Washington, D. C.

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ORIGINAL DRAFT OF NEW JERSEY BILL

The following is the original draft of a bill prepared for introduction in the New Jersey legislature. It was modified to meet a rule that no reference could be made to a publication which was not copied in the bill.

An Act to establish the legality of land boundary descriptions expressed in terms of plane rectangular coordinates.

Section 1. Be it enacted by the General Assembly of the State of New Jersey, That for purposes of describing the location and boundaries of any parcel of land within this State it shall be considered a complete, legal, and acceptable description of such location and boundaries to give the positions of the corners of said boundaries in terms of coordinates on the system of plane coordinates established over this State by the United States Coast and Geodetic Survey, and defined in Section 2 of this Act.

Section 2. And be it enacted, That the legal and official name for the system of plane coordinates to which reference is made in Section 1 of this Act shall be "The New Jersey System of Plane Coordinates," said system being defined by the tables computed and published by the United States Coast and Geodetic Survey in 1934, which tables are based on a transverse Mercator projection having a central meridian $74^{\circ} 40'$ west from Greenwich. In said system triangulation station Princeton southwest base has the coordinates: $X = 1,983,410.45$ feet; $Y = 573,281.81$ feet; and the grid azimuth to Princeton northeast base is $219^{\circ} 16' 42''90$. These correspond to the following geodetic values on the North American datum of 1927 as defined in the publications of the United States Coast and Geodetic Survey: Latitude = $40^{\circ} 24' 25''929$; Longitude = $74^{\circ} 43' 34''449$; and azimuth to Princeton northeast base = $219^{\circ} 14' 23''73$.

Section 3. And be it enacted, That any triangulation or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first and second-order work, whose geodetic position has been rigidly adjusted on the North American datum of 1927, and whose plane coordinates have been computed on the system defined in Section 2 of this Act, may be used in establishing a connection between a property survey and the above mentioned system of rectangular coordinates.

Section 4. And be it enacted, That when a connection has been made by acceptable survey methods between a station of any boundary survey of any type whatsoever and any triangulation or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first or second-order work, and whose geodetic position has been rigidly adjusted on the North American datum of 1927, such connection incorporated in any legal record shall constitute an adequate and legally acceptable description of said property survey station.

Section 5. And be it enacted, That this Act shall go into effect immediately after the passage thereof.

FORM OF ACT PROPOSED FOR STATE
HAVING MORE THAN ONE SYSTEM OF PLANE COORDINATES

An Act to establish the legality of boundary descriptions expressed in terms of plane rectangular coordinates.

Section 1. Be it enacted by the General Assembly of the State of *, That for purposes of describing the location and boundaries of any parcel of land in this State it shall be considered a complete, legal, and satisfactory description of such location and boundaries to give the positions of the corners of said boundaries in terms of coordinates on that system of plane coordinates established by the United States Coast and Geodetic Survey and defined in Section 2 of this Act which pertains to the area in which said land is located.

Section 2. And be it enacted*, That the legal and official name for each of the systems of plane coordinates established over the different parts of this State by the United States Coast and Geodetic Survey and the areas to which each shall pertain shall be as follows:

(a) "The (State) System of Plane Coordinates No. 1"*** shall be the standard for use in the Counties*** of and , and is defined by the tables computed and published by the United States Coast and Geodetic Survey in 1934, which tables are based on (describe the projection by name and standard meridian or standard parallels as the case may require). In said system triangulation station has the coordinates: X = ---,---.-- feet; Y = ---,---.-- feet; and the grid azimuth to triangulation station is --° --' --"---. These correspond to the following geodetic values on the North American datum of 1927: Latitude = --° --' --"---; Longitude = --° --' --"---; and azimuth to = --° --' --"---.

(b) "The (State) System of Plane Coordinates No. 2" shall be etc., etc., (For each system in the State there shall be a complete description as given under (a) above.)

Section 3. And be it enacted*, That any triangulation or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first or second-order work, whose geodetic position has been rigidly adjusted on the North American datum of 1927, and whose plane coordinates have been computed on a system defined in Section 2 of this Act may be used in establishing a connection between said system of coordinates and any property survey within the area to which said system pertains.

Section 4. And be it enacted*, That when a connection has been made by acceptable survey methods between a station of a boundary survey of any type whatsoever and a triangulation or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first or second-order work, and whose geodetic position has been rigidly adjusted on the North American datum of 1927, such connection incorporated in any legal record shall constitute an adequate and legally acceptable description of said property survey station.

Section 5. And be it enacted*, That this Act shall go into effect immediately after the passage thereof.

Notes on the foregoing.

* In each State these phrases should be made to agree with the standard legislative forms used in that State for an Act of this type.

** Where there are only two systems of coordinates over a State, the names of such systems might well take such forms as: "The (State) Eastern System of Plane Coordinates," and "The (State) Western System of Plane Coordinates." In fact, definite and characteristic names for the various systems may be better than numerals even where there are more than two systems.

*** The question naturally arises as to what to do in the case of the survey of a tract of land that extends into areas occupied by two systems of coordinates. The survey of a single tract of land should be made on a single system of coordinates, unless the boundary between the two systems which divides the land is a definite, well-determined line. Some additional clause will be required in the proposed Act to legalize the survey on a single system of plane coordinates of any tract of land that extends beyond the limits of such a system into the area where another system prevails. It is suggested that after the list of county names there be added the clause: "and in counties contiguous thereto for the survey of such lands as may extend partly into those counties."

ACT TO PERMIT ENTRY OF SURVEYORS ONTO PRIVATE PROPERTY

An Act to permit the entry of surveyors onto private property for the purpose of using survey stations established by or under the direction of the United States Coast and Geodetic Survey.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section 1. That any person recognized as a qualified surveyor or licensed by this State to make surveys of private and public lands within the State, and his duly accredited assistant and representatives, may, in the execution of such surveys enter upon any private land whereon there is a marked survey station for which the horizontal and/or vertical position have/has been determined by or under the direction of the United States Coast and Geodetic Survey, said entry being for the purpose of utilizing the horizontal and/or vertical position data in controlling surveys of land for cadastral purposes, or for other engineering purposes, private and/or public.

Section 2. That the surveyor and/or his duly accredited assistants and/or representatives shall do no unnecessary damage to the property on which a survey station stands, and that the owner of the land shall be reimbursed for all damage done in so entering, amount of damages to be agreed upon beforehand and paid promptly upon completion of work at said survey station, and where amount of damages to be paid has not been or can not be agreed upon beforehand, then amount of damages to be paid shall be determined by the commissioners court of county in which property is located, or by a board of three commissioners appointed by the county judge, and the findings of such commissioners shall be final, and the costs assessed against the entering party except as noted in Section 3 of this Act.

Section 3. That where the entering party, that is the surveyor responsible for entry onto private property for the purposes stated in Section 1 of this Act, shall tender damages to owner of said property and said proffer is not accepted, and the amount of damages determined according to procedure stated in Section 2 of this Act shall not exceed amount of damages so proffered, then all costs in the matter shall be borne by the owner of the property.

Section 4. If any person shall wilfully injure, deface, or destroy the mark or monument at any survey station established by or under the direction of the United States Coast and Geodetic Survey, or shall offer any obstacles to the proper, reasonable, and legal use of any such station, such person shall forfeit the sum of not to exceed \$ for each such offense, to be recovered for the use of the (school fund, road fund, poor fund, or etc.) of the precinct in which said offense is committed, and said person shall be further liable to the surveyor against whom the offense is committed for damages resulting from delaying, interfering with, and preventing the prosecution of his work, said damages to be recovered in a court of competent jurisdiction.

Section 5. This Act shall become effective immediately upon the passage thereof.

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ACT INTRODUCED IN THE NEW JERSEY LEGISLATURE

Below is the Act introduced in the New Jersey Legislature to establish a system of land boundary descriptions based on geodetic control and the State system of plane coordinates. It is followed immediately by the Act which became law on March 25, 1935.

ASSEMBLY, NO. 209

STATE OF NEW JERSEY

Introduced January 28, 1935
By Mr. McKean

Referred to Committee on Judiciary

AN ACT to establish a system of land boundary descriptions.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. For purposes of describing the location and boundaries of any parcel of land within this State it shall be considered a complete, legal and acceptable description of such location and boundaries to give the positions of the corners of said boundaries in terms of co-ordinates, and the direction of said boundaries in terms of bearings or azimuths, on the system of plane co-ordinates established over this State by the United States Coast and Geodetic Survey, and defined in section two of this act.

2. The official name for the system of plane co-ordinates to which reference is made in section one of the act shall be the New Jersey System of Plane Co-ordinates, said system being defined as a transverse Mercator projection of Clarke's Spheroid of 1866, having a central meridian $74^{\circ} 40'$ west from Greenwich on which meridian the scale is set at one part in 40,000 too small. All co-ordinates of the system are expressed in feet, the x co-ordinate being measured easterly along the grid and the y co-ordinate being measured northerly along the grid, the origin of the co-ordinates being on the meridian $74^{\circ} 40'$ west from Greenwich at the intersection of the parallel $38^{\circ} 50'$ north latitude, such origin being given the co-ordinates $x = 2,000,000$ feet; $y = 0$ feet. The precise position of said system shall be as marked on the ground by triangulation or traverse stations established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first and second-order work, whose geodetic positions have been rigidly adjusted on the North American datum of 1927, and whose plane co-ordinates have been computed on the system defined.

3. Any triangulation and/or traverse station established as described in section two of this act may be used in establishing a connection between a property survey and the above mentioned system of rectangular co-ordinates.

4. When a connection has been made by acceptable survey methods between a station of any boundary survey of any type whatsoever and any triangulation or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first or second-order work, and whose geodetic position has been rigidly adjusted on the North American datum of 1927, such connection incorporated in any legal record shall constitute an adequate and legally acceptable description of said property survey station.

STATEMENT

The purpose of this act is to make available to the people and agencies of the State a simple and efficient system of describing property corners and boundaries. When a piece of property is described according to this method no matter what monuments or marks are destroyed or lost, its position can be regained with precision.

The system has only recently been made possible by the establishment of a plane co-ordinate system for New Jersey and a Local Control Survey of the State, both under the direction of the United States Coast and Geodetic Survey.

Besides permanency, many advantages are to be gained by its adoption. Property owners, both private and public, will be protected from many of the causes of boundary disputes and land values enhanced by better title. Property once described by this system can be surveyed more economically and accurately. When this system is used over areas of any extent tax maps may be compiled with ease and precision, with no opportunity of the omission of taxable lands. State agencies, including the Departments of:

1. Commerce and Navigation
2. Conservation and Development
3. State Highway Department
4. Institutions and Agencies
5. Water Policy Commission

will be enabled to acquire property at a saving in the avoidance of otherwise unavoidable mistakes or the necessity for extensive property surveys.

The adoption of the act is recommended by the United States Department of Commerce, as offering an important improvement to the methods now in use for property description.

The Act given below was signed by the Governor and became a law on March 25, 1935.

[SECOND OFFICIAL COPY REPRINT]

ASSEMBLY, No. 209

STATE OF NEW JERSEY

INTRODUCED JANUARY 28, 1935

By Mr. McKEAN

Referred to Committee on Judiciary

AN ACT to establish a system of land boundary descriptions.

