5471-2

5471-2

Form 504
Rev. Dec. 1933

DEPARTMENT OF COMMERCE
U.S. COAST AND GEODETIC SURVEY
R. S. PATTON, DIRECTOR

DESCRIPTIVE REPORT

AIRPHOTO
Topographic
~~Hydrographic~~

Sheet No. 5471 & 5472

State Virginia

LOCALITY

5472
Albemarle & Chesapeake Canal
East section
~~North Landing River~~

5471
Albemarle & Chesapeake Canal
West section

1936

CHIEF OF PARTY
S. B. Grenell

U.S. GOVERNMENT PRINTING OFFICE: 1934

T-5472 Applied to Chart 830, April 8, 1937 R.L.J.
T-5471 " " " " , June 3, 1937 R.L.J.
Applied to Chart 512. June 14 1937 R.L.C.

Form 537a
Ed. Nov. 1929

DEPARTMENT OF COMMERCE
U.S. COAST AND GEODETIC SURVEY

REG. NO.

TOPOGRAPHIC TITLE SHEET

The Topographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

Field No.....

REGISTER NO. 5471 T5471

State Virginia

General locality ~~South east section~~

Locality Albemarle & Chesapeake Canal West ~~East~~ Section

Scale 1:10,000 Date of survey Compiled Photos, Sept. 1935 July - Nov., 19 36

Vessel Party # 18

Chief of party S. B. Grenell

Surveyed by Compiled by S. B. Grenell

Inked by S. B. Grenell

Heights in feet above - - - - to ground to tops of trees

Contour, Approximate contour, Form line interval - - - feet

Instructions dated March 18, 19 36

Remarks:

...

NOTES ON COMPILATION

One copy of this form must accompany each chart from beginning to completion. The last draftsman, whose name appears on this form, is responsible for it and all personnel will endeavor to keep these forms up to date and correctly posted. This form is very important inasmuch as the final Descriptive Report of the Chart compiled is based upon the information contained herein.

SHEET NO. 5471

Acc. No. 717
Acc. No. 718

PHOTO NO. 1 39 TO PHOTO NO. 10 51

	BY	START	FINISH
ROUGH RADIAL PLOT	S. B. Grenell		
SCALE FACTOR(.97)	S. B. Grenell		
SCALE FACTOR CHECKED	J. A. Giles		
PROJECTION	Washington Office		
PROJECTION CHECKED	S. B. G.		
CONTROL PLOTTED	S. B. G.		
CONTROL CHECKED	J. A. G.		
TOPOGRAPHY TRANSFERRED	none		
TOPOGRAPHY CHECKED			
SMOOTH RADIAL LINE PLOT	S. B. G.		
RADIAL LINE PLOT CHECKED	S. B. G.		
DETAIL INKED	S. B. Grenell		

AREA DETAIL INKED 34.8 sq. Statute Miles

LENGTH OF SHORELINE OVER 200 m. - - - Statute Miles

LENGTH OF SHORELINE UNDER 200 m. 9.2 Statute Miles

GENERAL LOCATION Eastern Virginia

LOCATION Albemarle Chesapeake Canal - North Landing River

DATUM STATION GREAT BRIDGE 1931 Latitude 36 43 12.787 (394.2)
Longitude 76 14 26.189 (649.9)

x 2,662,184.00 FT. ✓
y 148,782.08 FT. ✓

Datum: N. A. 1927

S. B. Grenell

Form 537a
Ed. Nov. 1929

DEPARTMENT OF COMMERCE
U.S. COAST AND GEODETIC SURVEY

REG. NO.

TOPOGRAPHIC TITLE SHEET

The Topographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

Field No. T5472

REGISTER NO. 5472

State Virginia

General locality ~~South-east section~~ East

Locality Albemarle & Chesapeake Canal ~~West~~ Section

Compiled Photos, Sept. 1935

Scale 1:10,000 Date of survey July - Nov., 1936

Vessel Party # 18

Chief of party S. B. Grenell

Surveyed by S. B. Grenell

Inked by S. B. Grenell - R. A. Earle

Heights in feet above - - - - to ground to tops of trees

Contour, Approximate contour, Form line interval - - - feet

Instructions dated March 18, 1936

Remarks:

NOTES ON COMPILATION

One copy of this form must accompany each chart from beginning to completion. The last draftsman, whose name appears on this form, is responsible for it and all personnel will endeavor to keep these forms up to date and correctly posted. This form is very important inasmuch as the final Descriptive Report of the Chart compiled is based upon the information contained herein.

SHEET NO. 5472

Acc. No. 738
Acc. No. 740

PHOTO NO. 37 108 TO PHOTO NO. 56 122

	BY	START	FINISH
ROUGH RADIAL PLOT	S. B. Grenell		
SCALE FACTOR(.97)	S. B. Grenell		
SCALE FACTOR CHECKED	J. A. Giles		
PROJECTION	Washington Office		
PROJECTION CHECKED	S. B. Grenell		
CONTROL PLOTTED	S. B. Grenell		
CONTROL CHECKED	J. A. Giles		
TOPOGRAPHY TRANSFERRED	S. B. Grenell		
TOPOGRAPHY CHECKED	J. A. Giles		
SMOOTH RADIAL LINE PLOT	S. B. Grenell		
RADIAL LINE PLOT CHECKED	S. B. Grenell		
DETAIL INKED	R. A. Earle (roads, streams, detail along streams) S. B. Grenell (all other detail)		

AREA DETAIL INKED 33.1 sq. Statute Miles

LENGTH OF SHORELINE OVER ~~500~~ 200 m. - - - Statute Miles

LENGTH OF SHORELINE UNDER ~~500~~ 200 m. 16.1 Statute Miles

GENERAL LOCATION Virginia, Eastern Part.

LOCATION Albemarle & Chesapeake Canal - North Landing River

DATUM STATION NORTH LANDING 1931 Latitude 36 43 05.247 (161.7)
Longitude 76 06 02.383 (59.1)
Datum: N. A. 1927

X coordinate: 2,703,210.31 FT.
Y " 149,031.82 FT.

S B Grenell

The traverse mentioned on the opposite page was not permanently marked and no records were turned in to this office. Traverse points are marked on the photographs and the positions are pricked on the celluloid compilation.

F.J.

REPORT OF COMPILATION

FOR

AIRPHOTO COMPILATIONS NOS. 5471 & 5472

Norfolk, Va., 1936

This report is written to cover two adjoining compilations of the same scale factor which were radial plotted as a unit. The general characteristics of both sheets are the same.

CONTROL:

After the field inspection of existing control was completed, it was apparent that it would be necessary to establish additional control in order to run through a fixed plot. In this connection, two short, closed traverses were run in with theodolite (6 D & R) and tape. Traverse # 1 on compilation 5471 between triangulation stations Pleasant & Turnpike closed with an error of less than three (3) m., which was adjusted. Traverse #2 on compilation 5472 between Pungo and North Landing, closed with an error of less than two (2) meters and was adjusted.

