COMMONWEALTH OF VIRGINIA
DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES

A MAGNETIC SURVEY OF THE COASTAL PLAIN IN VIRGINIA

D. C. Le Van and R. F. Pharr

REPORT OF INVESTIGATIONS 4

VIRGINIA DIVISION OF MINERAL RESOURCES

James L. Calver
Commissioner of Mineral Resources and State Geologist

CHARLOTTESVILLE, VIRGINIA
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Commonwealth of Virginia
Department of Purchases and Supply
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A MAGNETIC SURVEY OF THE COASTAL PLAIN IN VIRGINIA

By

D. C. Le Van and R. F. Pharr

ABSTRACT

A program of magnetic investigations on the Coastal Plain of Virginia was begun by the Virginia Division of Mineral Resources in May, 1960. Ground and airborne data collected indicate that the outstanding magnetic feature is a major trend of magnetic high anomalies 4 to 12 miles in width that extends in a northeasterly direction from the vicinity of Sussex, Sussex County, to Currioman Bay, Westmoreland County, a distance of about 100 miles. The trend continues northward into Maryland. Values of vertical magnetic intensity as much as 2000 gammas above the regional field were recorded locally along this trend. A second trend of magnetic highs extends northwestward from the vicinity of Whaleyville, Nansemond County, to the James River in northeastern Prince George County, a distance of approximately 50 miles. These two trends are bordered in part by magnetic lows. An elongate northerly-trending magnetic high occurs west of West Point, King William County. A prominent magnetic high occurs near Gloucester, Gloucester County, and other highs occur in the vicinity of Cape Henry, Princess Anne County; South Bay, Northampton County; and Parramore Island, Accomack County. Magnetic lows were recorded in an area near the mouth of the Rappahannock River, in the adjacent portions of Chesapeake Bay, and from near Newport News southward through Lake Drummond into North Carolina.

INTRODUCTION

In May, 1960, the Virginia Division of Mineral Resources began a program of magnetic investigations on the Coastal Plain of Virginia. This program was undertaken in order to make available additional data on the subsurface geology of the Coastal Plain of Virginia. The study is considered to be timely in view of the increasing interest in the Atlantic Coastal Plain as a potential petroleum province.

During 1960 determinations of the vertical intensity of the earth's magnetic field were made at 610 ground stations. Data from these stations were coordinated with the U. S. Magnetic Observatory at Corbin, Virginia, and were reduced to absolute values for the vertical component of the magnetic field. The program was subsequently broadened by information obtained during a Project Magnet flight by the Airborne Section of the U. S. Navy Hydrographic Office in October, 1961. This flight, which traversed approximately 1000 miles over the Coastal Plain, supplemented the ground data previously gathered, and provided information on portions of the Coastal Plain not previously covered by the ground survey.

GEOLOGIC SETTING

The Virginia Coastal Plain, approximately 8100 square miles, is bordered on the west by the Fall Zone, and on the east by the Atlantic Ocean and the submerged continental shelf. The area is characterized by a surface of low relief, with elevations lying between sea level and 300 feet. Chesapeake Bay and the large tidal estuaries of the Rappahannock, York, James, and other major streams are prominent features in the area.

This area is underlain by an eastward-thickening wedge of unconsolidated and poorly consolidated clay, sand, gravel, and marl of Cretaceous, Tertiary, and Quaternary age. These sediments have a gentle eastward dip and range in thickness from a feather-edge along the Fall Zone to a thickness of approximately 2300 feet in the Norfolk area. The sediments were deposited upon an east-dipping erosional surface underlain by igneous and metamorphic rocks. Three significant wells that have penetrated basement rocks in the Virginia Coastal Plain are as follows:

County	Well	Depth to Basement	Well Number on Plates 1 and 2
King William	Roberts Drilling Co. Hugh Townsend No. 1	2609′	1
Mathews	Elkins Oil & Gas Co. Phillips No. 1	2307′	2
City of Hampton	U. S. Army Fort Monroe	2246′	3

Samples from these wells indicate that granitic basement rocks underlie the sediments in Mathews County and at Fort Monroe, and that the basement is composed of hornblende schist, gneiss, and quartzite at the King William County location. Well samples indicate also that Triassic sediments, probably preserved in down-faulted

Triassic basins similar to those in the Piedmont province to the west, are concealed beneath the younger Mesozoic and Cenozoic sediments in the vicinity of Bowling Green, Caroline County, and in King William County. A total of approximately 1600 feet of strata of probable Triassic age were encountered in the No. 1 Townsend well in King William County.

PREVIOUS WORK

Woollard (1940) established three magnetic traverses across the Coastal Plain of Virginia. Two of these traverses followed previous seismic (Ewing, Crary, and Rutherford, 1937) and gravity (Swick, 1937) traverses. The first extended from Richmond eastward along the north side of the James River to Fort Monroe. The second extended from Centralia, on the west, along the south side of the James River to Cape Henry on the east. A third traverse was made from Petersburg to Waverly, also on the south side of the James River. On all three magnetometer traverses Woollard noted a marked area of magnetic "highs" about eight miles wide, just east of an area of marked magnetic "lows" near the Fall Zone. He found that the character of the magnetic highs appeared to vary on each traverse and explained this as a probable expression of marked variations in basement rock rather than in basement relief. From the relatively constant width of the anomaly on all three traverse lines, he postulated that the feature was continuous over a large area.

Skeels (1950) reported on an investigation conducted by the Standard Oil Company of New Jersey in the area between Chesapeake Bay, Virginia, and Albemarle Sound, North Carolina. A detailed magnetic survey was carried out over part of the area by that company and some magnetic stations were observed along the coast of Virginia south of Cape Henry. Several rather strong anomalies that were encountered were ascribed to variations in the basement rocks.

Previous to the flight made in October, 1961, for this report, the Airborne Section of the United States Hydrographic Office has recorded several aerial magnetic tracks in eastern Virginia during portions of flights connected with Project Magnet.

ACKNOWLEDGMENTS

The writers wish to express their appreciation to Robert E. Gebhardt, Observer in Charge of the Fredericksburg Magnetic Observatory, and J. B. Townshend, Observatory Geophysicist, for the close cooperation they extended to this Division during the ground survey.

Special thanks is due Wilburt H. Geddes, Head of the Airborne Section, U. S. Navy Hydrographic Office, for making possible the airborne survey, and to both him and N. J. Dipiazza, Geophysicist of the Airborne Section, for numerous helpful suggestions and for their kind assistance in reviewing the airborne data presented in this report.

MAGNETIC SURVEYS

GROUND SURVEY

The ground survey covered that portion of the Coastal Plain bounded by the Fall Zone on the west, the Potomac River on the north, Chesapeake Bay on the east, and the James River on the south (Figure 1). This report includes data from 486 stations established at approximate half mile intervals along seven traverses listed as A through G on Figure 1.