1 BE IT ENACTED *by the Senate and General Assembly of the State of New*
2 *Jersey:*

1 1. The official survey base for New Jersey shall be a system of plane co-
2 ordinates to be known as the New Jersey System of Plane Co-
3 ordinates, said system being defined as a transverse Mercator pro-
4 jection of Clark's^e spheroid of 1866, having a central meridian 74° 40' west
5 from Greenwich on which meridian the scale is set at one part in 40,000 too
6 small. All co-ordinates of the system are expressed in feet, the x co-ordinate
7 being measured easterly along the grid and the y co-ordinate being measured
8 northerly along the grid, the origin of the co-ordinates being on the meridian
9 74° 40' west from Greenwich at the intersection of the parallel 38° 50' north

10 latitude, such origin being given the co-ordinates $x=2,000,000$ feet; $y=0$ feet.
11 The precise position of said system shall be as marked on the ground by
12 triangulation or traverse stations established in conformity with the stand-
13 ards adopted by the United States Coast and Geodetic Survey for first and
14 second-order work, whose geodetic positions have been rigidly adjusted on the
15 North American datum of 1927, and whose plane co-ordinates have been
16 computed on the system defined.

1 2. Any triangulation and/or traverse station established as described in
2 section one of this act may be used in establishing a connection between a
3 property survey and the above mentioned system of rectangular co-ordinates.

1 3. No survey of lands hereinafter made shall have endorsed thereon any
2 legend or other statement indicating that it is based upon the New Jersey
3 System of Plane Co-ordinates unless the co-ordinates have been established
4 on that system as herein defined.

1 4. Nothing in this act contained shall be interpreted as requiring any
2 purchaser or mortgagee to rely on a description based wholly upon the afore-
3 said system.

1 5. This act is to take effect immediately.

RESPONSES

Hugh C. Mitchell
Senior Mathematician

In answer to the foregoing letter and memorandum very satisfactory replies were had. Of such importance and high constructive value do they appear that no attempt has been made to prepare a digest of them. Except for the deletion of a few formal introductory phrases and unimportant paragraphs they are quoted verbatim in the following pages. One has but to read carefully through those pages to realize further how futile would be any attempt at a detailed analysis thereof; not only how futile, but I am tempted to say, how valueless, - the story told in the words of the respondents themselves is clear and strong and simple - and the picture one gets from reading these pages will be a most convincing one of the value and desirability of utilizing the national geodetic control through the medium of the plane coordinate systems for purposes of controlling and perpetuating surveys of private boundaries. These replies come from all parts of the country, and represent the thoughts of men with backgrounds ranging all the way from that of the engineer engaged in private practice who is faced with an almost unlimited variety of survey problems and the State surveyor facing similar problems but with power to dictate methods and demand standard results, through the roll call of engineers interested primarily in surveys for highway and other engineering projects, on to the man of purely academic viewpoint and training.

If, when reading through these pages, one keeps in mind the question of whether legal recognition of the use of plane coordinates in describing private boundaries is worth while, he will naturally be impressed with the fact that the Commonwealth of Massachusetts has long used geodetic control and local systems of plane coordinates in its Land Court work, and will give careful reading to the statements of Mr. Humphrey (p. - 26), engineer of that court. One should also study carefully the statements by Mr. Ruediger (p. - 38) of Virginia, who faced and solved a survey problem more difficult than that which confronted the Egyptians of old when the Nile, overflowing, destroyed the bounds which marked the limits of their rich fields; the Egyptians had opportunity to drive stakes and measure to each corner before the waters came.

The statements of Mr. Halsey (p.-29) and of Mr. Ringwood (p.- 31) will interest those who desire to know more about the difficulties encountered by engineers in private practice: Mr. Halsey's statement shows most convincingly the need for extending a system of plane coordinates over a large area, while Mr. Ringwood tells how an engineer who appreciated and used plane coordinates in property descriptions established the legality of such use through court procedure. One can not fail to be impressed with a firm belief that a great cost in money and effort would have been saved for these two engineers had they had in advance a single system of plane coordinates for the part of the State in which they were working, and legal recognition accorded such system. Part of their difficulties have faded away, for the plane coordinate system established for Long Island by the Coast and Geodetic Survey embraces all of Long Island and New York City, and maintains a minimum scale accuracy of 1 part in 100,000. But the legality of property descriptions based on this coordinate system is yet to be established; Mr. Ringwood's pioneer work in this field should prove of great value when the engineers of that, and indeed of any other state, recognize the value of the state plane coordinate systems for property survey purposes, and ask legislative approval of that use.

The opinion of the engineer who uses geodetic control for obtaining a satisfactory degree of accuracy and of permanency in traverse surveys run for engineering purposes is surely of great value and interest to the engineer who is concerned with the perpetuation of property line monuments, for both rest on the same foundations: the accuracy obtainable by basing survey work on the national control net, and the possibility of replacing any station connected to that net should such station be destroyed. Note what Bishop Moorhead of Oregon says about accuracy (p.- 67), and Mr. Carpenter of Texas about permanency (p.- 58).

But there is no need to multiply references. When one has gone through the following pages, no doubt will remain in his mind as to the value of geodetic control for traverse surveys made for any purpose whatever. The engineer engaged in making surveys for private construction projects and the surveyor representing a state organization with power to make its own rules and establish its own specifications may go ahead without further thought and use the national control survey as a base for local surveys. But the land surveyor must give thought to possible challenges that may come from the uninformed or the misinformed, and protect his client by giving deed descriptions which are based on legal precedent or authority, or else be prepared to go to the expense of time and money required in proving up a new method.

That this is not a dilemma, and that there is a way to fully use geodetic control and state-wide systems of plane coordinates in property surveys has been clearly demonstrated by Professor Philip Kissam of Princeton University, sponsor of the first law established in the United States to give legal recognition to such uses. In this Geodetic Letter are given the form of this law as first drafted at the Coast and Geodetic Survey office in Washington, (p.-10), the bill as modified to meet certain legislative requirements, (p.-15), and the bill as passed, further modified to meet the objections of such responsible critics as title and mortgage companies (p.-18).

Departures from any model form of bill for the purpose under consideration will naturally vary with the legislative regulations and technical practices in the various states. The actual form which a bill should take for introduction into any state legislature is almost wholly a matter for determination by state officials, engineers, and other interested persons in that state. How much study should be given to a proposed measure before it is considered ready for introduction is well illustrated by the form proposed for such a law in the state of Florida (p.-44), and the discussion immediately following.

A practical procedure to secure such a law and thereby benefit from the many triangulation and traverse stations scattered throughout the land would be to have a committee of engineers make the first draft of such a law, and submit it for consideration to the various state engineering and legal societies, as well as to title and mortgage companies. From studies made by such people there should emerge an act which could be written into the laws of the state to the lasting benefit of all concerned.

There are several fundamental considerations which should be considered almost axiomatic by those preparing such a law. One of these is that recognition should be accorded only to a system of plane coordinates of wide extent; additional computations will be required and legal complexities may develop in the borderland between adjoining zones. The fewer such borderlands, the better. Another consideration is that the law should be optional, not mandatory. The use of geodetic control and plane coordinates will depend upon education to such use and the establishment of stations near enough to a surveying project for the use to be economical. Both are matters which are sure to accelerate; the national control survey is growing at a tremendous pace, and in a few years there will be few if any points in the country more than 12 miles from a station of that survey. For the present making the use of this control mandatory even under certain limited conditions may well be passed over.

The question of a law to permit entry of properly qualified surveyors onto private property for the purpose of using control stations located thereon requires little comment. Such a law is a natural corollary to a law legalizing the use of such stations. While detail control stations may be placed along highways in positions not requiring such a law, the very nature of the principal control is such that sites which are most suitable for triangulation stations will be away from the highways and on private property. Mr. Carpenter suggests (p.-58) that the two matters be combined in one law, and thus save one trip through the legislative mill. This would seem very worth while.

Several respondents have mentioned the need for a central office or repository where map and survey information may be assembled, filed, and made available to all having need of such data. Already, in Iowa, a bill has passed the senate enlarging the scope of the land office that it may give service of this kind. But this is a matter of such magnitude that it should be handled separately from that of the use of geodetic control and plane coordinates in cadastral surveying. Both are propositions of great value to the people, and each is made more valuable by the existence of the other, but each, by itself, will prove of inestimable value.

In placing a network of control stations over the country, and making it possible for the surveyor to use those stations by establishing systems of plane coordinates and computing the positions of the control stations on those systems, the Coast and Geodetic Survey has gone about as far as is consistent with its status as a federal bureau. From this point on its role must be that of advisor. In this number of the Geodetic Letter it has endeavored to show the value and desirability of using plane coordinates based on geodetic control for private boundary surveys. For such engineers as may desire to take advantage of the national geodetic control and of the state plane coordinate systems, the Coast and Geodetic Survey publishes as rapidly as available the data for the control stations; this includes geographical positions, plane coordinates, and descriptions of stations. Much data that are not yet ready for publication are available in the form of photostat or lithographed sheets.

The Survey has also published various manuals and tables required by the surveyor in extending the control surveys, and in coordinating and correlating detail surveys with the more basic ones. In the Washington office of the Survey are a number of scientists and engineers who are familiar with various aspects of making and using geodetic

control, and with matters pertaining to coordinate systems; the experience and advice of these men are available to interested engineers. The Coast and Geodetic Survey is deeply interested in this most important use of data which it secures.

While it is requested that all matters relating to the symposium contained in this number of the Geodetic Letter be addressed to the Editor thereof, all requests for information as to data, manuals, etc., should be addressed to The Director, U. S. Coast and Geodetic Survey, Washington, D. C.

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GENERAL RICHARD K. HALE

Associate Commissioner
Department of Public Works
Boston, Massachusetts

I received your letter of March 5, enclosing memorandum in regard to the use of geodetic control in private boundary surveys. This is a matter, as you know, in which we are very much interested. Under the direction of your Department we have adopted the Lambert Projection for the State surveys and are in the process of working out a rectangular coordinate system for a considerable portion of the State.

This Department has made considerable use of the National Triangulation Survey. We have connected all of the State, County and Town boundary points with this system and practically all of our river and harbor surveys have been tied in to it. There are a great many points scattered over the State which have been tied in with varying degrees of accuracy. We are in the process now of reducing many of these points to the rectangular coordinate system, but the points described have been determined on several different data and very few of them have been reduced to the 1927 datum. Within the last year or two we have been tying in all our State highway surveys to the Triangulation net and we expect that this work will be continued.

While we are in the process of transforming many points to the rectangular system, it seems unwise for us to pass any legislation in regard to this matter. My thought is that in another year or so when the system is more widely extended and our engineers are more accustomed to its use, we might submit a petition for legislation authorizing the use of this system in all private land surveys as has been done in New Jersey.

Personally, I should like to go a step further and require by law that all survey work of any extent done by public authority should be tied in to this system. I think it would be a great saving in cost of surveys if this could be brought about as it would be possible to tie in to these numerous monuments and save a great deal in the cost of back traverses.

