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IV A.

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TRIANGULATION COMPUTATIONS

MARSHALL ISLANDS

ENIWETOK ATOLL

1948

JTF 7

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TRIANGULATION

A scheme of first-order triangulation composed of check figures was executed along the eastern side of the atoll from a first-order base line on Runit Island. This scheme extends northward to Engebi Island and southward to Aniyaanii Island, and was executed for the the purpose of coordinating local surveys on the activated islands and to establish distances and azimuths between certain installations.

All observations were made at night, and standard procedure was followed throughout. The maximum triangle closure for the entire scheme was 02.41 seconds and the average 01.01 seconds. The maximum triangle closure in the base expansion figure was 01.10 seconds and the average 00.55 seconds.

With the exception of station REEF PHOTO TOWER, which could not be occupied because of excessive vibration, all stations were occupied. Traverse ties were made to the Zero and/or Photo towers on Engebi, Aomon, Runit, and Aniyaanii Islands.

In order to coordinate the triangulation of the U.S.S. BOWDITCH with the new survey, stations NORTH BASE USN, 1944 and SAND USN, 1944 were incorporated into the scheme.

BASE LINE

A first-order base line was measured on Runit Island between stations NORTH BASE USN, 1944 and newly established station RUNIT. The configuration of the island necessitated the adoption of a broken base consisting of four sections of varying lengths. First-order invar tapes were used, and standard procedure followed throughout.

The computed probable error of the total measurement is 1 part in 2,100,000.

This base line is shorter than the second-order base line measured on the same island by the U.S.S. BOWDITCH in 1944 due to the fact that a considerable portion of the sand spit extending off the south end of the island has washed away.

The base expansion figure was developed through station CORAL, a newly established station constructed in the same general area as station REEF USN, 1944, but not identical with that station. This is the most advantageous position at which the construction of a station suitable for observations was feasible.

The base expansion figure does not meet the specifications for first-order triangulation in that the R_1 for the figure is larger than is generally allowed on first order triangulation. This is the only respect in which the triangulation fails to meet first-order specifications, and is largely compensated by the limited extent of the scheme.

DATUM

No astronomic observations were made. The datum adopted was that established by the survey of the U.S.S. BOWDITCH in 1944, which is considered to meet all requirements of the present survey.

The probable errors of the elements of the datum as determined by the U.S.S. BOWDITCH are as follows:

Latitude	0"14
Longitude	0"16
Azimuth	0"74

Although the original azimuth observations were made from station NORTH BASE USN, 1944 to station SOUTH BASE USN 1944, a line which no longer exists, an examination of the correction obtained for the angle in the adjustment of the BOWDITCH triangulation shows that but little accuracy is lost by using the azimuth of the line NORTH BASE USN, 1944 to SAND USN, 1944. It was therefore considered that a reobservation for the purposes of the present survey was not justified.

In the computation of the new first-order scheme, the latitude and longitude of station NORTH BASE USN, 1944 and the forward azimuth of the line NORTH BASE USN, 1944 to SAND USN, 1944 have been held, and together with the elements of the Clarke spheroid of 1866 determine the datum used.

RECOMPUTATION OF USN STATIONS.

Since the introduction of a new base line into the scheme changes the length obtained for the line NORTH BASE USN, 1944 to SAND USN, 1944, a recomputation was made for stations of the BOWDITCH survey to the southward of the first-order scheme in order to make them consistent with the new scheme and available for use on the present project. This recomputation was made from the line NORTH BASE USN, 1944 -- SAND USN, 1944. The adjusted angles of the BOWDITCH surveys were used.

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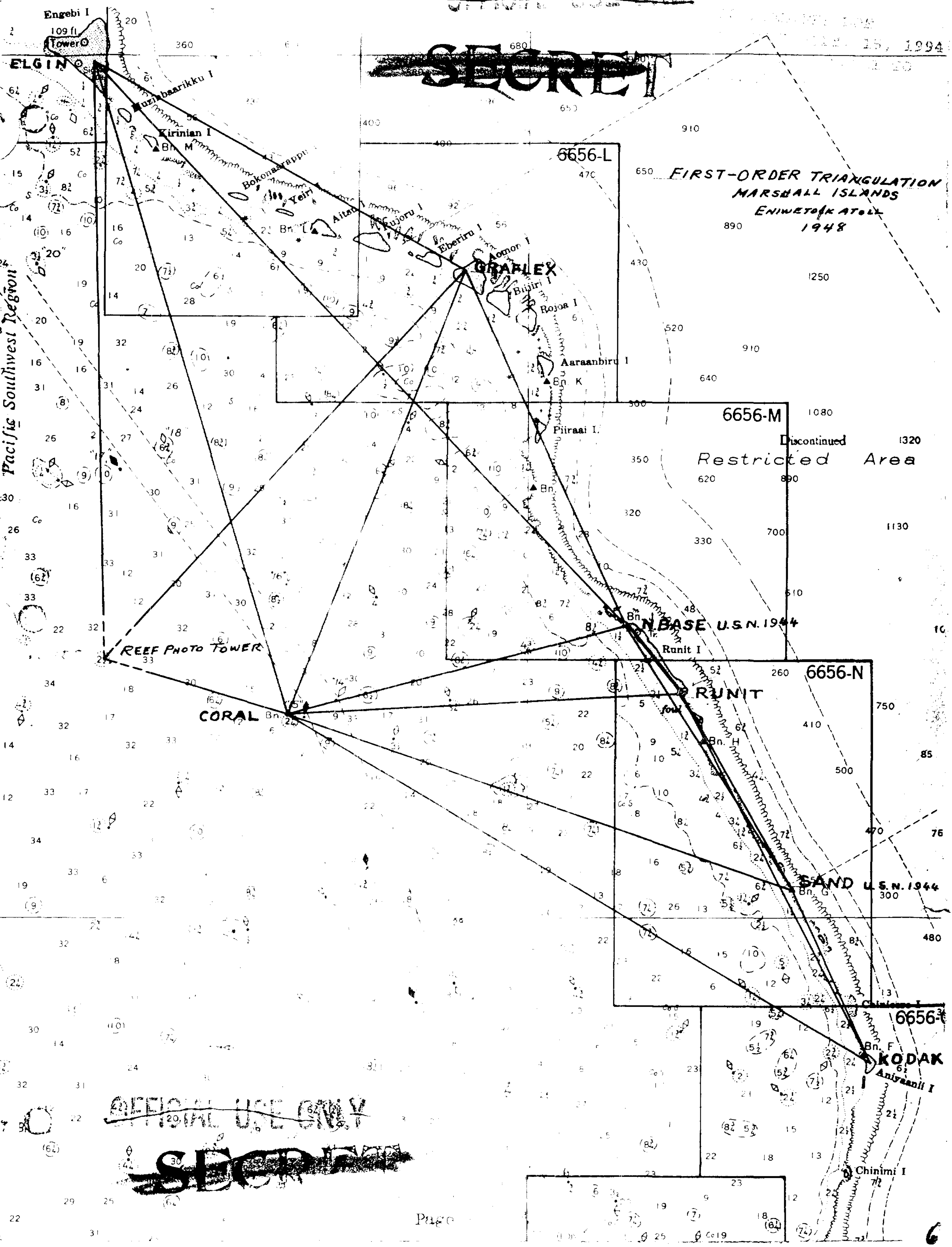

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Form 28 B
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FIELD COMPUTATION

GEOGRAPHIC POSITIONS

Accession No. of Computation: ______

Locality ENIWETOK ATOLL

ENIWETOK ASTRONOMIC DATUM, 1944

FIRST -order Triangulation. State MARSHALL ISLANDS

16—15634-1 U. S. GOVERNMENT PRINTING OFFICE

STATION	LATITUDE AND LONGITUDE ° ′ ″	SECONDS IN METERS	AZIMUTH ° ′ ″	BACK AZIMUTH ° ′ ″	TO STATION	DISTANCE: LOGARITHM (METERS)	DISTANCE: METERS	DISTANCE: FEET
NORTH BASE U.S.N., 1944	11 33 23.265		327 56 52.40	— — —	SAND, U.S.N., 1944	— —		
d.m.	162 21 09.890							
SAND, U.S.N., 1944	11 30 18.981		147 57 15.78	327 56 52.40	NORTH BASE, U.S.N., 1944	3.824 7990	[illegible]	[illegible]
d.m.	162 23 06.873							
CORAL	11 32 20.255		255 01 25.04	75 02 [illegible]	[illegible]	[illegible]	[illegible] 91 ✓	24 189 [illegible]
	[illegible]		[illegible] 02 52.95	109 04 [illegible]	SAND, U.S.N. [illegible]	[illegible]	[illegible]	[illegible]
[illegible]								
	[illegible] 32 6.08[illegible]		[illegible]	[illegible]	CORAL	[illegible] 772	8804.[illegible]	28 [illegible] 9
	[illegible]		[illegible] 46	322 17 [illegible]	[illegible]	[illegible] 6470	2591.9629	8,5[illegible].818
KODAK	[illegible] 28 [illegible]		[illegible] 16 28.70	300 15 [illegible]	CORAL	[illegible] 38 3840	14407.35 ✓	47,268.1
	[illegible] 32 38.135		[illegible]54 00 12.79	333 59 49.43	R[illegible]	3.908 2891	8096.35 ✓	26 562.8
GRAFLEX								
	[illegible] 37 [illegible]		[illegible]	[illegible] 22 [illegible]	NORTH BASE [illegible]	[illegible]	[illegible] ✓	[illegible]
	[illegible] 68		[illegible]	[illegible] 22 [illegible]	CORAL	[illegible]	[illegible] 8 ✓	[illegible]
ELG[illegible]	[illegible]		[illegible]	[illegible] 68	GRAFLEX	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible] 36	63 0[illegible]	CORAL	[illegible]	[illegible].39 ✓	[illegible] ✓
REEF PHOTO [illegible]	[illegible] 32 [illegible]		180 09 04.00	00 09 04.22	ELGIN	4.0[illegible] 7715	[illegible].99 ✓	40,11[illegible] ✓
	162 14 54.051		285 37 19.13	105 37 47.12	CORAL	3.637 2242	43[illegible].49 ✓	4,13[illegible].2 ✓
			266 31 08.64*	86 32 25.14*	RUNIT ZERO TOWER	4.[illegible] 2928*	[illegible]	38,04[illegible].2
			223 22 17.41*	43 2[illegible] 09.14*	AOMON ZERO TOWER	4.055 4312*	11361.40 ✓	32,27[illegible].9 ✓
			176 16 49.13*	356 1[illegible] 43.40*	ENGEBI ZERO TOWER	4.123 5877*	13291.92 ✓	43,608.6 ✓

[1] No check on this position.   Abbreviations used: d. = described; m. = marked; n. = not; r. = recovered; l. = lost; p. = probably. (Examples: n. d. = not described; p. l = probably lost.)

* Derived by inverse Position Computation

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FIELD COMPUTATION

GEOGRAPHIC POSITIONS

Accession No. of Computation:

Locality ENIWETOK ATOLL ~~North American 1927~~ ENIWETOK ASTRONOMIC 1944 Datum FIRST - order ~~Triangulation~~ TRAVERSE State MARSHALL ISLANDS

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK AZIMUTH	TO STATION	DISTANCE: LOGARITHM (METERS)	DISTANCE: METERS	DISTANCE: FEET
	° ′ ″		° ′ ″	° ′ ″				
ANIYAANII PHOTO TOWER	11 28 18.619		143 52 48.38	323 52 48.30	KODAK	1.330 9208	21.425	70.292
[illegible]	162 [illegible] [illegible].52		[illegible] 58 51.18*	331 58 18.62*	RUNIT ZERO TOWER	[illegible] 0406*	10520.60	34,516.3
RUNIT ZERO TOWER	[illegible]		[illegible] 58 50.04	290 58 48.81	NORTH BASE [illegible]	[illegible] 945	[illegible]	654.906
TRAVERSE [illegible]	[illegible] 3.295		26 17 41.20	30[illegible] 17 37.98	AOMON [illegible]	[illegible]	[illegible]	[illegible]
	162 [illegible] 21.518							

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† No check on this position. Abbreviations used: d.=described; m.=marked; n.=not; r.=recovered; l.=lost; p.=probably. (Examples: n. d.=not described; p. l.=probably lost.)

* Derived By Inverse Position Computation

8 8 8

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FIELD COMPUTATION GEOGRAPHIC POSITIONS

Accession No. of Computation:

Locality ENIWETOK ATOLL ENIWETOK ASTRONOMIC, 194 ~~North American 1927~~ Datum — order TRAVERSE ~~Triangulation~~. State MARSHALL ISLANDS

16—15634-1 U. S. GOVERNMENT PRINTING OFFICE

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK AZIMUTH	TO STATION	DISTANCE: LOGARITHM (METERS)	DISTANCE: METERS	DISTANCE: FEET
TRAVERSE STA BIIJIRI	11 [illegible] 162 [illegible]		[illegible]	306 17 41.20	TRAVERSE STA [illegible]	2.880 3885	759.2[illegible]	2,490.994

¹ No check on this position. Abbreviations used: d. = described; m. = marked; n. = not; r. = recovered; l. = lost; p. = probably. (Examples: n. d. = not described; p. l. = probably lost.)

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SECRET

LIST OF DIRECTIONS

Station CORAL

State Marshall Islands (Eniwetok Atoll)

Chief of party R.L.Pfau

Date 2-17-[illegible]

Computed by M.G.

Observer G.R.Stroude

Instrument [illegible]

Checked by JHRS

11—9508

OBSERVED STATION	Observed direction	Correction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	′ ″
ELGIN	0 00 00.00			0 00 00.00	
GRAFLEX	[illegible] 14 [illegible]				
N.BASE U.S.N. 1944	[illegible]				
RUNIT	[illegible]				
SAND U.S.N. 1944	[illegible] 54 25.[illegible]				
KODAK	[illegible] 46 [illegible]				
REEF PHOTO TOWER	[illegible]				

No eccentricity of signal or instrument at this station.

Observations made for [illegible]

Recorded in volumes [illegible]

NOTE: No reference [illegible]

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These columns [illegible]

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SECRET

Station ELGIN | State Marshall [illegible] (Eniwetok Atoll)
Chief of party R. L. Pfau | Date 2-1[illegible]-48 | Computed by G.R.S.
Observer G.R.S. | Instrument [illegible] | Checked by R.L.G.

OBSERVED STATION	Observed direction	[illegible]	[illegible]	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	° ′ ″
GRAFLEX	0 00 00.00			0 00 00.00	
N. BASE U.S.N. 1944	[illegible] 4[illegible] 03.[illegible]				
CORAL	1[illegible] 0[illegible] [illegible]6.[illegible]				
REEF PHOTO TOWER	[illegible] 0[illegible] [illegible].74				
ENGEBI ZERO TOWER	1[illegible] [illegible] [illegible]4.[illegible]				

No eccentricity of lights or instrument at this station.
Observations made from a [illegible] foot steel tower.
Observations recorded in volume [illegible].
NOTE: No reference marks were established at this station.

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LIST OF DIRECTIONS

Station GRAFLEX — State Marshall Islands (Eniwetok Atoll)

Chief of party R.L.Pfau — Date 2-18-4[illegible] — Computed by M.G.

Observer G.R.Strode — Instrument [illegible] — Checked by HLF

OBSERVED STATION	Observed direction		Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	° ′ ″
N.BASE U.S.N. 1941	0 00 00.00			0 00 00.00	
CORAL	[illegible]				
REEF PHOTO TOWER	[illegible] 05.7[illegible]	[illegible]		67 49 24.02	
ELGIN	[illegible] 07.5[illegible]				
Aomon Zero Tower Hor. Dist. 2,120.[illegible]	[illegible]				
Aomon Photo Tower Ecc HOr. Dist. 2[illegible]	[illegible]				

No eccentricity [illegible]

Observations made fr[illegible] steel [illegible]

Recorded in volume 3.

NOTE: No reference m[illegible]

* Observations [illegible]

† Record of meas[illegible]

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L[illegible] OF DIRECTIONS

Station KODAK | *State* Marshall Islands
Chief of party R.L.Pfau | *Date* 2-13-4[illegible] | *Computed by* M.G.
Observer G.R.Strode | *Instrument* G3[illegible]5 | *Checked by* HRS

OBSERVED STATION	[illegible]	[illegible]	[illegible]	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	° ′ ″
CORAL	0 00 00.00			0 00 00.00	
RUNIT	53 05 41.09				
SAND USN 1944	[illegible]				
R.M.No.1 NE Hor. Dist. 57.398ft 17.495meters	[illegible]				
*Aniyaanii photo tower SE Hor. Dist. 21.425m	[illegible]				
R.M.No.2 SSE Hor. Dist. 110.812ft. 33.778 meters	[illegible]				

No eccentricity [illegible]
Observations made from [illegible]
Recorded in volume 1.
*Distance to the [illegible] steel tape G3661 with tension of [illegible]

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LIST OF DIRECTIONS

Station N. BASE U.S.N. [illegible] State [illegible] Computed by M.G.

Chief of party R. L. P[illegible] Date [illegible] Checked by [illegible]

Observer G.R.Strode Instrument G [illegible]

11—2503

OBSERVED STATION	Observed direction	[illegible]	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	′ ″	″	° ′ ″	′ ″
RUNIT	0 00 00.00			0 00 00.00	
SAND U.S.N. 1944	[illegible] 09 34.[illegible]				
CORAL	[illegible] 12 55.[illegible]				
ELGIN	[illegible] 44.[illegible]				
GR[illegible]FLEX	[illegible] 54.[illegible]				
RUNIT PHOTO TOWER Hor. Dist. 40.164 m †	[illegible]				
RUNIT ZERO TOWER Hor. Dist. 199.615 m †	[illegible]				

N[illegible] eccentricity of li[illegible] instrument [illegible].

Observations made fro[illegible] wood tower.

Recorded in volume [illegible]

NOTE: No reference ma[illegible] station.

* Record of observations [illegible]

† Record of measurement [illegible]

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[illegible]

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LIST OF DIRECTIONS

Station RUNIT | *State* Marshall Islands (Eniwetok Atoll)

Chief of party R. L. Pfau | *Date* [illegible] | *Computed by* G.R.S.

Observer G.R.S. & J.C.H. | *Instrument* [illegible] | *Checked by*

11—9503

OBSERVED STATION	[illegible]	[illegible]	[illegible]	Corrected direction with zero initial	Adjusted direction*
				° ′ ″	° ′ ″
SAND U.S.N. 1944	[illegible]			0 00 00.00	
KODAK	[illegible]				
CORAL	[illegible]				
N. BASE U.S.N. 1944	[illegible]				
Reference mark No. 1 41.075 feet, 12.520 meters	[illegible]				
Reference mark No. 2 48.062 feet, 14.650 meters	[illegible]				

No eccentricity of light or instrument at this station.

Observations made from [illegible]

Observations recorded [illegible] 1 and 2 and in

Horizontal Angles volume [illegible]

NOTE: Reference mark [illegible] of instrument H-334.

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LIST OF DIRECTIONS

Station SAND U.S.N. [illegible] *State* Ma[illegible]nds (En[illegible]wetok Atoll)

Chief of party R.[illegible].Pf[illegible] *Date* 2-[illegible] *Computed by* M.G.

Observer G.R.Strode *Instrument* [illegible] *Checked by* [illegible]

U. S. GOVERNMENT PRINTING OFFICE 11—9563

OBSERVED STATION	Observed direction ° ′ ″	[illegible] ″	Sea level reduction* ″	Corrected direction with zero initial ° ′ ″	Adjusted direction* ′ ″
KODAK	0 00 00.00			0 00 00.00	
CORAL	[illegible] [illegible] 10.97				
N BASE U.S.N. 1944	[illegible]				
RUNIT	[illegible]				

No eccentricity [illegible] instrument [illegible]tion.

Observations made fr[illegible] ft. wood tower.

Recorded in volume 1.

NOTE: No reference m[illegible] this station.