Procedure

Measurements of the vertical component of the earth's magnetic field were made with an Askania Magnetic Field Balance Model GF6. The scale value of the instrument was established initially using a Helmholtz coil in a room free from magnetic interference at the Fredericksburg Magnetic Observatory, and was checked periodically in the field by use of the coil. The scale value ranged from 27.2 to 28.3 gammas during the survey.

Field observations on traverse lines were made, where practical, at intervals of approximately half a mile along highways and rural roads. All stations were established some distance from roads, powerlines, fences, buildings, and other potential sources of magnetic interference. Locations of all stations were plotted on standard topographic maps published by the U. S. Geological Survey and the Corps of Engineers.

In order to minimize errors because of orientation, two readings were made at each station with the north end of the magnet system in the east direction and two readings with the north end oriented west. These four readings were averaged to obtain the final reading for each station. The field party communicated regularly with the Fredericksburg Magnetic Observatory in order to synchronize the time of the readings made in the field with those made at the Observatory, and to be advised of the commencement of magnetic storms. Readings that were made during periods of pronounced magnetic disturbance were discarded and the stations were reoccupied to obtain new measurements.

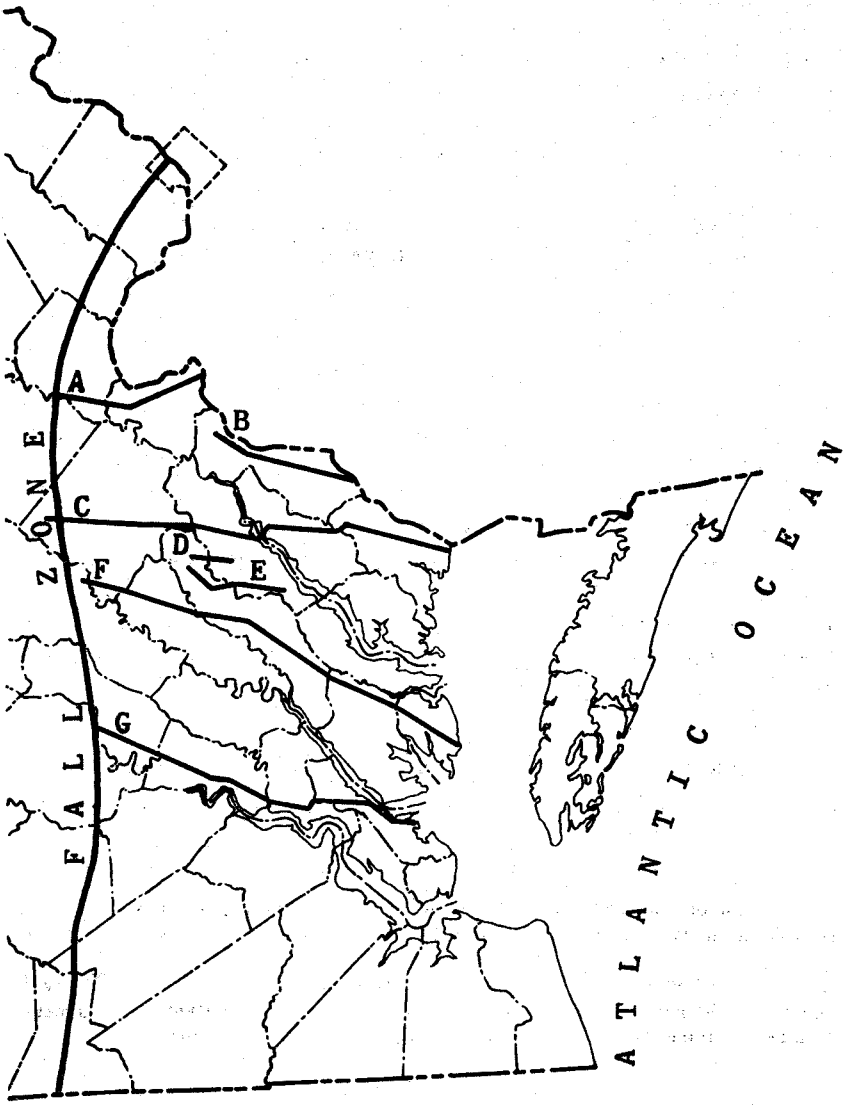

Figure 1. Map of the Virginia Coastal Plain showing location of ground traverses.

All magnetic determinations made in the field were corrected for temperature and for diurnal variations of the magnetic field by adjustment to a base line established by the Observatory. Continuous readings of the variations in the earth's magnetic field are made at the Observatory, and the variating recording instruments there are periodically calibrated with a nuclear precession magnetometer to an absolute accuracy of about one gamma (0.00001 gauss). The close control afforded by coordination with the Observatory allowed the field readings to be corrected to absolute values. The final determinations, presented in this report, have not been compensated for differences in magnetic latitude.

Field Work

The field work for the ground magnetic survey was done during the summer and fall of 1960. During the period from June 15 through September 15 field readings were made by Robert C. Barnes and John H. Feagans under the general supervision of the writers. These readings include the magnetic stations established along Traverses A, C, D, E, and F. The field readings for Traverse B were made by the writers, and Traverse G was made by Richard F. Pharr with the assistance of Robert S. Wood. Coordination of the program with the Fredericksburg Magnetic Observatory and adjustment of all field determinations were done by the writers.

Table 1.—Vertical intensity determinations obtained during ground survey, see Plate 1 for location of stations

Traverse A

Location of Traverse: from 1.2 miles west of Fredericksburg, Spotsylvania County, eastward to the Potomac River Toll Bridge on U. S. Highway 301 in King George County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	53092	8	53141	15	53223
2	53058	9	53146	16	53187
3	53072	10	53158	17	53172
4	53078	11	53227	18	53172
5	53066	12	53271	19	53176
6	53068	13	53255	20	53189
7	53102	14	53227	21	53216

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
22	53208	34	53143	46	53090
23	53213	35	53148	47	53065
24	53221	36	53151	48	53066
25	53222	37	53134	49	53063
26	53206	38	53131	50	53053
27	53164	39	53138	51	53060
28	53153	40	53167	52	53063
29	53166	41	53170	53	53038
30	53152	42	53156	54	53051
31	53139	43	53140	55	53045
32	53140	44	53114	56	53026
33	53140	45	53095		