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ELMER C. HOUDLETTE

Administrator and Certifying Officer
Emergency Relief Administration
100 Nashua Street
Boston, Massachusetts

The Massachusetts Land Court has adopted the Lambert Projection Coordinates for this state as the basis for all their future work, and we have at present engaged on this project five or six computers whose work consists solely of transferring the triangulation points that have been used by the Land Court on to the Lambert Coordinates on the 1927 North American Datum, and at the present writing we have completed for them on the Islands of Nantucket and Martha's Vineyard the two hundred fifteen triangulation stations that have been established there by the Land Court.

We have just had an inquiry from the Department of Conservation as to the possibility of establishing control for them for all the state forests in Massachusetts and the positions of all the fire towers.

Control has been completed in the following cities and towns:- Winthrop, Malden, Melrose, Fitchburg, Peabody, and Needham; and work is now under way in:- Winchester, Wakefield, Worcester, Lexington, Haverhill, Sharon, and Lynn. All of the above have been by special request from the Engineer or Board of Government of the respective cities and towns.

You can readily see that here in Massachusetts the various State Departments and the cities and towns are cooperating to the fullest extent in taking advantage of this control.

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CLARENCE B. HUMPHREY

Engineer for Court
Massachusetts Land Court
Boston, Massachusetts

The use of geodetic control for boundary line surveys, either public or private, is a subject that I have been interested in for many years. The time has long since passed when the natural topographical features of the country should be used to describe lands conveyed. Due to the Massachusetts Land Court, established in 1898, whereby boundaries, as well as the ownership of land, are adjudicated by the Court, and the boundaries so determined remain definitely fixed, we are, I believe, further advanced in the use of triangulation for control of private boundaries than in any other State.

The first triangulation in Massachusetts was made by Simeon Borden in 1846. He recognized the value of these points if reduced to a system of rectangular coordinates based upon a tangent plane, and his publication shows the state divided into five sections, with five separate origins and rectangular coordinates for all triangulation points in each section. This publication was made little use of.

Between the time of the Borden survey and the publication of the topographical maps and town boundary atlases in 1890, the Borden points were recomputed and many new points determined by the U. S. Coast and Geodetic Survey engineers, and all computations based upon the Clarke Spheroid of 1867. We thus at that time had a system which was available, upon which to connect all surveys, and more particularly a system that could have been used by engineers doing work for the government where the cost of the surveys would not be taken into account, as would necessarily be the case in private work. A few towns did avail themselves of these points and established a system of rectangular coordinates for their own locality, based upon an origin within their town.

Our Land Court plans, which, with their subdivisions now amount in numbers to about twenty thousand, are computed upon a rectangular system. While these surveys remained isolated and apart from each other no serious problems arose, but as they became contiguous or situated in the immediate vicinity and were connected by survey data it became necessary to reduce them to a system of rectangular coordinates having a common origin and a common meridian. As all cases are coordinated from an assumed origin relative

to locus, it became a simple matter by carrying the first system along and gradually connecting the other surveys with it. Thus we would have several distinct groups coordinating, but floating in relation to other groups. To enable these surveys to be coordinated relative to a common origin and a common meridian within each registry district, a small continuous appropriation was obtained in 1915 to enable new triangulation points to be established, and we were thus enabled to keep our registered land within one registry district upon one datum. The system is based upon a plane tangent to the earth's surface at a point, which point is approximately the center of each registry district, and all surveys are referred to this point on one common meridian passing through the origin. The area of each district is such that no appreciable error appears on the exterior lines. The reduction of geodetic coordinates to plane coordinates was first made using the L M Z formula, and later by using formula in special publication No. 71 issued by the United States Department of Commerce. Under this system we had twenty one origins as there are twenty one registry districts in our Commonwealth.

This system gradually became known to engineers working throughout the State, and more particularly to engineers working on the State Highways who gradually began to use it in connecting their traverses of new highways. Their difficulty in crossing from one district to another, which was necessary on account of the twenty one origins, resulted in April 1933 in the adoption of a new system whereby the State was divided into eight zones, still using the plane rectangular system and the datum plane as heretofore. Since December 1933, and which I charge up to the depression, there has been much activity in triangulation and survey work in connection with the United States Coast and Geodetic Survey in Massachusetts, and much work has been done, which will be of inestimable value in the future. The result of this work has been that in Massachusetts, at least unofficially, the 1927 North American Datum has been adopted, and furthermore a rectangular system adopted based upon the Lambert Conformal Conic Projection with two standard parallels and one origin for the whole state, which on account of its shape and area would show a maximum error on its extreme north and south boundaries of only one in twenty eight thousand.

Work is now being carried on under various projects connected with the Emergency Relief Administration reducing triangulation points in Massachusetts to this projection, and connecting the triangulation points by traverse, thereby establishing points in smaller areas, making them more available for private survey work.

The use of this system has enabled me to lay down a system of cadastral maps upon which may be plotted from time to time lands as registered and connected by triangulation. It is not necessary that these maps be of contiguous territories, and they are located in various parts of the Commonwealth, depending upon the activity of registered land in those sections. The basis for these maps are the fifty four topographical sheets of the State. These sheets are numbered from 1 to 54 consecutively. Each sheet covers an area equal to 15 minutes of latitude and 15 minutes of longitude. For our purpose of indexing, we have subdivided each sheet into nine lettered sections and each section into eight numbered plans. Thus we have seventy two plans to a topographical sheet, and the area covered by these plans is equal to 1' 15" of latitude and 2' 30" of longitude. The scale used is 300 feet to an inch, which adapts itself to standard double elephant paper, namely 27 by 40 inches. On these plans lines of latitude and meridian are carried for the border lines and the rectangular lines of the coordinate surveys plotted relative thereto. We have many hundreds of these plans upon which appear registered lands and town boundaries, and although detailed engineering data are not carried in every instance, they are useful in locating land as registered and the court number of the case itself, as well as in some instances the name of the party to whom a decree of the Court was issued.

I question whether anything would be gained by the adoption of an act to establish land boundary descriptions in Massachusetts at this time, although the act that you have suggested and which is being considered by the State of New Jersey does not make it mandatory that all surveys should be immediately connected with this system, but simply is the official adoption of a system which could gradually come into use. Everybody understands the value of a plane rectangular system covering the whole state, and its greater potential value, if those in charge of engineers working for State departments or other political subdivisions of the Commonwealth would gradually adopt the system and have all of their surveys connected with it.

In this State Land Court plans with corners determined in terms of coordinates referring to local bounds and referred to in our decrees are considered acceptable descriptions and are so recognized by the Court.

There must be some fountain head where one goes for information along these lines, and some time ago I wrote General Hale, Associate Commissioner of the Department of Public Works, with which department the Emergency Relief

Administration is closely allied, that I hoped if this work was discontinued by the federal government that a department might be created in Massachusetts to have charge of all triangulation and traverse data in connection with this new projection, and that the work be continued so that eventually we might have all of our town and state boundary corners, exterior lines of the Commonwealth and State Highways recomputed on this basis. If this was done I believe that railroads and other engineering work would easily fall into line.

We have not at the present time any act establishing a system of land surveying, but under our chapter 42 entitled "Boundaries of Cities and Towns" there is a section in which triangulation points as established by the Commonwealth shall be regarded as evidence of the location of town boundary lines. The monuments themselves, as a matter of law, determine the true corners and the coordinates represent the location of the monument referred to the survey system. If a monument was lost, then the theoretical point determined by the coordinates would be placed back upon the ground from points in the vicinity.

I believe that recognition of the value of this work will come from within, that is, by junior engineers in the various departments becoming acquainted with its use, and as the same is extended throughout the State it will gradually result in the introduction of an act similar to that now proposed in the State of New Jersey. With such an act established, some provision should then be made whereby, at the expense of the state, local control points could on request be established, and then subsequently other acts could be established whereby it would become mandatory that all surveys of a governmental nature be referred to this system of land boundary descriptions before the same could be accepted and filed.

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WALLACE H. HALSEY

Southampton, New York

My surveys of highways and village of Deering Harbor, Town of Shelter Island, Suffolk County, New York, made in 1909-10-11, were tied into the true meridian of the Coast Survey. My surveys of Quogue and Southampton Villages, made many years ago, were also directly tied into the triangulation net, which was then very expensive. But since the primary triangulation was run through this locality, supplemented with strong systems of second and third order,

it is comparatively simple to coordinate into the survey direct, using rectilinear coordinates as computed for Long Island by your survey.

I tied my ten-thousand-acre survey of Montauk into the old Montauk Station 2 in 1925, and in the same year I made a survey of Island Beach, Monmouth County, N.J., which I tied directly into the triangulation, as established by Major Hodgson, and field locations by Lieut. Bainbridge, as well as establishing my azimuth of many other surveys directly from the old stations. Therefore, I am heartily in accord with your work, and any little thing I can do to cooperate will be a pleasure.

The only fault I have to find with your system is that, had your work been established twenty or twenty-five years ago, it would have saved me many thousands of dollars, and my records would be more valuable, and more simple to use than they are today, instead of the maze of coordinates having all kinds of values and meridians.

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SUFFOLK COUNTY CHAPTER

New York State Society of Professional Engineers

By

R. E. Cook, Secretary

At our last regular Meeting, Mr. Thomas E. Ringwood of Montauk, a Director in our Chapter, brought to our attention the suggestions of your Department concerning the use of Geodetic control in private boundary surveys and also the proposed Legislation for the State of New Jersey. These items were discussed at considerable length with much interest.

By unanimous vote our Chapter has endorsed your efforts, and we will be glad to cooperate with you in every way possible so that the purposes as outlined may be legally accomplished. Your Department will recall that our Chapter also enthusiastically endorsed the adoption of a system of plane coordinates for Long Island.

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T. E. RINGWOOD

Montauk Beach Development Corporation
Montauk, New York

The following brief outline of our experience with the use of a plane coordinate system based on Geodetic triangulation control together with some of the legal obstacles we encountered in using this control for the conveyance of private property is submitted in the hope that it may be of interest.

In view of the following I believe that it is imperative that the general use of a standard plane coordinate control system based on geodetic triangulation be legalized in each state without delay. The ultimate objective should be the establishment and exclusive use of a national system for survey control, the authority of which would be established legally as being superior.

Our plane coordinate control system based on the U. S. Coast and Geodetic Survey triangulation was established some years ago and now contains some 900 monumented stations. It has been used exclusively in this area by the following agencies for the purposes indicated:

1. Army engineers in sounding operations in Fort Pond Bay.
2. Long Island State Park Commission in location of ten miles of parkway and topographic survey of 2,000-acre park.
3. Suffolk County Highway Department in relocating county roads.
4. Montauk Beach Development Corporation in layout and development and sales from 9,700 acres.
5. Gold Cup Race-course committee in layout of two and a half mile official race course in 1931-1932 on which world records were broken.
6. U. S. Army in preparation of fire of large coast artillery batteries.

The benefits derived from the use of a common control system by all agencies operating in a given area are too obvious to mention. We were fortunate in having ten U. S. Coast and Geodetic Survey stations in the area to start with but the advantages and economy resulting from the

establishment of a standard control in this relatively small area would necessarily attach to its use in a larger area and increase in direct proportion to the number and variety of projects in which such control was used.