With the combination of traverse and triangulation control, it was possible to run through fairly well fixed plots with the assurance that compilation in the critical areas was well controled and accurate.

RADIAL LINE PLOTS:

The preliminary scale plot showed the photographs to be of approximately the same scale for the four flights which covered the two compilations, so a mean scale factor of 0.97 was adopted. This made it possible to join the two sheets togather while running the radial plot and thus take advantage of all control in the overlapping flights along the sheet junction.

The photos for compilation 5471 were new and were flown with a camera in good adjustment. The photos for compilation 5472, however, were flown over two years ago and were taken with a camera known to be out of adjustment. For this reason it was advisable to run the overlap or junction plots togather so that a careful check could be made. This junction area had very little control except the traverse but the plots went through fairly well the first try and subsequent adjustments developed a system of excellent intersections in the flight overlap and assured a smooth, even plot.

ADJUSTMENT OF PHOTOGRAPHS:

The individual photographs varied considerably in scale and most of them were badly tilted - especially on compilation # 5471, so that adjustment ofdetail was a tedious job. This was particularily so due to the great amount of fine detail such as ditch systems and roads, but the radial points were excellent and by intersecting for additional, break-down points it was possible to run through a smooth, accurate compilation. The photo detail was generally clear.

Accuracy

The probable error of location of 2 to 3 mm. noted on the opposite page applies to the north limits of these compilations.

With the traverses mentioned on page 1 of this report, the control along the canal and north to lat. 36° 44' on T-5471 is ample and the accuracy of location of well defined detail is accepted as within 1 millimeter. From lat. 36° 44' northward, there was practically no control. The photo plots which are in a north-south direction do not close on control above 36° 43' and could be checked only by tying in with the plots of the adjacent compilation T-5149 which was well controlled.

On T-5471 the detail above lat. 36° 46' will not be published except for a small portion at the west edge.

On T-5472, the detail above 36° 45' will not be published except for a small portion at the west edge.

H. J. Jones

FIELD INSPECTION:

The field inspection was carried on by the writer and one draftsman and was easily accomplished by truck. It was impossible to penetrate the heavily wooded areas to determine the amount of land which is normally flooded and since this feature does not show on the photothgraphs it was impossible to show by the conventional water-line symbol the area which is actually swamp.

All heavily wooded areas in this section of the country are classed locally as "swamp" because most ofthe higher ground has been cleared for cultivation. All of the land is very low and flat and the fields are closely ditched for drainage. Much of the so-called "swamp" is actually dry a greater part of the year altho there is considerable cypress growing in the areas adjacent to the w waterways. The bulk ofthe timber is gum with a mixture of pine, oak, maple, beach, et c. on the higher ground.

INTERPRETATION OF DETAIL:

The photographs were quite clear and with the use of the stereoscope it was possible to identify and locate most of the large buildings and special structural features. The ditch systems show up clearly in the cultivated areas because of the growth of grass and low brush lining the banks. There were no unusual features and no special symbols used.

COMPARISON WITH CONTEMPORARY SURVEYS:

The only comparison possible was made with planetable sheet #6362, R. P. Eyman, 1934, showing the upper reaches of the North Landing River which appeared on compilation 5472. The check was excellent where the shoreline was rodded in on definite points and islands and the mouths of tributary streams but there were numerous, small discrepancies between rodded points where the topographer had sketched the general outline.

ACCURACY AND COMPLETENESS:

The compilations are complete in every detail as well as can be determined from the photographs. Although the control is not well distributed, the excellent intersections obtained on the radial plot lead me to believe that the maximum error in controlled areas should not exceed two millimeters and in less well controled areas, three millimeters. Use opposite page

JUNCTIONS:

All junctions with adjoining compilations are complete.

LANDMARKS: No list of landmarks submitted.

COAST PILOT NOTES: None submitted.

BRIDGE DATA: Data for all bridges is shown on the overlay sheets as

taken from the publication; List of Bridges over Navigable Waters of the U. S. - 1934 and verified for subsequent change with the U. S. E. D., Norfolk, Va.

PHOTOGRAPH NUMBERS:

Compilation 5471				Compilation 5472			
Acc. No.	717	1 to	10	Acc. No.	738	37 to	56
"	718	39 to	51	"	740	108 to	122

Respectfully submitted,

S. B. Grenell,
Chief of Party # 18.

T- 5471

	Remarks	Decisions
1		see T-6362 a, b
2		
3		off sheet
4		see T-6362 a, b
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
M 234		

GEOGRAPHIC NAMES

Survey No. T-5471

Name on Survey	A On Chart No. 1227	B On previous survey No. H-1579b	C On U. S. quadrangle Maps	D From local information	E On local Maps	F	G P. O. Guide or Map	H Rand McNally Atlas	K Inside Route U.S. Light List Pilot	
Albemarle & Chesapeake Canal ✓	✓ appd									1
Great Bridge ✓	✓		✓				✓ Greatbridge	✓		2
Camden Mill	on ✓ 5,4y									3
North Landing R.	✓ appd	on 5472								4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25
										26
										27

Names underlined in red approved by GHE on 3/9/37

M 234

T- 5472

	Remarks	Decisions
1		see T-6362 a, b
2		" "
3		" "
4		" "
5		
6		" "
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		

M 234

GEOGRAPHIC NAMES

Survey No. T-5472

Name on Survey	A On Chart No. 1227	B On previous survey No. T-6364, H-1529	C On U. S. quadrangle Maps.	D From local information	E On local Maps	F P. O. Guide or Map	G Rand McNally Atlas	H U. S. Light List	K	
West Neck Creek	✓ app'd									1
Haynes Cr.	GNS app'd									2
North Landing	✓ app'd									3
Albemarle and Chesapeake Canal	✓ app'd									4
Princess Anne	✓		✓			✓	✓			5
North Landing River	✓ app'd									6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25
Names underlined in red approved by GFE on 3/9/37										26
										27

M 234

REVIEW OF AIR PHOTO COMPILATIONS T-5471 and T-5472
Scale 1:10,000

Data Record

1. Triangulation to 1934
2. Photographs to September 1935
3. Theodolite and tape traverses, 1936
4. Field inspection to November 1936

The field inspection indicated that there were no considerable changes in detail and that detail on the compilations is that of the date of photographs.

Comparison with Graphic Control Survey

T-6362a (Jan. 1935), 1:10,000

The compilation T-5472 and T-6362a are in agreement except for slight differences in the location of shoreline between rodded points on the graphic control sheet.

Numerous snags, tree stumps, and piles which were shown on T-6362a were added to the compilation along the North Landing River.

There were slight differences in the position of sunken barges at lat. 36° 41.9', long. 76° 04.6'. After checking with the photographs, the position shown on the compilation was proved correct.

There are no contemporary hydrographic surveys in the area covered by this compilation.

Comparison with Topographic Surveys

T-1387 (1873), 1:20,000
T-3250 (1912), 1:10,000

There have been slight changes in the locations of shorelines of numerous streams. The ~~alignment of the~~ Albemarle and Chesapeake Canal has been improved by eliminating several bends in the North Landing and Elizabeth Rivers where these streams are included in the Intracoastal Waterway.