Traverse B

Location of Traverse: from 1.5 miles east of Oak Grove, Westmoreland County, eastward to a position half a mile south of Sandy Point, Westmoreland County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52773	17	53291	33	52611
2	52757	18	53137	34	52626
3	52746	19	53126	35	52590
4	52789	20	53133	36	52593
5	52757	21	53055	37	52600
6	52760	22	52817	38	52605
7	52765	23	52733	39	52626
8	52784	24	52843	40	52600
9	52811	25	52821	41	52615
10	52817	26	52907	42	52619
11	52918	27	53213	43	52635
12	52944	28	53122	44	52652
13	52954	29	52940	45	52683
14	53070	30	52727	46	52716
15	53367	31	52715	47	52740
16	53375	32	52700	48	52737

Traverse C

Location of Traverse: from 0.3 mile east of Ladysmith, Caroline County, eastward to a position near the mouth of Gaskin Pond, two miles east of Beverlyville, Northumberland County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52961	34	52715	67	52545
2	53033	35	52707	68	52508
3	53176	36	52688	69	52492
4	53116	37	52682	70	52492
5	53029	38	52687	71	52435
6	53063	39	52700	72	52433
7	52948	40	52728	73	52457
8	52994	41	52776	74	52496
9	53047	42	52867	75	52581
10	53105	43	53048	76	52594
11	52922	44	53267	77	52544
12	53014	45	53519	78	52565
13	52929	46	53783	79	52626
14	53029	47	54236	80	52706
15	52957	48	54127	81	52745
16	52935	49	54074	82	52760
17	52916	50	53779	83	52704
18	52952	51	53472	84	52684
19	52930	52	53086	85	52636
20	52894	53	52778	86	52640
21	52884	54	52618	87	52633
22	52833	55	52620	88	52593
23	52799	56	52717	89	52596
24	52776	57	52765	90	52654
25	52789	58	52669	91	52664
26	52770	59	52560	92	52610
27	52765	60	52573	93	52557
28	52740	61	52702	94	52521
29	52746	62	52666	95	52515
30	52731	63	52568	96	52531
31	52745	64	52565	97	52559
32	52715	65	52524	98	52534
33	52726	66	52521		

Traverse D

Location of Traverse: from 1.5 miles east of Helmet, King and Queen County, eastward to a position 0.6 mile west of Whitlock Forks, Essex County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52792	7	53795	13	53657
2	52812	8	54477	14	53061
3	52841	9	54637	15	52853
4	52900	10	54626	16	52864
5	53220	11	54352		
6	53531	12	54090		

Traverse E

Location of Traverse: from 1.75 miles southwest of Owenton, King and Queen County, eastward to a position 0.4 mile south of Center Cross, Essex County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52750	14	52808	27	52504
2	52824	15	52783	28	52490
3	52879	16	52674	29	52490
4	52942	17	52656	30	52465
5	53204	18	52517	31	52490
6	53676	19	52475	32	52507
7	53771	20	52505	33	52529
8	53917	21	52486	34	52516
9	53556	22	52480	35	52463
10	52948	23	52492	36	52430
11	52813	24	52450	37	52427
12	52799	25	52484	38	52429
13	52822	26	52520		

Traverse F

Location of Traverse: from 1.5 miles west of Doswell, Hanover County, to a position 0.8 mile east of Diggs, Mathews County. Extended traverse leg (stations 35-A through 35-G) extends from 0.2 mile west of Sharon Church southwestward to a position 0.25 mile northwest of Manquin Farms, King William County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52666	35E	52550	72	52440
2	52669	35F	52591	73	52471
3	52669	35G	52560	74	52412
4	52686	36	52618	75	52439
5	52674	37	52797	76	52456
6	52671	38	53060	77	52493
7	52668	39	53155	78	52482
8	52644	40	53101	79	52460
9	52636	41	52852	80	52462
10	52633	42	52753	81	52441
11	52633	43	52678	82	52448
12	52626	44	52648	83	52589
13	52622	45	52606	84	52567
14	52631	46	52446	85	52505
15	52672	47	52583	86	52519
16	52697	48	52566	87	52491
17	52734	49	52614	88	52455
18	52683	50	52951	89	52440
19	52617	51	53195	90	52455
20	52593	52	52925	91	52456
21	52613	53	52521	92	52438
22	52664	54	52347	93	52426
23	52845	55	52414	94	52500
24	52750	56	52425	95	52423
25	52630	57	52445	96	52402
26	52657	58	52428	97	52346
27	52714	59	52489	98	52345
28	52685	60	52424	99	52308
29	52647	61	52386	100	52310
30	52592	62	52411	101	52285
31	52588	63	52382	102	52321
32	52581	64	52373	103	52319
33	52604	65	52378	104	52310
34	52597	66	52403	105	52267
35	52611	67	52397	106	52280
35A	52619	68	52425	107	52285
35B	52572	69	52361	108	52323
35C	52512	70	52411	109	52334
35D	52539	71	52418	110	52389

Traverse G

Location of Traverse: from approximately 0.7 mile east of Richmond, eastward to a position 2.25 miles east of Seaford and just south of Bay Tree Point, York County.

Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity	Station Number	Observed Magnetic Intensity
	Gammas		*Gammas*		*Gammas*
1	52361	39	52135	77	52315
2	52273	40	52149	78	52319
3	52239	41	52160	79	52391
4	52329	42	52159	80	52415
5	52248	43	52210	81	52437
6	52348	44	52247	82	52501
7	52458	45	52298	83	52498
8	52414	46	52245	84	52488
9	52518	47	52206	85	52436
10	52525	48	52230	86	52405
11	52372	49	52193	87	52435
12	52402	50	52181	88	52492
13	52343	51	52167	89	52449
14	52486	52	52188	90	52422
15	52542	53	52139	91	52435
16	52690	54	52214	92	52488
17	52461	55	52281	93	52434
18	52481	56	52271	94	52376
19	52502	57	52234	95	52354
20	52768	58	52253	96	52333
21	53570	59	52235	97	52332
22	54340	60	52253	98	52303
23	53543	61	52264	99	52307
24	53264	62	52381	100	52209
25	52984	63	52222	101	52226
26	53765	64	52261	102	52207
27	54645	65	52245	103	52199
28	54159	66	52276	104	52192
29	53087	67	52338	105	52200
30	53328	68	52355	106	52114
31	52629	69	52332	107	52179
32	52570	70	52371	108	52202
33	52569	71	52386	109	52199
34	52336	72	52332	110	52229
35	52360	73	52359	111	52248
36	52160	74	52365	112	52258
37	52067	75	52343		
38	52128	76	52268		

AIRBORNE SURVEY

The airborne magnetic survey was flown in October, 1961, by the Airborne Section, United States Navy Hydrographic Office, as a part of Project Magnet, a world-wide geomagnetic investigation. This aeromagnetic survey was planned to supplement the ground data listed in this report, and to provide additional information on the Virginia Coastal Plain. The magnetic measurements were recorded using a Navy vector magnetometer (VAM), mounted in a Navy R5D-4R aircraft. During the flight the total magnetic intensity, the direct magnetic dip, and the integrated magnetic dip were measured and recorded continuously. Copies of the recordings were furnished to the Virginia Division of Mineral Resources for use in this report. These data are on file and may be examined at the Division's offices in Charlottesville. Data from the total intensity magnetic record have been computed and plotted by the writers. The aeromagnetic data derived from this record are summarized on Plates 2 and 3. A total of 910 values were scaled from the total intensity tape and plotted for use in construction of the total intensity profiles. Approximately 480 values were used as control points in constructing the total intensity contour map, and the positioning of contour lines was further guided by reference to the profiles.