The two general methods of describing and conveying property in this state are:

1. Including in the deed a metes and bounds description referring to some generally known prominent monument which may or may not have any well defined geographical location but which is generally recognized as a land mark.
2. The other method which is used considerably in the conveyance of small parcels is to file a map or plat of the entire tract showing the various lots and subdivisions in the office of the Clerk of the County in which the property is located. The description in the deed is then merely a reference to this map which includes usually the number or designation of the tract conveyed, number of the map and the date on which it was filed.

The method by which we finally established the legality of descriptions based on our plane coordinate system and the U. S. Coast and Geodetic Survey control was developed from suggestions of the late Mr. E. P. Clark of the Title Guarantee & Trust Company of New York who, incidentally, was one of the recognized title experts on both engineering and legal points in the New York area was as follows:

We simply prepared a map showing the Coast and Geodetic Survey triangulation stations located on the property in which we were interested, together with our own intermediate triangulation stations and our traverse points, all of which were monumented with concrete monuments. On this map we also indicated the locations of certain of the old landmarks which had been used in previous surveys and which we had included in traverses. On one part of the map was a schedule showing the adjusted coordinate values for each point indicated. The zero of coordinates was a centrally located Coast and Geodetic Survey triangulation station.

This map together with a legal declaration of intention was filed in the office of the County Clerk of this county and given a regular number. We then proceeded to convey property including in the deed a

metes and bounds description tied directly to one of the stations shown on this map including also a file reference to this control map.

Such portions of the property as had been previously subdivided were also tied into this system and from such legal advice as I have had in the matter there was no necessity for additional legislation in this particular instance.

The above is merely our experience in one county but we had some expensive litigation as a result of which the reference of the description to the Coast and Geodetic Survey system was sustained in the Supreme Court of this state but which litigation and attendant expense could have been avoided had the legality of such control been previously established.

From the above it is apparent that a system of control scientifically recognized as being superior is considered legally inferior and this situation should be corrected without unnecessary delay by the various states.

A further suggestion submitted for consideration would be an active program of expansion of a national control net-work and a plan to make Federal aid to highway projects conditional on the tying in of such highway projects to the national control system. This suggestion is based on the rather reasonable assumption that if the Federal government assists financially in these projects they would be entitled to an accurate determination of the location of such projects. State, county and town and private projects located on these highways would eventually be tied in. It is submitted that such a scheme would constitute one important step toward the ultimate objective of a national system of superior control with proper legal recognition.

PROFESSOR PHILIP KISSAM
20 Nassau Street
Princeton, New Jersey

(The following comments were written by Professor Kissam on March 8, 1935. Assembly Bill No. 209 about which he writes was introduced on January 28th, and being signed by the governor became a law on March 25th, having passed both houses a few days earlier under a suspension of the rules.)

I have your letter dated March 5th, enclosing various items about New Jersey Assembly Bill No. 209.

As you know, of course, I am very much in favor of the system proposed. In the actual use of a system of this kind there are five items which occur to me which should be borne in mind:

1. I believe that in order to insure the proper operation of such a system, the coordinates of all monumented points should be made extremely accessible to the private engineer. I believe he should not be required to write for them nor to travel more than a few miles to get them. In this connection I feel also that he should be able to easily determine what coordinated points do exist in the locality in which he is working.

2. With the above idea in view, I believe that each state should establish a central office for the maintenance of records which can be distributed throughout the various counties to the county engineers and also throughout the metropolitan areas to the city engineers. I feel that this should be done without waiting for requests from these persons.

3. While the method of coordinates for describing property is still new I believe we should recommend changing the method of describing boundaries only by the addition of the coordinates for each property corner or other point described.

4. I believe that in various localities throughout the Country there should be maintained maintenance parties. Perhaps two in New Jersey, for instance, would be sufficient. This maintenance party should be equipped to travel quickly throughout the state, and its duties should be:

(a) To make a recovery of all points in the state at certain periods of time, perhaps every four years.

(b) To replace any points found to be missing.

(c) To replace points on a moment's notice when requests for them are received.

5. Like the telephone, the use of coordinates becomes greatly increased in value as other people use them. For that reason, it should be a duty of local offices to instruct the engineers of the existence of the points, the methods of using them, and proper methods for accurate surveying.

Just how these various ideas could be worked out in detail, I feel should be given thoughtful consideration. We have already had the objection raised to the bill that information was so hard to get that it would be a detriment rather than an asset to include the coordinates in the description of the property.

I can foresee the Coast Survey as a great organization in the future for the maintenance of known points. This will be a terrific task of inestimable value to the country. I feel that these valuable monuments must be backed up in an organization which will be immediately available for very detailed work for the public in many small isolated points.

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EDWARD C. WYCKOFF

Fidelity Union Title and Mortgage Guaranty Company
Newark, N. J.

Editor's Note:

Deeply concerned with any legislation that may affect existing methods of describing boundaries of private properties are companies engaged in examining and guaranteeing titles for trust purposes. On how sound a basis such interest rests, and how the opposition of one such company to the New Jersey bill (p.) was changed to endorsement is well illustrated by the following letter addressed by Mr. Wyckoff to Myron Hendee, Municipal Engineer, Hackensack, N. J., and by Professor Kissam's statement which follows immediately after.

I have your favor of February 15, 1935 in re Assembly Bill 209.

It appeals to me that surveying today upon the basis set forth in this bill will be found to be exceedingly disturbing and impracticable. No purchaser or mortgagee should be compelled to accept a deed or security based only upon a survey made under conditions defined in this act. The act should be wholly permissible if it is passed; but in my judgment it need not be passed. The surveyors who desire to encourage this method of surveying can educate their clients to it by making surveys in the usual manner and imposing on them the definition of beginning point designed by this act.

There is no thought on my part that a survey made on the basis described in this bill would not be technically correct. Had this system been the original basis of our surveying practice in connection with land titles; and had permanent monuments been planted on this basis throughout the State at such short intervals as would have made surveys based thereon economical, the chances are we would have had less trouble with erroneous and overlapping surveys.

It is very significant that leading surveyors and county engineers are not acquainted with the location of monuments planted in accordance with the Geodetic Survey made by the system of plane-coordinates. In making inquiry, it was necessary to contact the office of Professor Kissam at Princeton before any knowledge of the Geodetic Survey could be had. It develops that the monuments in existence are not numerous; and further, that if all monuments of intersections indicated by the Geodetic Survey maps should be planted, the nearest monument to another monument would be from 1-1/2 to 2 miles; and of course the location of two monuments is necessary to establish a base line from which to survey. This indicates that surveys in well established areas would become very expensive.

It is my understanding that state, county, and municipal highways, can not now be adequately defined under the system recommended by the term of this act without expensive additional surveying in the field.

When it comes to land surveys as a basis of title, the surveyor would need to do two things. Survey the plot according to recognized and established title lines and occupations; and then establish the beginning point according to the proposed system of plane-coordinates. No lawyer experienced in todays way of surveying could assume to pass upon a survey defined only in the manner defined in said act. He would need also the survey with

relation to existing street monuments and lines of occupation. If a technical description only were used in a deed or mortgage, a searcher would be unable to identify descriptions used since the beginning of our state without having the technical description established for him. When a man like James A. Bradley, who gave over 1500 deeds, is to be searched and you are only interested in one of his lots, and the only description the searcher has is a technical description, think of the confusion of the searcher.

No, for myself, I could not recommend to our association the passage of this act, I am, however, sending a copy of this letter to you and your letter to me, to the other members of our legislative committee. No act is required if the surveyors desire to impose upon any survey they make the additional data a survey under the act would show.

It is to be regretted that this state did not have the sound basic system this act contemplated at the beginning. In this respect our patented lands in the west have a much more simple system of conveying and surveying.

PROFESSOR PHILIP KISSAM

Princeton University

(Statement accompanying Edward C. Wyckoff's letter (above))

I am happy to say that I have had a long talk with Mr. Wyckoff and have discovered his real objection to the bill. Mr. Wyckoff felt that should the bill become a law, the title companies would be bound to accept a survey of a piece of property which consisted merely of eight coordinates, two for each corner. He explained that although he has been Title Examiner for one of the biggest title companies in the State for over 30 years, he would have no way of knowing where that particular property was, what were the lengths of the lines, and what were the angles in the survey. For these reasons he objected to the bill.

Mr. Wyckoff was, on the other hand, very much in favor of the coordinate system, and made many excellent suggestions for the future use of coordinates. I explained to him that my chief purpose for the bill was to make it possible to refer by name to the system of coordinates which was computed according to certain methods, marked in the field by certain methods, and which was standard in the State.

Mr. Wyckoff sat down and wrote out several amendments for the bill which eliminated his objection, and I understand that he and Mr. Aiken (Mr. Aiken is the engineer for the West Jersey Title & Trust Company) who form the Legislative Committee for the Title Company Association, would write a letter recommending the bill.

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FRED E. RUEDIGER

Engineer to Commission of Fisheries of Virginia,
Newport News, Virginia

WHY WE ACCEPTED GEODETIC CONTROL IN THE SURVEYS OF OYSTER PLANTING GROUNDS IN VIRGINIA

Surveys of oyster planting grounds in this state are generally made by the County Surveyor of the respective counties in which these grounds are located.

It has been the practice of the surveyor to run a base line for every single survey (very often a rather short one) at some convenient point on the shore opposite the ground to be surveyed, and to cut in the stakes or buoys at the corners of this ground often by compass bearings, but lately always by transit angles taken from both ends of such lines.

The law requires that reference angles be taken to prominent objects from the ends of the base lines, but after the lapse of years many of these would be destroyed, trees would die or be cut down, houses would burn, or be washed away, and even if enough reference points would remain to relocate the base line, it would often be found, that the stations could not be occupied because the shore had washed away and they were in deep water.

Now as nearly always a new base line was run for subsequent surveys, and as these surveys were made without reference to one another the natural consequence is, that many overlapped, but oftener left large bodies of planting ground between them, the rent of which is lost to the state.

We did not have, nor could we make complete maps from surveys of that kind.

We have a very extensive survey of the natural oyster beds in Virginia, made from stations established on the shores.

Stations were marked by terra cotta pipe, in most cases extending, according to the field notes, 12 inches out of the ground.

Any one knowing usual length of such pipe can readily see that this marking in the first place was a joke, and most of the pipes were used as chimneys for the oystermen's shanties shortly after they were planted.

Stations were not connected by triangulation, and their Geodetic positions were not determined, but the surveys were platted from assumed points under maps of the Coast and Geodetic Survey on a 1 - 20,000 scale.

Points down the river and up the river, points of woods and other such are given as reference points at times.

Where buildings are given as reference most of these have disappeared (since 1894), and only with the greatest difficulty and loss of time can these points be re-established, if at all.

And then most always the doubt of accuracy in the relocation remains, and quite a lot of money has been wasted in law suites on account of resurveys.

Possibly some engineer or surveyor would make a small net of triangulation, establish stations on the shore, but this is hardly an improvement, no more than changing from a compass survey of land to a transit survey of the same area, with deflection angles carefully measured and closing nicely.