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Form 382
Ed. June 1929

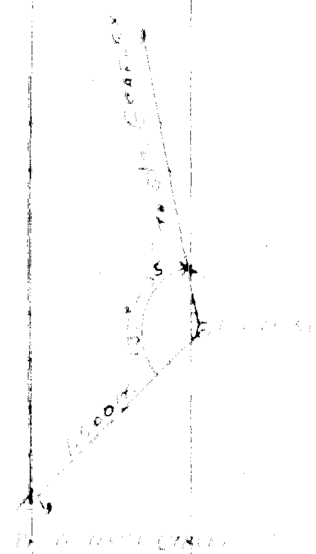
REDUCTION TO CENTER

Eccentric Light at Station
REEF PHOTO TOWER

d = 1.500 *meters*

16—19440

STATION	[illegible]	[illegible]	[illegible]	[illegible]	LOGARITHM OF REDUCTION IN SECONDS	REDUCTION
						"
Center	[illegible]					
Graflex	13[illegible]	[illegible]8310	[illegible]	[illegible]7 35	[illegible]26187	+19.28



Ecc. Light at station Reef Photo Tower [illegible] from station Graflex ONLY [illegible] other stations.

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U. S. COAST AND GEODETIC SURVEY
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Ed. Oct., 19

ABSTRACT OF DIRECTIONS

Station [illegible] Computed [illegible] Date 2-17-48

Observer [illegible] Checked by [illegible] Inst. No. 6335

POSITION NO.	STATIONS OBSERVED					KODAK	REEF PHOTO TOWER	
	(INITIAL) 0° 00'	[illegible]	[illegible]	[illegible]	[illegible]	137° 46'	302° 31'	° '
					"	"	"	"
1	0.00	[illegible]	[illegible]	[illegible]	[illegible]	42.2	18.4	
2	0.00	[illegible]	[illegible]	[illegible]	[illegible]	40.1	18.2	
3	0.00	[illegible]	[illegible]	[illegible]	[illegible]	39.7	19.9	
4	0.00	[illegible]	[illegible]	[illegible]	[illegible]	46.5	18.6	
5	0.00	[illegible]	[illegible]	[illegible]	[illegible]	37.6 35.9 (36.4)R	16.3 (15.3)R	
6	0.00	[illegible]	[illegible]	[illegible]	[illegible]	40.1	17.6	
7	0.00	[illegible]	[illegible]	[illegible]	[illegible]	40.9	17.3	
8	0.00	[illegible]	[illegible]	[illegible]	[illegible]	35.9	17.2	
9	0.00	[illegible]	[illegible]	[illegible]	[illegible]	41.5	20.4	
10	0.00	[illegible]	[illegible]	[illegible]	[illegible]	38.5	21.6	
11	0.00	[illegible]	[illegible]	[illegible]	[illegible]	47.5	20.4	
12	0.00	[illegible]	[illegible]	[illegible]	[illegible]	41.2	[illegible]	
13	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	19.9	
14	0.00	[illegible]	[illegible]	[illegible]	[illegible]	42.1	22.0	
15	0.00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	22.3	
16	0.00	[illegible]	[illegible]	[illegible]	[illegible]	52.9	21.2	
Sum,		[illegible]	[illegible]	[illegible]	[illegible]	11.3	52.4	
Mean,		[illegible]	[illegible]	[illegible]	[illegible]	40.71	19.52	
Cor. for ecc.,								
Direction,								

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U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct., 19[illegible]

SECRET

ABSTRACT OF DIRECTIONS

State [illegible]

Station ELGIN   Computed by [illegible]   Date 2-19-48

Observer G. R. Strode   Checked by [illegible]   Inst. No. 6335

U. S. GOVERNMENT PRINTING OFFICE: 1931   11—4689

DO NOT WRITE IN THIS MARGIN

POSITION No.	STATIONS OBSERVED						
	GRAFLEX	[illegible]	[illegible]	[illegible]	[illegible]		
	(INITIAL) 0° 00'	° ′	° ′	° ′	° ′	° ′	° ′
	″	″	″	″	″	″	″
1	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
2	0.00	[illegible]	[illegible]	[illegible]			
3	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
4	0.00	[illegible]	[illegible]	[illegible]			
5	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
6	0.00	[illegible]	[illegible]	[illegible]			
7	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
8	0.00	[illegible]	[illegible]	[illegible]			
9	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
10	0.00	[illegible]	[illegible]	[illegible]			
11	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
12	0.00	[illegible]	[illegible]	[illegible]			
13	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
14	0.00	[illegible]	[illegible]	[illegible]			
15	0.00	[illegible]	[illegible]	[illegible]	[illegible]		
16	0.00	[illegible]	[illegible]	[illegible]			
Sum,		[illegible]	[illegible]	[illegible]	[illegible]		
Mean,		[illegible]	[illegible]	[illegible]	[illegible]		
Cor. for ecc.,							
Direction,							

SECRET

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. [illegible]

SECRET

ABSTRACT OF DIRECTIONS

[illegible] Marshall Islands [illegible] (AF-M)

Station GRAFLE[illegible] Computed by [illegible] Date 2-18-48

Observer G R S[illegible] Checked by [illegible] Inst. No. 6335

U. S. GOVERNMENT PRINTING OFFICE 11—4689

POSITION NO.	STATIONS OBSERVED							
	N BASE U.S.N. 1944	[illegible]	[illegible]	[illegible]		N BASE USN 1944	AOMON PHOTO TOWER	
	(INITIAL) 0° 00′ 00″	[illegible]	[illegible]	[illegible]		00 00	263 34	
1	0.00						12.0	
2	0.00							
3	0.00							
4	0.00							
5	0.00						07.5	
6	0.00							
7	0.00							
8	0.00							
9	0.00						15.8	
10	0.0							
11	0.0							
12	0.0							
13	0.0							
14	0.0							
15	0.0							
16	0.0							
Sum,			41.8				05.3	
Mean,			[illegible]				[illegible] 8	
Cor. for ecc.								
Direction,							[illegible]	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct., 193[illegible]

SECRET

ABSTRACT OF DIRECTIONS

State [illegible]

Station KODA[illegible] Computed by [illegible] Date [illegible] 48

Observer G. R. STRO[illegible] Checked by [illegible] Inst. No. [illegible] 35[illegible]

U. S. GOVERNMENT PRINTING OFFICE: 193[illegible]

11—4680

POSITION No.	STATION							
	CORAL	[illegible]	[illegible]					
	(INITIAL) 0° 00′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	″	″	″	″	″	″	″	″
1	0.00	4[illegible]	[illegible]					
2	0.00	[illegible]	[illegible]					
3	0.00	[illegible]	[illegible]					
4	0.00	4[illegible]	[illegible]					
5	0.00	4[illegible]	[illegible]					
6	0.00	4[illegible]	[illegible]					
7	0.00	4[illegible]	[illegible]					
8	0.00	4[illegible]	[illegible]					
9	0.00	43.[illegible]	[illegible]					
10	0.00	43.[illegible]	[illegible]					
11	0.00	4[illegible]	[illegible]					
12	0.00	4[illegible]	[illegible]					
13	0.00	4[illegible]	[illegible]					
14	0.00	4[illegible]	[illegible]					
15	0.00	4[illegible]	[illegible]					
16	0.00	4[illegible]	[illegible]					
Sum,		[illegible]	[illegible]					
Mean,		4[illegible] 85	[illegible] 7					
Cor. for ecc.,								
Direction,								

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470

SECRET

ABSTRACT OF DIRECTIONS

Station [illegible] Computed by [illegible] Date 2-13-48

Observer G. A. S[illegible] Checked by [illegible] Inst. No. 6335

11—4669

DO NOT WRITE IN THIS MARGIN

POSITION No.	STATION OBSERVED							
	SANI 1st N 1944	[illegible]	[illegible] PRO OBSERVER	[illegible]				
	INITIAL 0° 00′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
	″	″	″	″	″	″	″	″
1	0.00							
2	0.00							
3	0.00							
4	0.00							
5	0.00							
6	0.00							
7	0.00							
8	0.00							
9	0.00							
10	0.00							
11	0.00							
12	0.00							
13	0.00							
14	0.00							
15	0.00							
16	0.00							
Sum,								
Mean,								
Cor. for ecc.,								
Direction,								

SECRET

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct., 1932

SECRET

ABSTRACT OF DIRECTIONS

State [illegible]

Station N. BASE USN 1947 Computed by [illegible] Date 2-6-48

Observer G. R. Strode Checked by [illegible] Inst. No. 6335

POSITION NO.	STATIONS OBSERVED							
	RUNIT	BASE USN 1947	[illegible]	[illegible]	[illegible]			
	(INITIAL) 0° 00″	02	[illegible]	[illegible]	[illegible]	° ′	° ′	°
		″	″	″	″	″	″	″
1	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
2	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
3	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
4	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
5	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
6	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
7	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
8	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
9	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
10	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
11	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
12	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
13	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
14	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
15	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
16	0.00	[illegible]	[illegible]	[illegible]	[illegible]			
Sum,		[illegible]	[illegible]	[illegible]	[illegible]			
Mean,		[illegible]	[illegible]	[illegible]	[illegible]			
Cor. for ecc.,								
Direction,								

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct. 1882

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ABSTRACT OF DIRECTIONS

Station RUNIT   Computed by   Date 2-15-48

Observer G.R. Strock   Checked by   Inst. No. 6335

POSITION No.	STATIONS OBSERVED						
	SAND USN 1944						
	(INITIAL) 0° 00″	66 12	49 36		° ′ ″	° ′ ″	° ′ ″
1	0.00						
2	0.00						
3	0.00						
4	0.00						
5	0.00						
6	0.00						
7	0.00						
8	0.00						
9	0.00						
10	0.00						
11	0.00						
12	0.00						
13	0.00						
14	0.00						
15	0.00						
16	0.00						
Sum,							
Mean,		[illegible]	[illegible]				
Cor. for ecc.,							
Direction,							

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 470
Ed. Oct. [illegible]

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ABSTRACT OF DIRECTIONS

State [illegible]

Station [illegible] Computed by [illegible] Date 2-[illegible]-48

Observer [illegible] Checked by [illegible] Inst. No. [illegible]

DO NOT WRITE IN THIS MARGIN

POSITION No.	STATIONS OBSERVED TO								
	[illegible]	[illegible]	[illegible]	[illegible]					
	(INITIAL) 0° 00' 00"	[illegible]	[illegible]	[illegible]					
1	0.00	[illegible]	[illegible]	[illegible]					
2	0.00	[illegible]	[illegible]	[illegible]					
3	0.00	[illegible]	[illegible]	[illegible]					
4	0.00	[illegible]	[illegible]	[illegible]					
5	0.00	[illegible]	[illegible]	[illegible]					
6	0.00	[illegible]	[illegible]	[illegible]					
7	0.00	[illegible]	[illegible]	[illegible]					
8	0.00	[illegible]	[illegible]	[illegible]					
9	0.00	[illegible]	[illegible]	[illegible]					
10	0.00	[illegible]	[illegible]	[illegible]					
11	0.00	[illegible]	[illegible]	[illegible]					
12	0.00	[illegible]	[illegible]	[illegible]					
13	0.00	[illegible]	[illegible]	[illegible]					
14	0.00	[illegible]	[illegible]	[illegible]					
15	0.00	[illegible]	[illegible]	[illegible]					
16	0.00	[illegible]	[illegible]	[illegible]					
Sum,		[illegible]	[illegible]	[illegible]					
Mean,		[illegible]	[illegible]	[illegible]					
Cor. for ecc.,									
Direction,									

SECRET

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25

COMPUTATION OF TRIANGLES

State: *Marshall Islands Eniwetok Atoll*

[illegible]	[illegible]	[illegible] ANGLE	[illegible] EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3				2591.9689m	3 413 6298
1 Coral	[illegible]	[illegible]	0.02	0950	0.564 9132
2 N. Base	[illegible]	[illegible]	[illegible]	55.76	9 966 3991
3 Reef	[illegible]	[illegible]	.02	54.74	9 896 2271
1-3					3 944 9421
1-2					3 874 7701
	[illegible]		0.05	00.00	
2-3					3.874 7701
1 Sand	[illegible]	[illegible]	0.04	1169	0.202 1920
2 Coral	[illegible]	27.91	0.04	27.87	9 747 8359
3 N. Base	[illegible]	20.48	0.04	20.44	9 980 3895
1-3					3.824 7980
1-2					4 057 3516
	[illegible]		0.12	00.00	
2-3					3.944 9421
1 Sand	[illegible]	[illegible]	0.03	[illegible]	0.173 2968
2 Coral	[illegible]	18.36	0.03	18.33	9 495 1219
3 Reef	[illegible]	[illegible]	[illegible]	10.54	9 939 1108
1-3					3. 613 3608
1-2					4. 057 3497 (85)
	[illegible]		0.08	00.00	
2-3					3. 413 6298
1 Sand	[illegible]	[illegible]	[illegible]	19.55	1 245 7478
2 N. Base	[illegible]	34.9[illegible]	[illegible]	34.92	8 953 91[illegible]
3 Reef	[illegible]	05.5[illegible]	[illegible]	05.53	9 165 3757
1-3					3. 613 2922
1-2					3. 824 7533
			0.01	00.00	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Nov. 1946

COMPUTATION OF TRIANGLES

State: ____________

STATION		OBSERVED ANGLE			CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM	
2-3									3.944	9421
1	Kodak	33	03	44.89	-0.80	44.09	0.05	44.04	0.263	1657
2	Coral	30	05	33.60	-0.80	32.80	0.05	32.75	9.700	1813
3	Runit	116	50	44.08	-0.81	43.27	0.06	43.21	9.950	4762
1-3									3.908	2891
1-2									4.158	5840
				02.57	-2.41		0.16	00.00		
2-3									4.057	3497 [56]
1	Kodak	35	55	36.07	-0.61	35.46	0.03	35.43	0.231	5490
2	Coral	11	52	14.87	-0.61	14.26	0.03	14.23	9.313	2313
3	Sand, U.S.N.	132	12	10.97	-0.60	10.37	0.03	10.34	9.869	6879
1-3									3.602	13~~80~~ [72]
1-2									4.158	58~~26~~ [813]
				01.91	-1.82			00.00		
2-3									3.613	3608
1	Kodak	02	51	51.18	-0.17	51.01	0.00	51.01	1.301	3048
2	Runit	02	47	26.84	-0.17	26.67	0.00	26.67	8.687	4452
3	Sand, U.S.N.	174	20	42.50	-0.17	42.33	0.01	42.32	8.993	3778
1-3									3.602	09~~68~~ [22]
1-2									3.908	26~~34~~ [4]
				00.52	-0.51			00.00		
2-3										
1										
2										
3										
1-3										
1-2										

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Nov. 1946

COMPUTATION OF TRIANGLES

State: Marshall Islands ~ Eniwetok Atoll

STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.874 7701
1 Graflex	45 59 53.24	-0.43	52.81	0.05	52.76	0.143 0806
2 N. Base, USN	80 21 39.08	-0.42	38.66	0.06	38.60	9.993 8247
3 Coral	53 38 29.12	-0.43	28.69	0.05	28.64	9.905 9691
1-3						4.011 6754
1-2						3.923 8198
	01.44	-1.28			00.00	
2-3						4.011 6754
1 Elgin	46 07 16.82	+0.16	16.98	0.08	16.90	0.142 1794
2 Graflex	95 38 14.34	+0.16	14.50	0.07	14.43	9.997 8945
3 Coral	38 14 28.59	+0.16	28.75	0.08	28.67	9.791 6729
1-3						4.151 7493 (67)
1-2						3.945 5277
	59.75	+0.48		0.23	00.00	
2-3						3.874 7701
1 Elgin	27 26 12.84	+0.34	13.18	0.09	13.09	0.336 5134
2 N. Base, USN	60 40 48.70	+0.34	49.04	0.09	48.95	9.940 4670
3 Coral	91 52 57.71	+0.34	58.05	0.09	57.96	9.999 7655
1-3						4.151 7505
1-2						4.211 0490
	59.25	+1.02		0.27	00.00	
2-3						4.211 0490
1 Graflex	141 38 07.58	-0.60	06.98	0.04	06.94	0.207 1425
2 N. Base, USN	19 40 50.38	-0.61	49.77	0.04	49.73	9.527 3392
3 Elgin	18 41 03.98	-0.61	03.37	0.04	03.33	9.505 6285
1-3						3.945 5307
1-2						3.923 8200
	01.94	-1.82		0.12	00.00	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Nov. 1946

COMPUTATION OF TRIANGLES

State: *Marshall Islands ~ Eniwetok Atoll*

STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.011 6754
1 *Reef Photo tower*	(62 27 20.26)	0.00	20.26	0.04	20.22	0.052 2464
2 *Graflex*	21 49 30.78	0.00	30.78	0.04	30.74	9.570 2816
3 *Coral*	95 43 09.07	0.00	09.07	0.03	09.04	9.997 8328
1-3						3.634 2034
1-2						4.061 7546
	00.11	0.00		0.11	00.00	
2-3						3.945 5277
1 *Reef Photo tower*	(43 02 55.95)	0.00	55.95	0.08	55.87	0.165 8199
2 *Elgin*	63 08 20.74	0.00	20.74	0.08	20.66	9.950 4165
3 *Graflex*	73 48 43.56	0.00	43.56	0.09	43.47	9.982 4306
1-3						4.061 76~~41~~ 3–
1-2						4.093 77~~82~~ 72
	00.25			0.25	00.00	
2-3						4.151 7505
1 *Reef Photo tower*	(105 30 15.73)	0.00	15.73	0.05	15.68	0.016 0986
2 *Elgin*	1[illegible] 01 03.92	0.00	03.92	0.04	03.88	9.466 3751
3 *Coral*	5[illegible] 28 40.48	0.00	40.48	0.04	40.44	9.925 9224
1-3						3.634 2242
1-2						4.093 7715
	00.13			0.13	00.00	
2-3						
1						
2						
3						
1-3						
1-2						

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

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			°	′	″				°	′	″
α	2	to 3	255	01	25.04	α	3	to 2	75	[illegible]	12.88
2d ∠		&	+15	48	09.52	3d ∠			−112	14	55.77
α	2	to 1	270	49	34.56	α	3	to 1	322	47	17.11
Δα			+	00	58.14	Δα			+	00	10.36
			180	00	00.00				180	00	00.00
α′	1	to 2	90	50	32.70	α′	1	to 3	142	47	27.47
		First Angle of Triangle	51	56	54.76						
			42	47	27.46						

	° ′ ″			°	′	″		°	′	″			°	′	″
φ	11 32 [illegible]	2 [illegible]	λ	162	17	10.931	φ	11	33	23.265	3 N. Bose, USN	λ	162	21	09.890
Δφ	− 00 07 [illegible]		Δλ	+	04	50.690	Δφ	−	01	01.185		Δλ	+	00	51.731
φ′	[illegible] 16.080	1 Runit	λ′	162	22	01.621	φ′	11	32	16.080	1 Runit	λ′	162	22	01.621

	Logarithms				Logs		° ′ ″ / Logarithms
s	3.[illegible]	(1)	+04.1345	½	9̄.699	½(φ+φ′)	11 32 18.17
cos α	8.[illegible]	(2)	+0.0404	s²			Logarithms
B	[illegible] 4997	Sum	+[illegible] 44	K		s	3.944 7421
(1)·h	[illegible]	(3)	[illegible]	E		(−) sin α	9.999 7548
s²	[illegible]	(4)	[illegible]	(5)		A	8.509 6678
sin² α	7.779 91	(5)		3	0.477	sec φ′	0.008 8657
C	0.11668	(6)		cos² α		Sum	2.463 4304
(2)=K	8.60647	(7)		(6)		Arc−sin corr.	0
(δφ)²	1.2327	−Δφ	+04.1749	(colog) E		−Δλ	2.463 4304
D	1.9845	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.301 0828
(3)	3.2172			sec²φ		sec Δφ/2	0
−h	0.6164			(7)		(approx.) −Δα	1.764 5132
s² sin² α	7.8898					do	−58.145″
E	5̄.6635	Arc−sin corr.				(8)	0″
(4)	4.7697	for s	−1	(Δλ)³	7.390	−Δα	−58.145″
		for Δλ	+1	F	7̄.575		
		Total	0	(8)	4.965	−Δλ	−290.690″