The flight path (Figure 2), which traversed approximately 1000 miles over the Coastal Plain, consists essentially of a series of ten lines that extend in an eastward direction from the Fall Zone. These lines were planned to supplement the ground data and are spaced 7 to 20 miles apart in a north-south direction between the Potomac River on the north and the Virginia state line on the south. Eight of these lines extend entirely across the Coastal Plain from the Fall Zone to the Atlantic Ocean. The northernmost line extends from near the Fredericksburg Magnetic Observatory to the Potomac River, and the southernmost line lies just north of the Virginia state line and extends eastward from the Fall Zone for a distance of about 30 miles. These ten lines are tied by a north-south line. The aircraft crossed the Fredericksburg Magnetic Observatory at the beginning and end of the flight in order to tie to a known value of magnetic intensity. The magnetogram for October 19, 1961, recorded by the Observatory, shows no significant magnetic disturbance during the period of the flight. During the flight the altitude of the aircraft ranged from 1800 to 3600 feet. The altitude is indicated at five-minute intervals of flight time on the aeromagnetic profiles, Plate 3.

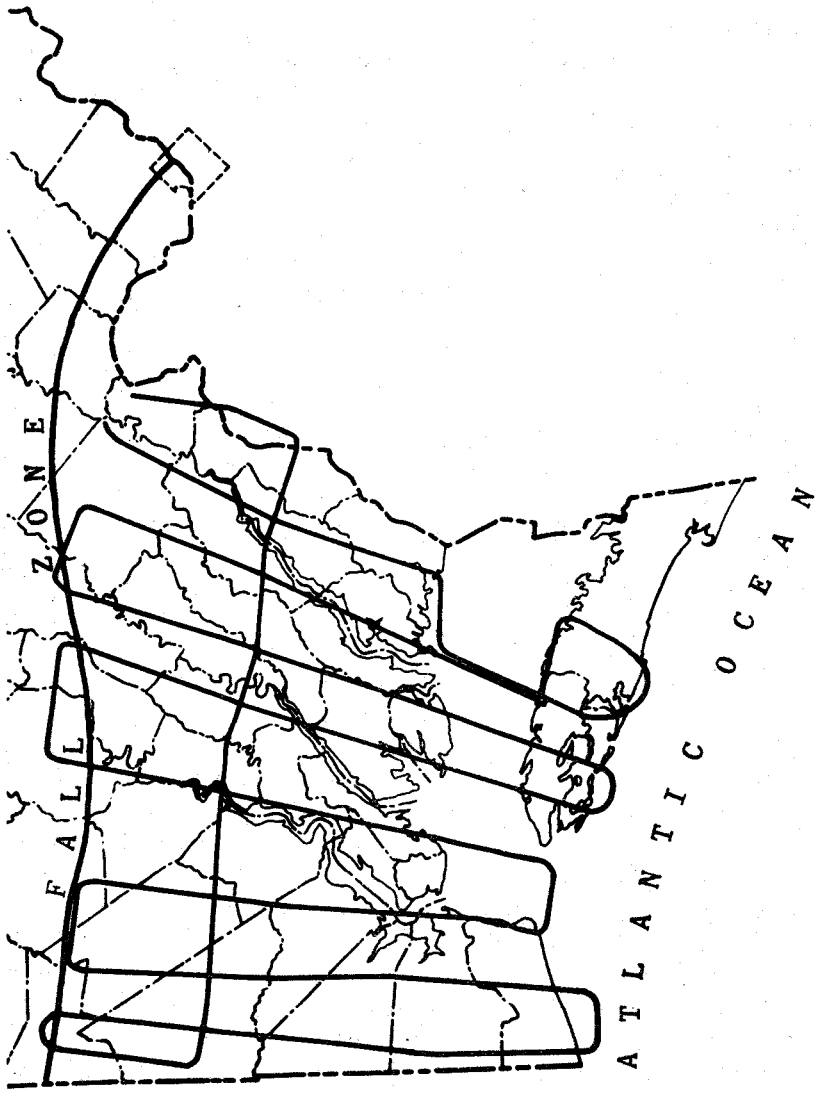

Figure 2.—Map of the Virginia Coastal Plain showing location of airborne track.

RESULTS OF GROUND AND AIRBORNE SURVEY

The configuration of the magnetic field on the Virginia Coastal Plain is shown on Plates 1, 2 and 3. Values of total magnetic intensity recorded during the airborne survey ranged from approximately 55425 to 57300 gammas, a range of about 1875 gammas. Values of vertical magnetic intensity observed in the more-limited area covered by the ground survey range from 52067 to 54637 gammas, a range of 2570 gammas.

MAGNETIC FEATURES

The magnetic features outlined on the Coastal Plain by this survey tend to be aligned in a northerly direction. Seismic evidence (Ewing, Crary, Rutherford, 1937) along a line from near Petersburg to Cape Henry and thence offshore indicates that the surface of the basement rocks is one of relatively low relief. The magnetic variations outlined by the present survey appear to be related to lithologic variations in the basement rocks and reflect the strike of rock units. The sharpness and relative magnitude of the magnetic features diminish eastward across the Coastal Plain and correspond with the increasing thickness of sediments in that direction and the increase in depth to the basement rocks.

Magnetic Highs

(1) The most prominent feature determined is a major trend of positive magnetic anomalies that extends in a northeasterly direction from the vicinity of Sussex, Sussex County, to Currioman Bay, Westmoreland County, a distance of about 100 miles. High values of total magnetic intensity obtained over the Potomac River on the northernmost line of control indicate that the trend continues northward into Maryland. The trend diminishes greatly in magnetic intensity southward from the vicinity of Sussex, Sussex County, and loses its distinctive character in the area northeast of Emporia.

This major feature ranges in width from 4 to 12 miles and follows a somewhat sinuous course. There is a marked change in the magnetic intensities along this trend, and individual profiles across it show single and multiple peaks of different shape and magnitude. Values of vertical intensity of 2000 gammas above the regional field were recorded locally along this feature by the ground survey. The trend is bordered along much of its length, both on the east and the west, by magnetic lows. This trend represents both a northward and

a southward extension of the area of magnetic highs reported by Woollard in 1940 and confirms his postulation of "a continuous feature over a large area."