Changes in structural features have taken place in the locks near Great Bridge.

This compilation is complete and adequate to supersede the above topographic surveys for charting.

Comparison with Charts 452 (1:20,000) and 1227 (1:80,000)

These compilations show additional roads and a number of small changes in shoreline as compared with the present charts.

No landmarks have been recommended by the compilation party.

General

A statement of the accuracy of location and additional control has been included in the descriptive report opposite page 2.

All geographic names were added to the compilation in this office.

The field inspection reports that numerous drainage ditches in this area are essential for cultivation and are characteristic of this locality. The land is low and cultivation is possible only in the areas which are a few feet higher than the surrounding swamp and which can be drained into the swamp. These ditches are often covered by brush and hedges and are not apparent on the photographs but the Chief of Party states that these brush and hedge lines are invariably over a drainage ditch.

March 24, 1937.

H. H. Lollester

B.J. Gould

REVIEW OF AIR PHOTO COMPILATION NO. 5471

Chief of Party: J.B. Grenell Compiled by: J.B. Grenell

Project: Party #18 Instructions dated: Mar. 18, 1936

1. ✓ The charts of this area have been examined and topographic information necessary to bring the charts up to date is shown on this compilation. (Par. 16a, b,c,d,e,g and i; 26; and 64)

2. ✓ Change in position, or non-existence of wharfs, lights, and other topographic detail of particular importance to navigation which affect the chart, is discussed in the descriptive report. (Par. 26; and 66 g,n)

3. ✓ Ground surveys by plane table, sextant, or theodolite have been used to supplement the photographic plot where necessary to obtain complete information, and all such surveys are discussed in the descriptive report. (Par. 65; and 66 d,e)
Traverse for photo control

4. ~~Blue-prints and maps from other sources which were transmitted by the field party contain sufficient control for their application to the charts.~~ (Par. 28)

5. ✓ ~~Differences~~ between this compilation and contemporary plane ~~table and hydrographic~~ surveys have been examined and rectified in the field before forwarding the compilations to the office and are discussed in the descriptive report.
No contemporary surveys for comparison

6. ✓ The control and adjustment of the photo plot are discussed in the descriptive report. Unusual or large adjustments are discussed in detail and limits of the area affected are stated. (Par. 12b; 44; and 66 c,h,i)

7. ✓ High water line on marshy and mangrove coast is clear and adequate for chart compilation. (Par. 16a, 43, and 44)

NOTE: Strike out paragraphs, words or phrases not applicable and modify those requiring it. Paragraph numbers refer to those in the Topographic Manual. Refer also to the pamphlet "Notes on the Compilation of Planimetric Line Maps from Five Lens Air Photographs." M-87

8. The representation of low water lines, reefs, coral reefs and rocks, and legends pertaining to them is satisfactory. (Par. 36, 37, 38, 39, 40, 41)

9. Recoverable objects have been located and described on Form 524 in accordance with circular 30, 1933, circular letter of March 3, 1933, and circular 31, 1934. (Par. 29, 30, and 57)

10. A list of landmarks was furnished on Form 567 and instructions in the Director's letter of July 16, 1934, Landmarks for Charts, complied with. (Par. 16d, e; and 60)

11. ✓ All bridges shown on the compilation are accompanied by a note stating whether fixed or draw, clearance, and width of draw if a draw bridge. ~~Additional information of importance to navigation is given in the descriptive report.~~ (Par. 16c)

12. ✓ Geographic names are shown on the overlay tracing. The accepted local usage of new names has been determined and they are listed in the report, together with a general statement as to source of information and a specific statement when advisable. Complete discussion of place names differing from the charts and from the U. S. G. S. Quadrangles is given in the descriptive report, together with reasons for recommendations made. (Par. 64, and 66k)

No new names

13. ✓ The geographic datum of the compilation is N.A. 1927 and the reference station is correctly noted.

14. ✓ Junctions with adjoining compilations have been examined and are in agreement. (Par. 66j)

15. ✓ The drafting is satisfactory and particular attention has been given the following:

1. ✓ Standard symbols authorized by the Board of Surveys and Maps have been used throughout except as noted in the report.

2. ✓ The degrees and minutes of Latitude and Longitude are correctly marked.

3. All station points are exactly marked by fine black dots.

4. Closely spaced lines are drawn sharp and clear for printing.

5. Topographic symbols for similar features are of uniform weight.

6. All drawing has been retouched where partially rubbed off.

7. Buildings are drawn with clear straight lines and square corners where such is the case on the ground.

(Par. 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48)

16. No additional surveying is recommended at this time.

17. Remarks:

18. Examined and approved;

S. B. Linnell
Chief of Party

19. Remarks after review in office:

Reviewed in office by: H. H. Schleiter 3/20/37

Examained and approved:

E. K. Green
Chief, Section of Field Records

Fred. L. Peacock
Chief, Section of Field Work

L. O. Colbert
Chief, Division of Charts

Chief, Division of Hydrography and Topography.

REVIEW OF AIR PHOTO COMPILATION NO. 5472

Chief of Party: S.B. Grenell Compiled by: S.B. Grenell R.A. Earle

Project: Party #18 Instructions dated: Mar. 18, 1936

1. The charts of this area have been examined and topographic information necessary to bring the charts up to date is shown on this compilation. (Par. 16a, b,c,d,e,g and i; 26; and 64)

2. Change in position, or non-existence of wharfs, lights, and other topographic detail of particular importance to navigation which affect the chart, is discussed in the descriptive report. (Par. 26; and 66 g,n)

3. Ground surveys by plane table, sextant, or theodolite have been used to supplement the photographic plot where necessary to obtain complete information, and all such surveys are discussed in the descriptive report. (Par. 65; and 66 d,e)
Traverse for photo control

4. Blue-prints and maps from other sources which were transmitted by the field party contain sufficient control for their application to the charts. (Par. 28)

5. Differences between this compilation and contemporary plane table and hydrographic surveys have been examined and rectified in the field before forwarding the compilations to the office and are discussed in the descriptive report.