Stations will wash away, people will destroy them, and all references made disappear, and all the tedious work of making such triangulation survey will be lost completely.

But, if, as we have done, these triangulation stations are connected with the triangulation net of the United States Coast Survey, their Geographical positions computed, and all surveys made from these stations, then, even if they are destroyed or washed away, new stations may be established.

Azimuth from these new stations can always be computed, to any point determined by surveys from the lost stations. Nothing is lost in the way of accuracy. We are always sure of our location.

We now have issued a pamphlet of Instructions to Surveyors, and all surveys of oyster planting grounds must be made to conform to its requirements by making surveys from or referring them in a satisfactory manner to triangulation points the geographic position and distance between which are furnished surveyors by request.

There is no other known method whereby a lost point can be accurately determined after all references and markers disappear.

Every point determined by Geodetic Control is permanent for all time, or as I have told people at times, there is only one very definite point in God's World, a location given by Geodetic Control will fit.

With Geodetic Control I have never failed to recover old Coast Survey stations by computing azimuth and distances to them from new stations established by me, when all surface markers were destroyed or the monuments had sunk in the soft marshes.

This shows the necessity for sub-surface as well as surface monuments.

The State of Virginia has benefitted to the extent of thousands of dollars in oyster ground rents by our surveys.

And there is no reason why the method of Geodetic Control could not be applied to property surveys on land with the greatest of benefit to all concerned, * * *.

In open country there would be no more difficulty than across water, in wooded sections and level land the difficulty might be the distance to, or access to the nearest two Geodetic Control points.

In such case the party who is having the survey, say of a farm, done, might object to paying for the time required to connect one line of the farm with the control points, especially if any great distance away.

But as most farms border on state or county roads control points naturally established on them should not be a great distance away in most cases, and I think, that after a few people had their lands surveyed by this new method their neighbors would not be satisfied if their surveys were not made in exactly the same way, and would insist that it be so done.

The time honored description by metes and bounds could easily be maintained and surveys made and relocated with the greatest amount of accuracy by referring the same, instead of to the magnetic meridian to the azimuth of the line this survey is referred to.

A survey made under the present system of referring it to the magnetic meridian may be very correct, as far as the area of the land surveyed, but if we go ad absurdum in this matter and suppose that every monument of such a survey should disappear leaving not even a known starting point, it will be very plain that it is utterly impossible to locate the land so surveyed except by parole evidence, which is mostly after all a compromise and leads to expensive law suits.

With Geodetic Control it will be possible to relocate the corners of any and all tracts of land in any county of any state very accurately if all farm boundaries or even all the Geodetic Control stations would be destroyed.

Every survey would be permanent.

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O. B. BESTOR

Engineer of Permanent Surveys and Records
North Carolina State Highway and Public Works Commission
Raleigh, North Carolina

I have studied your memorandum with great interest and believe that one of the most valuable features of the Geodetic Control is its application to boundary surveys of land. The correct restoration of property boundaries which is made possible when tied to this control, can be appreciated by every land owner, especially those who have become involved in disputes and expensive litigation over lost corners. When the enormous aggregate value of property is considered it is apparent that this item alone would justify the cost of monumentation.

We are fortunate in having in this State a single system of plane coordinates based on the Lambert Projection. We are progressing with the establishment of a supplementary State monumentation at 5-mile intervals, and while this work is only about 10% completed, we have had two sizeable land surveys tied into the system, one town boundary survey, and a portion of a county boundary survey. Further we have tied into the State system the excellent monumentation

of the City of Greensboro, and are making a triangulation and traverse survey of the City of Raleigh, establishing monuments based on the State plane coordinates system. As the State monumentation progresses it will become increasingly available for use in private surveys. The engineers engaged on supplementary monumentation, who are all local men, will promote the use of the monumentation for they understand what they mean. I am convinced, however, that what is most needed is a central agency established in each State which will have all information concerning the geodetic monumentation, will gather and keep on record all available maps and plans that have been tied in, and make the information available to engineers and surveyors. This agency should also, by issuing bulletins and maps, encourage the use of the control.

I am particularly impressed by your suggestion to promote the use of the State system by providing for its legal recognition before such use occurs. It had been my thought that we should have to wait until the system was established, and then have legislation make its use obligatory; but by making its use optional and legal, as suggested by you, it is not necessary to wait until the system is completed.

The form of bill which has been introduced in the Legislature in the State of New Jersey appears to meet the first requirements and the statement attached to the bill is illuminating and effective.

It may be also desirable to have a second bill authorizing entry of licensed engineers and surveyors upon private property to reach the monuments; although practically all the monuments thus far established in this State are on railroad right-of-ways, or on highway right-of-ways; and other public lands.

It appears quite desirable that the bill should also carry a clause for the protection of the survey marks themselves, as we have already had a few of our monuments destroyed, and a number of the Government monuments have been destroyed unnecessarily.

THE FLORIDA ENGINEERING SOCIETY
W. W. Fineren, Secretary

Resolutions adopted April 6, 1935

Whereas, the Board of Direction of this society in session on October 14, 1933 in Jacksonville, Fla., did instruct the Secretary to request the U. S. Coast and Geodetic Survey, through its Director, Captain R. S. Patton, stationed at Washington, D. C., to establish a system of Plane Coordinates for the State of Florida, and

Whereas, it was understood that this would be done upon application without cost to the State of Florida, and

Whereas, systems of Plane Coordinates have been worked out embracing the Lambert and Mercator systems of Plane Projections and tables for coordinates have been computed by the U. S. Coast and Geodetic Survey for the State of Florida, and are now available, therefore be it

Resolved that the Florida Engineering Society in annual session at Miami, Florida on April 4-5-6, 1935, go on record as approving the same and expressing their sincere appreciation for the work done in this connection by the U. S. Coast and Geodetic Survey, through its Director, Captain R. S. Patton, at Washington, and as outlined in the report of the Committee on Land Surveys and Subdivisions of the Society. And

Be it further Resolved that a copy of this resolution be sent to Captain R. S. Patton, Director, at Washington, by the Secretary of the Society. And

Be it further Resolved that this resolution be spread upon the minutes of the Society for the convention as now in session and as of the above date.

H. A. ELMORE

Executive Engineer, Local Control Surveys
Gainesville, Florida

I have your letter of March 5 with the enclosed drafts of the bills suggested and introduced in the New Jersey State Legislature.

I also have your letter of March 28 enclosing copy of the bill which passed the New Jersey Legislature establishing a system of land boundary descriptions.

I am very much interested in the passage of a similar bill for the State of Florida. I am enclosing a copy of a letter which I am sending to the members of the Florida Mapping Authority, together with a proposed bill for the Florida Legislature, which was prepared by members of the staff of the Local Control Surveys. You will note by the comments, which are also enclosed, that many changes from the Act passed in New Jersey will be necessary for Florida.

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BILL PROPOSED FOR FLORIDA

AN ACT TO LEGALIZE THE DESCRIPTIONS OF LOCATIONS OF LAND BOUNDARY CORNERS AND LINES IN TERMS OF PLANE RECTANGULAR COORDINATES AND TO ESTABLISH THREE DIVISIONS OR SYSTEMS OF SUCH COORDINATES IN THE STATE OF FLORIDA.

SECTION 1.

Systems of rectangular plane coordinates having been established by the U. S. Coast and Geodetic Survey for three Divisions of the State of Florida described in Section 2 of this Act, it shall be considered a complete legal and acceptable description of the location and boundaries of any parcel of land within this State to give the positions of the corners of said boundaries in terms of rectangular plane coordinates and the directions of said boundaries in terms of bearings or azimuths on the system of coordinates established for the Division of the State in which said parcel of land lies.

SECTION 2.

The official names and descriptions of the three Divisions of systems of rectangular plane coordinates in Florida established as provided in Section 1 are as follows:

The Northern Division (No. 1) of the Florida Systems of Rectangular Plane Coordinates shall cover the counties of Alachua, Baker, Bay Bradford, Calhoun, Columbia, Dixie, Escambia, Franklin, Gadsden, Gilchrist, Gulf, Hamilton, Holmes, Jackson, Jefferson, Lafayette, Leon, Liberty, Madison, Okaloosa, Santa Rosa, Suwannee, Taylor, Union, Wakulla, Walton and Washington, and counties contiguous thereto for the survey and location of such contiguous lands under the same ownership as may extend partly into these counties. The Northern Division (No. 1) is represented on maps and charts as a Lambert projection of Clarke's Spheroid of 1866, having a central parallel of $30^{\circ} 10'$ north latitude. All coordinates of the Northern Division are expressed in feet, the X coordinates being measured easterly along the grid and the Y coordinates being measured northerly along the grid, the origin of the coordinates being on the meridian $84^{\circ} 30'$ west from Greenwich at the intersection of parallel $29^{\circ} 00'$ north latitude, such origin being given the coordinates $X = 2,000,000$ feet; $Y = 0$ feet.

The Western Division (No. 2) covers the counties of Charlotte, Citrus, DeSoto, Hardee, Hernando, Hillsborough, Lee, Levy, Manatee, Marion, Pasco, Pinellas, Polk, Sarasota and Sumter, and counties contiguous thereto for the survey and location of such contiguous lands under the same ownership as may extend partly into those counties. The Western Division (No. 2) is represented on maps and charts as a transverse Mercator projection of Clarke's Spheroid of 1866, having a central meridian $82^{\circ} 00'$ west from Greenwich. All coordinates of the Western Division are expressed in feet, the X coordinates being measured easterly along the grid and the Y coordinates being measured northerly along the grid, the origin of the coordinates being on the meridian $82^{\circ} 00'$ west from Greenwich at the intersection of the parallel $24^{\circ} 20'$ north latitude, such origin being given the coordinates $X = 500,000$ feet; $Y = 0$ feet.

The Eastern Division (No. 3) covers the counties of Broward, Brevard, Clay, Collier, Dade, Duval, Flagler, Glades, Highlands, Hendry, Indian River, Lake, Martin, Monroe, Nassau, Okeechobee, Orange, Osceola, Palm Beach, Putnam, St. Johns, St. Lucie, Seminole, Volusia and counties contiguous thereto for the survey and location

of such contiguous lands under the same ownership as may extend partly into those counties. The Eastern Division is represented on maps and charts as a transverse Mercator projection of Clarke's Spheroid of 1866 having a central meridian $81^{\circ} 00'$ west from Greenwich. All coordinates of the Eastern Division are expressed in feet, the X coordinates being measured easterly along the grid and the Y coordinates being measured northerly along the grid, the origin of the coordinates being on the meridian $81^{\circ} 00'$ west from Greenwich at the intersection of the parallel $24^{\circ} 20'$ north latitude, such origin being given the coordinates X = 500,000 feet; Y = 0 feet.

The precise positions in said systems of coordinates, northern, western and eastern Division (Numbers 1, 2, and 3 respectively) shall be as marked on the ground by triangulation or traverse stations established in conformity with the standards adopted by the United States Coast Survey for first and second order work, the geodetic positions of which have been rigidly adjusted on the North American datum of 1927, and whose rectangular plane coordinates have been computed on the systems and for the Divisions defined in this section.