The sharpness and relative intensity of the major trend indicate that the underlying cause must be at relatively shallow depth. On the basis of seismic data (Ewing, Crary, and Rutherford, 1937), Woollard (1940) believed that, near Petersburg, this feature may be due to variation in basement lithology rather than to relief on the basement surface. No wells have penetrated the basement rocks along this magnetic high. In 1960-61, however, the Roberts Drilling Company No. 1 Townsend well (Well No. 1, Plates 1 and 2) was drilled in King William County in the magnetic low that borders this high on the west. The well, located approximately five miles west of the high, penetrated approximately 1600 feet of strata of probable Triassic age, and therefore appears to have encountered a Triassic basin of unknown extent concealed beneath the younger sediments. The well penetrated pre-Triassic basement rocks, identified as quartzite, gneiss, and hornblende schist at a depth of 2609 feet. The relatively featureless magnetic low in which the well is located reflects the low magnetic susceptibilities of the rocks penetrated by the well, whereas the magnitude and form of the magnetic high to the east indicate that a sharply defined body of rock of high magnetic susceptibility underlies that area. Woollard (1940) noted that the rocks causing the positive anomaly in the Richmond-Petersburg area might be similar to gabbro or basalt. Available data suggest that in the vicinity of the Townsend well the magnetic high may represent one or more basic igneous rock bodies situated within a down-faulted Triassic basin, or perhaps along the eastern margin of such a basin. Other portions of the Sussex-Currioman Bay trend may reflect the position of basic igneous rocks that are in contact with rocks of relatively lower magnetic susceptibilities such as granite, schist, and Triassic sediments.

(2) A second prominent trend of magnetic highs extends in a northwesterly direction for a distance of approximately 50 miles from the vicinity of Whaleyville, Nansemond County, to the James River in northeastern Prince George County. This feature narrows and increases in magnitude in a northwesterly direction. Control is not sufficient to determine whether this trend joins, or terminates against, the Sussex-Currioman Bay trend in that area, or whether it terminates against the magnetic low north of the James River. Like the Sussex-Currioman Bay trend, this magnetic high is flanked on either side by magnetic lows. Near Franklin, Isle of Wight County, the western margin of this high trend as shown on aeromagnetic line A-8 appears

to correspond in position with a structural monocline at Franklin in which the sediments slope 40 feet to the east in a distance of less than half a mile (Cederstrom, 1939, 1945).

(3) An elongate northerly-trending magnetic high occurs west of West Point, King William County. This high terminates against or joins the Sussex-Currioman Bay trend in the vicinity of Stevensville, King and Queen County. Vertical magnetic intensities 600 to 800 gammas higher than surrounding values were observed over this anomaly.

(4) A prominent magnetic high exists near Gloucester, Gloucester County. This high is a relatively broad and gradual feature over which were recorded total magnetic intensity values 400 to 500 gammas higher than those surrounding the feature.

(5) A series of rather gradual magnetic highs occurs along the extreme east coast of Virginia. These highs are located northeast of Cape Henry, Princess Anne County, in the vicinity of South Bay, Northampton County, and east of Parramore Island, Accomack County. The highest magnetic intensities observed along the coast line were recorded over the Atlantic Ocean just east of Parramore Island but offshore control is not sufficient to outline the extent or magnitude of this anomaly.

Magnetic Lows

In addition to the lows that flank the Sussex-Currioman Bay and the Whaleyville-James River trends, there are several areas over which magnetic lows have been outlined. Gentle magnetic lows occur in the area near the mouth of the Rappahannock River and adjacent portions of Chesapeake Bay. An elongated low was recorded over an area from near Newport News southward through Lake Drummond into North Carolina. Lake Drummond in the Dismal Swamp appears to occupy a medial position in this low. Relatively low magnetic intensities were recorded over much of the area south of Norfolk between the Dismal Swamp and the Atlantic Coast. On the basis of geophysical data, Woollard (1940) attributed the low magnetic values that he observed in the Newport News-Norfolk area to the presence of granite or granite gneisses in the basement rocks. The deep well at Fort Monroe, near Newport News (Well No. 3, Plates 1 and 2) encountered granite beneath the sedimentary section at a depth of 2246 feet.