6. The control and adjustment of the photo plot are discussed in the descriptive report. Unusual or large adjustments are discussed in detail and limits of the area affected are stated. (Par. 12b; 44; and 66 c,h,i)

7. High water line on marshy and mangrove coast is clear and adequate for chart compilation. (Par. 16a, 43, and 44)

NOTE: Strike out paragraphs, words or phrases not applicable and modify those requiring it. Paragraph numbers refer to those in the Topographic Manual. Refer also to the pamphlet "Notes on the Compilation of Planimetric Line Maps from Five Lens Air Photographs." M-87

8. The representation of low water lines, ~~reefs, coral reefs~~ and rocks, and legends pertaining to them is satisfactory. (Par. 36, 37, 38, 39, 40, 41)

9. Recoverable objects have been located and described on Form 524 in accordance with circular 30, 1933, circular letter of March 3, 1933, and circular 31, 1934. (Par. 29, 30, and 57)

10. A list of landmarks was furnished on Form 567 and instructions in the Director's letter of July 16, 1934, Landmarks for Charts, complied with. (Par. 16d, e; and 60)

11. All bridges shown on the compilation are accompanied by a note stating whether fixed or draw, clearance, and width of draw if a draw bridge. Additional information of importance to navigation is given in the descriptive report. (Par. 16c)

12. Geographic names are shown on the overlay tracing. The accepted local usage of new names has been determined and they are listed in the report, together with a general statement as to source of information and a specific statement when advisable. Complete discussion of place names differing from the charts and from the U. S. G. S. Quadrangles is given in the descriptive report, together with reasons for recommendations made. (Par. 64, and 66k)

13. The geographic datum of the compilation is N.A. 1927 and the reference station is correctly noted.

14. Junctions with adjoining compilations have been examined and are in agreement. (Par. 66j)

15. The drafting is satisfactory and particular attention has been given the following:

    1. Standard symbols authorized by the Board of Surveys and Maps have been used throughout except as noted in the report.

    2. The degrees and minutes of Latitude and Longitude are correctly marked.

3. All station points are exactly marked by fine black dots.

4. Closely spaced lines are drawn sharp and clear for printing.

5. Topographic symbols for similar features are of uniform weight.

6. All drawing has been retouched where partially rubbed off.

7. Buildings are drawn with clear straight lines and square corners where such is the case on the ground.

(Par. 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 48)

16. No additional surveying is recommended at this time.

17. Remarks:

18. Examined and approved;

Chief of Party

19. Remarks after review in office:

Reviewed in office by: H. H. Schlatter 3/24/37 B. J. Jones

Examained and approved:

E. F. Green
Chief, Section of Field Records

F. L. S. Peacock
Chief, Section of Field Work

L. O. Colbert
Chief, Division of Charts

Chief, Division of Hydrography and Topography.

T-5471

PLANE COORDINATE GRID SYSTEM

Positions of grid intersections used for fitting the grid to this compilation were computed by Division of Geodesy and the computation forms are included in this report.

Positions plotted by H. D. REED. JR.

Positions checked by _____

Grid inked on machine by H. D. REED, JR.

Intersections inked by H. D. REED, JR.

Points used for plotting grid:

x 2,655.000 FT y 170,000 FT	x 2,670,000 y 160,000
x 2,690.000 y 170,000	x y
x 2,690.000 y 145,000	x y
x 2,655,000 y 145,000	x y

Triangulation stations used for checking grid:

1. Great Bridge, 1931 (X= Y=)	5.
2.	6.
3.	7.
4.	8.

~~T-5470~~
T-5471

Geodetic positions from Lambert coordinates

State Va. South Station Grid intersection A

x	2,655,000	$R_b + A$	27,811,312.71
C		y	170,000
x' (= x − C)	+ 655,000	$R_b + A - y$	27,641,312.71
tan θ		R	
θ	° ′ ″		
	″	y	170,000
$\frac{\theta}{\ell}$ (= Δλ)		y″	− 7759.49
		y′	162,240.51
λ (central mer.)	78° 30′ ″		
− Δλ	2 14 11.7746	φ (by interpolation)	36° 46′ 44.2225
λ	76 15 48.2254		

Station Grid intersection B

x	2,690,000	$R_b + A$	
C		y	170,000
x' (= x − C)	+ 690,000	$R_b + A - y$	27,641,312.71
tan θ		R	
θ	° ′ ″		
	″	y	170,000
$\frac{\theta}{\ell}$ (= Δλ)		y″	− 8,610.77
		y′	161,389.23
λ (central mer.)	78° 30′ ″		
− Δλ	2 21 21.8479	φ (by interpolation)	36° 46′ 35.8050
λ	76 08 38.1521		

$\tan\theta = \frac{x - C}{R_b + A - y}$

$\Delta\lambda = \frac{\theta}{\ell}$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec\theta$

$y'' = 2R \sin^2 \frac{\theta}{2}$

$y' = y - y''$

C is constant added to x′ in computation of coordinates

R_b is map radius of lowest parallel

A is value of y′ for R_b; in most cases it is zero

φ is interpolated from table of y′

(M-28)

~~T 5470~~
T 5471

Geodetic positions from Lambert coordinates

State Va. South Station Grid intersection C

x	2,690,000	$R_b + A$	27,811,312.71
C		y	145,000
x' (= x − C)	+ 690,000	$R_b + A - y$	27,666,312.71
tan θ		R	
θ	° ′ ″		
	″	y	145,000
$\frac{\theta}{\ell}$ (= Δλ)		y″	− 8602.99
		y′	136,397.01
λ (central mer.)	78° 30′ ″		
− Δλ	2 21 14.1865	φ (by interpolation)	36° 42′ 28.6810
λ	76 08 45.8135		

Station Grid intersection D

x	2,655,000	$R_b + A$	
C		y	145,000
x' (= x − C)	+ 655,000	$R_b + A - y$	27,666,312.71
tan θ		R	
θ	° ′ ″		
	″	y	145,000
$\frac{\theta}{\ell}$ (= Δλ)		y″	− 7,752.48
		y′	137,247.52
λ (central mer.)	78° 30′ ″		
− Δλ	2 14 04.5013	φ (by interpolation)	36° 42′ 37.0909
λ	76 15 55.4987		

$\tan\theta = \frac{x - C}{R_b + A - y}$

$\Delta\lambda = \frac{\theta}{\ell}$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec\theta$

$y'' = 2R \sin^2 \frac{\theta}{2}$

$y' = y - y''$

C is constant added to x′ in computation of coordinates

R_b is map radius of lowest parallel

A is value of y′ for R_b; in most cases it is zero

φ is interpolated from table of y′

(M-28)

~~T 5470~~
T 5471

Geodetic positions from Lambert coordinates

State Va. South Station Grid intersection E.

x	2,670,000	$R_b + A$	27,811,312.71
C		y	160,000
$x' (= x - C)$	+ 670,000	$R_b + A - y$	27,651,312.71
$\tan \theta$		R	
θ {	° ′ ″		
	″	y	160,000
$\frac{\theta}{\ell} (= \Delta\lambda)$		y″	− 8 115.96
		y′	151,884.04
λ (central mer.)	78° 30′ ″		
$- \Delta\lambda$	2 17 13.1174	ϕ (by interpolation)	36° 45′ 01.8183
λ	76 12 46.8826		

Station

x		$R_b + A$	
C		y	
$x' (= x - C)$		$R_b + A - y$	
$\tan \theta$		R	
θ {	° ′ ″		
	″	y	
$\frac{\theta}{\ell} (= \Delta\lambda)$		y″	−
		y′	
λ (central mer.)	° ′ ″		
$- \Delta\lambda$		ϕ (by interpolation)	° ′ ″
λ			

$$\tan \theta = \frac{x - C}{R_b + A - y}$$

$$\Delta\lambda = \frac{\theta}{\ell}$$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec \theta$

$$y'' = 2R \sin^2 \frac{\theta}{2}$$

$y' = y - y''$

C is constant added to x′ in computation of coordinates

R_b is map radius of lowest parallel

A is value of y′ for R_b; in most cases it is zero

ϕ is interpolated from table of y′

(M-28)