	Logarithms		″		Logs		° ′ ″ / Logarithms
s	3.413 6298	(1)	+67.1835	½	9̄.699	½(φ+φ′)	11 32 49.67
cos α	9.[illegible] 336	(2)	+0.0013	s²			Logarithms
B	8.[illegible] 4992	Sum	+67.[illegible]	K		s	3.413 6298
(1)−h	1.827 2626	(3)	+0.0000	E		(−) sin α	9.781 5865
s²	6.827 26	(4)	0.0000	(5)		A	8.509 6678
sin² α	9.563 17	(5)		3	0.477	sec φ′	0.008 8657
C	0.11737	(6)	+	cos² α		Sum	1.713 7498
(2)=K	7.10780	(7)	+	(6)		Arc−sin corr.	0
(δφ)²	3.6545	−Δφ	+67.1848	(colog) E		−Δλ	1.713 7498
D	1.9851	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.301 4075
(3)	5.6396			sec²φ		sec Δφ/2	0
−h	1.8273			(7)		(approx.) −Δα	1.015 1573
s² sin² α	6.3904					do	10.355″
E	5̄.6636	Arc−sin corr.				(8)	0″
(4)	3.8813	for s	−0	(Δλ)³	5.141	−Δα	−10.355″
		for Δλ	+0	F	7̄.135		
		Total	0	(8)	2.276	−Δλ	−51.7309″

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POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

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			°	′	″				°	′	″
α	2	to 3	270	49	34.56	α	3	to 2	90	50	32.70
2d ∠		&	+30	05	32.80	3d ∠		&	−116	50	43.27
α	2	to 1	300	55	07.36	α	3	to 1	333	59	49.43
Δα			+	01	21.34	Δα			+	00	23.36
			180	00	00.00				180	00	00.00
α′	1	to 2	120	56	28.70	α′	1	to 3	154	00	12.79
		First Angle of Triangle	33	03	44.09						
			154	00	12.79						

	°	′	″			°	′	″		°	′	″			°	′	″
φ	11	32	20.255	2 CORAL	λ	162	17	10.931	φ	11	32	16.080	3 RUNIT	λ	162	22	01.621
Δφ		04	~~00.986~~ 01.013		Δλ	+	06	47.804	Δφ	−	03	56.838		Δλ	+	01	57.114
φ′	[illegible]	28	[illegible]242	1 KODAK	λ′	162	23	58.735	φ′	[illegible]	[illegible]	[illegible]242	1 KODAK	λ′	[illegible]	[illegible]	[illegible]

	Logarithms		″		Logs		
s	4.158 5840	(1)	+ 240.9328	½	9̄.699	½(φ+φ′)	11 32 19.15
cos α	9.710 8123	(2)	+ 0.0796	s²			Logarithms
B	8.512 4491	Sum	~~+240.9847~~ +241.0024	K		s	4.158 5840
(1)=h	2.381 8960	(3)	+ 0.0006	E		(−) sin α	9.933 4352
s²	8.31[illegible]	(4)	− 0.0002	(5)		A′	8.509 6484
sin² α	7.866 [illegible]	(5)		3	0.477	sec φ′	0.008 7642
C	[illegible]	(6)	+	cos² α		Sum	[illegible]
(2)=K	8.700 7[illegible]	(7)	+	(6)		Arc−sin corr.	1
(δφ)²	4.7638	−Δφ	~~+240.9851~~ 241.0029	(colog) E		−Δλ	2.610 4517
D	1.9845	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.299 8596
(3)	6.7483			sec²φ		sec Δφ/2	1
−h	2.3818			(7)		(approx.) −Δα	1.910 3114
s² sin² α	8.1840					do	−81.342
E	5.6635	Arc−sin corr.				(8)	0
(4)	6.2293	for s	−3.5	(Δλ)³	7.832	−Δα	−81.342
		for Δλ	+2.8	F	7̄.575		
		Total	−0.7	(8)	5.407	−Δλ	−40[illegible]

	Logarithms		″		Logs		
s	3.908 2891	(1)	+ 236.8308	½	9̄.699	½(φ+φ′)	11 30 [illegible]7.66
cos α	9.953 6493	(2)	+ 0.0066	s²			Logarithms
B	8.512 4998	Sum	+ 236.8374	K		s	3.908 2891
(1)=h	2.374 4382	(3)	+ 0.0005	E		(−) sin α	9.64[illegible]
s²	7.816 58	(4)	− 0.0000	(5)		A′	8.5[illegible]
sin² α	9.283 [illegible]8	(5)		3	0.477	sec φ′	0.008 7642
C	0.[illegible]6 65	(6)	+	cos² α		Sum	2.068 6093
(2)=K	7.811 01	(7)	+	(6)		Arc−sin corr.	1
(δφ)²	4.7489	−Δφ	+ 236.8379	(colog) E		−Δλ	2.068 6092
D	1.9845	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.299 8380
(3)	6.7334			sec²φ		sec Δφ/2	1
−h	2.3744			(7)		(approx.) −Δα	1.368 4473
s² sin² α	7.1004					do	23.358
E	5.6635	Arc−sin corr.				(8)	0
(4)	5.1383	for s	−1.1	(Δλ)³	6.206	−Δα	−23.358
		for Δλ	+02	F	7̄.575		
		Total	−0.9	(8)	3.781	−Δλ	−117.1141

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			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2ᵈ ∠		&	+			3ᵈ ∠		&	-		
α	2	to 1	327	56	52.40	α	3	to 1			
Δα			+	00	23.38	Δα	Note: Position of N. Base, USN, 1944 and Azimuth N. Base USN to Sand USN 1944 has been Held fixed in these Computations				
			180	00	00.00				180	00	00.00
α′	1	to 2	147	57	15.78	α′	1	to 3			
φ	[illegible]	[illegible]	162	21	09.890	φ		3	λ		
Δφ	− 03 04.284		Δλ +	01	56.983	Δφ			Δλ		
φ′	11 30 18.981	1 Sand USN	λ′ 162	23	06.873	φ′		1	λ′		

	Logarithms				Logs		° ′ ″
s	3.824 7980	(1)	+ 184.2768	½	$\bar{9}$.699	½(φ+φ′)	11 31 51.128
cos α	9.928 [illegible]34	(2)	+ 0.0066	s²			Logarithms
B	8.[illegible]		[illegible]	h		s	3.824 7980
(1)=h	2.265 4706	(3)	+ 0.0003	E		sin α	9.724 8412
s²	7.649 60	(4)	.0000	(5)		A′	8.509 6681
sin² α	9.449 68	(5)		3	0.477	sec φ′	0.008 8154
C	0.717 37	(6)	+	cos² α		Sum	2.068 1227
(2)=K	7.816 65	(7)	+	(6)		Arc−sin corr.	−1
h² (δφ)²	4.53 09	−Δφ	+184.2837	(colog) E		−Δλ	2.068 1226
D	1.98 51	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.300 8038
(3)	6.5160			sec²φ		sec Δφ/2	0
−h	2.2655			(7)		(approx.) −Δα	1.368 9264
s² sin² α	7.0993					do	−23.384″
E	$\bar{\bar{5}}$.6636	Arc−sin corr.				(8)	0″
(4)	5.0284	for s	− 1	(Δλ)³	6.204	−Δα	−23.384″
		for Δλ	+ 0	F	$\bar{\bar{7}}$.576		
		Total	−1	(8)	$\bar{3}$.780	−Δλ	−116.9830″

	Logarithms				Logs		
s		(1)		½	$\bar{9}$.699	½(φ+φ′)	
cos α		(2)		s²			Logarithms
B		Sum		K		s	
(1)−h		(3)	+	E		sin α	
s²		(4)		(5)		A′	
sin² α		(5)	−	3	0.477	sec φ′	
C		(6)	+	cos² α		Sum	
(2)=K		(7)	+	(6)		Arc−sin corr.	
(δφ)²		−Δφ		(colog) E		Δλ	
D		Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	
(3)				sec²φ		sec Δφ/2	
−h				(7)		(approx.) −Δα	
s² sin² α						do	″
E		Arc−sin corr.				(8)	″
(4)		for s	−	(Δλ)³		−Δα	″
		for Δλ	+	F			
		Total		(8)		Δλ	″

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			°	′	″				°	′	″
α	2	to 3	327	56	52.40	α	3		147	57	15.78
2d ∠		&	+107	05	20.48	3d ∠			−38	53	11.73
α	2	to 1	75	02	12.88	α	3	to 1	109	04	04.05
Δα			−	00	47.84	Δα			−	01	11.10
			180	00	00.00				180	00	00.00
α′	1	to 2 N	255	01	25.04	α′	1	to 3	289	02	52.95
			34	01	27.91						
		First Angle of Triangle	289	02	52.95						

	°	′	″			°	′	″		°	′	″			°	′	″
φ	11	33	23.265	2 N Base, USN	λ	162	21	09.890	φ	11	30	18.981	3 Sand U.S.N.	λ	162	23	06.873
Δφ		01	03.010		Δλ	−	[illegible]	[illegible]	Δφ	+	02	01.274		Δλ	−	05	55.942
φ′	[illegible]	[illegible]	[illegible]	1	λ′	162	17	10.931	φ′	11	32	20.255	1 CORAL	λ′	162	17	10.931

	Logarithms				Logs					Logarithms				Logs		
s	3.874 7701	(1)	+ 62.7825	h	9.699	½(φ+φ′)	11 32 51.76	s	4.057 3516	(1)	−121.3336	h	9.699	½(φ+φ′)	11 31 19.62
cos α	9.411 7308	(2)	+ 0.0274	s²		Logarithms		cos α	9.514 1338	(2)	+ 0.0604	s²		Logarithms	
B	8.512 4992	Sum	+ 63.0099	K		s	3.874 7701	B	8.512 5007	Sum	−121.2739	K		s	4.057 3516
(1)=h	1.799 2201	(3)	+ 0.0000	E		sin α	9.985 0186	(1)=h	2.083 9837	(3)	+ 0.0001	E		sin α	9.975 4928
s²	7.749 54	(4)	[illegible]	(5)		A′	8.509 6677	s²	8.114 70	(4)	+ 0.0001	(5)		A′	8.509 6677
sin² α	9.970 [illegible]	(5)		3	0.477	sec φ′	0.008 8675	sin² α	9.950 79	(5)		3	0.477	sec φ′	0.008 8675
C	[illegible]	(6)		cos² α		Sum	2.378 3239	C	0.715 35	(6)	+	cos² α		Sum	2.551 3793
(2)=K	8.436 [illegible]	(7)		(6)		Arc−sin corr	0	(2)=K	8.781 04	(7)	+	(6)		Arc−sin corr.	0
(δφ)²	3.5984	−Δφ	+ 63.0099	(colog) E		−Δλ	2.378 3239	(δφ)²	4.1680	−Δφ	−121.2737	(colog) E		−Δλ	2.551 3793
D	1.9851	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.301 4290	D	1.9833	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.300 4785
(3)	5.5835			sec²φ		sec Δφ/2	0	(3)	6.1513			sec²φ		sec Δφ/2	0
−h	1.7992			(7)		(approx.) −Δα	1.679 7529	−h	2.0840			(7)		(approx.) −Δα	1.851 8581
s² sin² α	7.7196					do	+ 47.836″	s² sin² α	8.0657					do	+ 71.098″
E	5.6636	Arc−sin corr.				(8)	0″	E	5.6632	Arc−sin corr.				(8)	0″
(4)	5.1824	for s	− 1	(Δλ)³	7.135	−Δα	+47.836″	(4)	5.8129	for s	− 2	(Δλ)³	7.654	−Δα	+71.098″
		for Δλ	+ 1	F	7.576					for Δλ	+ 2	F	7.567		
		Total	± 0	(8)	4.711	−Δλ	+238.9593″			Total	0	(8)	5.221	−Δλ	+355.9423″

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			°	′	″				°	′	″
α	2	to 3	75	02	12.88	α	3	to 2	255	01	25.04
2d ∠		&	+80	21	38.66	3d ∠		&	−53	38	28.69
α	2	to 1	155	23	51.54	α	3	to 1	201	22	56.35
Δα			−	00	23.17	Δα			+	00	24.82
			180	00	00.00				180	00	00.00
α′	1	to 2	335	23	28.37	α′	1	to 3	21	23	21.17
	First Angle of Triangle		45	59	52.81						

			°	′	″				°	′	″
φ	[illegible] N Bos[illegible]	λ	[illegible]	[illegible]	[illegible]	φ	[illegible]	λ	[illegible]	[illegible]	[illegible]
Δφ	[illegible]	Δλ		[illegible]	55.322	Δφ	[illegible]	Δλ	1	02	03.631
φ′	[illegible] 1 GRAFLEX	λ′	162	19	[illegible] .068	φ′	11 37 31.067 1 GRAFLEX	λ′	162	[illegible]	14.368

	Logarithms		″		Logs		° ′ ″
s	3.923 8198	(1)	−238.3062	½	$\bar{9}$.699	½(φ+φ′)	11 35 27.41
cos α	9.988 668[illegible]	(2)	+ 0.0064	s²			Logarithms
B	[illegible]	Sum	−238.[illegible]	K		s	3.923 8198
(1)=h	2.374 98[illegible]	(3)	+ 0.0066	E		sin α	[illegible]
s²	[illegible]	(4)				A′	[illegible]
sin² α	9.238 8[illegible]	(5)		3	0.477	sec φ′	0.009 0018
C	0.71737	(6)	+	cos² α		Sum	2.061 9138
(2)=K	7.80386	(7)	+	(6)		Arc−sin corr.	−1
(δφ)²	4.7900	−Δφ	−238.2992	(colog) E		−Δλ	2.061 9137
D	1.7851	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.303 0300
(3)	6.7751			sec²φ		sec Δφ/2	1
−h	2.3950			(7)		(approx.) −Δα	1.364 9438
s² sin² α	7.0865					do	″
E	$\bar{\bar{5}}$.6636	Arc−sin corr.				(8)	″
(4)	5.1451	for s	−1.3	(Δλ)²	6.186	−Δα	+23.171
		for Δλ	+0.2	F	$\bar{\bar{7}}$.576		
		Total	−1.1	(8)	3.762	−Δλ	+115.3224

	Logarithms		″		Logs		° ′ ″
s	4.011 6754	(1)	−311.3174	½	$\bar{9}$.699	½(φ+φ′)	11 34 55.91
cos α	9.969 0283	(2)	+ 0.0023	s²			Logarithms
B	8.5[illegible]	Sum	[illegible]	K		s	[illegible]
(1)=h	2.493 2034	(3)	+ 0.0061	E		sin α	[illegible]
s²	[illegible]	(4)	+			A′	[illegible]
sin² α	9.1236	(5)		3	0.477	sec φ′	0.009 [illegible]8
C	0.11668	(6)	+	cos² α		Sum	2.092 1482
(2)=K	7.86364	(7)	+	(6)		Arc−sin corr.	−2
(δφ)²	4.9864	−Δφ	−311.3092	(colog) E		−Δλ	2.092 1480
D	1.9845	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.302 7065
(3)	6.9709			sec²φ		sec Δφ/2	1
−h	2.4932			(7)		(approx.) −Δα	1.394 8546
s² sin² α	7.1470					do	″
E	$\bar{\bar{5}}$.6635	Arc−sin corr.				(8)	″
(4)	5.3037	for s	−1.9	(Δλ)²	6.274	−Δα	−24.823
		for Δλ	+0.2	F	$\bar{\bar{7}}$.575		
		Total	−1.7	(8)	3.851	−Δλ	−123.6369

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			°	′	″
α	2	to 3	21	23	21.18
2d ∠		&	+95	38	14.50
α	2	to 1	117	01	35.68
Δα			−	00	52.36
			180	00	00.00
α′	1	to 2	297	00	43.32
			46	07	16.98
		First Angle of Triangle	343	08	00.30

			°	′	″
α	3	to 2	201	22	56.35
3d ∠		&	−38	14	28.75
α	3	to 1	163	08	27.60
Δα			−	00	27.31
			180	00	00.00
α′	1	to 3	343	08	00.29

φ	11 31 [illegible] 564	2 [illegible]RAFLEX	λ	162 19	14.568
Δφ	[illegible]		Δλ	[illegible]	[illegible]
φ′	[illegible]		λ′	[illegible]	[illegible]

φ	11 32 20.255	3 CORAL	λ	162 17	10931
Δφ	[illegible]		Δλ	02	15 [illegible]
φ′	[illegible]		λ′	[illegible]	[illegible]

s	[illegible]	(1)	[illegible]	s	9.699	½(φ+φ′)	[illegible]
cos α	[illegible]	(2)	[illegible]	s²			Logarithms
B	[illegible] 4970	Sum	[illegible]	K		s	3.943 5217
(1) = h	7 [illegible] 4666	3	[illegible]	E		sin α	[illegible]
s²	[illegible]	4		5		A′	[illegible]
sin² α	[illegible]	5		3	0.477	sec φ′	[illegible]
C	[illegible]	6		cos² α		Sum	[illegible]
(2) = K	[illegible]	7	[illegible]	6		Arc-sin corr	[illegible]
(δφ)²	4.2309	−Δφ	[illegible] 7242	(colog) E		−Δλ	2.414 0308
D	1.9876	Δφ / 2		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin ½(φ+φ′)	9.307 9695
(3)	6.2185			sec² φ		sec $\frac{\Delta\phi}{2}$	0
−h	2.115 5			(7)		(approx.) −Δα	1.719 0003
s² sin² α	7.790 6					do	+52.360″
E	$\bar{\bar{5}}$.6643	Arc−sin corr.				(8)	0.000″
(4)	5.5704	for s	−1.4	(Δλ)³	7.242	−Δα	+52.360″
		for Δλ	+1.1	F	$\bar{\bar{7}}$.578		
		Total	−0.3	(8)	[illegible].820	−Δλ	+259.4364″

s	[illegible]	(1)	[illegible]	s	9.699	½(φ+φ′)	[illegible]
cos α	[illegible]	(2)	[illegible]	s²			Logarithms
B	8.512 4991	Sum	−441 7351	K		s	4.151 1493
(1) = h	2.645 706	(3)	+ [illegible]	E		sin α	9.462 [illegible]
s²	[illegible]	4		5		A′	[illegible]
sin² α	[illegible]	5	−	3	0.477	sec φ′	[illegible]
C	[illegible]	6		cos² α		Sum	[illegible]
(2) = K	7.7143 [illegible]	7	+	(6)		Arc-sin corr	[illegible]
(δφ)²	5.2403	−Δφ	−771.703[illegible]	(colog) E		−Δλ	2.132 8480
D	1.9845	Δφ / 2		$\frac{A^2 \text{arc}^2 1''}{3}$	$\bar{5}$.912	sin ½(φ+φ′)	9.303 3758
(3)	7.2748			sec² φ		sec $\frac{\Delta\phi}{2}$	2
−h	2.6452			(7)		(approx.) −Δα	1.4362 740
s² sin² α	7.2284					do	+27.307″
E	$\bar{\bar{5}}$.6535	Arc−sin corr.				(8)	0.000″
(4)	5.5271	for s	−3.6	(Δλ)³	6.399	−Δα	+27.307″
		for Δλ	+0.3	F	$\bar{\bar{7}}$.575		
		Total	−3.3	(8)	$\bar{5}$.974	−Δλ	+135.7994″

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			°	′	″				°	′	″
α	2	to 3	343	08	00.30	α	3	to 2	163	08	27.60
2d ∠		&	+17	01	03.92	3d ∠		&	−57	28	40.48
α	2	to 1	000	09	04.22	α	3	to 1	105	39	47.12
Δα			−	00	00.22	Δα			−	00	27.39
			180	00	00.00				180	00	00.00
[illegible]			80	09	04.00	α′	1	to 3	285	39	[illegible]
			105	3[illegible]	[illegible]						
			[illegible]	[illegible]	[illegible]						
φ			[illegible]	4	55.132	φ	[illegible]	[illegible]			
Δφ			[illegible]			Δφ	08 [illegible]			[illegible]	[illegible]
φ′		Rest Photo Tower	[illegible]	[illegible]	[illegible]	φ′	[illegible] 58.093	1 Rest Photo Tower	[illegible]	[illegible]	54.[illegible]