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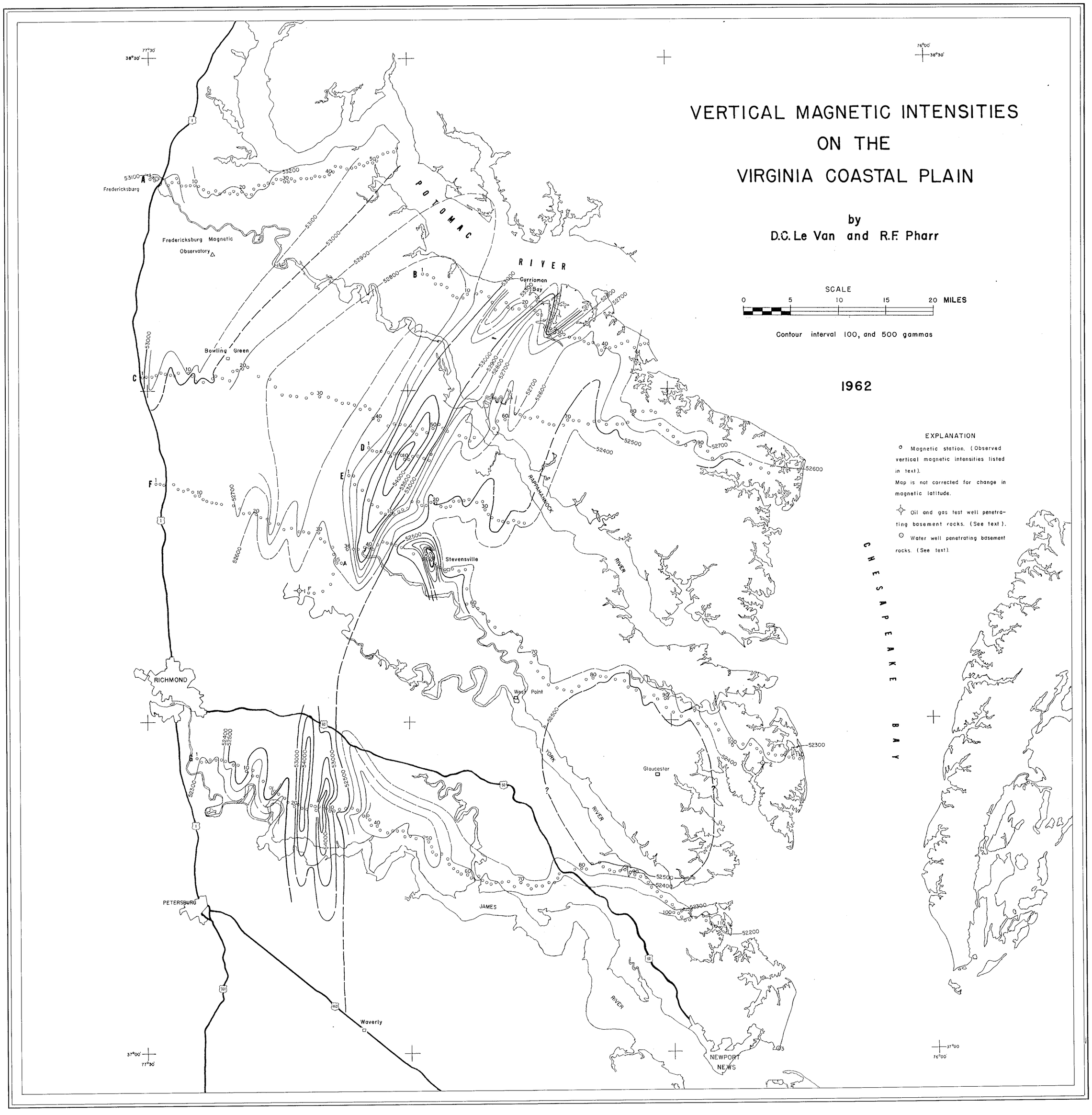
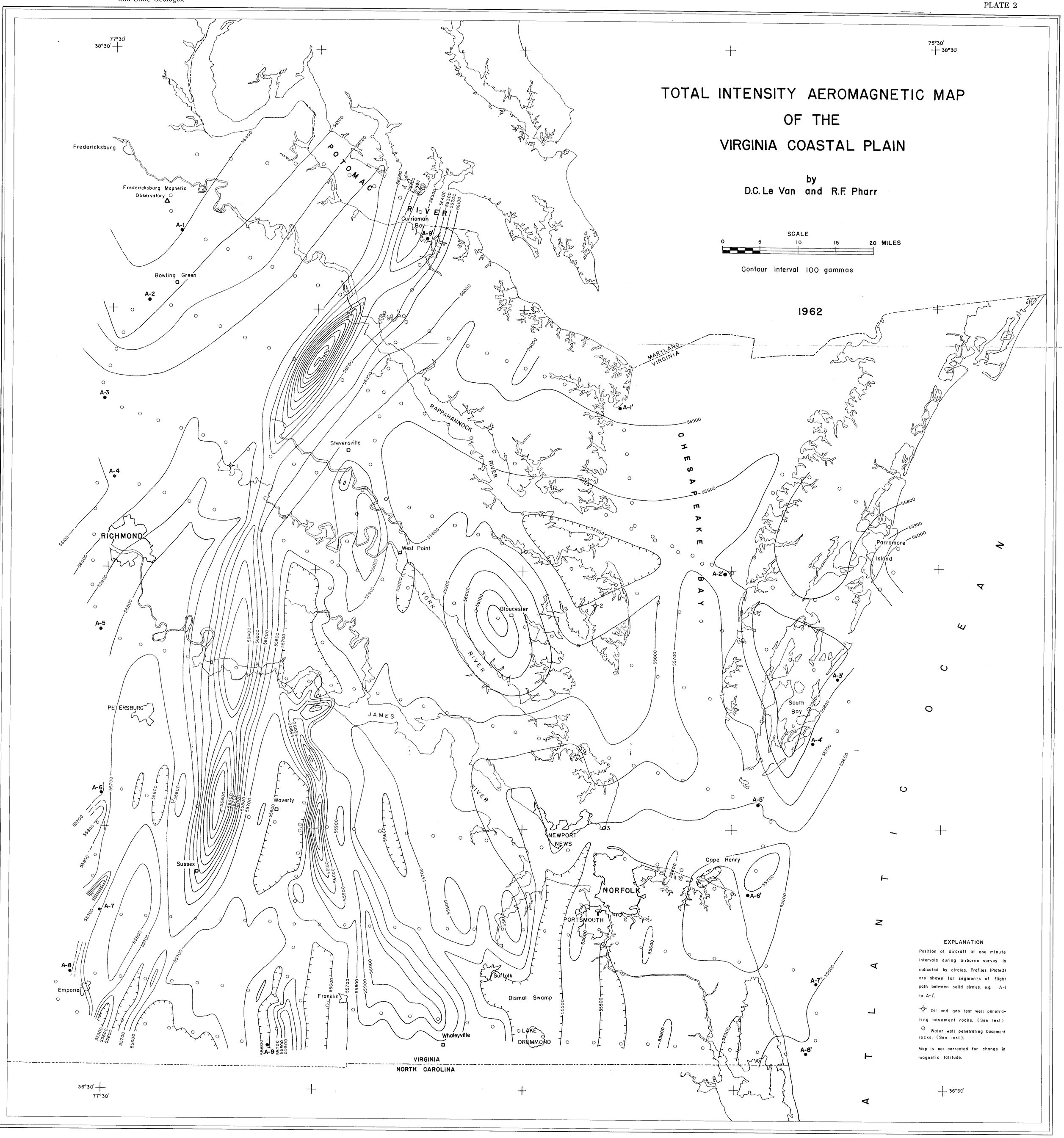
DIVISION OF MINERAL RESOURCES
James L. Calver, Commissioner of Mineral Resources
and State Geologist