SECTION 3.

Any triangulation and/or traverse station established as described in Section 2 of this act may be used in establishing connection or connections between a property survey and the above mentioned system of rectangular plane coordinates.

SECTION 4.

When a connection has been made by acceptable survey methods and with acceptable accuracy between a station of a boundary survey of any type whatsoever and a triangulation and/or traverse station established in conformity with the standards adopted by the United States Coast and Geodetic Survey for first or second order work, and whose Geodetic position has been rigidly adjusted on the North American datum of 1927, such connection, incorporated in any legal record shall constitute an adequate and legally acceptable description of said property survey station.

COMMENTS

TITLE

The constitutional requirement that each Act of the Legislature must contain in its title all the subjects treated in the Act, would require enlargement of the title from either of the other forms presented.

SECTION 1.

The fact that there are three systems of plane rectangular coordinates established in Florida requires direct establishment of each of the three.

SECTION 2.

As full description and assignment of coordinates is required for each of the three divisions of Florida Coordinates, this section is three times the length of Section 3 of the New Jersey bill and in addition the list of counties in each Division. It differs otherwise from the New Jersey model by providing for the extension from one Division to that adjoining in case property under one ownership lies partly in each one of two Divisions. This is at the suggestion of Mr. Mitchell of the U. S. Coast and Geodetic Survey.

SECTION 3.

This Section for Florida is shortened from Coast and Geodetic Survey Section 3 by transferring part of it to Section 2.

SECTION 4.

Provides for "acceptable survey methods" in all drafts. The Florida draft provides also for "acceptable accuracy". Otherwise there is no standard set for the accuracy of connections of land surveys with the monuments in the system of plane rectangular coordinates and any methods of surveying could be used and there would be no record showing what method was used or what the accuracy of the connection would be.

It will be noted that Section 1 provides for the connection of all corners of a parcel of land with the triangulation or traverse station and that the description

of these connections is a complete legal and acceptable description of the location and boundaries of any parcel of land. Section 4 provides in addition that when a connection has been made by acceptable survey methods between a triangulation or traverse station and a station of a boundary survey of any type whatsoever, in connection when incorporated in any legal record shall constitute an adequate and legally acceptable description of such property survey station. Section 1 indicates a standard survey and connection with the traverse station of every angle point in the survey of the parcel of land. Section 4 would require a standard survey of only one line of connection of one point in the boundary of the parcel of land with the traverse station and the rest of the survey of the parcel of land could be of "any type whatsoever" correct or incorrect. It would seem possible to the one point of a survey to the traverse station even though it had been made hundreds of years ago. One corner of a township section or quarter section could be connected in the same way if it could be shown to be the original corner, even though the survey of the parcel of land was the original survey by the U. S. Land Office. Since utilization of the Act is entirely voluntary, any one of these procedures or none at all is permissible. The words "and with acceptable accuracy" have been inserted in the Florida Act to emphasize accuracy in the connecting line even if the survey of the boundaries of the parcel of land is very inaccurate. Corners of Spanish and other grants are of similar nature but do not have the U. S. Land Survey system to aid in finding lost corners. The Act does not attempt to go into the determination of the correct locations of corners of the parcel of land or of township, section, or half-section corners. It has to do only with connections of such points with the established triangulation or traverse points, when these connections are presented for approval and for record.

The term "any legal record" is susceptible of many interpretations. Undoubtedly, recording in the usual offices for keeping record of property transfers and changes in counties would be necessary although record in other national, state, county or other political subdivision would be advisable in special cases.

GENERAL

The words "acceptable" and the like imply an authority to determine acceptability for official records. The Bills proposed by the Coast Survey authorities and that of the New Jersey Legislature do not set up such authority. The county office for recording documents seldom has technical attainments sufficient to judge what documents and methods

would be acceptable. So long as the recording of the proposed connections is voluntary there will probably not be much work to be done in examining plats and surveys and approving them, hardly enough to require a special office.

The only Board in existence which is technically fitted for the administration of the work is the State Board of Engineering Examiners, who already have control of the men who would make the surveys and maps, under the law requiring registration of Land Surveyors. This Board is therefore suggested to operate until the work shows tendencies toward becoming a full time job.

RULES AND REGULATIONS

It may be assumed that the Board will have authority to administer the law and to prepare rules and regulations for the conduct of its business. These may include such subjects as:

Qualifications of Engineers, which may be fixed under the law covering registration of land surveyors, with some rules for enforcing the special requirements of this Act.

Methods of Survey and of connection with established points in the plane rectangular coordinate systems.

Standards for making Maps and Computations and for making the entries on maps and other documents accurate, complete, and in standard form.

Regulation of times, places and forms for recording completed and approved documents for each case.

Control of survey of entire property. The connection of a township, section, or grant corner of any sort with the system of plane rectangular coordinates would be a connection of a single point with the system, and could be made without reference to surveys of parcels of land and should be made with the accuracy required for second order traverses, as provided in Section 4 of this bill. Should the map include the boundaries of the parcel of land, the entire survey should be made with the same accuracy as the connection of the one point with a traverse or triangulation station of the system, and the entire survey should be checked and approved by the Board before authority to make official record of the documents and maps is given. It may be claimed that the testing of the accuracy of the surveys need not be a function of the Examining Board. In such case the recording of an approved survey of the connecting line under Section 4 is sufficient and the

possible inaccuracies of the survey of the parcel of land may cause overlaps in locations of such parcels, hiatuses between surveys and other difficulties for the settlement of which the courts are open (with the expense of a suit). Boards and their employees are subject to mistakes and inaccuracies so that the courts may have some business in case the decisions of the Board do not agree with the ideas, or the facts developed in suits brought by property owners affected thereby. The survey of lands has never been an exact science and no system of surveys has been so complete and accurate that the results of individual surveys are safe from attack. Many devices for correcting irregularities in surveys and maps have been tried and the blanket provision that occupation for a term of years (7 years in Florida) sometimes confirms title to property. The Board, although expert in technicalities of surveying could not be expected to attempt the solution of the legal and personal problems involved in the approval of a survey. Responsibility of the Board should end, therefore, with the acceptance of the individual surveys and maps presented, whether of single points or of several points and lines in a survey of a parcel of land.

The approval of the location of the points on the survey demonstrates the accuracy of the methods and results of the survey but does not touch the validity of the selection of the point so located. This principle applies to points stated to be corners in the U. S. Land Survey in State or parts of States covered thereby as well as to all points in the boundary of a parcel of land in the survey whose approval is desired.

Special Office, as the survey of the State is extended the use of its results by the citizens of the state will increase in proportion to the area covered and to the recognition of the benefits of connections with its monuments. Ultimately a special office may be required with a staff of experts sufficient to keep in control the quality of surveys and of men making them, the permanency and location of records, cooperation with similar bodies.

As surveys of parcels of land are connected with the established triangulation and/or traverse stations, many locations of township, section, and grant corners will be recorded in forms used for many purposes. Recording only in county offices would require for large projects, visits to many counties, whereas the additional record in the central office suggested would put them all together and require a minimum of travel and search.

An important reason for the central office is the coordination of surveys and records in the various counties, especially those along the boundaries of Divisions where changes in the basis of the maps take place and those of properties extending across county lines anywhere.

Coordination of surveys and maps and compilation of them in State, County, City and District maps for various purposes, including therein maps and charts from all official surveys made by National Governmental organizations of all sorts, State organizations having charge of surveys of any sort, organizations needing maps for special purposes for public dissemination; in short extending and making definite as the system develops the work of the Florida Mapping Authority. This unofficial body might well be the sponsor and advisor for such work as this.

Publication of the results of the surveys in such compilations for special purposes as would not be covered by the general maps printed by the National organization may be an important part of the work of the State Board.

Compulsory Compliance with the Law is repugnant to the spirit of America. Practically the expense of connections of all property with a system of plane rectangular coordinates would be greater than the value of much property in almost any State. On the other hand the benefits of connections are very great and will be recognized by those owning and/or wishing to dispose of valuable landed property. They would be the first to recognize the benefits and to make use of the system. Later the same effect can be produced by requiring the connections to be made before a title to land property can be transferred. The administration of such a law would be quite expensive and would require large fees for efficient approval and recording if the central office must pay all the expenses of the examination and approval. This is a further reason for making compliance with the law voluntary.

Transfers of title to considerable areas of land or of real property of a certain value could be made to depend upon character of surveys and compliance with regulations established by the Board. The many results of such a plan of procedure would demand a central office for approval of such connections and a method of payment of the expenses of such an office.

The law now proposed is only a means of calling attention of owners and prospective owners to the new method of establishing the positions of parcels of land. Its operation will gradually educate those interested in land and transfers of title to the value of the process

and of enlarging the field of the law the better to serve those interested. Additions to the law to meet the problems developing will undoubtedly be made from time to time as the value of the possibilities is recognized.

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PROFESSOR N. W. DOUGHERTY

University of Tennessee
Knoxville, Tennessee

I have read your story on the use of geodetic control in private boundary surveys. I am in very hearty agreement with the idea. I believe New Jersey is taking a step forward in considering tying land surveys to permanent markers. We should do the same thing in Tennessee.

With the limited control we have such descriptions would be limited to a comparatively small territory. In Knox, Davidson, and Hamilton Counties we have several miles of traverse with permanent markers established at from 1/2 to 3 mile intervals. We have suggested in a number of newspaper stories that these markers should be used in land surveying.

By 1937 I believe we can present such legislation to the Tennessee Legislature and get favorable consideration.

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A. T. DUSENBURY

2108 American Bank Building
New Orleans, Louisiana

From experience gained through many years in Louisiana and other states, I am in a position to fully realize the benefits which will accrue to the various states and all parties at interest if and when the Systems of Plane Coordinates recently developed by the U. S. Coast and Geodetic Survey are put into general effect and I am sure you are proceeding properly in endeavoring to secure State Legislation recognizing this new method of survey control.

I am highly pleased to learn of the progress made in New Jersey and I hope you will keep me advised of future legislative action in that state as well as such action as may be instituted elsewhere.

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PROFESSOR E. F. CODDINGTON

The Ohio State University
Columbus, Ohio

I am much interested in having all boundary monuments connected with the national triangulation system. Whether this connection can best be established by means of plane coordinates or by geographical positions might be open to debate.

I am inclined to the opinion that all state boundary monuments should be connected to the national triangulation by first order traverse and their positions defined by latitudes and longitudes. In Ohio national triangulation is already available to make this possible at relatively small cost.

I would prefer to have the positions of county boundary monuments also defined by geographic positions. Connecting these monuments to the national triangulation system may be readily done when all the proposed triangulation has been completed.

Thus I would have state and county monuments located by geographic positions. It will require some one who is capable of making the reduction from local plane coordinates to geographic positions, to connect these monuments to triangulation stations. These ties should be made by traverses with an accuracy of at least 1 in 25,000.

I am not ready to commit myself as to the type of plane coordinates which should be used to fill in between the boundary monuments and the triangulation stations. I am at present inclined to county systems, in which the convergence would not be sufficient to bother the local surveyor. The establishment of county systems might educate surveyors to the point where one or more state systems of coordinates might be substituted.