Logarithms			Logs			Logarithms			Logs		
s	[illegible]	(1)	$\bar{5}$.099	λ	11 36 20.04	s	3.637 2242	(1)	32.8[illegible]	$\bar{5}$.099	λ′ 11 3[illegible] 59.78
cos α	[illegible]	(2)			Logarithms	cos α	[illegible]	(2)			Logarithms
B	[illegible]			s	[illegible]	B	[illegible]	s²			3.637 [illegible]
h	[illegible]			A′	[illegible] 3489	h		3			[illegible]
s²	[illegible]	4		sin α	[illegible]	s²	[illegible]	4			[illegible]
sin² α	[illegible]	5	3 0.477	sec φ′	[illegible]	sin² α	9.96[illegible]	(5)	3 0.477	sec φ′	[illegible]
C	[illegible]89	(6) +	cos² α	Sum	0.033 6717	C	0.716 68	(6) +	cos² α	Sum	2.136 3413
(2)−K	3.[illegible]53	(7) +	(6)	Arc−sin corr.	3	(2)−K	7.952 26	(7) +	(6)	Arc−sin corr.	0
(δφ)²	5.2125	−Δφ	+403.8921 (colog) E	−Δλ	0.033 6714	(δφ)²	3.1561	−Δφ	−37.8401 (colog) E	−Δλ	2.136 3413
D	[illegible].9889	$\frac{\Delta\phi}{2}$	$\frac{A^2 arc^2 1''}{3}$ $\bar{5}$.912	$\sin\frac{1}{2}(\phi+\phi')$	9.303 5699	D	1.9845	$\frac{\Delta\phi}{2}$	$\frac{A^2 arc^2 1''}{3}$ $\bar{5}$.912	$\sin\frac{1}{2}(\phi+\phi')$	9.301 2994
(3)	$\bar{7}$.2014		sec² φ	sec $\frac{\Delta\phi}{2}$	2	(3)	5.1406		sec² φ	sec $\frac{\Delta\phi}{2}$	0
−h	2.6063		(7)	(approx.) −Δα	9.337 2415	−h	1.5781		(7)	(approx.) −Δα	1.437 6407
s² sin² α	3.0302			do	+0.217″	s² sin² α	7.2356			do	+27.393″
E	$\bar{\bar{5}}$.6646	Arc−sin corr.		(8)	0″	E	$\bar{\bar{5}}$.6635	Arc−sin corr.		(8)	0″
(4)	1.3011	for s −2.8	(Δλ)³	−Δα	+0.217″	(4)	4.4772	for s −0.3	(Δλ)³ 6.409[illegible]	−Δα	+27.393″
		for Δλ +0	F $\bar{\bar{7}}$.580					for Δλ +0.4	F $\bar{\bar{7}}$.575		
		Total −2.8	(8)	−Δλ	+1.0806″			Total +0.1	(8) 3.984	−Δλ	+136.8804″

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POSITION COMPUTATION, ~~THIRD~~ ORDER ~~TRIANGULATION~~ TRAVERSE

		°	′	″		— CHECK COMPUTATION —	°	′	″
α	Δ KODAK to Δ CORAL	120	56	28.70	α	3 to 2			
2d ∠	&	+202	56	19.60	3d ∠	&			
α	2 to 1	323	52	48.30	α	3 to 1	143	52	48.38
Δα		+	00	00.08	Δα		−	00	00.08
		180	00	00.0			180	00	00.0
α	1 to 2	143	52	48.38	α	1 to 3	[illegible]	[illegible]	[illegible]
	[illegible]	+	00	00.4[illegible]		[illegible]			[illegible]
	[illegible]	162	23	59.?82		[illegible] 28 [illegible] 1 KODAK	162	23	58.[illegible]

Logarithms			Logarithms				Logarithms	
[illegible] 330 9208		[illegible] 11 28 18.96		[illegible] 330 9208			11 28 18.96	
[illegible]				1.1[illegible]				
[illegible]		[illegible] 9208		[illegible]				
Sin ″ [illegible]		Sec φ′ 0.008 7640		Sin ″			Sec φ′ 0.008 7642	
C 0.7[illegible]08		−Δλ 9.6198202	−00.4167	C			Δλ 9.6198202	+00.4167
[illegible]	2d term [illegible]	Sin ½(φ+φ′) 9.2986084			2d term		Sin ½(φ+φ′) 9.2986084	
h² 9.5014		−Δα 8.9184286	−00.083	h²			−Δα 8.9184286	+00.083
D 1.9821				D				
1.4835	3d term	+ 0.0000			3d term	+		
	−Δφ	+00.563			−Δφ	−00.5633		

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POSITION COMPUTATION, FIRST [redacted] ORDER TRAVERSE ~~TRIANGULATION~~

CHECK COMPUTATION

		°	′	″				°	′	″
α	2 N Base, USN to 3 Δ Runit	322	47	17.11	α 3	to 2				
2d	&	328	11	31.70	3d	&				
α	2 to 1	290	58	48.81	α 3	to 1		[illegible]	58	[illegible]
Δα		+	00	01.23	Δα				00	[illegible]

φ 11	33	23.265	2 N Base, USN	λ 162	21	09.890	φ 11	33	20.939
Δφ							+	00	02.326
φ 11	33	20.9[illegible]	3 Runit Zero Tower	λ 162	21	16.041	φ 11	33	23.265

3 Runit Zero Tower	λ 162	21	16.0[illegible]	Δλ	00	06.151
1 N Base USN	λ 162	21	[illegible]			

Logarithms — Values in seconds

				[illegible]					
		2 [illegible] 4992						[illegible]	
0.366 [illegible]	Sin	[illegible] 2083		0.366 6389	1st term		Sin	[illegible] 2083	
s	4.[illegible] 39	A′	8.509 6676	s	4.600 39		A′	8.509 6675	
Sin² α	[illegible]	Sec φ′	0.008 8936	Sin² α	9.740 42		Sec φ′	0.008 8946	
C	0.717 3[illegible]	−Δλ	0.788 9650	−06.1513	C	0.717 33		−Δλ	0.788 9649	+06.1513
	5.258 1[illegible]	2d term	+0.0000	Sin ½(φ+φ′)	9.301 7416		5.258 14	2d term	+0.0000	Sin ½(φ+φ′)	9.301 7416
h²	0.733 3	−Δα	0.090 7066	−01.232	h²			−Δα	0.090 7065	+01.23[illegible]
D	1.9851			D					
	2.7184	3d term	+0.0000			3d term	+		
		−Δφ	+2.3261			−Δφ	−02.3662		

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POSITION COMPUTATION, ~~THIRD~~ FIRST ORDER ~~TRIANGULATION~~ TRAVERSE

			°	′	″				°	′	″
						— CHECK COMPUTATION —					
α	N. Base, USN	to Δ Runit	322	47	17.11	α 3		to 2			
2d ∠		&	+298	54	07.00	3d ∠		&	—		
α	2	to 1	261	41	24.11	α 3		to 1	81	41	24.37
Δα			+	00	00.26	Δα			−	00	00.26
			180	00	00.0				180	00	00.0
α	1	to 2	81	41	24.37	α 1		to 3	261	41	24 [illegible]

First Angle of Triangle

[illegible]	[illegible] Base [illegible]		62	[illegible]	04.890	33	23.454	[illegible]	[illegible]
Δ [illegible]	00.89	[illegible]	+	00	01.312	Δ	00	00.187	[illegible] 40.643 [illegible]	− 00 [illegible]
[illegible]	[illegible] Photo Tower		[illegible]	[illegible]	[illegible] 202	33	23.265	[illegible] Base [illegible]	62 21 04.89 [illegible]

Logarithms	Values in seconds		Logarithms	Values in seconds	Logarithms	Values in seconds		Logarithms	Values in seconds
1.603 8402				23.56	1.603 8402				33 23.56
[illegible]					Cos α 9.159 9600				
[illegible]		s	1.603 8402		B 8.512 4992		s	1.603 8402	
[illegible]			[illegible]		[illegible]	1st term [illegible] 887	Sin α	9.110 [illegible]	
			[illegible]					[illegible]	
			[illegible] 8747		Sin		Sec	[illegible] 008 [illegible] 186	
			[illegible] 8186	[illegible]			Δα	[illegible] 3185	[illegible]
3.7 [illegible] 88	2d term [illegible]	Sin ½(φ+φ′)	9.301 7546			2d term +	Sin ½(φ+φ′)	9.301 7546	
[illegible]		Δα	[illegible] 12	−00.26	h²		Δα	[illegible]	+00.26
D 1.3851					D				
[illegible]	3d term + 0.0000					3d term +			
	−Δφ +00.1889					−Δφ +00.1889			

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

— CHECK COMPUTATION —

			°	′	″
α	2 Δ GRAFLEX	to 3 Δ ELGIN	117	01	35.68
Δα					
α	2		31	43	30.58
Δα					00.60

	+ 00 00 60
	62 19 4.56?

Sin α	9.720 8580		B	8.512 [illegible]	
A′	8.509 6669		h	0.673 0304	
Sec φ′	0.008 9998		s²	4.461 64	
−Δλ	0.470 3424	+02.9535	Sin² α	9.441 71	
Sin ½(φ+φ′)	9.304 2784		C	0.719 97	
−Δα	9.774 6208	+00.595		4.62332	2d term +0.0000
			h²	1.3461	
			D	1.9876	
				3.3337	3d term +0.0000
					−Δφ −04.7101

C	0.720 00	
	4.622 36	2d term +0.0000
h²	1.3461	
D	1.9876	
	3.3337	3d term +0.0000
		Δφ +04.7101

A′	8.509 6669	
−Δλ	0.470 3423	−02.9535
Sin ½(φ+φ′)	9.304 2784	
−Δα	9.774 6207	−00.595

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Ed. April 1945

POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ Traverse

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			°	′	″			Check Computation:	°	′	″
α	2 Graflex	to 3 N. Base, U.S.N.	335	23	28.37	α	3	to 2			
∠		&	+263	34	11.8–	3d ∠		&	–		
α	2	to 1	238	57	40.17	α	3	to 1	58	57	40.31
Δα			+	00	00.14	Δα			–	00	00.14
			180	00	00.0				180	00	00.0
α	1	to 2	58	57	40.31	α	1	to 3	238	57	40.17

First Angle of Triangle

φ	11	37	31.564	2 Graflex	162	19	14.568	φ	[illegible]	[illegible]	[illegible]	3 [illegible]	[illegible]
Δφ	+	00	00.420	[illegible]	+	00	00.[illegible]	Δφ	–	00	00.420	[illegible]	– 00 00.[illegible]
φ	11	37	31.784	1 Aomen Photo Tower	162	19	15.2[illegible]	φ	11	37	31.564	1 Graflex	162 19 14.568

	Logarithms	Values in seconds		Logarithms	Values in seconds		Logarithms	Values in seconds		Logarithms	Values in seconds
s	[illegible]398 9[illegible]		½(φ+φ′)	11 37 31.77		s	1.398 9117		½(φ+φ′)	11 37 31.77	
Cos α	9.[illegible]					Cos α	9.[illegible]				
B	8.512 49[illegible]		s	[illegible]		B	8.5[illegible]		s	[illegible]	
	1.[illegible]		Sin α	[illegible] 8885			[illegible]		Sin α	[illegible]	
s²	2.797 8[illegible]		A	8.[illegible]		s²			A	[illegible]	
Sin²α	9.865 78		Sec φ′	[illegible]		Sin²α			Sec φ′	[illegible]	
C	0.720 00		–Δλ	4.850 4691	–00.7087	C			–Δλ	4.850 4691	+00.7087
	3.383 60	2d term [illegible]	Sin ½(φ+φ′)	9.304 3047				2d term	Sin ½(φ+φ′)	9.304 3047	
h²	9.2426		–Δα	9.154 7738	–00.143	h²			–Δα	9.154 7738	+00.143
D	1.9876					D					
	1.2351	3d term +0.0000						3d term +			
		Δφ –00.4205						–Δφ +00.4205			

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DEPARTMENT OF COMMERCE
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Form 27
Ed. April 1945

POSITION COMPUTATION, ~~THIRD~~ First -ORDER ~~TRIANGULATION~~ Traverse

CHECK COMPUTATION

		°	′	″				°	′	″
α	2 Δ ELGIN to 3 Δ GRAFLEX	297	00	43.32	α	3 to 2				
	&	-196	38	34.52	3d	&				
α	2 to 1	133	39	17.84	α	3 to 1		313	39	11.86
Δα			00	05.98	Δα			+	00	05.98
		180	00	00.0				180	00	00.0
		[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
φ	ELGIN	42	14	55.132	φ	40	29.782	3 Zero Tower		
Δφ		—	00	29.552	Δλ			+	00	29.552
φ′	3 Zero Tower	42	14	25.580	λ′	37	4.988	1 ELGIN	14	[illegible]

s	[illegible]				[illegible]	s	[illegible]				[illegible]
B	1.443 9810	1st term	-27.7940		851 [illegible]	B	[illegible] 7875	1st term		Sin α	9.851 [illegible]
s²	6.184 82			A′	8.509 6665	s²	6.[illegible] 82			A′	8.509 6665
Sin² α	9.718 89			Sec φ′	0.009 0705	Sin² α	[illegible]			Sec φ′	0.009 0584
C	0.721 39			−Δλ	1.470 5900 +29.5522	C	0.72170			−Δλ	1.470 5899 −29.5522
	6.625 10	2d term	+0.0004	Sin ½(φ+φ′)	9.305 7769		6.625 43	2d term	+0.0004	Sin ½(φ+φ′)	9.305 7769
h²	2.8879			−Δα	0.776 3669 +05.975	h²	2.8879			−Δα	0.776 3668 −05.975
D	1.9889					D	1.9891				
	4.8768	3d term	+0.0000				4.8770	3d term	+0.0000		
		−Δφ	−27.7936					−Δφ	+27.7935		

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[illegible] USE ONLY

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POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

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	Station	°	′	″			Check Computation	°	′	″
α	* N. Base USN to B RUNIT	322	47	17.11	α	3	to 2			
	&	+344	17	02.5	3d ∠		&	–		
α	2 to 1	307	04	19.61	α	3	to 1	127	04	21.64
Δα		+	00	02.03	Δα	* Corrected ∠ from B.L. Loop Comp.		–	00	02.03
		180	00	00.0				180	00	00.0
α	1 to 2	127	04	21.64	α	1	to 3	307	04	19.61
	[illegible]			[illegible]		[illegible]		162	21	20.002
	00 07.534 [illegible]	+	00	[illegible]		00 07.534 [illegible]			00	[illegible]
φ	11 33 15.731 Base on B. Pt. 4(A)*	λ	162 21	20.002	φ	11 33 23.265	N. Base, USN.	λ	162 21	09.99[illegible]

Logarithms	Values in seconds		Logarithms	Values in seconds		Logarithms	Values in seconds		Logarithms	Values in seconds
2.587 [illegible]		½(φ+φ′) 11 33	20.00 ~~24.50~~		s 2.584 3323		½(φ+φ′) 11 33	20.0[illegible]		
[illegible]					Cos α 9.180 1930					
[illegible]			[illegible]		h 8.012 [illegible]			2.584 3323		
[illegible]			[illegible]		[illegible] 246		Sin α	9.901 93~~18~~ 30		
[illegible]			[illegible]		[illegible]			[illegible]		
[illegible]		Sec φ′	[illegible]008 8914		Sin² α [illegible]		Sec φ′	[illegible]008 8946		
[illegible]		−Δλ	1.004 8275	−10.1118	C 0.111 28		−Δλ	1.004 8274	+10.1118	
[illegible]	3d term [illegible]	Sin ½(φ+φ′)	9.30[illegible] ~~7663~~ 7200		[illegible]	2d term	Sin ½(φ+φ′)	[illegible] 7200		
h² 1.2540		−Δα	0.306 ~~5938~~ 5475	−2.026	h²		−Δα	0.306 5474	+02.026	
D 1.9851					D					
3.7391	3d term + 0.0000					3d term +				
	−Δφ +07.5339					−Δφ −07.5340				

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* Not a permanent station

VRLG.

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Form 27
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POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

		°	′	″		Check		°	′	″
α	2 to 3	[illegible]	04	21.67 x	α	3	to 2			
	3	196	03	38.5 * x	3		&			
	2	223	08	00.14 x	α	3	to 1	143	08	04.90
		+	00	04.76	Δα	*Corrected ∡ from Base line Loop Comp.		−	00	04.76
								180	00	00.0
φ	[illegible]	[illegible]	[illegible]	44.486	3	*Traverse* sta. Runit	λ			
Δφ	00 31.245	999.9485	Δλ	+ 00	23.757	Δφ	00 31.244	999.9485	Δλ	00 23.759
φ	33 [illegible]	1 Runit (Traverse Sta.) **	λ	162	21 43.261	φ	33 15.730	1 4(A)	λ	162 21 20.002

				Δλ	1.375 8264	−23.7589	C	0.71695		−Δλ	1.375 8265	+23.7589
	6.43184	2d term	+0.0003	Sin½(φ+φ′)	9.301 5151			6.43149	2d term +0.0003	Sin½(φ+φ′)	9.301 5151	
h²	2.4895			Δα	0.677 3415	−04.757	h²	2.9846		−Δα	0.677 3416	+04.757
D	1.2851						D	1.9848				
	4.9746	3d term	+0.0000					4.9744	3d term +			
		−Δφ	+31.2446						−Δφ −31.2445			

Other entries: Sin α 9.178 1049; A′ 8.509 6676; Sec φ′ 0.008 8914; C 0.71695 (left: 0.717 37); A 8.5076617.

** This is a permanent station
Marked with a standard U.S.C+G.S. Triangulation Disk
Stamped "TRAVERSE Sta. RUNIT"

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April 1945

POSITION COMPUTATION, ~~THIRD~~ FIRST-ORDER ~~TRIANGULATION~~ TRAVERSE

← CHECK COMPUTATION →

		°	′	″				°	′	″
* Aomon Zero Tower to A GRAFLEX		211	43	29.98	α	3 to 2				
&		+94	34	08.0-	3d	&				
2	to 1	[illegible]	[illegible]	[illegible]	α	3 to 1		126	11	41.20
			00	03.22	Δα			–	00	03.22
		180	00	00.0				180	00	00.0
1	to 2	[illegible]	[illegible]	[illegible]	α	1 to 3		[illegible]	[illegible]	[illegible]

Logarithms					Logarithms			
C 0.11996		–Δλ 1.203 1552	15.7645	C 0.11984		–Δλ 1.203 1553	+15.9645
6.08848	2d term 0.000	sin ½ 9.304 1951		6.08882	2d term +0.0001	Sin ½ (φ+φ′) 9.304 1951	
h² 2.1257		–Δα 0.507 3503	–03.216	h²		–Δα 0.507 3504	+03.216
D 1.9876				D			
4.135	3d term +				3d term +		
	–Δφ +11.5593				–Δφ –11.5594		

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* This point is identical with stake Aomon 12 of the Gamma line third tape traverse.