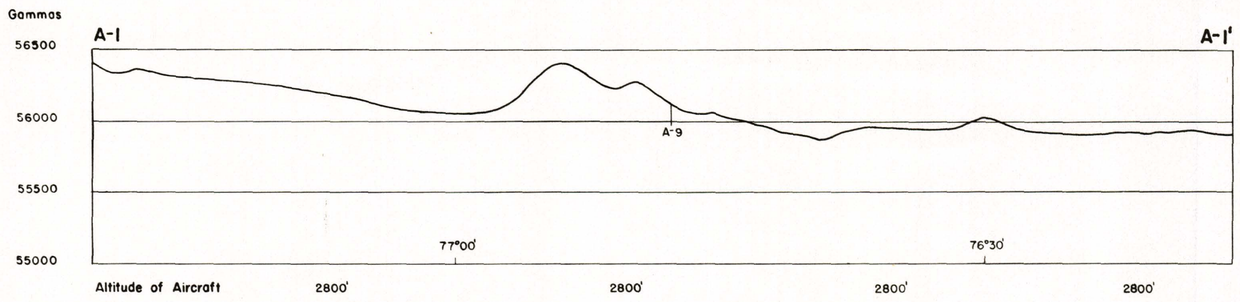


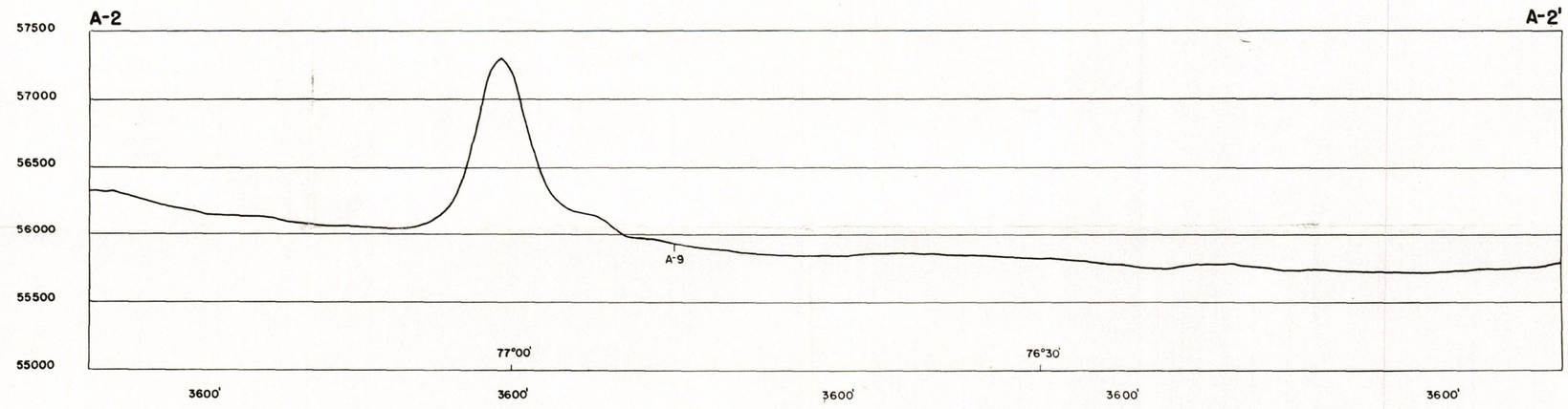

TOTAL INTENSITY AEROMAGNETIC MAP
OF THE
VIRGINIA COASTAL PLAIN
by
D.C. Le Van and R.F. Pharr
SCALE
0 5 10 15 20 MILES
Contour interval 100 gammas
1962
77°30'
38°30'
75°30'
38°30'
36°30'
77°30'
36°30'
Fredericksburg
Fredericksburg Magnetic Observatory
Bowling Green
RICHMOND
PETERSBURG
Stevensville
West Point
Gloucester
Waverly
Sussex
Emporia
Franklin
Whaleyville
Suffolk
Dismal Swamp
LAKE DRUMMOND
NEWPORT NEWS
NORFOLK
PORTSMOUTH
Cape Henry
Parramore Island
South Bay
Currioman Bay
POTOMAC RIVER
RAPPAHANNOCK RIVER
YORK RIVER
JAMES RIVER
CHESAPEAKE BAY
ATLANTIC OCEAN
MARYLAND
VIRGINIA
VIRGINIA
NORTH CAROLINA
A-1
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
A-1'
A-2'
A-3'
A-4'
A-5'
A-6'
A-7'
A-8'
EXPLANATION
Position of aircraft at one minute intervals during airborne survey is indicated by circles. Profiles (Plate 3) are shown for segments of flight path between solid circles. e.g. A-1 to A-1'.
Oil and gas test well penetrating basement rocks. (See text)
Water well penetrating basement rocks. (See text).
Map is not corrected for change in magnetic latitude.