~~T 5470~~
T 5471

Plane coordinates on Lambert projection

State Va. ~~Lost~~ Station Grid intersect. A

ϕ = 36° 47 " λ = 76° 16 "

Tabular difference of R for 1" of ϕ =

R (for min. of ϕ)			y' (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,647,477	y'		163,836
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 7,736
		° ' "	y		171,572
θ (for min. of λ)					
Cor. for sec. of λ		−			
θ		+ 1 21 19.6756	$\frac{\theta}{2}$		° 40 39.8378
θ''	For machine computation	"		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	0236551283	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.01182 83916
log R				R sin $\frac{\theta}{2}$	327,025
log x'			log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	3,868
x'	R sin θ	+654,005	log R		
		2,000,000.00	log 2		0.30103000
x		2,654,005	log y''		

$x = 2{,}000{,}000.00 + R \sin \theta$ ↓9626 → 1521

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

~~T 5470~~
T5471

Plane coordinates on Lambert projection

State Va. South Station Grid intersect. B

$\phi = 36^\circ\ 47'\ ''$ $\lambda = 76^\circ\ 08'\ ''$

Tabular difference of R for 1" of ϕ =

R (for min. of ϕ)			y' (for min. of ϕ)			
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+	
R		27,647,477	y'			163,836
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+	8,688
		° ' ''	y			172,524
θ (for min. of λ)						
Cor. for sec. of λ		−				
θ		+ 1 26 10.9975	$\frac{\theta}{2}$			°43' 05".49975
θ''	For machine computation	''		For machine computation		
			log θ''			
log θ''			colog 2			9.69897000
S for θ			S for $\frac{\theta}{2}$			
log sin θ	sin θ	.025067087 1	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$		.012534528 3
log R				R sin $\frac{\theta}{2}$		346,548
log x'			log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$		4,344
x'	R sin θ	693,042	log R			
		2,000,000.00	log 2			0.30103000
x		2,693,042	log y''			

x = 2,000,000.00 + R sin θ ↑ 1008 → 507

y = y' + 2R $\sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

~~T 5470~~
T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid intersection C

$\phi = 36^\circ 42'$ " $\lambda = 76^\circ 08'$ "

Tabular difference of R for 1" of ϕ =

R (for min. of ϕ)			y' (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,677,816	y'		133,496
		° ' "	y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 8.696
θ (for min. of λ)			y		142,192
Cor. for sec. of λ		−			
θ		+ 1 26 10.9995	$\frac{\theta}{2}$		° 43 0549975
θ''	For machine computation	"		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	.025067087 1	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.012534578 3
log R				R sin $\frac{\theta}{2}$	346,928
log x'			log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	4,348
x'	R sin θ	693,802	log R		
		2,000,000.00	log 2		0.30103000
x		2,693,802	log y''		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

~~T 5470~~
T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid intersection D

ϕ = 36° 42′ ″ λ = 76° 16′ ″

Tabular difference of R for 1″ of ϕ =

R (for min. of ϕ)			y′ (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,677,816	y′		133.496
			y″ (=2R sin² $\frac{\theta}{2}$)		+ 7.744
θ (for min. of λ)		° ′ ″	y		141,240
Cor. for sec. of λ		−			
θ		+ 1 21 19.6756	$\frac{\theta}{2}$		° 40′ 39.8378
θ''	For machine computation	″		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	.02365 51283	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.01182 83916
log R				R sin $\frac{\theta}{2}$	327,384
log x′			log sin² $\frac{\theta}{2}$	R sin² $\frac{\theta}{2}$	3,872
x′	R sin θ	654,722	log R		
		2,000,000.00	log 2		0.30103000
x		2,654,722	log y″		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y′= the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y′, and θ are given in special tables

(R 340)

T5470

Plane coordinates on Lambert projection

State Va. South Station Grid intersect E

$\phi = 36^\circ\ 45'\ 01''.8183$ $\lambda = 76^\circ\ 12'\ 46''.8826$

Tabular difference of R for 1" of ϕ = 101.13233

R (for min. of ϕ)		27,659,612.46		y' (for min. of ϕ)		151,700.25
Cor. for sec. of ϕ		− 183.89		Cor. for sec. of ϕ		+ 183.89
R		27,659,428.57		y'		151,884.14
				y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 8,115.96
θ (for min. of λ)		+ 1°23' 45".3375		y		160,000.00
Cor. for sec. of λ		− 28.4542				
θ		+ 1 23 16.8833		$\frac{\theta}{2}$		° 41' 38".44
θ''	For machine computation	4996".8833			For machine computation	
				log θ''		3.69869921
log θ''		3.69869921		colog 2		9.69897000
S for θ		4.68553238		S for $\frac{\theta}{2}$		4.68556425
log sin θ	sin θ			log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.08323346
log R		7.44184320			R sin $\frac{\theta}{2}$	
log x'		582607479		log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	6.16646692
x'	R sin θ	669,999.98		log R		7.44184320
		2,000,000.00		log 2		0.30103000
x		2,669,999.98		log y''		3.90934012

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T 5470

Plane coordinates on Lambert projection

State Va. South Station Grid Intersect. A

ϕ = 36° 46' 44.2225 λ = 76° 15' 48.2254

Tabular difference of R for 1" of ϕ = 101.13217

R (for min. of ϕ)		27,653,544.52	y' (for min. of ϕ)		157,768.19
Cor. for sec. of ϕ		− 4472.32	Cor. for sec. of ϕ		+ 4472.32
R		27,649,072.20	y'		162,240.51
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 7759.49
θ (for min. of λ)		+ 1°21' 56.0911	y		170,000.00
Cor. for sec. of λ		− 29.2692			
θ		+ 1 21 26.8219	$\frac{\theta}{2}$		°40' 43.41
θ''	For machine computation	4886".8219		For machine computation	
			log θ''		3.68902651
log θ''		3.68902651	colog 2		9.69897000
S for θ		4.68553423	S for $\frac{\theta}{2}$		4.68556471
log sin θ	sin θ		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.07356122
log R		7.44168056		R sin $\frac{\theta}{2}$	
log x'		5.81624130	log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	6.14712244
x'	R sin θ	655 000.00	log R		7.44168056
		2,000,000.00	log 2		0.30103000
x		2,655,000.00	log y''		3.88983300