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U. S. COAST AND GEODETIC SURVEY
Form 27
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POSITION COMPUTATION, THIRD-ORDER ~~TRIANGULATION~~ TRAVERSE

← CHECK COMPUTATION

		°	′	″				°	′	″
α	2 Trav. Sta. Aomon to 3 Aomon Base Trav.	126	17	41.20	α	3	to 2			
Δα	&	+180	00	00.	Δα		&			
α	2	306	17	41.20	α	3	to 1	126	17	45.27
Δα		+	00	04.07	Δα			−	00	04.07
		180	00	00.0				180	00	00.0

37	18.24	Trav. Sta. Aomon	162	19	27.576	37 00.667 Trav. Sta. Biijiri	162 19 47.779
			+	00	20.201	4.628 (1592.565 m)	− 00 20.20
						Trav. Sta. Aomon	

s		A	8.509 6670		s		A	8.509 6670
$Sin^2α$			2.008 7883		$Sin^2α$		Sec φ′	2.008 9945
C	0.7?? 8?	−Δλ	1.305 3696	−20.2008	C	0.71969	−Δλ	1.305 3694 +20.2008
	6.293 ?7	2d term +0.0002	$Sin\frac{1}{2}(φ+φ′)$	9.304 0611		6.293 11	2d term +0.0002	$Sin\frac{1}{2}(φ+φ′)$ 9.304 0611
h^2	2.33?3	−Δα	0.609 4301	−4.069	h^2	2.3303	−Δα	0.609 4305 +4.067
D	1.98?5				D	1.9873		
	4.3178	3d term +14.6275				4.3176	3d term +	
		−Δφ +14.6275					−Δφ −14.6279	

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* This point is identical with stake Biijiri 11 of the Gamma Line, Invar Traverse

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON INVERSE COMPUTATION"

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	331	58	18.62	α	3	to 1			
Δα			+	00	32.56	Δα					
			180	00	00.00				180	00	00.00
α	1	to 2	151	58	51.18	α	1	to 3			
		First Angle of Triangle									
φ		[illegible] TOWER	62	2	6	φ		3			
Δφ		[illegible]	−	02	[illegible]	Δφ					
φ′		[illegible]				φ′		1			

	Logarithms		Logs		Logarithms		Logarithms		Logs		Logarithms
s	4.022 0406	1		s	4.022 0406	s		1			
cos α	[illegible]	(2)				cos α		(2)			
B	[illegible]	Sum				B		Sum			
h	2.48[illegible]					h		3			
						s²		4			
				sec φ′		sin² α		5		sec φ′	
				Sum		C		6	cos² α	Sum	
(2)=K	[illegible]	(7) +	(6)	Arc − sin corr.		(2)=K		(7) +	(6)	Arc − sin corr.	
(δφ)²	[illegible]	Δφ	colog E	Δλ	− [illegible]	(δφ)²		Δφ	(colog) E	Δλ	
D	1.9851	$\frac{\Delta\phi}{2}$	$\frac{A^2 arc^2 1''}{3}$ 5̄.912	sin ½(φ+φ′)	7.300 1705	D		$\frac{\Delta\phi}{2}$	$\frac{A^2 arc^2 1''}{3}$ 5̄.912	sin ½(φ+φ′)	
(3)	6.9458		sec² φ	sec $\frac{\Delta\phi}{2}$		(3)			sec² φ	sec $\frac{\Delta\phi}{2}$	
−h	2.4804		(7)	(approx.) Δα	1.512 6541	−h			(7)	(approx.) −Δα	
s² sin² α	7.3881			do	− 32.558″	s² sin² α				do	
E	5.6636	Arc − sin corr.		(8)	—″	E		Arc − sin corr.		(8)	
(4)	5.5321	for s −	(Δλ)²	Δα	− 32.558″	(4)		for s −	(Δλ)²	−Δα	
		for Δλ +	F					for Δλ +	F		
		Total	(8)	−Δλ	−163.1111″			Total	(8)	Δλ	

SECRET

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. [illegible]

[illegible] POSITION COMPUTATION

in which log Δλ = log [illegible] correction for arc to sin*; and log s = log s_1 + correction for arc to sin*

1. φ	[illegible]	λ	162 23 59.152 E
2. φ′	[illegible]	λ′	162 21 16.041 E
Δφ	[illegible]	(Δλ)	+ 02 43.111
$\frac{\Delta\phi}{2}$	[illegible]		+ 01 21.556
$\phi_m\left(\phi+\frac{\Delta\phi}{2}\right)$	[illegible]		
Δφ (secs.)	[illegible]	(secs.)	+ 163.111
log Δφ	[illegible]	log Δλ	2.212 4833 P
corr. arc to sin	[illegible]		0
log Δφ	[illegible]		2.212 4833
log cos $\frac{\Delta\lambda}{2}$	[illegible]	log cos φ	9.991 1714
colog B_m	[illegible]	colog A	1.490 3320
log s cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	[illegible]	log s sin$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	3.693 9867 P
		log s cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	3.967 8802 n
log Δλ	[illegible]	log tan$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.726 1065
log sin ϕ_m	[illegible]	$\alpha+\frac{\Delta\alpha}{2}$	151 58 34.90
log sec $\frac{\Delta\phi}{2}$	[illegible]	log sin$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.671 9461
log a	[illegible]	log cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.945 8396
a	[illegible]	log s_1	4.022 0406
b		corr.	0
Δα secs.	[illegible]	log s	4.022 0406
$\frac{\Delta\alpha}{2}$	[illegible]		
$\alpha+\frac{\Delta\alpha}{2}$	[illegible]		
α (1 to 2)	[illegible]		
Δα	[illegible]		
	180		
α′ (2 to 1)	[illegible]		

[illegible] the back of this form for correction of [illegible]

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NOTE.—For log [illegible] omit all terms below the heavy line except those printed [illegible] use underscored [illegible] 7 decimal places.

16—31070-1

Page 4[illegible]

SECRET

DEPARTMENT [illegible]
Form [illegible]

in which log [illegible] correction for arc to sine; and log s = log s_1 +

correction for arc to sine

1. ϕ	[illegible]		62 21 12.02
2. ϕ'	[illegible]		64 23 11.611
$\Delta\phi$ (2 − 1)	[illegible]		1 01 59.588
$\frac{\Delta\phi}{2}$	[illegible]		1 00 59.794
$\phi_m \left(\phi + \frac{\Delta\phi}{2}\right)$	[illegible]		
$\Delta\phi$ (secs.)	[illegible]		119.588
log $\Delta\phi$	[illegible]		2.077 6876
cor. arc − sine			0
log $\Delta\phi_1$	2.38[illegible]		2.077 6876
log cos $\frac{\Delta\lambda}{2}$		log cos	9.991 0528
colog B_m	[illegible]	colog A	1.490 3328
log $\left[s_1 \cos\left(\alpha + \frac{\Delta\alpha}{2}\right)\right]$	[illegible]	log s sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	3.559 0732 p.
		log s cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	3.873 8225 ?
log $\Delta\lambda$	[illegible]	log tan $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.685 2507
log sin ϕ_m	[illegible]		154 09 07.36
log sec $\frac{\Delta\phi}{2}$		log sin $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.629 4710
log a	[illegible]	log cos $\left(\alpha + \frac{\Delta\alpha}{2}\right)$	9.954 2204
a	[illegible]		3.917 6022
b			0
$\Delta\alpha$ (**secs.**)	[illegible]		3.917 6022
$\frac{\Delta\alpha}{2}$	[illegible]		
$\alpha + \frac{\Delta\alpha}{2}$	[illegible]		
α (**1 to 2**)	[illegible]		
$\Delta\alpha$	[illegible]		
	180		
α' (**2 to 1**)	[illegible]		

[illegible] table on the back of this form for correction of [illegible]

NOTE.—For log [illegible] below the heavy line except those printed (in whole or in part) in heavy type or those underscored [illegible] 7 decimal places.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

CHECK ON INVERSE COMPUTATION

SECRET

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	334	08	55.35	α	3	to 1			
Δα			+	00	24.03	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	[illegible]	09	19.38	α′	1	to 3			
		Plane Angle of Triangle									
φ	[illegible]	[illegible]	[illegible]	19	11.614	φ		3			
Δφ	[illegible]		+	01	59.588	Δφ					
φ′	[illegible]	[illegible]	162	21	11.202	φ′		1			

	Logarithms		Logs		Logarithms		Logarithms		Logs		Logarithms
s	3.9.6022	(1) [illegible]	1 | $\bar{5}$.699	½(φ+φ′)	11 35 25.15	s	(1)	1	$\bar{5}$.699	½(φ+φ′)	
cos α	9 [illegible]	2				cos α	2				
B	8.[illegible]	Sum		s	3.[illegible]6022	B	Sum			s	
(1)—h	[illegible]	3				(1)—h	3				
s²	[illegible]	4	5	A	8.[illegible]	s²	4	5		A	
sin² α	9.[illegible]	(5)	3 | 0.477	sec φ	[illegible] 8947	sin² α	(5)	3 | 0.477		sec φ	
C	[illegible]	(6) +	cos² α	Sum	2.077 6811	C	(6) +	cos² α		Sum	
(2)=K	7.838 21	(7) +	(6)	Arc—sin corr.	~~2.077~~ [illegible]	(2)=K	(7) +	(6)		Arc—sin corr.	
(δφ)²	4.1726	—Δφ +243.[illegible]	(colog) E	—Δλ	2.077 6811	(δφ)²	—Δφ	(colog) E		Δλ	
D	1.9876	Δφ/2	A²arc²1″/3 | $\bar{5}$.912	sin½(φ+φ′)	9.30[illegible] 0067 4133	D	Δφ/2	A²arc²1″/3 | $\bar{5}$.912		sin½(φ+φ′)	
(3)	6.7602		sec²φ	sec Δφ/2	0	(3)		sec²φ		sec Δφ/2	
—h	2.3863		(7)	(approx.) —Δα	1.380 6944	—h		(7)		(approx.) —Δα	
s² sin² α	7.1182			do	″	s² sin² α				do	″
E	5.6642	Arc—sin corr.		(8)	″	E	Arc—sin corr.			(8)	″
(4)	5.[illegible]87	for s —	(Δλ)³	—Δα	— 24.027	(4)	for s —	(Δλ)³		—Δα	″
		for Δλ +	F		″		for Δλ +	F			″
		Total	(8)	— Δλ	—119.5880		Total	(8)		Δλ	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

SECRET

INVERSE POSITION COMPUTATION

OFFICIAL USE ONLY

in which log $\Delta\lambda_1$ = log ($\lambda' - \lambda$) – correction for arc to sin*; and log s = log s_1 + correction for arc to sin*.

NAME OF STATION

1. ϕ	[illegible]	[illegible]	62 19 15.277 ✓
2. ϕ'	[illegible]	[illegible]	62 14 25.580 ✓
$\Delta\phi$ $(=\phi'-\phi)$	[illegible]	$\Delta\lambda$ $(=\lambda'-\lambda)$	+ 04 49.697 ✓
$\frac{\Delta\phi}{2}$	[illegible]	$\frac{\Delta\lambda}{2}$	+ 02 24.848 ✓
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	[illegible]		
$\Delta\phi$ (secs.)	+ 157.718	$\Delta\lambda$ secs.	+ 289.697 ✓
log $\Delta\phi$	2.178 [illegible]	**log** $\Delta\lambda$	2.461 9440 ✓
cor. arc – sin		cor. arc – sin	0
log $\Delta\phi_1$	2.198 [illegible]	log $\Delta\lambda_1$	2.461 9440 ✓
log cos $\frac{\Delta\lambda}{2}$	9.999 [illegible]	log cos ϕ'	9.990 9636 ✓
colog B_m	1.487 5026	**colog** A'	1.490 3334 ✓
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.685 [illegible] (opposite in sign to log)	**log** $\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.943 2410 ✓
		log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.685 6050 ✓
log $\Delta\lambda$	2.461 944[illegible]	**log tan** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.257 636,0 ✓
log sin ϕ_m	9.205 [illegible]	$\alpha+\frac{\Delta\alpha}{2}$	118 55 20.77
log sec $\frac{\Delta\phi}{2}$	[illegible]	**log sin** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.942 1447
log a	[illegible]	**log cos** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.684 5087
a	[illegible]	**log** s_1	4.001 0963
b		cor. arc – sin	+ 0
$-\Delta\alpha$ (**secs.**)	[illegible]	log s	4.001 0963
$-\frac{\Delta\alpha}{2}$	[illegible]		
$\alpha+\frac{\Delta\alpha}{2}$	118 55 [illegible]		
α (**1 to 2**)	118 [illegible]		
$\Delta\alpha$	[illegible]		
	180		
α' (**2 to 1**)	278 54 51.47		

See table on the back of this form for correction of arc to sin.

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NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3.0 omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

CHECK ON INVERSE COMPUTATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	298	54	51.47	α	3	to 1			
Δα			+	00	58.49	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	118	55	49.96	α′	1	to 3			
	First Angle of Triangle										
φ	[illegible]	[illegible]	162	[illegible]	25.583	φ		3	λ		
Δφ	[illegible]	Δλ	1	04	49.697	Δφ			Δλ		
φ′	[illegible]	[illegible]	162	19	15.277	φ′		1	λ′		

Logarithms			Logs				Logarithms			Logs		
s	[illegible]	(1)	9.699	½(φ+φ′)	17 38 7.88	s		(1)	½	9.699	½(φ+φ′)	
cos α	[illegible]	(2)		Logarithms		cos α		(2) +	s²		Logarithms	
B	[illegible]	Sum		s	[illegible]	B		Sum	K			
(1)=h	[illegible]	3		sin α	[illegible]	h		3 +	F		sin α	
s²	[illegible]	4		A′	8.[illegible]	s²		4	(5)		A′	
sin² α	[illegible]	(5)	3	0.477	sec φ′ 0.0089 [illegible]	sin² α		(5)	3	0.477	sec φ′	
C	[illegible]	(6) +	cos² α		Sum 2.4619439	C		(6) +	cos² α		Sum	
(2)=K	8.608[illegible]	(7) +	(6)		Arc sin corr. 0	(2)=K		(7) +	(6)		Arc−sin corr.	
(δφ)²	7.37[illegible]	−Δφ +157.7978	(colog) E		−Δλ 2.4619439	(δφ)²		−Δφ	(colog) E		Δλ	
D	[illegible]	Δφ/2	$\frac{A^2 \sin^2 1''}{3}$	5̄.912	sin ½(φ+φ′) 9.3051135	D		Δφ/2	$\frac{A^2 \sin^2 1''}{3}$	5̄.912	sin ½(φ+φ′)	
(3)	6.3857		sec² φ		sec Δφ/2 0	(3)			sec² φ		sec Δφ/2	
−h	2.1980		(7)		(approx.) −Δα 1.7610574	−h			(7)		(approx.) −Δα	
s² sin² α	7.8866				do −58.487″	s² sin² α					do	″
E	5.6646	Arc−sin corr.			(8) −	E		Arc−sin corr.			(8)	″
(4)	5.7492	for s −1.8	(Δλ)²		−Δα −58.487″	(4)		for s −	(Δλ)²		−Δα	″
		for Δλ +1.4	F					for Δλ +	F			
		Total −0.4	(8)		−Δλ −289.6969″			Total	(8)		Δλ	″

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. [illegible]

INVERSE POSITION COMPUTATION

in which log $\Delta\lambda_1$ = log (λ' − λ) [illegible] for arc to sin*, and log s = log s_1 + correction for arc to sin*.

NAME OF STATION

1. ϕ	[illegible]	REEF [illegible]		162 14 54.051 E
2. ϕ'	[illegible]	[illegible]		162 21 16.041 E
$\Delta\phi$ (= ϕ' − ϕ)	[illegible]			− 06 21.990
$\frac{\Delta\phi}{2}$	[illegible]			− 03 10.995
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	[illegible]			
$\Delta\phi$ (secs.)	[illegible]			− 381.990

log $\Delta\phi$	1.358 [illegible]	log $\Delta\lambda$	2.582 0520 n
cor. arc − sin			0
log $\Delta\phi_1$	1.358 [illegible]		2.582 0520
log cos $\frac{\Delta\lambda}{2}$	9.999 [illegible]	log cos	9.991 [illegible] 3
colog B$_m$	1.487 [illegible]	**colog A**	1.490 3324
log$\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	2.846 [illegible]	log $\left\{s \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.063 4957 n
		log $\left\{s \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	2.846 2727 n
log $\Delta\lambda$	2.582 [illegible]	log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	1.217 2230
log sin ϕ_m	9.301 [illegible] 2576	$\alpha+\frac{\Delta\alpha}{2}$	266 31 46.89
log sec $\frac{\Delta\phi}{2}$	[illegible]	log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.999 2029
log a	1.8[illegible]	log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	8.78[illegible] 9198
a	[illegible]	log s	4.064 2928
b	[illegible]		0
−$\Delta\alpha$ **(secs.)**	[illegible]	log s	4.064 2928
−$\frac{\Delta\alpha}{2}$	[illegible]		
$\alpha+\frac{\Delta\alpha}{2}$	266 31 46.89	[illegible] back of this form for correction of [illegible]	
α (1 to 2)	266 31 [illegible]		
$\Delta\alpha$	[illegible]		
	180		
α' (2 to 1)	86 [illegible]		

NOTE.—For logs up to 4.0 [illegible] (or both) [illegible] below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON INVERSE COMPUTATION"

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	266	31	08.64	α	3	to 1			
Δα			+	01	16.50	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	86	32	25.14	α′	1	to 3			

First angle of triangle

	°	′	″			°	′	″		°	′	″			°	′	″
φ	11	32	58.095	2 CELL [illegible] TOWER	λ	162	14	54.051	φ				3	λ			
Δφ	+	00	22.844		Δλ	+	06	21.710	Δφ					Δλ			
φ′	11	33	20.939	1 KUNIT ZERO TOWER	λ′	162	21	16.041	φ′				1	λ′			

	Logarithms				Logs				Logarithms				Logs		
s	4.064 2928	(1)		½	$\bar{6}$.699	½(φ+φ′)	11 33 09.52	s		(1)		½	$\bar{9}$.699	½(φ+φ′)	
(−) cos α		(2)		s²			Logarithms	cos α		(2)		s²			Logarithms
B	8	Sum		K		s	4.064 2928	B		Sum		K		s	
(1)=h	1.360 0981	(3)		E		(−) sin α	9.994 1980	(1)=h		(3)		E		sin α	
s²	8.128 59	(4)		(5)		A′	8.509 6675	s²		(4)		(5)		A′	
sin² α	9.998 40	(5)		3	0.477	sec φ′	0.008 8936	sin² α		(5)	−	3	0.477	sec φ′	
C	0.1.710	(6)	+	cos² α		Sum	2.582 0519	C		(6)	+	cos² α		Sum	
(2)=K	8.84449	(7)	+	(6)		Arc−sin corr.	0	(2)=K		(7)	+	(6)		Arc−sin corr.	
(δφ)²	2.7202	−Δφ	22.844	(colog) E		−Δλ	2.582 0519	(δφ)²		−Δφ		(colog) E		Δλ	
D	1.9849	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.301 6120	D		Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	
(3)	4.7051			sec²φ		sec Δφ/2	0	(3)				sec²φ		sec Δφ/2	
−h	1.3601			(7)		(approx.) −Δα	1.883 6639	−h				(7)		(approx.) −Δα	
s² sin² α	8.1270					do	″	s² sin² α						do	″
E	5.6636	Arc−sin corr.				(8)	″	E		Arc−sin corr.				(8)	″
(4)	5.1507	for s	−	(Δλ)³		−Δα	″ −76.500	(4)		for s	−	(Δλ)³		−Δα	″
		for Δλ	+	F						for Δλ	+	F			
		Total		(8)		−Δλ	″ −381.9899			Total		(8)		Δλ	″

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
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INVERSE POSITION COMPUTATION

$$s_1 \sin\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha = \Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2} + F(\Delta\lambda)^3$$

in which log $\Delta\lambda_1$ = log ($\lambda' - \lambda$) − correction for arc to sin*; log $\Delta\phi_1$ = log ($\phi' - \phi$) − correction for arc to sin*; and log s = log s_1 + correction for arc to sin*.