We have in this State the Ohio Society of Professional Engineers which is affiliated with the National Society of Professional Engineers. Branches of this society are being formed in many of the counties, especially in those counties having cities located in them. The membership of this society is made up almost entirely from civil engineers and surveyors.

Any bill introduced into the General Assembly of Ohio such as the one introduced into the General Assembly of the State of New Jersey would have to have the backing of the Ohio Society of Professional Engineers.

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MAJOR A. H. HOLT

The State University of Iowa
Iowa City, Iowa

Thank you for letting me see what is being done in New Jersey, in the matter of legalizing the use of coordinates for control of boundary surveys.

It seems to me that the suggestion of your office for a form for the New Jersey bill is an excellent one. I should prefer it to the one written into the suggested form for a state having more than one system. Of course, if there is more than one system, the extent of the use of each must be stated, and I think that such data for each as you suggested for the one system of New Jersey might well be stated, -- even if it involves some repetition, -- so that the statement for each system would be complete in itself. Except where such inhibition against references to publications or documents not quoted exists as is apparently the case in New Jersey, I think it would be simpler and consequently better not to put in too much material which would be "Greek" to the legislators, -- references to Clarke's Spheroid, etc. After all, there will, in general, be no other systems of coordinates with which the one being defined will be likely to be confused; nor will any legal question be likely to arise (say in a case in court) as to the basis or method of determination of coordinates of the control points; so it seems to me that the implication rather than the full statement of these facts will leave a more workable result. It is well, however, that the system be tied to the ground and to the geodetic positions to the extent that your proposed bill shows.

It seems to me that names rather than numbers will be much better to distinguish the several systems where a state has more than one. If there be but two, as in Iowa, it is easy to say the "Northern Iowa System of Plane Coordinates," or the "Southern Iowa System of Plane Coordinates." That is much more distinctive and descriptive than Number 1 or Number 2. Other names could be devised if a state has more than two systems.

With reference to the proposed bill permitting a surveyor to go on privately-owned land to reach a control station, it seems to me that the permission should be granted only to "a registered land surveyor of this state and his assistants," rather than to "any person recognized as a qualified surveyor, etc." The provisions of Section 4 of this proposed bill are substantially covered by code in this state at the present time (Sec. 5495); but the additional provisions not now law might well be included.

It seems to me that your discussion in the proposed Geodetic Letter might well go so far as to illustrate a proposed form of use of these coordinates in describing parcels of land. These illustrations should be of two sorts, -- one of a certain quarter-section, say; and one a metes and bounds description of an irregular tract.

Something over a year ago I proposed for purposes of local discussion a description of the latter type, of which a copy is inclosed. I now suggest by red-pencil changes certain modifications in form and terminology because of developments within the past year. The purpose in mind was to write a description from which all reference to coordinates could be deleted and still leave a complete metes and bounds description. Obviously, then, there are redundant data. If the coordinates of the ends of a line are known, the length and bearing or azimuth are of course thereby determined. This makes a bulky result but the excuse for the suggestion was to produce a description which would not be objectionable to those who are by long usage accustomed to bearings and distances and who are unaccustomed and perhaps opposed to the use of coordinates.

Quite a few of those attending an Iowa Surveyors' Conference this week expressed the opinion that the use of coordinates made a description too bulky, and offered too much opportunity for typographical or other mistakes to get in, in the course of necessary copying into records, etc. Their suggestion was to give by coordinates the location of a starting point for the description and then to write the description as they have always been written, -- not even using grid north as the meridian for bearings. That doesn't appeal to me, but I'd be glad to see how you would write a description.

(Following is the form to which reference
is made in Major Holt's statement)

SUGGESTED FORM OF METES AND BOUNDS DESCRIPTION OF LAND

Using coordinates, referred to U. S. Coast and Geodetic Survey Triangulation, to define the positions of corners.

"A Parcel of land situated in Blank County, Iowa, and described as follows. The coordinates used to define the positions of corners are referred to the Southern Iowa System of Plane Coordinates. Bearings used are referred to the meridian of that system of coordinates:

"Beginning at a point marked by an iron pin set in concrete, whose coordinates are: Y, 571,001.4 feet, X, 2,461,271.3 feet, and which is on the north line of Section 00, Township 00 North, Range 0 West of the Fifth Principal Meridian, three hundred one and six tenths (301.6) feet east of the northwest corner of said section; thence south seventy-two degrees and forty-seven minutes east (S 72°-47'E) one thousand eight-three and four tenths (1083.4) feet along a fence line to an iron pin set in concrete, whose coordinates are: Y, 570,680.7 feet, X, 2,462,306.2 feet; thence south sixteen degrees and twelve minutes west (S 16°-12'W) fifteen hundred eighty-nine and three tenths (1589.3) feet, along and in prolongation of a fence line, to an iron pin, set on the center line of Blank road, whose coordinates are: Y, 569,154.5 feet, X, 2,461,862.8 feet; thence south sixty-six degrees and five minutes west (S 66°-05'W) twelve hundred ninety-two and one tenth (1292.1) feet along the center line of said Blank road to an iron pin whose coordinates are: Y, 568,630.7 feet, X, 2,460,681.6 feet; thence north thirteen degrees and fifty-eight minutes east (N 13°-58'E), to and along a fence line, twenty-four hundred forty-three and one tenth (2443.1) feet to the point of beginning; containing forty-eight and thirty-six hundredths (48.36) acres, more or less."

Note: The order of X and Y might well be interchanged.

It should sometime be practicable to refer to "the point 2461271.3--571001.4" without danger of being misunderstood.

J. C. CARPENTER

Senior Highway Engineer
Fort Worth, Texas

Geodetic control in private boundary surveys is the only truly permanent method of establishment of boundary line locations. Without doubt this method will ultimately be adopted for the entire country and engineers and surveyors should lead in an active campaign for its early adoption. Legislative action recognizing this practice as the correct and legal method of designating boundaries is the only satisfactory procedure to follow.

The present time is indeed opportune for consideration of the inauguration of State legislative acts for this purpose. State Planning Boards have been created, or are being created, in many of the states and there is much talk of the study and regulation of land use. This increased interest by recognized governmental Boards will serve to create a desire for better definition of boundaries. If a Planning Board does nothing more than establish the Coast and Geodetic Survey's network as a datum for all surveys, it will have rendered service to the citizens which will grow in value as time goes on.

The employment of large numbers of engineers on Geodetic Surveys in the past several years has served to familiarize not only the engineers but many business men and property owners with the existence of the Survey's excellent system of horizontal and vertical control.

There is a natural and justified objection, on the part of property owners, to the resurvey of tracts where no question now exists as to the location of boundaries. This is particularly true where boundaries are described by "metes and bounds" and a resurvey may involve the owners in an argument and possibly in court action. While the legislation as proposed does not make the adoption of this method mandatory, it would seem desirable to emphasize this fact in explanatory descriptions of the proposed procedure, in order to quiet any fears that may arise as to the probability of extensive boundary difficulties being stirred up by the introduction of such legislation. It might even be desirable to incorporate a paragraph in the model act, setting forth that the legislation will in no way disturb present boundaries as established and recognized by law, but rather will serve to perpetuate these boundaries and insure that they may be reestablished in exactly their former positions if lost or obliterated.

There are still in existence in the State of Texas many large tracts of land in single ownership. There is, also, a wholesome respect for any monument that bears the stamp of the United States Government and it would not be difficult to enlist the owners of these large tracts in a movement to have the boundaries permanently established by referencing them to the U. S. Coast and Geodetic Survey's network. With the exterior boundaries thus accurately established, the interior lines can be tied in on the same basis when the larger tracts are subdivided.

A movement is being started in Texas to have all highway surveys monumented and, where possible, tied in to the U. S. Coast and Geodetic Survey's network of horizontal and vertical control. It is proposed that a minimum accuracy of second order traverse and leveling be used in these surveys. This extension of the network will, if accomplished, permit the use of control for land subdivisions over a much larger area and undoubtedly bring the subject to the attention of many surveyors and land owners who would not, otherwise, know of its existence and value.

The second bill, to provide for the entry of surveyors on private property, should, I believe, be included in the first bill legalizing the use of coordinates in the establishment of the location of boundaries. This would make the legislation complete in one Act and render its acceptance by a legislature much simpler than with two bills.

The legislation as proposed is well phrased and should prove entirely satisfactory when revised to comply with special requirements of the Constitutions of the individual states where it is adopted. It is desirable that this movement be vigorously promoted as it has large potential value and its adoption will mean much to the citizens of this country.

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PROFESSOR N. E. WOLFARD

The University of Oklahoma
Norman, Oklahoma

I have given the separate typical bills some study and thought, and find no fault or major criticism to offer. By way of minor criticism it occurs to me that the following addition and insertion might be made in the memorandum entitled "An act to permit entry of surveyors".

Section 2. Add at end of paragraph " . . . provided that the costs so assessed, if not paid within thirty days, may be collected through due process of law."
Section 4. (line 4) Change to read " . . . or shall oppose, or offer any obstacles to"

I have been very much interested in, and hopeful of securing early recognition of the Geodetic Control through coordinates as a legal structure to which to tie land descriptions, and will be glad at any time to assist in any way in bringing about and perfecting a uniform system of description and procedure.

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(The following paragraphs are from an article written by Professor Wolfard and entitled "Sufficiency of Title". It is expected that the entire article will appear in a future number of the Geodetic Letter.)

Conveyance of real property is, or should be, conditioned on clear title which is attested by abstract. Abstract is a summary of records financial, legal, and descriptive. Descriptive record is established by position, fixed or relative.

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* * * However the reader will agree, I am sure, that a point of reference determined or established by the rigorous procedure of Coast Survey methods will be more exact in position, more permanent, and more readily reestablished in case it becomes disturbed, than is the ordinary point of reference used in deed description.

The surveys set up as C.W.A. projects throughout the several states in December were mostly concerned with "second order" traverse and leveling. The general procedure was to execute traverse from previously established and computed arc triangulation stations. The traverse was to be run from one station to another along highway or railway and monuments carrying a standard bronze marker set from one-fourth mile to two miles apart, depending on topography and cultural demands. Thus were formed closed loops affording accuracy check. Levels were run along the traverse establishing elevation of each marker, together with intermediate bench marks on bridge heads, etc. These monuments afford convenient and accurate horizontal and vertical control reference points for future surveys and "check in" points for surveys already made.

A system of coordinates has been set up for Oklahoma and computers are now busy computing the coordinates of all triangulation stations within the state as well as the coordinates of each of the monuments set in the local control survey now in progress under C.W.A. The advantage of a state coordinate system of reference points is evident on a moment's reflection. With public and private surveys throughout the state referred to common position coordinates and elevation datum relative position, either vertical or horizontal, of control or objective points in a projected enterprise, great or small, could be readily determined without preliminary surveys.

In order to facilitate the usefulness of data resulting from the numerous surveys constantly being carried on by various governmental units, corporations, and individuals a clearing house in the form of a state survey bureau should be set up. The functions of this bureau would be various and far-reaching, and must needs be a subject of separate discussion in a future issue. Modification of procedure in legal surveys and public responsibility and license of surveyors should come up for study and analysis.