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T 5470

Plane coordinates on Lambert projection

State Va South Station Grid Intersection B

$\phi = 36^\circ\ 46'\ 35.8050$ $\lambda = 76^\circ\ 08'\ 38.1521$

Tabular difference of R for 1" of ϕ = 101.13217

R (for min. of ϕ)		27,653,544.52	y' (for min. of ϕ)		157,768.19
Cor. for sec. of ϕ		− 3621.04	Cor. for sec. of ϕ		+ 3621.04
R		27,649,923.48	y'		161,389.23
			y" (=2R $\sin^2 \frac{\theta}{2}$)		+ 8,610.77
θ (for min. of λ)		+ 1° 26' 10.9995	y		170,000.00
Cor. for sec. of λ		− 23.1555			
θ		+ 1 25 47.8440	$\frac{\theta}{2}$		°42' 53.9
θ"	For machine computation	5147.8440		For machine computation	
			log θ"		3.71162538
log θ"		3.71162538	colog 2		9.69897000
S for θ		4.68552978	S for $\frac{\theta}{2}$		4.68556359
log sin θ	sin θ		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.09615897
log R		7.44169394		R sin $\frac{\theta}{2}$	
log x'		5.83884910	log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	6.19231794
x'	R sin θ	690,000.02	log R		7.44169394
		2,000,000.00	log 2		0.30103000
x		2,690,000.02	log y"		3.93504188

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine

(see log tables)

R, y', and θ are given in special tables

(R 340)

T 5470

Plane coordinates on Lambert projection

State Va. South Station Grid Intersect. C

$\phi = 36^\circ\ 42'\ 28''.6810$ $\lambda = 76^\circ\ 08'\ 45''.8135$

Tabular difference of R for 1" of ϕ = 101.13233

R (for min. of ϕ)		27,677,816.28		y' (for min. of ϕ)		133,496.43	
Cor. for sec. of ϕ		− 2900.58		Cor. for sec. of ϕ		+ 2900.58	
R		27,674,915.70		y'		136,397.01	
				y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 860299	
θ (for min. of λ)		+ 1° 26' 10''.9995		y		145,000.00	
Cor. for sec. of λ		− 27.8054					
θ		+ 1 25 43.1941		$\frac{\theta}{2}$		°42' 51''.6	
θ''	For machine computation	5143".1941			For machine computation		
				log θ''		3.71123291	
log θ''		3.71123291		colog 2		9.69897000	
S for θ		4.68552987		S for $\frac{\theta}{2}$		4.68556361	
log sin θ	sin θ			log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.09576652	
log R		7.44208631			R sin $\frac{\theta}{2}$		
log x'		5.83884909		log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	6.19153304	
x'	R sin θ	690,000.00		log R		7.44208631	
		2,000,000.00		log 2		0.30103000	
x		2,690,000.00		log y''		3.93464935	

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T 5470

Plane coordinates on Lambert projection

State Va. South Station Grid Intersect. D

$\phi = 36^\circ 42' 37''.0909$ $\lambda = 76^\circ 15' 55''.4987$

Tabular difference of R for 1" of ϕ = 101.13233

R (for min. of ϕ)		27,677,816.28	y' (for min. of ϕ)		133,496.43
Cor. for sec. of ϕ		− 3751.09	Cor. for sec. of ϕ		+ 3751.09
R		27,674,065.19	y'		137,247.52
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 7,752.48
θ (for min. of λ)		+ 1° 21' 56".0911	y		145,000.00
Cor. for sec. of λ		− 33.6835			
θ		+1 21 22.4076	$\frac{\theta}{2}$		°40' 41".2
θ''	For machine computation	4882".4076		For machine computation	
			log θ''		3.68863404
log θ''		3.68863404	colog 2		9.69897000
S for θ		4.68553431	S for $\frac{\theta}{2}$		4.68556473
log sin θ	sin θ		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.07316877
log R		7.44207296		R sin $\frac{\theta}{2}$	
log x'		5.81624131	log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	6.14633754
x'	R sin θ	655,000.02	log R		7.44207296
		2,000,000.00	log 2		0.30103000
x		2,655,000.02	log y''		3.88944050

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

T5470

A

2,654,005
171,572

2,655,000
170,000

B

2,693,042
172,524

2,690,000
170,000

E

2,670,000
160,000

D

2,654,722
141,240

2,655,000
145,000

2,690,000
145,000

C

2,693,802
142,192

M-350

T-5472

PLANE COORDINATE GRID SYSTEM

Positions of grid intersections used for fitting the grid to this compilation were computed by Division of Geodesy and the computation forms are included in this report.

Positions plotted by H. D. REED, JR.

Positions checked by —

Grid inked on machine by H. D. REED, JR.

Intersections inked by H. D. REED, JR.

Points used for plotting grid:

x 2,695,000 FT y 165,000 FT	x 2,710,000 y 150,000
x 2,725,000 y —165,000	x y
x 2,695,000 y 140,000	x y
x 2,725,000 y 140,000	x y

Triangulation stations used for checking grid:

1. North Landing, 1931 (X= Y=)	5.
2.	6.
3.	7.
4.	8.

~~T-5471~~

Geodetic positions from Lambert coordinates

State Va South Station Grid Intersection A

x	2,695,000	$R_b + A$	27,811,312.71
C		y	165,000
x' (= x − C)	+695,000	$R_b + A - y$	27,646,312.71
tan θ		R	
θ	° ′ ″		
	″	y	165,000
$\frac{\theta}{\ell}$ (= Δλ)		y''	− 8 734.41
		y'	156,265.59
λ (central mer.)	78° 30′ ″		
− Δλ	+ 2 22 21.7403	φ (by interpolation)	36° 45′ 45.1422
λ	76 07 38.2597		

Station Grid intersection B

x	2,725,000	$R_b + A$	
C		y	165,000
x' (= x − C)	+725,000	$R_b + A - y$	27,646,312.71
tan θ		R	
θ	° ′ ″		
	″	y	165,000
$\frac{\theta}{\ell}$ (= Δλ)		y''	− 9 504.61
		y'	155,495.39
λ (central mer.)	78° 30′ ″		
− Δλ	2 28 30.2832	φ (by interpolation)	36° 45′ 37.5265
λ	76 01 29.7168		

$$\tan\theta = \frac{x - C}{R_b + A - y}$$

$$\Delta\lambda = \frac{\theta}{\ell}$$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec\theta$

$$y'' = 2R \sin^2 \frac{\theta}{2}$$

$y' = y - y''$

C is constant added to x′ in computation of coordinates

R_b is map radius of lowest parallel

A is value of y′ for R_b; in most cases it is zero

φ is interpolated from table of y′

(M-28)

T 5471

Geodetic positions from Lambert coordinates

State Va. South Station Grid intersection C

x	2,695,000	$R_b + A$	27,811,312.71
C		y	140,000
x' (= x − C)	+695,000	$R_b + A - y$	27,671,312.71
tan θ		R	
θ	° ′ ″		
	″	y	140,000
$\frac{\theta}{\ell}$ (= Δλ)		y''	− 8,726.53
		y'	131,273.47
λ (central mer.)	78° 30′ ″		
− Δλ	2 22 14.0261	φ (by interpolation)	36° 41′ 38.0193 ✓
λ	76 07 45.9739 ✓		

Station Grid intersection D.