NAME OF STATION

	° ′ ″			° ′ ″
1. ϕ	11 … 28.095	REEF PACK TOWER	λ	162 14 54.051 E
2. ϕ'	11 3… 26.854	AOMON ZERO TOWER	λ'	162 19 11.614 E
$\Delta\phi$ ($=\phi'-\phi$)	+ …		$\Delta\lambda$	−04 17.563
$\frac{\Delta\phi}{2}$	+ …		$\frac{\Delta\lambda}{2}$	−02 08.782
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	11 3… …47			
$\Delta\phi$ (secs.)	+248.759		$\Delta\lambda$ (secs.)	−257.563

log $\Delta\phi$	2.429 36…	log $\Delta\lambda$	2.410 8818 n
cor. arc − sin		cor. arc − sin	0
log $\Delta\phi_1$	2.429 36…	log $\Delta\lambda_1$	2.410 8818
log cos $\frac{\Delta\lambda}{2}$	9.999 999	log cos ϕ_m	9.991 0583
colog B_m	1.487 50…	**colog A**	1.490 3327
log{s_1 cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$}	3.916 864… (opposite in sign to $\Delta\phi$)	log{s_1 sin$\left(\alpha+\frac{\Delta\alpha}{2}\right)$}	3.892 2728 n
		log{s_1 cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$}	3.916 8647 n
log $\Delta\lambda$	2.410 8818	log tan$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.975 4081
log sin ϕ_m	9.302 …6… (3 log $\Delta\lambda$ 7.233; log F 7.577)	$\alpha+\frac{\Delta\alpha}{2}$	223 22 43.27
log sec $\frac{\Delta\phi}{2}$	(log … 4.8…)	log sin$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.836 8411
log a	1.713 5…	log cos$\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.861 4330
a		log s_1	4.055 4317
b		cor. arc − sin	0
−$\Delta\alpha$ (**secs.**)		log s	4.055 4317
$-\frac{\Delta\alpha}{2}$			
$\alpha+\frac{\Delta\alpha}{2}$	223 22 43.27		
α (1 to 2)	223 2… …1		
$\Delta\alpha$	+ …		
	180		
α' (2 to 1)	43 23 09.…		

*See table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (for both) up to 3, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON INVERSE COMPUTATION"

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	223	22	17.41	α	3	to 1			
Δα			+	00	51.73	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	43	23	09.14	α′	1	to 3			

First Angle of Triangle

	°	′	″			°	′	″		°	′	″			°	′	″
φ	11	34	58.095	2 KEEF PHOTO TOWER	λ	162	14	54.051	φ				3	λ			
Δφ	+	04	[illegible]		Δλ	+	04	17.562	Δφ					Δλ			
φ′	11	37	26.864	1 AOMON ZERO TOWER	λ′	162	19	11.613	φ′				1	λ′			

	Logarithms				Logs		° ′ ″
s	4.055 4317	(1)	−268.7916	½	$\bar{9}$.699	½(φ+φ′)	11 35 12.47
cos α	1.861 4844	(2)	+ 0.0317	s²			Logarithms
B	8 [illegible]	Sum	[illegible]	K		s	4.055 4317
(1)=h	2.429 4 [illegible]	(3)	+ 0.0007	F		sin α	9.836 [illegible]
s²	8 [illegible] 86	(4)	− 0.0001	(5)		A′	8.5[illegible] 6669
sin² α	9.673 57	(5)	−	3	0.477	sec φ′	0.008 9978
C	0.717 10	(6)	+	cos² α		Sum	2.410 8819
(2)=K	8.501 53	(7)	+	(6)		Arc−sin corr.	1
(δφ)²	4.8588	−Δφ	−268.7592	(colog) E		Δλ	2.410 8818
D	1.9849	Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	9.302 8765
(3)	6.8437			sec²φ		sec Δφ/2	1
−h	2.4294			(7)		(approx.) −Δα	1.713 7584
s² sin² α	7.7844					do	51.73″
E	5.6636	Arc−sin corr.				(8)	″
(4)	5.8774	for s	−2.3	(Δλ)²		−Δα	−51.73″
		for Δλ	+1.1	F			
		Total	−1.2	(8)		−Δλ	−257.5620″

	Logarithms		″		Logs		° ′ ″
s		(1)		½	$\bar{9}$.699	½(φ+φ′)	
cos α		(2)	+	s²			Logarithms
B		Sum		K		s	
(1)=h		(3)	+	F		sin α	
s²		(4)		(5)		A′	
sin² α		(5)	−	3	0.477	sec φ′	
C		(6)	+	cos² α		Sum	
(2)=K		(7)	+	(6)		Arc−sin corr.	
(δφ)²		−Δφ		(colog) E		Δλ	
D		Δφ/2		A²arc²1″/3	$\bar{5}$.912	sin½(φ+φ′)	
(3)				sec²φ		sec Δφ/2	
−h				(7)		(approx.) −Δα	
s² sin² α						do	″
E		Arc−sin corr.				(8)	″
(4)		for s	−	(Δλ)²		−Δα	″
		for Δλ	+	F			
		Total		(8)		Δλ	″

U. S. GOVERNMENT PRINTING OFFICE : 1941—Q-305152

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept 1942

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INVERSE POSITION COMPUTATION

$s_1 \sin\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{\Delta\lambda_1 \cos \phi_m}{A_m}$

$s_1 \cos\left(\alpha + \frac{\Delta\alpha}{2}\right) = \frac{\Delta\phi_1 \cos \frac{\Delta\lambda}{2}}{B_m}$

$-\Delta\alpha = \Delta\lambda \sin \phi_m \sec \frac{\Delta\phi}{2} - F\,\Delta\lambda^3$

1994

in which log $\Delta\lambda_1$ = log ($\lambda' - \lambda$) − correction for arc to sin*; log $\Delta\phi_1$ = log $\Delta\phi$ − correction for arc to sin*; and log s = log s_1 + correction for arc to sin*.

NAME OF STATION

1. ϕ	11 32 38.095	REEF PHOTO TOWER		162 14 54.051 E
2. ϕ'	11 40 09.782	ENGEA ZERO TOWER		162 14 25.580 E
$\Delta\phi$ $(=\phi'-\phi)$	+ 07 31.687			+ 28.471
$\frac{\Delta\phi}{2}$	+ 03 35.844			+ 14.235
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	11 36 3[illegible].938			
$\Delta\phi$ (secs.)	+ 431.687		$\Delta\lambda$ (secs.)	+ 28.471
log $\Delta\phi$	2.635 169[illegible]		log $\Delta\lambda$	1.454 4027
cor. arc − sin	−		cor. arc − sin	0
log $\Delta\phi_1$	2.635 169[illegible]		log $\Delta\lambda_1$	1.454 4027
log cos $\frac{\Delta\lambda}{2}$			log cos ϕ_m	9.991 0231
colog B_m	1.487 5025		**colog A_m**	1.490 3330
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.122 6715 n	(opposite in sign to $\Delta\phi$)	log s_1 sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	2.935 7588 p
			log s_1 cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	4.122 6715 n
log $\Delta\lambda$	1.454 402[illegible]	4.363	log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	8.813 0873
log sin ϕ_m	9.303 712[illegible]	7.576	$\alpha+\frac{\Delta\alpha}{2}$	176 16 46.27
log sec $\frac{\Delta\phi}{2}$		[illegible]939	log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	8.812 1711
log a	0.758 [illegible]		log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.999 0838
a	+05.[illegible]		log s_1	4.123 5877
b			cor.	0
$-\Delta\alpha$ **(secs.)**	+5.[illegible]		log s	4.123 5877
$-\frac{\Delta\alpha}{2}$	+ [illegible]			
	00 [illegible] [illegible]			
$\alpha+\frac{\Delta\alpha}{2}$	176 [illegible] 46.[illegible]		See back of this form for correction of	
α (1 to 2)	176 [illegible] 49.[illegible]			
$\Delta\alpha$	[illegible]			
	180			
α' (2 to 1)	356 6 43.40			

NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3.[illegible] omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored. Use logarithms to 7 decimal places.

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16—31070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, FIRST-ORDER TRIANGULATION

"CHECK ON" INVERSE COMPUTATION

			°	′	″				°	′	″
α	2	to 3				α	3	to 2			
2d ∠		&	+			3d ∠		&	−		
α	2	to 1	176	16	49.13	α	3	to 1			
Δα			−	00	05.73	Δα					
			180	00	00.00				180	00	00.00
α′	1	to 2	356	16	43.40	α′	1	to 3			

First Angle of Triangle

	° ′ ″			°	′	″		° ′ ″			° ′ ″
φ	11 22 [illegible]	2 [illegible] TOWER	λ	162	14	54.051	φ		3	λ	
Δφ	+ [illegible]		Δλ	−	00	28.471	Δφ			Δλ	
φ′	11 [illegible] 07.182	1 [illegible] TOWER	λ′	162	14	25.580	φ′		1	λ′	

	Logarithms				Logs		° ′ ″
s	4 [illegible]	1		½	9̄. 699	½(φ+φ′)	11 36 33.94
cos α	[illegible]	2		s²			Logarithms
B	[illegible]	Sum		K		s	4 123 5877
(1)=h	2 [illegible]	3		h		sin α	8 812 [illegible]
s²	8 [illegible]	4		5		A′	[illegible] 509 6665
sin² α	7 [illegible]	(5)		3	0. 477	sec φ′	0.009 0705
C	[illegible]	(6)	+	cos² α		Sum	1.454 4032
(2)=K	6.588 44	(7)	+	(6)		Arc−sin corr.	−3
(δφ)²	5.2703	−Δφ	−431.6870	(colog) E		−Δλ	1.454 4029
D	1.9849	Δφ/2		A²arc²1″/3	5̄. 912	sin½(φ+φ′)	9.303 7124
(3)	7.2552			sec²φ		sec Δφ/2	2
−h	2.6351			(7)		(approx.) −Δα	0.758 1155
s² sin² α	5.8713					do	″ + 05.729
E	5.6636	Arc−sin corr.				(8)	″ 0.00
(4)	4.6700	for s	−3.2	(Δλ)³		−Δα	″ + 05.729
		for Δλ	+ 0	F			
		Total	−3.2	(8)		−Δλ	″ 28.4710

	Logarithms				Logs		° ′ ″
s		(1)	″	½	9̄. 699	½(φ+φ′)	
cos α		(2)	+	s²			Logarithms
B		Sum		K		s	
(1)=h		(3)	+	h		sin α	
s²		(4)		(5)		A′	
sin² α		(5)	−	3	0. 477	sec φ′	
C		(6)	+	cos² α		Sum	
(2)=K		(7)	+	(6)		Arc−sin corr.	
(δφ)²		−Δφ		(colog) E		Δλ	
D		Δφ/2		A²arc²1″/3	5̄. 912	sin½(φ+φ′)	
(3)				sec²φ		sec Δφ/2	
−h				(7)		(approx.) −Δα	
s² sin² α						do	″
E		Arc−sin corr.				(8)	″
(4)		for s	−	(Δλ)³		−Δα	″
		for Δλ	+	F			
		Total		(8)		Δλ	″

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Page 5[illegible]

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Field Computation [illegible]

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 28 B

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GEOGRAPHIC POSITIONS

Accession No. of Computation

North American 1927 Datum — *[illegible] Order Triangulation* — *State MARSHALL ISLANDS*

STATION	LATITUDE AND LONGITUDE	[illegible] METERS	AZIMUTH	BACK AZIMUTH	TO STATION	LOGARITHM METERS	METERS	FEET
REEF U.S.N. [illegible]	[illegible] 32 [illegible]		25[illegible] [illegible] [illegible]	50 [illegible]	NORTH BASE [illegible]	[illegible] 409[illegible]	[illegible]	[illegible]
	162 [illegible] [illegible]		288 5[illegible] [illegible]	55 [illegible]	SANI [illegible]	[illegible] 382	[illegible]	[illegible]
[illegible]	[illegible] 25 3[illegible]		[illegible]	[illegible]	REEF U.S.N.	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]	47 [illegible]	SANI [illegible]	3.[illegible]	[illegible]	[illegible]

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
E. L. No. 394

COMPUTATION OF TRIANGLES

State

U. S. GOVERNMENT PRINTING OFFICE

STATION	ADJUSTED [redacted]	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3 824 7980✓
1 Reef [illegible]	[illegible]		0.03	05.98	0 [illegible] [illegible]848✓
2 N Bas[illegible]	[illegible]		[illegible].04	16.09	9 [illegible] 8554✓
3 Sand [illegible]	[illegible]		[illegible].03	[illegible]93	9 [illegible] [illegible]263✓
1-3					4 057 1382✓
1-2					3 875 4091✓
	[illegible]		0.10	0000	
2-3					4 057 1382
1 [illegible]	66 [illegible]		0.08	13 56	0 140 9749✓
2 Reef [illegible]	[illegible]		0.08	[illegible]54	9 742 8155✓
3 Sand [illegible]	[illegible]		0.09	[illegible]4.90	9 993 1739✓
1-3					3 940 9286✓
1-2					4 191 2870✓
	[illegible]		0.25	0000	
2-3					4 191 2870
1 Lantana [illegible]	[illegible]		0.23	38.53	0 153 7422✓
2 Reef [illegible]	[illegible]		0.23	[illegible].10	9 905 6860✓
3 [illegible]	[illegible]		0.24	55.37	9 995 5719✓
1-3					4 250 7152✓
1-2					4 340 6011✓
	[illegible]		0.70	0000	
2-[illegible]					4 250 7152
1 Pier [illegible]	113 [illegible]		0.07	06.17	0 539 0510✓
2 Lantana [illegible]	[illegible]		0.08	[illegible]	9 571 6653✓
3 [illegible]	[illegible]		0.08	59.44	9 843 0745✓
1-[illegible]					[illegible] 86 4315✓
1-[illegible]					4 132 8407✓
	00.23		0.23	0000	

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 25
Ed. Nov. 1946

COMPUTATION OF TRIANGLES

State

STATION	Adjusted ANGLE	[illegible]	[illegible] ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.250 7152
1 STEEL USE	[illegible]			[illegible]	50.43	0.000 1653 ✓
2 LANTANA USE	[illegible]			[illegible]	44.95	8.985 1647 ✓
3 LILAC USE	[illegible]			[illegible]	24.62	9.996 6319 ✓
1-3						3.236 0452 ✓
1-2						4.247 5124 ✓
	0.08			0.08	00.00	
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

SECRET

			°	′	″				°	′	″
α	2	to 3	240	38	43.70	α	3	to 2	60	40	24.82
2d ∠		&	+05	32	44.98	3d ∠		&	-82	52	24.65
α	2	to 1	246	11	28.68	α	3	to 1	337	48	00.17
Δα			+	01	45.30	Δα			+		04.25
			180	00	00.00				180	00	00.00
α′	1	to 2	66	13	13.98	α′	1	to 3			

First Angle of Triangle

φ	[illegible]		162	13	50.646	φ	[illegible]		[illegible]
Δφ	[illegible]	Δλ		03	[illegible]	Δφ	[illegible]	Δλ	[illegible]
φ′	[illegible] 46.456	1 [illegible] λ′	162	22	44.3 [illegible]	φ′	[illegible] 46.856	1 [illegible] λ′	162 [illegible]

Logarithms				Logs		Logarithms
s	4.247 5.24	(1) [illegible]	½	9.699	½(φ+φ′)	[illegible] 22 [illegible]
cos α	[illegible]	(2)				
h	[illegible]	Sum				[illegible]
s²/h	[illegible]	(3)			sin	[illegible]
s²	[illegible]	(4)				[illegible]
sin² α	[illegible]	(5)	3	0.477	sec φ′	[illegible]
C	[illegible]	(6) +	cos² α		Sum	2.727 2277
(2)=K	9.[illegible]	(7) +	(6)		Arc−sin corr.	
(δφ)²	4.733	−Δφ 232.1207	(colog) E		Δλ	2.727 2276
D	[illegible]	Δφ/2 [illegible]	A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.245 1842
(3)	6.7096		sec²φ		sec Δφ/2	
−h−	2.366		(7)		(approx.) −Δα−	2.022 4118
s² sin² α	8.4178				do	105.2960″
E	5.6619				(8)	
(4)+	6.4458				−Δα−	105.2960″
					−Δλ−	533.6146″

Arc−sin corr.				
for s	− 5.5	(Δλ)²	8.182	
for Δλ	+ 4.8	F	7.569	
Total	− 0.7	(8)	5.751	

Logarithms				Logs		
s	3.336 [illegible]452	(1) +	½	[illegible]	½(φ+φ′)	[illegible]
cos α	[illegible]	(2)				
h	[illegible]	Sum +				[illegible]
s²/h	[illegible]	(3)				
s²	[illegible]	(4)			λ	[illegible]
sin² α	[illegible]	(5) −	3	0.477	sec φ′	[illegible] 134
C	0.71235	(6) +	cos² α		Sum	[illegible]
(2)=K	6.33[illegible]	(7) +	(6)		Arc−sin corr.	
(hδφ)²	3.4302	−Δφ 51.8920	(colog) E		Δλ	1.331 [illegible]955
D	1.9805	Δφ/2	A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.296 [illegible]
(3)	5.4107		sec²φ		sec Δφ/2	
−h+	1.7151		(7)		(approx.) −Δα−	0.628 3627
s² sin² α	5.6267				do	4.2497″
E	5.6626				(8)	
(4)	3.0044				−Δα−	4.2497″
					−Δλ−	21.4633″

Arc−sin corr.				
for s	− —	(Δλ)²	3.995	
for Δλ	+ —	F	7.576	
Total		(8)	1.571	

U. S. GOVERNMENT PRINTING OFFICE 1941—O-305152

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 26—Rev. Apr. 11, 1930

POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	327	56	52.40	α	3	to 2	147	57	15.78
2d ∠		&	106	53	16.13	3d ∠		&	-39	01	37.96
α	2	to 1	74	50	08.53	α	3	to 1	108	55	37.82
Δα				-	47.86	Δα				01	11.12
			180	00	00.00				180	00	00.00
α′	1	to 2	254	[illegible]	20.67	α′	1	to 3	288	54	26.70

First Angle of Triangle

			°	′	″				°	′	″
φ	[illegible]	[illegible]		[illegible]	[illegible]	φ	[illegible]	[illegible]		[illegible]	16.273
−Δφ	[illegible]	Δλ		[illegible]	[illegible]	+Δφ	[illegible]	Δλ		[illegible]	56.068
φ′	[illegible]	λ′	62	[illegible]	[illegible]	φ′	32 [illegible]	λ′	62	[illegible]	[illegible]

Logarithms				Logs			
s	3.875 4091	(1)	+63.5[illegible]	½	9.699	½(φ+φ′)	[illegible]
cos α	[illegible]	(2)	+ [illegible]	s²		Logarithms	
B	[illegible]	Sum	[illegible]	E		s	3.875 4091
(1)=h	1.865 [illegible]	(3)	[illegible]	F		sin α′	9.484 6082
s²	[illegible]	(4)	[illegible]	(6)		A	[illegible]
sin² α						sec φ′	
C	[illegible]	(6)	[illegible]	cos² α		Sum	2.[illegible]
						Arc−sin corr.	
(2)=K	[illegible]	(7)	+	(6)			
(h/δφ)²	3.6111	−Δφ	+63.931	(colog) E		Δλ	2.378 5521
D	1.4851	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.301 [illegible]243
(3)	5.5962			sec²φ		sec Δφ/2	
−h	1.8055			(7)		(approx.) −Δα	1.679 9764
s² sin² α	7.7200					do	47.8604″
E	5.6636	Arc−sin corr.				(8)	0.0000″
(4)	5.1891	for s	− 1	(Δλ)²	7.136	−Δα	47.8604″
		for Δλ	+ 1	F	7.576		
		Total	0	(8)	4.712	−Δλ	239.0849″

Logarithms				Logs			
s	4.027 1382	(1)	[illegible]	½	9.699	½(φ+φ′)	[illegible]
cos α	[illegible]	(2)	+ [illegible]	s²		Logarithms	
B	8.514 5007	Sum	[illegible]	E		s	4.027 1382
(1)=h	2.080 6742	(3)	+ [illegible]	F		sin α′	9.975 [illegible]
s²	8.[illegible]	(4)	[illegible]	(5)		A	[illegible]
sin² α	[illegible]	5				sec φ′	[illegible] 8677
C	[illegible]	(6)	[illegible]	cos² α		Sum	[illegible] 5327
						Arc−sin corr.	[illegible]
(2)=K	8.78[illegible]	(7)	+	(6)			
(h/δφ)²	4.1613	−Δφ	[illegible] 3526	(colog) E		Δλ	2.551 5327
D	1.4833	Δφ/2		A²arc²1″/3	5.912	sin½(φ+φ′)	9.300 [illegible]
(3)	6.1446			sec²φ		sec Δφ/2	
−h	2.0807			(7)		(approx.) −Δα	1.852 0064
s² sin² α	8.0660					do	71.1224″
E	5.6632	Arc−sin corr.				(8)	
(4)	5.8099	for s	− 1.8	(Δλ)²	7.655	−Δα	71.1224″
		for Δλ	+ 2.2	F	7.574		
		Total	+ 0.4	(8)	5.229	−Δλ	356.0678″

DEPARTMENT OF COMMERCE
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POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	288	54	26.69	α	3	to 2	108	55	37.82
2d ∠		&	+33	34	51.62	3d ∠		&	100	07	54.99
α	2	to 1	322	29	18.31	α	3	to 1	008	47	42.83
Δα				01	02.12	Δα			−		8.75
			180	00	00.00				180	00	00.00
α′	1	to 2	[illegible]	[illegible]	[illegible]	α′	1	to 3	[illegible]	[illegible]	[illegible]
	Third angle of Triangle										