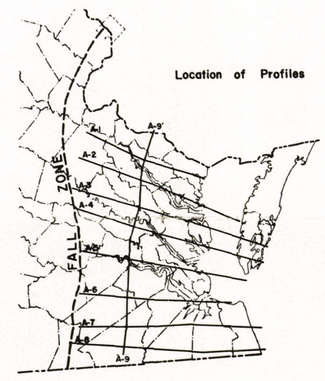
TOTAL INTENSITY AEROMAGNETIC PROFILES OF THE VIRGINIA COASTAL PLAIN

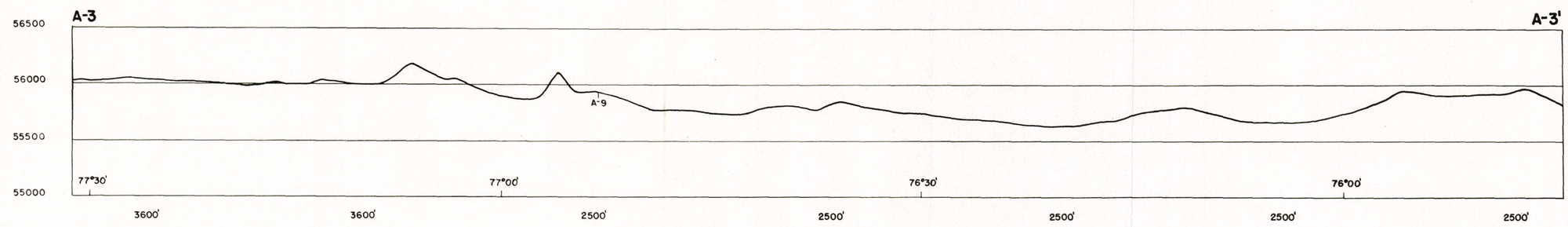
by
D.C. Le Van and R.F. Pharr

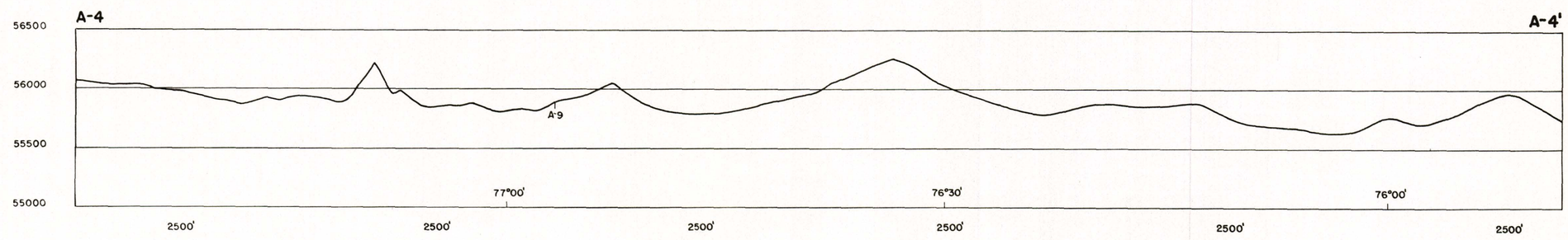
1962

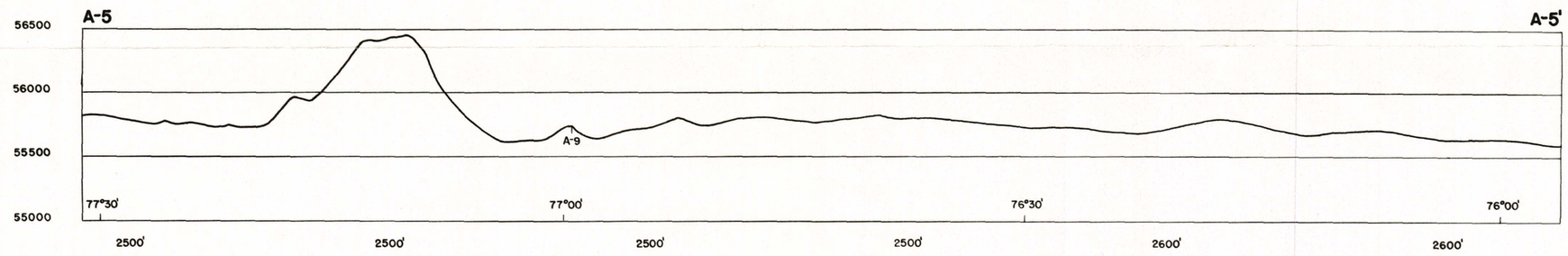


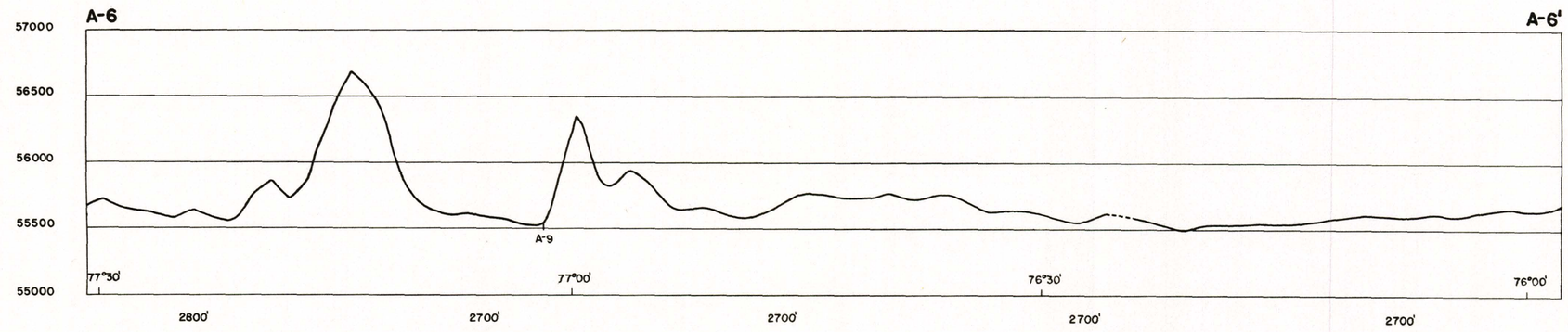


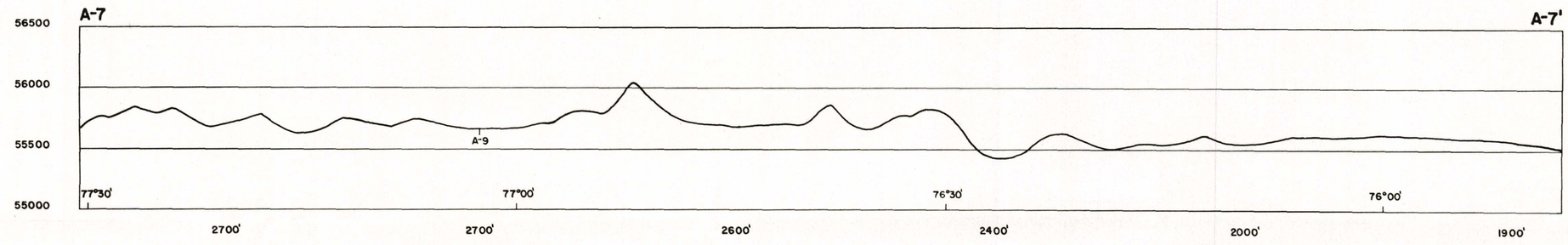


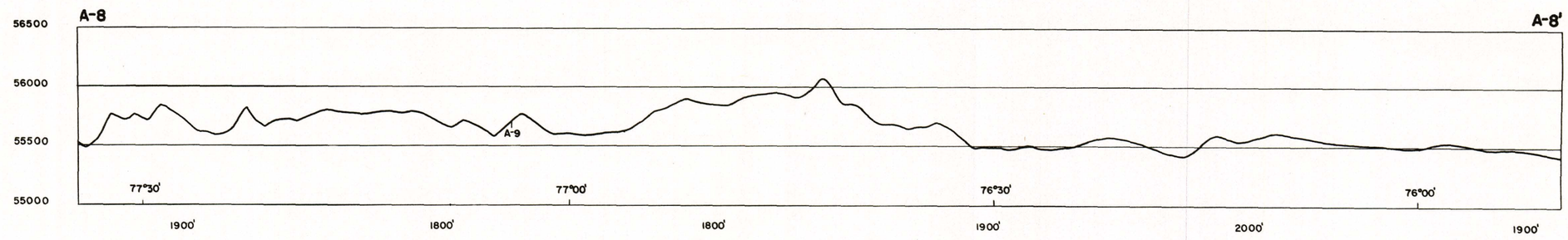


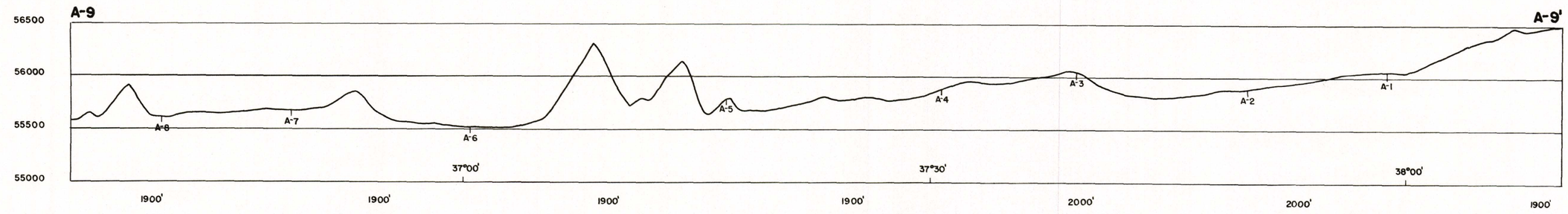












SCALE
0 5 10 15 20 MILES