x	2,725,000	$R_b + A$	
C		y	140,000
x' (= x − C)	+725,000	$R_b + A - y$	27,671,312.71
tan θ		R	
θ	° ′ ″		
	″	y	140,000
$\frac{\theta}{\ell}$ (= Δλ)		y''	− 9,496.02
		y'	130,503.98
λ (central mer.)	78° 30′ ″		
− Δλ	2 28 22.2367 ✓	φ (by interpolation)	36° 41′ 30.4106
λ	76 01 37.7633		

$\tan\theta = \frac{x - C}{R_b + A - y}$

$\Delta\lambda = \frac{\theta}{\ell}$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec\theta$

$y'' = 2R \sin^2 \frac{\theta}{2}$

$y' = y - y''$

C is constant added to x' in computation of coordinates

R_b is map radius of lowest parallel

A is value of y' for R_b; in most cases it is zero

φ is interpolated from table of y'

(M-28)

T5471

Geodetic positions from Lambert coordinates

State Va. South Station Grid intersection E

x	2,710,000	$R_b + A$	27,811,312.71
C		y	150,000
x' (= x − C)	+710,000	$R_b + A - y$	27,661,312.71
tan θ		R	
θ	° ′ ″		
	″	y	150,000
$\frac{\theta}{\ell}$ (= Δλ)		y″	− 9110.50
		y′	140,889.50
λ (central mer.)	78° 30′ ″		
− Δλ	2 25 21.2843	φ (by interpolation)	36° 43′ 13.1029 ✓
λ	76 04 38.7157 ✓		

Station

x		$R_b + A$	
C		y	
x' (= x − C)		$R_b + A - y$	
tan θ		R	
θ	° ′ ″		
	″	y	
$\frac{\theta}{\ell}$ (= Δλ)		y″	−
		y′	
λ (central mer.)	° ′ ″		
− Δλ		φ (by interpolation)	° ′ ″
λ			

$$\tan\theta = \frac{x - C}{R_b + A - y}$$

$$\Delta\lambda = \frac{\theta}{\ell}$$

$\lambda = \lambda$ (central mer.) $- \Delta\lambda$

$R = (R_b + A - y) \sec\theta$

$$y'' = 2R \sin^2\frac{\theta}{2}$$

$y' = y - y''$

C is constant added to x′ in computation of coordinates

R_b is map radius of lowest parallel

A is value of y′ for R_b; in most cases it is zero

φ is interpolated from table of y′

(M-26)

T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid Intersection A.

$\phi = 36^\circ\ 45'\ 45''.1422$ $\lambda = 76^\circ\ 07'\ 38''.2597$

Tabular difference of R for 1" of ϕ = 101.13233

R (for min. of ϕ)		27,659,612.46		y' (for min. of ϕ)		151,700.25	
Cor. for sec. of ϕ		− 4565.34		Cor. for sec. of ϕ		+ 4,565.34	
R		27,655,047.12		y'		156,265.59	
				y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 8734.41	
θ (for min. of λ)		+ 1° 26' 47".4150		y		165,000.00	
Cor. for sec. of λ		− 23.2208					
θ		+ 1 26 24.1942		$\frac{\theta}{2}$		°43' 12".971	
θ''	For machine computation	"			For machine computation		
				log θ''			
log θ''				colog 2		9.69897000	
S for θ				S for $\frac{\theta}{2}$			
log sin θ	sin θ	.025131 0367		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.012565 5106	
log R					R sin $\frac{\theta}{2}$	347,527.443	
log x'				log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	4,367.207	
x'	R sin θ	695,000.00		log R			
		2,000,000.00		log 2		0.30103000	
x				log y''			

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T 5471

Plane coordinates on Lambert projection

State Va South Station Grid intersection B.

ϕ = 36° 45' 37.5265 λ = 76° 01' 29.7168

Tabular difference of R for 1" of ϕ = 101.13233

R (for min. of ϕ)		27,659,612.46	y' (for min. of ϕ)		151,700.25
Cor. for sec. of ϕ		− 3795.14	Cor. for sec. of ϕ		+ 3795.14
R		27,655,817.32	y'		155,495.39
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 9,504.61
θ (for min. of λ)		+ 1° 30' 25.9079	y		165,000.00
Cor. for sec. of λ		− 18.0359			
θ		1 30 07.8720	$\frac{\theta}{2}$		° 45' 0"3936
θ''	For machine computation	"		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	.0262150997	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.013108 6762
log R				R sin $\frac{\theta}{2}$	362,531.14
log x'			log sin^2 $\frac{\theta}{2}$	R sin^2 $\frac{\theta}{2}$	4,752.303
x'	R sin θ	725,000.00	log R		
		2,000,000.00	log 2		0.30103000
x		2,725	log y''		

x = 2,000,000.00 + R sin θ

y = y' + 2R $\sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid intersection C

ϕ = 36° 41′ 38.0193 λ = 76° 07′ 45.9739

Tabular difference of R for 1″ of ϕ = 101.13250

R (for min. of ϕ)		27,683,884.23	y′ (for min. of ϕ)		127,428.48
Cor. for sec. of ϕ		− 384499	Cor. for sec. of ϕ		+ 3844.99
R		27,680,039.24	y′		131,273.47
			y″ (=2R sin² $\frac{\theta}{2}$)		+ 8,726.53
θ (for min. of λ)		+ 1° 26′ 47″.4150	y		140,000.00
Cor. for sec. of λ		− 27.9027			
θ		1 26 19.5123	$\frac{\theta}{2}$		°43 ′09.75
θ″	For machine computation	+ 5179.″5123		For machine computation	
			log θ″		3.71428887
log θ″		3.71428887	colog 2		9.69897000
S for θ		4.68552922	S for $\frac{\theta}{2}$		4.68556345
log sin θ	sin θ		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.09882232
log R		7.44216671		R sin $\frac{\theta}{2}$	
log x′		5.84198480	log sin² $\frac{\theta}{2}$	R sin² $\frac{\theta}{2}$	6.19764464
x′	R sin θ	695,000	log R		7.44216671
		2,000,000.00	log 2		0.30103000
x			log y″		3.94084135

x = 2,000,000.00 + R sin θ

y = y′ + 2R sin² $\frac{\theta}{2}$

y′ = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y′, and θ are given in special tables

(R 340)