			°	′	″		°	′	″			°	′	″
φ	[illegible]					φ	[illegible]			3		[illegible]		
−Δφ	[illegible]		Δλ	05	12.042	−Δφ		04	40.734		−Δλ			44.026
φ′	[illegible]	1	λ	162	22	22.841	φ′	11	25	38.247	1	λ′	[illegible]	22.84

Logarithms				Logs			½(φ+φ′)	[illegible]
s	[illegible]	(1)	[illegible]	s	8.699		Logarithms	
cos α	[illegible]	(2)		s²				
B	[illegible]	Sum		h				
(1)=h	[illegible]	(3)		E			sin α	[illegible]
s²	[illegible]	(4)		(5)			A′	8.509 6689
sin² α	9.5[illegible]	(5)	−	3	0.477		sec φ′	0.008 6955
C	[illegible]	(6)		cos² α			Sum	2.494 2130
(2)=K	8.6683[illegible]	(7)	+	(6)			Arc−sin corr.	0.000 0003
(h/δφ)²	5.2[illegible]63	−Δφ	461.2364	(colog) E			Δλ	2.494 2133
D	1.18[illegible]5	Δφ/2	[illegible]	A²arc²1″/3	$\bar{5}$.912		sin ½(φ+φ′)	9.299 0214
(3)	7.[illegible]			sec² φ			sec Δφ/2	0.000 0002
−h	2.6032			(7)			(approx.) −Δα	1.793 2349
s² sin² α	7.95[illegible]7						do	62.1205″
E	5.6635	Arc−sin corr.					(8)	
(4)	6.2184	for s	− 4.3	(Δλ)²	7.483		−Δα	62.1205″
		for Δλ	+ 1.7	F	7.575			
		Total	− 2.6	(8)	5.058		−Δλ	312.0417″

Logarithms				Logs		½(φ+φ′)	[illegible]
s	3.740 9286	(1)	+ [illegible]	s	$\bar{8}$.699		Logarithms
cos α	9.994 8630	(2)	+	s²			
B	8.[illegible]2 5667	Sum		h			[illegible]
(1)=h	2.448 2923	(3)	+	E		sin α	[illegible]
s²	7.88186	(4)		(5)		A′	8.507 6689
sin² α	8.36883	(5)	−	3	0.477	sec φ′	0.008 6955
C	0.71537	(6)	+	cos² α		Sum	1.643 7106
(2)=K	6.96606	(7)	+	(6)		Arc−sin corr.	0.000 0001
(h/δφ)²	4.8966	−Δφ	280.7340	(colog) E		Δλ	1.643 7105
D	1.9833	Δφ/2	140.37	A²arc²1″/3	$\bar{5}$.912	sin ½(φ+φ′)	9.298 397[illegible]
(3)	6.8799			sec² φ		sec Δφ/2	0.000 0001
−h	2.4483			(7)		(approx.) −Δα	0.942 1077
s² sin² α	6.2507					do	8.7520″
E	5.6632	Arc−sin corr.				(8)	—
(4)	4.3622	for s	− 1.3	(Δλ)²	4.931	−Δα	8.7520″
		for Δλ	+ 0.0	F	7.574		
		Total	− 1.3	(8)	2.505	−Δλ	44.0261″

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DEPARTMENT OF COMMERCE
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POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

OFFICIAL USE ONLY

			°	′	″				°	′	″
α	2	to 3	322	29	18.31	α	3	to 2	142	30	20.43
2d ∠		&	+53	35	26.33	3d ∠		&	−81	49	55.61
α	2	to 1	16	04	44.64	α	3	to 1	60	40	24.82
Δα			−		39.70	Δα				01	41.12
			180	00	00.00				180	00	00.00
α′	1	to 2	196	04	04.94	α′	1	to 3	240	38	[illegible]
			44	34	38.76						

First Angle of Triangle

	°	′	″			°	′	″			°	′	″
φ	[illegible]	2[illegible]	[illegible]	2	λ	[illegible]	[illegible]	[illegible]	φ	[illegible]	[illegible]	[illegible]	[illegible]
Δφ		[illegible]	26.49		Δλ		3	[illegible]	Δφ	[illegible]		[illegible]	[illegible]
φ′	11	20	34.85	1	λ′	162	[illegible]	[illegible]	φ′	[illegible]	[illegible]	[illegible]	[illegible]

	Logarithms				Logs
s	4340 6011	(1)	+ 685.1255	½	9.699
cos α	9.982 6693	(2)	+ [illegible]	s²	
B	8.512 4997	Sum	685.1447	E	
(1)=h	2.835 [illegible]	(3)	+ [illegible]	F	
s²	[illegible]	4			
sin² α	[illegible]	5			
C	[illegible] 666	6			
(2)−K	828 27[illegible]	(7)		6	
h (Δφ)²	5.6715	−Δφ	685.1449	(colog) E	
D	1.9845	Δφ/2	342.5[illegible]	A² arc³ 1″ / 3	5.912
(3)	7.6560			sec²φ	
−h	2.8358			(7)	
s² sin² α	7.5660				
E	5.6635				
(4)−	6.0653				

Arc−sin corr.			
for s	− 8.5	(Δλ)³	
for Δλ	+ .7	F	7.575
Total	− 7.8	(8)	

	Logarithms
½(φ+φ′)	11 [illegible] 26.262
s	4.340 [illegible]
sin α	[illegible]
A′	[illegible]
sec φ′	
Sum	
Arc sin corr	
Δλ	[illegible]
sin ½(φ+φ′)	[illegible]
sec Δφ/2	0.000 0006
(approx.) −Δα	1.598 8150
do	″
(8)	″
−Δα	39.7022
−Δλ	200.1049

	Logarithms				
s	[illegible]	(1)	[illegible]	½	
cos α	[illegible]	(2)	[illegible]	s²	
B	[illegible]	Sum	[illegible]	E	
(1)=h	[illegible]	(3)	[illegible]	F	
s²	[illegible]	4			
sin² α		5			
C		6			
(2)−K	[illegible]	(7)			
h (Δφ)²	[illegible]	−Δφ	[illegible]	(colog) E	
D		Δφ/2	[illegible]	A² arc³ 1″ / 3	
(3)	6.8869			sec²φ	
−h	2.4532			(7)	
s² sin² α	5.3323				
E	5.6626				
(4)−	6.4981				

Arc−sin corr.			
for s	− [illegible]	(Δλ)³	
for Δλ	+ [illegible]	F	[illegible]
Total	− 1.6	(8)	

	Logarithms
½(φ+φ′)	[illegible]
s	[illegible]
sin α	[illegible]
A′	[illegible]
sec φ′	[illegible]
Δλ	[illegible]
sin ½(φ+φ′)	[illegible]
sec Δφ/2	[illegible]
(approx.) −Δα	[illegible]
do	
(8)	
−Δα	[illegible]
Δλ	[illegible]

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
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POSITION COMPUTATION, ~~FIRST~~ SECOND-ORDER TRIANGULATION

			°	′	″				°	′	″
α	2	to 3	240	38	43.70	α	3	to 2	60	40	24.82
2d ∠		&	+21	53	54.47	3d ∠		&	-44	09	59.52
α	2	to 1	262	32	38.17	α	3	to 1	16	30	25.30
Δα			+	01	27.44	Δα			−		13.46
			180	00	00.00				180	00	00.00
α	1	to 2	82	34	05.61	α	1	to 3	[illegible]		
				67	24.045	Δφ					
			162	21	.4135	φ′					

Logarithms

s		4		5		A	8.5096…
sin² α	[illegible]	5		3	0.477	sec φ′	0.0035995
C	0.16776	(6)		cos² α		Sum	[illegible]
(2)=K	8.92758	(7)		(6)		Arc−sin corr.	0.
h²	3.8550	−Δφ	57.2344	(colog) E		Δλ	2.6474218
D	[illegible]	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	9.2942682
(3)	5.4945			sec²φ		sec Δφ/2	
+h	1.7585			(7)		(approx.) −Δα −	1.9416900
s² sin² α	8.2583					do	87.4359″
E	5.6619	Arc−sin corr.				(8)	0.0000″
(4)+	5.6787	for s	− 3.3	(Δλ)²	7.942	−Δα−	87.4359″
		for Δλ	+ 3.3	F	7.569		
		Total	0.0	(8)	5.511	−Δλ−	444.0397″

s		4		5		A	[illegible]
sin² α	8.10704	(5)		3	0.477	sec φ′	[illegible]
C	[illegible]	(6)		cos² α		Sum	1.833…
(2)=K	7.34225	(7)	+	(6)		Arc−sin corr.	0.0000001
h²	4.7113	−Δφ	[illegible]	(colog) E		Δλ	1.8332228
D	1.9805	Δφ/2		A²arc²1″/3	5̄.912	sin½(φ+φ′)	[illegible]
(3)	6.6918			sec²φ		sec Δφ/2	0.0000001
−h	2.3556			(7)		(approx.) −Δα +	1.1289765
s² sin² α	6.6299					do	
E	5.6626	Arc−sin corr.				(8)	
(4)	4.6481	for s	− 0.9	(Δλ)²	5.500	−Δα +	13.4579″
		for Δλ	+ 0.0	F	7.576		
		Total	0.9	(8)	3.076	−Δλ +	68.1117″

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GEOGRAPHIC POSITIONS

Locality ENIWETOK, Marshall Islands 2nd order triangulation Astro *Datum*

State Pacific Ocean USS BOWDITCH - 1944 Archive No. 305697/1

Station	Latitude	Seconds in Meters	Longitude	Seconds in Meters	Azimuth	Back Azimuth	To Station	Distance Meters	Logarithms
PETUNIA	[illegible] 38 59.362	1823.957	162 09 40.138	1215.740	239 34 23.79	59 34 48.57	SAGE	4305.72	3.634 0460
					243 33 46.69	63 34 28.48	ZINNIA	6990.82	3.844 5280
					270 33 20.46	90 34 32.30	ASTER	10,777.10	4.032 5004
[illegible]	[illegible]	[illegible]	162 [illegible] [illegible].721	1293.934	59 34 48.97	239 34 23.79	PETUNIA	4305.72	3.634 0459
					[illegible]	[illegible]	ZINNIA	2712.13	3.433 3102
					[illegible] 58.27	107 56 45.39	ASTER	7424.24	3.870 6519
					291 10 00.03	[illegible]	CAMELLIA	11,271.60	4.051 9852
					325 30 39.85	145 31 43.84	REEF	[illegible]	[illegible]
[illegible]	[illegible] 40.435	[illegible]	162 [illegible] 04.822	206.611	63 34 28.48	243 33 46.69	PETUNIA	6990.82	3.844 5280
					69 54 58.90	249 54 41.89	SAGE	2712.13	3.433 3102
					[illegible]	[illegible]	ASTER	3545.29	[illegible] 9238
[illegible]	[illegible]	[illegible].583	162 [illegible] [illegible].921	1088.011	[illegible]	[illegible]	PETUNIA	[illegible]777.10	4.032 5004
					[illegible]	[illegible] 28.27	SAGE	7424.24	3.870 6519
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 9238
					[illegible]	[illegible]	CAMELLIA	3881.83	3.589 0367
					346 43 32.85	166 43 51.92	REEF	[illegible],519.30	4.097 5728
CAMELLIA	11 37 57.805	1776.116	162 17 29.721	900.279	03 09 27.99	183 09 24.19	REEF	10,415.70	4.017 6901
					111 11 10.10	291 10 00.03	SAGE	11,271.60	4.051 9852
					117 22 47.25	297 22 24.29	ASTER	3881.83	3.589 0368
					302 57 25.15	122 57 58.18	GARDENIA	5922.17	3.772 4806
					321 39 33.90	141 40 18.15	NORTH BASE	10,753.90	4.031 5685
GARDENIA	11 36 12.938	397.533	162 20 13.749	416.526	37 41 02.45	217 40 25.76	REEF	9069.22	3.957 5698
					122 57 58.18	302 57 25.15	CAMELLIA	5922.17	3.772 4806
					341 55 44.09	161 55 55.27	NORTH BASE	5483.79	3.739 0812

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FINAL VALUES GEOGRAPHIC POSITIONS

ENIWETOK, Marshall Islands — 2nd order triangulation — Astro Datum — State: Pacific Ocean — USS BOWDITCH - 1944 — Archive No. 305697/1

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Station	Latitude	Seconds in Meters	Longitude	Seconds in Meters	Azimuth	Back Azimuth	To Station	Distance (Meters)	Logarithms
ENIWETOK ASTRO PIER	11 33 29.480	72[illegible]	162 [illegible] 10.250	310.575					
NORTH BASE	11 33 [illegible]	[illegible]	[illegible] .890	2[illegible].667	238 44 37.63	58 44 37.70	ENIWETOK ASTRO PIER	12.767	[illegible]
					325 59 12.56	145 59 43.57	SOUTH BASE	2981.4[illegible]	[illegible]
					327 56 52.40	147 57 15.77	SAND	6680.87	3.824 8331
					74 50 08.53	254 49 20.67	REEF	7506.61	3.875 4441
					141 40 18.15	321 39 33.90	CAMELLIA	10,753.90	4.031 5685
					161 55 55.27	341 55 44.00	GARDENIA	5483.79	3.739 0812
SOUTH BASE	[illegible]	[illegible]	[illegible]	149.086	129 [illegible] [illegible].64	[illegible] 44.01	SAND	[illegible]	[illegible]
					357 21 58.31	177 22 01.87	LILAC	[illegible]	[illegible]
					[illegible] 50.96	[illegible]	REEF	[illegible]	[illegible]
					145 59 43.57	325 59 12.56	NORTH BASE	2981.4[illegible]	[illegible]
REEF	[illegible]	[illegible]	[illegible]	[illegible]	145 31 45.84	325 30 39.85	SAGE	17,555.80	4.244 2200
					166 43 51.92	346 43 32.85	ASTER	12,519.30	4.097 5798
					183 09 24.19	03 09 27.99	CAMELLIA	10,415.70	4.017 6901
					217 40 25.76	37 41 02.45	GARDENIA	9069.22	3.957 5698
					254 49 20.67	74 50 08.53	NORTH BASE	7506.61	3.875 4441
					273 14 52.17	93 15 50.99	SOUTH BASE	8927.19	3.950 7152
					288 54 26.68	108 55 37.81	SAND	11,407.00	4.057 1732
					322 29 18.30	142 30 20.43	LILAC	15,535.40	4.191 3221
					16 04 44.63	196 04 04.93	LANTANA	21,909.70	4.340 6362

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FINAL VALUES GEOGRAPHIC POSITIONS

Locality ENIWETOK, Marshall Islands 2nd order triangulation ASTRO *Datum.* *State* Pacific Ocean USS BOWDITCH - 1944 Archive No. 305697/1

STATIONS	LATITUDE	Seconds in Meters	LONGITUDE	Seconds in Meters	AZIMUTH	BACK AZIMUTH	TO STATIONS	DISTANCE Meters	LOGARITHMS
BAND	11 30 18.966	582.749	162 23 06.883	208.596	08 47 42.82	188 47 34.07	LILAC	8728.98	3.940 9636
					44 11 17.84	224 09 27.65	LANTANA	24,196.90	4.383 7598
					108 [illegible] 37.81	288 [illegible] 24.68	REEF	[illegible],407.00	[illegible] 1733
					147 [illegible]	32 [illegible]	NORTH BASE	6080.87	[illegible]
					149 3[illegible] [illegible].01	[illegible]	SOUTH BASE	[illegible]	[illegible]
LILAC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	PRIVILEGE	7268.86	[illegible]
					60 40 24.82	240 38 43.69	LANTANA	17,813.50	4.250 7502
					[illegible] 30 20.43	322 [illegible] 28.30	REEF	[illegible],535.40	[illegible] 7221
					177 22 01.87	357 21 58.31	SOUTH BASE	[illegible],830.00	4.072 9854
					188 47 34.07	08 47 42.82	BAND	8728.98	3.940 9636
					337 48 00.17	157 48 04.42	STEEL	1722.19	3.236 0804
LANTANA	[illegible]	[illegible]	162 [illegible]	[illegible]	[illegible]	[illegible]	REEF	[illegible]	[illegible] 6362
					[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
					[illegible]	[illegible]	LILAC	[illegible] 813.50	[illegible]
					246 11 28.67	66 [illegible] [illegible].97	STEEL	[illegible],682.70	[illegible]
					262 32 38.16	82 34 05.60	PRIVILEGE	[illegible],579.20	[illegible]
STEEL	[illegible]	1422.998	162 [illegible] [illegible].19	1343.530	26 48 36.39	206 48 18.70	PRIVILEGE	6022.03	[illegible] 7427
					66 13 13.97	246 11 28.67	LANTANA	17,682.70	4.247 5474
					157 48 04.42	337 48 00.17	LILAC	1722.19	3.236 0804
PRIVILEGE	11 21 51.383	1578.743	162 21 14.736	446.800	82 34 05.60	262 32 38.16	LANTANA	13,579.20	4.132 8757
					196 30 11.84	16 30 25.30	LILAC	7268.86	3.861 4665
					206 48 18.70	26 48 36.39	STEEL	6022.03	3.779 7427

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

OFFICIAL USE ONLY

SECRET

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: ELGIN
CHIEF OF PARTY: R. L. F
STATE: Marshall Islands   COUNTY: Eniwetok Atoll
YEAR: 1948   LOCALITY: Engebi Island

Surface-station mark, No. 18
Underground-station mark, No. 7
Reference mark, No.
Reference mark, No.
Azimuth mark, No.
Witness mark, No.
Height of light above station mark meters.
Height of telescope above station mark meters.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″

Detailed description: The station is located on Engebi Island, approximately 700 feet north of the south end of the island, 400 feet east of the seaward side, 300 feet west of the lagoon side, and 45 feet south of the southeast corner of a small quonset hut. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that projects 2 inches above the surface of the ground and is stamped ELGIN.

Described by G.R.S.   Marked by G.A.J.

NOTE.—The initial direction ... scheme station ... Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145. ... nearest meter only, when no trigonometric leveling is being done.   11—6761

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

SECRET

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: GRAFLEX
CHIEF OF PARTY: R. L. Pfau
STATE: Marshall Islands   COUNTY: Eniwetok Atoll
YEAR: 1948   LOCALITY: Aomon Island

Surface-station mark, No. 1a
Underground-station mark, No. 7a
Reference mark, No.
Reference mark, No.
Azimuth mark, No.
Witness mark, No.
Height of light above station mark meters.
Height of telescope above station mark 19 meters.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″

Detailed description: The station is located on the north end of Aomon Island, about 500 feet west of the east shoreline of the island, 275 feet south of the north shoreline, and 75 west of the northwest leg of the photo-tower. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that projects 6 inches above the surface of the ground and is stamped GRAFLEX.

No reference marks were established at this station.

Described by G.R.S.   Marked by G.A.J.

NOTE.—The initial direction ... scheme station ... Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145. ... nearest meter only, when no trigonometric leveling is being done.   11—6761

M.D.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 525
Rev. Oct., 1932

DESCRIPTION OF TRIANGULATION STATION

SECRET

NAME OF STATION: CORAL
STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau
YEAR: 1948 LOCALITY: Eniwetok Lagoon

Surface-station mark, Note,*
Underground-station mark, Note,*
Reference mark, Note,*
Reference mark, Note,*
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark meters
Height of telescope above station mark† meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″

Detailed description: The station is located atop a circular [illegible] crete cell that is 15 feet in diameter, about 2 miles east-southeast of the reef [illegible] tower, about 5 miles west of Runit Island, and 0.15 mile west of bouy No. 15. The [illegible] is a standard USC&GS station disk set in the center of the structure, about [illegible] feet above the high water mark, stamped CORAL, and is surrounded by a sheet met[illegible] projects 10 feet out of the water.

Described by G.R.S. Marked by G.A.J.

NOTE.—The initial direction must be to main scheme station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter only when no trigonometric leveling is being done.

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DESCRIPT[illegible] STATION

SECRET

NAME OF STATION: REEF PHOTO TOWER
STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau
YEAR: 1948 LOCALITY: Eniwetok Lagoon

Surface-station mark, Note,*
Underground-station mark, Note,*
Reference mark, Note,*
Reference mark, Note,*
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark meters
Height of telescope above station mark meters†

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″
This is an intersection station.			