It is hoped that engineers and surveyors, as well as industrial and political leaders, will consider and analyze the coordinate basis for surveys in its various aspects of economy, utility, accuracy, and permanence.

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PROFESSOR WILLARD J. TURNBULL

University of Nebraska
Lincoln, Nebraska

In the following paragraphs are a few remarks with respect to your letter of March 5, 1935. These remarks concern the various phases in the development of the use of plane rectangular coordinates, which I believe to be pertinent.

I was very much interested in your resume of the present condition and stage of development in the use of plane coordinates under the heading "The Use of Geodetic Control in Private Boundary Surveys".

I am confining my discussion under various headings, each heading being self-explanatory.

1. PLANE COORDINATE SYSTEMS FOR NEBRASKA.

Two plane coordinate systems, a north and a south, have already been selected for Nebraska by the U. S. Coast Survey. These systems are Lambert Conformal conic projections, and have quite evidently been selected with the idea of keeping the scale error due to the projection as small as possible. As a rough estimate, the greatest scale error with these projections will probably be less than 1:10,000.

The plane coordinates of the intersections of the various degrees of latitude and longitude for Nebraska have recently been computed for the two previously mentioned systems. It is now possible to construct a projection for the entire state or for individual sections. An attempt is being made by a State F.E.R.A. mapping project to fit past state surveys to this projection. Considerable difficulty will undoubtedly be experienced due to the variable types of surveys and the variable accuracies obtained.

2. LEGAL RECOGNITION OF THE USE OF A SYSTEM OF PLANE COORDINATES.

A point of primary importance in introducing a system of plane coordinates for use in the description of boundary lines for public or private properties in a state in the enactment of a law by the state legislature establishing the recognition and legality of the system.

In the near future I will submit to you a draft of a bill for legal recognition of a state system of plane coordinates for Nebraska, modeled along the lines suggested by you. The allotted time for submitting bills to the present session of the Nebraska Legislature expired almost three weeks ago. Consequently, it will not be possible to introduce such a measure in Nebraska for some time.

I think that the draft of the bill which you have prepared concerning the "entry on private property", "payment of damages", "protection of survey marks", etc. covers all these points quite well. As I see it, the main purpose of this bill is to secure the maximum use of, and protection for, the survey monument without creating antagonism on the part of the property owner.

3. PRIVATE BOUNDARY CONTROL.

The final success of any measure is dependent on the backing of that measure by the people as a whole, and not on its acceptance by just a few specially trained people. The average individual must be made to see and feel that without great trouble and expense to himself he may receive a definite benefit from the measure under consideration. The average citizen might be inclined to question the value of geodetic control, as he might feel that it would benefit only the larger engineering projects. But if you were able to prove to that citizen that he could use such control to permanently mark the boundaries of his property for all time, with practically no cost to himself, he would probably be considerably more interested.

The establishment of permanent boundaries of private properties through the use of plane coordinates would then seem to be the logical way to approach the taxpayers of a state, and this would seem to be the greatest potential use of plane coordinates.

Since Nebraska is an agricultural state, the principal class of people to interest in this movement will be the farming population. Due to erosion and road construction, the mortality of the "buried corner-stone" marker has been very high. In many cases the ties to these markers such as trees and corner posts have also been removed, thus the actual locations of these markers are lost. When the farmer or property owner recognizes that plane coordinates ties to his boundary lines can never be lost, and that with a minimum effort on his part the boundary of his property can actually be traced at any time, he will probably become sympathetic with such a movement. He will also be free from possible boundary disputes which are often embarrassing and costly.

The above reasoning applies equally to the private urban property owners, especially those owners of high priced plots of ground in the business section of the city.

Thus, regardless of ownership or size of property, the boundary once established by a system of plane coordinates and legally described and recorded can never be lost.

4. GENERAL EDUCATION OF THE PUBLIC TO THE ECONOMY AND NEED OF PERMANENT AND UNIFIED SYSTEM OF CONTROL SURVEYS.

It should not be difficult to prove that the great part of our surveys to date have been expensive principally due to the fact that permanent monuments were not established, and the value of the survey even though possibly made with great care and accuracy is lost to all future needs which may arise in that particular area. Then too, we usually have as many different methods of surveys with as many different degrees of accuracy as there are private, city, county, state, or federal agencies which undertake surveying projects. With the establishment of this unified system, the maximum error of the survey could be held within prescribed limits.

I believe that I could name five or six federal agencies which have duplicated and often show conflicting elevations on the same monument. The same is equally true of local surveying agencies. This points out very definitely the need of a strong central agency whose duty would be to supervise or control all surveys carried on in the state. This central agency should be national rather than state, otherwise we might have 48 more or less individual systems of survey, and we would not be much nearer than before to a unified national system of control surveys. The Coast Survey is the logical national agency to supervise or control such a comprehensive system of first and second order surveys and the development of the various state systems of plane coordinates.

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PROFESSOR A. S. CUTLER

University of Minnesota
Minneapolis, Minnesota

I have gone through the memorandum regarding control of boundary surveys which you sent me some time ago. Also, the members of this department have examined the statement, and are all agreed that this proposal is very desirable. In order to secure any definite action along this line by the members of the Legislature, it will be necessary, first, to do a large amount of educational work among the engineers and surveyors, as well as among the laymen. It has been only during the last year or two that even the local engineers and surveyors have taken any particular interest in the work of the Geodetic Survey and in precise methods of surveying. The work which was done through the C.W.A. Project last winter, of course, received considerable interest from both the surveyors and the general public.

I think it would be desirable for your department to issue as often as is practicable bulletins or letters which could be used for publicity purposes. This information could be made the basis of papers to be presented before the various engineering society meetings and for articles to be published in the various state engineering papers.

The need for such a control of boundary surveys is not quite so evident in this part of the country as it is in the older New England states, as our sub-divisions are all on the basis of the public land rectangular system. I think perhaps one of the first objectives which we should attempt to accomplish is to require that the location of all township corners, as well as city and village boundary lines, be tied into the triangulation system. Assuming, however, that this triangulation net would be extended so that stations would not be great distances from each other. In this state we have a comparatively small number of precise triangulation stations so that it is a little more difficult to convince the public of the necessity of such a plan as you propose. I am assuming, however, that this net will be extended in the very near future so that these stations will be available. Of course, it would be very desirable to have the section corners located in their true positions - that is the final objective toward which we should move.

You refer in your letter to the fact that plane coordinates for these triangulation stations must be computed. Also, it will be necessary to have very definite specifications drawn for the conducting of surveys by local surveyors and engineers who would be tying into these triangulation stations. It might be necessary to draw up some definite regulations under which certain men would be licensed to make these surveys before they could be accepted for record. It is unfortunate that all of these stations and this information were not available several years ago when our state and federal truck highway systems were being projected, as the surveys which were made for that purpose would have formed a very complete network, covering the entire state. I should like to suggest also that it might be desirable to require surveys which are being made by state departments, such as, highway, water resource surveys, etc., to be tied into permanent bench marks, as well as to precise triangulation stations. I think that the difficulty we are having in this state is due to the fact that there has been no control of elevations for various surveys, so that it has been impossible to correlate all this information which might otherwise be valuable.

ROY M. BUCK

Supervising Engineer
Idaho State Geodetic Survey

(The following pertinent paragraphs are taken verbatim from a paper entitled "Land Surveys and National Welfare", in which is told the story of precise land surveys made in the Philippine Islands by the Bureau of Lands to meet the need for a wholesale quieting of titles to lands held by the people. It is expected that Mr. Buck's paper, which is based on ten years of experience with that bureau, will appear in its entirety in a future number of the Geodetic Letter.)

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In the United States the old monuments and corner markings of original surveys were established from 40 to 200 years ago and in many cases are lost without a trace. Another 25 years will see a large percentage of them here in the West permanently obliterated. This situation is further aggravated by the fact that everybody and anybody is conveying titles to land based on descriptions wholly inadequate to identify the properties intended. Such deeds are made of record in the county where the land is located and there is no one at present with authority to insist upon definite, sufficient and accurate descriptions.

* * * * *

The plan to have special legislative sanction to the grid system of surveying is a step in the right direction. It might be possible to include with such a bill a provision requiring all title conveyances to be checked for description deficiencies by the county surveyors at a nominal fee where no field work is required.

A law providing a sound establishment of land titles is urgently needed in connection with the program because new surveys and new monuments are without bearing in old titles. Owing to their greater economy and absolute effectiveness the program at the proper time, should include cadastral surveys. Titles based on such a survey would save us a great deal of trouble that may well be expected in another generation.

V. G. SANDERS

Chief Computer
Joint Committee on Survey Control
Los Angeles, California

The testimony of courts crowded with land litigation should be evidence enough of the necessity of establishing property boundaries by methods which will make them permanent even though all their monuments may be destroyed. This can only be accomplished through the use of a coordinate system based on triangulation and the respective coordinate values of each point and the bearing of each line of the boundary incorporated in the legal description of the property. Legislation in each State is necessary to legalize this method of description writing.

Should not the necessary legislation, however, be more mandatory? The City of Toledo, Ohio, has a very interesting ordinance (No. 9098) making compulsory that the various surveys be connected and coordinated to the triangulation.

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BISHOP MOORHEAD

206 Old Post Office Building
Portland Oregon

In reply to your communication of March 22, 1935, in regard to the Plane Coordinate System for Oregon. As you no doubt realize it has been unnecessary to convince the writer of the value of a uniform system of Plane Coordinates, as he has realized the importance of this work, and from experience in the army, has seen possibilities of such a development. It was only necessary for some important organization or bureau to make the initial step, which the Coast Survey has done. The State Highway Department has adopted the system of Plane Coordinates in so far as triangulation or traverse points are available from which the coordinates can be computed. Owing to the large spacing of triangulation stations in Oregon it is impossible to utilize the benefits that can be derived therefrom in all parts of the state, but wherever points may be obtained the system is being adhered to.

This office has computed the Plane Coordinates of all triangulation stations in Oregon that may be used for the initial of local surveys and these are furnished upon the request of any engineer, having use for them. In addition to this, we have completed approximately 450 miles of second-order primary traverse. About 3,000 more miles will be necessary to break the state up into units from which any local survey can be started. We have prepared a pamphlet of 60 pages, giving a full explanation of Lamberts Conformal Conic Projection where it pertains to field and office work; eliminating the derivation of the projection and stating the explanation in language that can be understood by the general engineer. We are now printing an additional supply of these pamphlets, which will be mailed to each county engineer, together with a questionnaire for them to complete, in regard to their reactions toward the system.

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All people who have utilized the system state that it has increased the accuracy of the work done by their surveying crews, at least 25 percent; this being caused by the fact that their lines will be checked in place of left "hanging in the air."

Of course it is necessary to educate the surveyor and engineer in the use of this system; but to whomever we have explained the advantage of uniform plane coordinates; it has met with an enthusiastic approval and when our campaign in its favor is completed, you may rest assured that we will have the whole-hearted support of all parties concerned in the State of Oregon.