T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid intersection D

ϕ = 36° 41' 30.4106 λ = 76° 01' 37.7633

Tabular difference of R for 1" of ϕ = 101.13250

R (for min. of ϕ)		27,683,884.23	y' (for min. of ϕ)			127,428.48
Cor. for sec. of ϕ		− 3075.50	Cor. for sec. of ϕ			+ 3075.50
R		27,680,808.73	y'			130,503.98
			y'' (=2R sin² $\frac{\theta}{2}$)			+ 9,496.02
θ (for min. of λ)		+ 1° 30' 25.9079	y			140,000.00
Cor. for sec. of λ		− 22.9195				
θ	'	1 30 02.9884	$\frac{\theta}{2}$			°45 0'1.49
θ''	For machine computation	5402.9884		For machine computation		
			log θ''			3.73263404
log θ''		3.73263404	colog 2			9.69897000
S for θ		4.68552520	S for $\frac{\theta}{2}$			4.68556246
log sin θ	sin θ		log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$		8.11716650
log R		7.44217878		R sin $\frac{\theta}{2}$		
log x'		5.86033802	log sin² $\frac{\theta}{2}$	R sin² $\frac{\theta}{2}$		6.23433300
x'	R sin θ	725,000.02	log R			7.44217878
		2,000,000.00	log 2			0.30103000
x			log y''			3.97754178

x = 2,000,000.00 + R sin θ

y = y' + 2R sin² $\frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine

(see log tables)

R, y', and θ are given in special tables

(R 340)

T 5471

Plane coordinates on Lambert projection

State Va. South Station Grid Intersection E

ϕ = 36° 43′ 13.1029 λ = 76° 04′ 38.7157

Tabular difference of R for 1″ of ϕ = 101.13233

R (for min. of ϕ)		27,671,748.34	y′ (for min. of ϕ)		139,564.37
Cor. for sec. of ϕ		− 1 325.13	Cor. for sec. of ϕ		+ 1 325.13
R		27,670,423.21	y′		140,889.50
			y″ (=2R sin² $\frac{\theta}{2}$)		+ 9,110.50
θ (for min. of λ)		+ 1° 28′ 36.6615	y		150,000.00
Cor. for sec. of λ		− 23.4975			
θ		1 28 13.1640	$\frac{\theta}{2}$		° 44 06.6
θ''	For machine computation	5293.1640		For machine computation	
log θ''		3.72371535	log θ''		3.72371535
S for θ		4.68552720	colog 2		9.69897000
log sin θ	sin θ		S for $\frac{\theta}{2}$		4.68556295
log R		7.44201580	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	8.10824830
log x′		5.85125835		R sin $\frac{\theta}{2}$	
x′	R sin θ	710,000	log sin² $\frac{\theta}{2}$	R sin² $\frac{\theta}{2}$	6.21649660
		2,000,000.00	log R		7.44201580
			log 2		0.30103000
x			log y″		3.95954240

x = 2,000,000.00 + R sin θ

y = y′ + 2R sin² $\frac{\theta}{2}$

y′ = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y′, and θ are given in special tables

(R 340)

A

2,691,974
166,426

2,695,000
165,000

B

2,727,358
167,335

2,725,000
165,000

2,710,000 E
150,000

2,695,000
140,000

C

2,692,733
136,096

2,725,000
140,000

B

2,728,156
137,005

T 5471

Plane coordinates on Lambert projection

State Va South Station A

ϕ = 36° 46′ λ = 76° 08′ 15″

Tabular difference of R for 1″ of ϕ =

R (for min. of ϕ)			y′ (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,653,544	y′		157,768
			y″ (=2R $\sin^2 \frac{\theta}{2}$)		+ 2x4 329
		° ′ ″			~~162,097~~
θ (for min. of λ)			y		166,426
Cor. for sec. of λ		−			° ′ ″
θ		+ 1 26 01.895	$\frac{\theta}{2}$		
θ''	For machine computation	″		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	0.02502296	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	0.01251242
log R				R sin $\frac{\theta}{2}$	346,013.
log x′			log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	
x′	R sin θ	+691,974	log R		
		2,000,000.00	log 2		0.30103000
x		2,691,974	log y″		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T5471

Plane coordinates on Lambert projection

State Va South Station B

$\phi = 36^\circ 46''$ $\lambda = 76^\circ 01''$

Tabular difference of R for 1" of ϕ =

R (for min. of ϕ)			y' (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,653,544	y'		157,768
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 9,567
		° ′ ″	y		167,335
θ (for min. of λ)					
Cor. for sec. of λ		−			
θ		+ 1 30 25.907	$\frac{\theta}{2}$		° ′ ″
θ''	For machine computation	"		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	0.026302510 1	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.013152 3927
log R				R sin $\frac{\theta}{2}$	363,710.3
log x'			log sin^2 $\frac{\theta}{2}$	R sin^2 $\frac{\theta}{2}$	4,783.6
x'	R sin θ	+ 727,358	log R		
		2,000,000.00	log 2		0.30103000
x		2,727,358	log y''		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables

(R 340)

T5471

Plane coordinates on Lambert projection

State Va South Station C

$\phi = 36^\circ\ 41'\ ''$ $\lambda = 76^\circ\ 08'\ 15''$

Tabular difference of R for 1″ of ϕ =

R (for min. of ϕ)			y′ (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,683,884	y′		127,428
			y″ (=2R $\sin^2 \frac{\theta}{2}$)		+ 2(4,334)
θ (for min. of λ)		+ 1° 26′ 10.9995	y		~~131,762~~
Cor. for sec. of λ		− 9.1039			136,096
θ		+ 1 26 01.8956	$\frac{\theta}{2}$		° ′ ″
θ''	For machine computation	″		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	0.02502296	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	.0125 1242
log R				R sin $\frac{\theta}{2}$	346,392.4
log x′			log sin^2 $\frac{\theta}{2}$	R sin^2 $\frac{\theta}{2}$	
x′	R sin θ	+692,733	log R		
		2,000,000.00	log 2		0.30103000
x		2,692,733	log y″		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y′, and θ are given in special tables

(R 340)

T 5471

Plane coordinates on Lambert projection

State Va South Station D

$\phi = 36° 41' ''$ $\lambda = 76° 01' ''$

Tabular difference of R for 1" of ϕ =

R (for min. of ϕ)			y' (for min. of ϕ)		
Cor. for sec. of ϕ		−	Cor. for sec. of ϕ		+
R		27,683,884	y'		127,428
			y'' (=2R $\sin^2 \frac{\theta}{2}$)		+ 9,577
		° ' ''	y		137,005
θ (for min. of λ)					
Cor. for sec. of λ		−			° ' ''
θ		+ 1 30 25.9079	$\frac{\theta}{2}$		
θ''	For machine computation	''		For machine computation	
			log θ''		
log θ''			colog 2		9.69897000
S for θ			S for $\frac{\theta}{2}$		
log sin θ	sin θ	0.026302510	log sin $\frac{\theta}{2}$	sin $\frac{\theta}{2}$	0.013152392
log R				R sin $\frac{\theta}{2}$	364,109.3
log x'			log $\sin^2 \frac{\theta}{2}$	R $\sin^2 \frac{\theta}{2}$	4,788.9
x'	R sin θ	+ 728,156	log R		
		2,000,000.00	log 2		0.30103000
x		2,728,156	log y''		

$x = 2{,}000{,}000.00 + R \sin \theta$

$y = y' + 2R \sin^2 \frac{\theta}{2}$

y' = the value of y on the central meridian for the latitude of the station

S = log of ratio for reducing arc expressed in seconds to sine (see log tables)

R, y', and θ are given in special tables