Detailed description: The station is a 4 leg steel structure constructed atop 4 steel piles encased in concrete ~~pilings~~ located on a reef that is approximately 7 staute miles south of Engebi, 7 miles west of the north end of Runit Island, and [illegible] miles west northwest of station CORAL.

Directions were observed on a temporary point established at the intersection of the diagonals of the opposite legs of the tower and this point was marked on a wood deck that was constructed about [illegible] feet above the high water mark. No permanent mark was set and the station was not occupied due to the [illegible] present.

Described by G.R.S. Marked by

NOTE.—The initial direction must be to main scheme station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
† To nearest meter only when no trigonometric leveling is being done.

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U. S. COAST AND GEODETIC SURVEY
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SECRET

DESCRIPTION OF [illegible] STATION

NAME OF STATION: KODAK
STATE: Marshall Islands
COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau
YEAR: 1948
LOCALITY: Aniyaanii Island

Surface-station mark, Note [illegible]
Underground-station mark, Note [illegible]
Reference mark, No. 1 Note 1
Reference mark, No. [illegible] Note [illegible]
Azimuth mark, Note [illegible]
Witness mark, Note [illegible]
Height of light above station mark [illegible] meters
Height of telescope above station mark [illegible] meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
COR 1	meters	0 00 00.0	
Reference [illegible]	17.495	113 01 16	
Aniyaanii [illegible] tower	21.425	202 56 19.6	
Reference [illegible]	33.777	224 07 02	

Detailed description: The station [illegible] located about [illegible] feet south of the end of vegetation in a small clearing on the lagoon side of Aniyaanii Island, 80 feet south of the north edge of the clearing, 125 feet [illegible] of the high-water mark on the lagoon beach, and 75.5 feet north of the northwest leg of the photo tower. The disk is a standard USC&GS station disk set in a 12 by [illegible] inch concrete [illegible] 1 inch above the surface of the ground and is stamped KODAK.

Reference mark No. [illegible] is [illegible] feet east of the station, 74 feet north-northeast of the northeast leg ~~of the northeast leg~~ of the photo tower, and 25 feet west of the east edge of the clearing. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark [illegible] surface of the ground and is stamped KODAK MK 1.

Described by [illegible]
Marked by G. A. J.

*Note.—The initial direction [illegible]

[1] Refers to pages 108 and 109, Special Publication No. 120, or to pages [illegible] and [illegible], Special Publication No. 145.
[illegible] nearest [illegible] only, when no trigonometric leveling is being done.

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m.D.

SECRET

Station: KODAK [illegible] Islands County: Eniwetok Atoll
Chief: R. L. Pfau Year: 1948 Locality: Aniyaanii Island

Reference mark No. [illegible] is 110.819 feet south-southeast of the station, 37 feet north of the south edge of the clearing, and 35 feet southwest of the southwest leg of the photo tower. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground and is stamped KODAK MK 11.

The Aniyaanii photo tower is 21.425 meters southeast of the station. The tower is a 4-leg steel structure [illegible] feet in heigth. Distance and direction were taken from a stake with a [illegible] in the center that is under the center of the tower.

m.D.

Page [illegible]

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DEPARTMENT OF COMMERCE
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SECRET

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION: RUNIT STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau YEAR: 1948 LOCALITY: Runit Island

Surface-station mark, Note,* 1
Underground-station mark, Note,* 7
Reference mark, No. 1 Note,* 1
Reference mark, No. 2 Note,* 1
Azimuth mark, Note,*
Witness mark, Note,*
Height of light above station mark 6 meters.
Height of telescope above station mark 6 meters.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
		° ′ ″	° ′ ″
SAND U.S.N. 1944	meters	0 00 00.0	
Reference mark No. 1	12.520	180 12 25	
Reference mark No. 2	14.650	278 37 39	

Detailed description: The station is located approximately 450 feet north of the south end of Runit Island, 60 feet east of the high water mark on the lagoon side of the island, and 130 feet west of the high water mark on the seaward side. The disk is a standard USC&GS station disk set in a 12 by 12 inch concrete mark that projects 2 inches above the ground, and is stamped RUNIT.

Reference mark No. 1 is 41.075 feet north-northwest of the station, 60 feet east of the high water mark of the lagoon, and 2 feet south of the southwest corner of the southernmost quonset hut on Runit Island. The disk is a standard USC&GS reference disk set in a 12 by 12 inch concrete mark that is flush with the ground and is stamped RUNIT.

Reference mark No. 2 is 48.062 feet east of the station, 90 feet west of the high water mark on the seaward side of the island, and 45 feet south of a quonset hut. The disk is a standard USC&GS disk set in a 12 by 12 inch concrete mark that is flush with the surface of the ground, and is stamped RUNIT.

Described by G.R.S. Marked by G.A.L.

NOTE.—The initial direction must be to main scheme station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
To nearest meter only when no trigonometric leveling is being done.

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DESCRIPTION OF TRAVERSE STATION

NAME OF STATION: AOMON TRAVERSE STA. STATE: Marshall Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau YEAR: 1948 LOCALITY: Aomon

Surface-station mark, Note * 1e
Underground-station mark, Note *
Reference mark, Note *
Reference mark, Note *
Azimuth mark, Note *
Witness mark, Note *
Height of light above station mark meters
Height of telescope above station mark meters

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

OBJECT	DISTANCE	DIRECTION	AZIMUTH
		° ′ ″	° ′ ″

Detailed description: The station is located in the southwestern corner of Aomon Island, about 500 feet northeast of the southwest corner of the island, 200 feet northwest of the northwest corner of the causeway, and 120 feet east of the high-water mark of the lagoon. The disk is a standard USC&GS triangulation disk set in a [illegible] concrete mark that projects 2 inches and is stamped AOMON TRAVERSE [illegible].

Described by G.R.S. Marked by G.A.L.

NOTE.—The initial direction must be to main scheme station.

* Refers to pages 108 and 109, Special Publication No. 120, or to pages 112 and 113, Special Publication No. 145.
To nearest meter only when no trigonometric leveling is being done.

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U. S. COAST AND GEODETIC SURVEY
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SECRET

DESCRIPTION OF TRAVERSE STATION

NAME OF STATION: BIIJIRI [illegible] ERSE STA. STATE Marsh[illegible] l Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: Ralph L. [illegible] YEAR 1948. LOCALITY: Biijiri Island

Surface-station mark, Note [illegible]
Underground-station mark. Note
Reference mark, Note
Reference mark, Note
Azimuth mark, Note
Witness mark, Note
Height of light above station mark [illegible] meters.
Height of telescope above station mark [illegible] meters.

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″

Detailed description: The statio[illegible] is located in the so[illegible] [illegible]estern corner of Biijiri Island, about 550 feet northeast of the southwestern [illegible] of [illegible] island, 180 feet north of the south end of the island, and [illegible] east of the [illegible] mark of the lagoon. The disk is a standard USC&GS triangulation disk set [illegible] concrete mark that projects 2 inches and is stamped [illegible]I[illegible]JIRI TRAVERSE STA.

Described by [illegible] Marked by G.A.J.

NOTE.—The initial direction [illegible] pages 108 and 109, Special Publication No. 120, or to pages [illegible] Special Publication No. 145. [illegible] when no trigonometric leveling is being done. 11—5761

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U. S. COAST AND GEODETIC SURVEY
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SECRET

DESCRIPTION OF [illegible] STATION

NAME OF STATION: RUNIT TRAVERSE STA. STATE Marsha[illegible] Islands COUNTY: Eniwetok Atoll
CHIEF OF PARTY: R. L. Pfau YEAR 1948 LOCALITY: Runit Island

Surface-station mark, Note [illegible]
Underground-station mark, Note
Reference mark, Note
Reference mark, Note
Azimuth mark Note
Witness mark, Note
Height of light above station mark [illegible]
Height of telescope above station mark [illegible]

DISTANCES AND DIRECTIONS TO REFERENCE MARKS AND PROMINENT OBJECTS WHICH CAN BE SEEN FROM THE GROUND

	DISTANCE	DIRECTION ° ′ ″	AZIMUTH ° ′ ″

Detailed description: The st[illegible] [illegible]entral part of Runit Island, about 1200 feet northeast [illegible] larger sections of the island, 221 feet west of the [illegible] side of the island, and 121 feet east of a pontoon, [illegible] [illegible]f the island. The disk is a standard USC&GS disk set [illegible] that projects 1 inch above the ground and is stamped [illegible]

Described by [illegible] Marked by G.A.J.

NOTE.—The initial direction [illegible] Special Publication No. 120, or to pages [illegible] Special Publication No. 14[illegible] [illegible] trigonometric leveling is being done. 11—5761

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 526

RECOVERY NOTE TRIANGULATION STATION

R

NAME OF STATION: SOUTH BASE STATE: MARSHALL ISLANDS COUNTY: ENIWETOK ATOLL
ESTABLISHED BY: U.S.S. BOWDITCH YEAR: 1944 [illegible]
RECOVERED BY:* R.L.Pfau YEAR: 1947-8

Detailed statement as to the fitness of the [illegible]: This station has been destroyed

J.C.H.

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[redacted]

* Name of chief of party [illegible] recovery note.

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 526

RECOVERY NOTE TRIANGULATION STATION

R

NAME OF STATION: ENIWETOK ASTRO STATE: MARSHALL ISLANDS COUNTY: ENIWETOK ATOLL
ESTABLISHED BY: U.S.S. BOWDITCH YEAR: 1944 [illegible]
RECOVERED BY:* R.L.Pfau YEAR: 1947-8

Detailed statement as to the fitness of the [illegible]: This station has been destroyed

J.C.H.

[redacted]

* Name of chief of party [illegible]

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION SAND [illegible] 1944 — [illegible] Islands COUNTY Eniwetok Atoll
ESTABLISHED BY [illegible] 1944
RECOVERED BY* R. L. [illegible] 1948

Detailed statement as to the [illegible] The [illegible] was recovered and found to be in good condition. A complete description follows:

The station is [illegible] the third [illegible] south of Runit Island, about 450 feet south of the [illegible] the island and [illegible] feet east of the high-water mark on the lagoon beach. The disk is a standard USN triangulation survey disk set in an 8 by 8 inch concrete [illegible] surface of the ground and is not stamped.

No reference [illegible]

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*Name [illegible] should sign his name at the end of the recovery note. [illegible] Gordon R. Strade

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 526

RECOVERY NOTE, TRIANGULATION STATION

R

NAME OF STATION NORTH [illegible] 1944 — Marshall Islands COUNTY Eniwetok Atoll
ESTABLISHED BY [illegible] 1944 [illegible] Runit Island
RECOVERED BY* R. L. [illegible] 1948

Detailed statement as to the [illegible] The station was recovered and found to be in good condition. A complete description follows:

The station is located on the north end of Runit Island, 180 feet southeast of the north tip of the main island, 120 feet west of the northwest leg of the photo tower, and 35 feet east of the high-water mark on the lagoon side of the island. The disk is a standard USN triangulation [illegible] disk set in an 8 by 8 inch concrete mark that projects [illegible] above the surface of the ground. There is no stamping on the disk.

No reference marks were established [illegible]

SECRET

*Name [illegible] the end of the recovery note. [illegible]

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SECRET

IV B

~~OFFICIAL USE ONLY~~

[illegible]

[illegible]

[illegible]

([illegible] Included)

SECRET

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SECRET

CONTENTS

(1) [illegible] of the general features of the tri[illegible] scheme, base [illegible] expansion figures.

(2) Base [illegible]

(3) Compu[illegible] of base line.

(4) Base line [illegible]

(5) Abstract of [illegible] levels [illegible] of ine[illegible]

(6) List of [illegible] angles.

(7) [illegible] order [illegible] and [illegible]

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TRIANGULATION

A scheme of first-order [illegible] composed of check figures was executed [illegible] from a first-order base line on [illegible] Island. [illegible] northward to Engebi Island and [illegible] Aniyaanii [illegible] was executed for the the purpose of [illegible] the [illegible] islands and to establ[illegible] between certain installations.

All observations were [illegible] standard procedure was followed thr[illegible] he maxi[illegible] closure for the entire scheme was [illegible] s and th[illegible] seconds. The maximum triangle closure [illegible] was 01.[illegible] seconds and the average [illegible]

With the exc[illegible], which could not be occupied because of excessive [illegible] all stations were occupied. Traverse ties [illegible] the [illegible] towers on Engebi, Aomon, Runit, [illegible] Aniyaanii [illegible].

In order [illegible] of the U.S.S. BOWDITCH with the new survey stations [illegible] and SAND USH, 1944 were incorporated into the scheme.

BASE LINE

A first-order [illegible] Runit Island between stations [illegible] 1944 [illegible] established station RUNIT. The configur[illegible] the adoption of a broken base consisting of four sections [illegible] lengths. First-order invar tapes [illegible] followed throughout.

The [illegible] measurement is 1 part in 2,100,000

[illegible] second-order base line measured on the same [illegible] 1944 due to the fact that [illegible] extending off the south end of the [illegible]

The [illegible] through station CORAL, a newly [illegible] general area as station [illegible] 1944 [illegible] station. This is the most [illegible] station suitable [illegible]

The [illegible] specifications for first-[illegible] figure is larger than is [illegible]. This is the only respect [illegible] first-order specifications, [illegible] of the scheme.

SECRET

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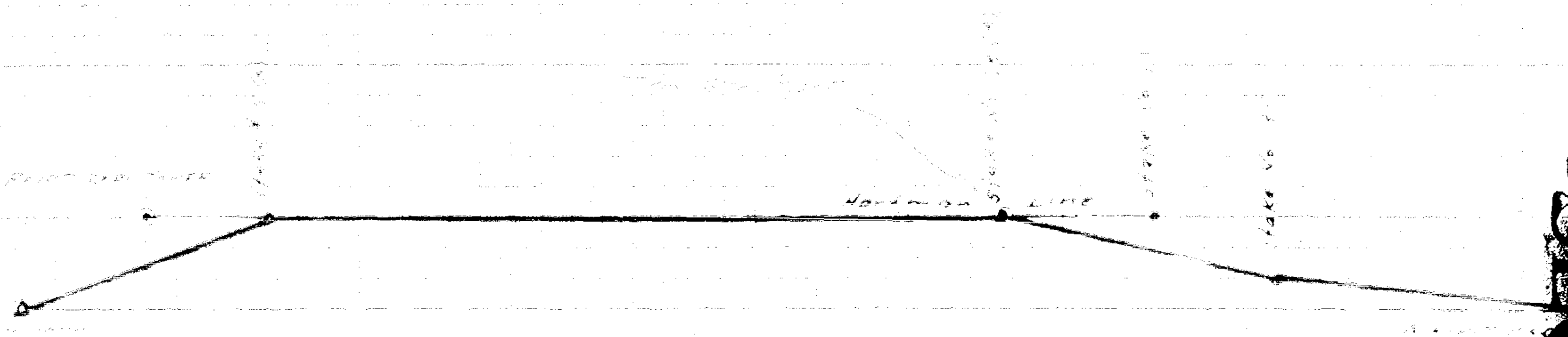
BASE LINE SKETCH
(No scale)



Note: The Hartman line was staked out first, using regular sequential stake numbers thru stake No 33.
The portion of this Line from stake No 4 thru stake No 28 was also used as a section of the Triangulation Base line and stakes 4 + 28 of the Hartman Line were designated 4(A) and 28(B) to indicate that they were angle stations in the Base line. Following the same system of designation angle station "C" of the base line was designated 9(C), 9 being the stake No ~ The designations were used in all record book + Computations.

Department of Commerce
U. S. Coast and Geodetic Survey
Form 589
Rev. April 1933

[redacted]

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COMPUTATION OF *Runit I* BASE LINE

					Uncorrected length			Cor-		(Folding space)	rections			Reduced length	Adopted length		
											Sat. Sag		Sea level				
											Meters	Meters	Meters	Meters	Meters		
	1-28-48	B	733	1	[illegible]	5[illegible]0	33.4	+0.0048	-0.0405		0.0832	-0.0415		580.9923		+1.4	1.46
		B	735	2	1/2	25	[illegible]0	+0.00[illegible]3	0.0018								
		B	3661	2	-		30.4	+0.0001	+0.0003		5.9968						

Pe entire measurement = 1.245 mm
= 1:2,100,000

DECLASSIFIED PER DOE LETTER DATED JULY 15, FROM ANTON SINISCALLI TO DIANE S. NIXON

[redacted]

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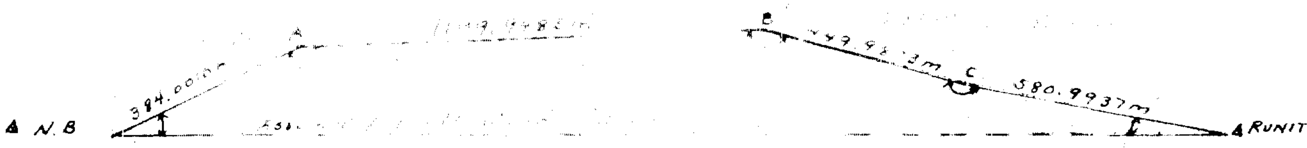

	OBSERVED				CORRECTED
N.B.	[illegible]				[illegible]
A	[illegible]				[illegible]
B	[illegible]				[illegible]
C	[illegible]				[illegible]
RUNIT	[illegible]				[illegible]
Σ	[illegible]				[illegible]

N.B.-RUNIT	2.017 [illegible]13	+104.0139	
	9.9[illegible]2 [illegible]590		
N.B.-A	2.[illegible]54 [illegible]123		
	9.983 4532		
	2.5[illegible]7 [illegible]855		369.6456
A-B	0.858 5066	+7.2195	
	[illegible].779 [illegible]440		
	[illegible].0[illegible]9 [illegible]626		
B-C	9.999 9921		
	[illegible].079 1547		1199.9266
	1.939 8407	+87.0644	
C-RUNIT	9.286 [illegible]404		
	[illegible].653 [illegible]003		
	1.99[illegible] 1150		
RUNIT-N.B.	[illegible].644 [illegible]153		441.4843
	0.987 3814	+9.7136	
	[illegible].[illegible] 2100		
	[illegible].764 [illegible]		
	9.999 9393		
	[illegible].764 [illegible]07		580.9124
Σ		-0.0164	2591.9689
			Log = 3.4136298

✓RSB

SECRET

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 685

ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

(Runit I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	[illegible]	MEAN ELEVATION	REMARKS
	Mars	[illegible]	[illegible]	[illegible]	Mars	
Mark N. Base U.S.N 1944						
Bench N. Base U.S.N 1944	0	[illegible]	[illegible]			
N. Base Setup	[illegible]784	[illegible]	1.8			
1	.50	[illegible]	[illegible]			
2	.50?	[illegible]	[illegible]			
2 + 25	.25	[illegible]	[illegible]			
3	.50	[illegible]	[illegible]			
4	.50	[illegible]	[illegible]			
5	.50	[illegible]	[illegible]			
6	.50	[illegible]	[illegible]			
4(A)	.50	[illegible]	[illegible]			
			15.6?			
				[illegible]		

11—8156 GOVERNMENT PRINTING OFFICE

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 635

ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	[illegible]	[illegible]	[illegible]	Meters	Meters	
4 (A)						
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			
12	[illegible]	[illegible]	[illegible]			
13	[illegible]	[illegible]	[illegible]			
14	[illegible]	[illegible]	[illegible]			
15	[illegible]	[illegible]	[illegible]			
16	[illegible]	[illegible]	[illegible]			
17	[illegible]	[illegible]	[illegible]			
18	[illegible]	[illegible]	[illegible]			
19	[illegible]	[illegible]	[illegible]			
20	[illegible]	[illegible]	[illegible]			
21	[illegible]	[illegible]	[illegible]			
22	[illegible]	[illegible]	[illegible]			
23	[illegible]	[illegible]	[illegible]			
24	[illegible]	[illegible]	[illegible]			
25	[illegible]	[illegible]	[illegible]			
26	[illegible]	[illegible]	[illegible]			
27	[illegible]	[illegible]	[illegible]			
28 (B)	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]			

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 635

ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	[illegible]	MEAN ELEVATION	REMARKS
	Meters	[illegible]	[illegible]	[illegible]	[illegible]	
28 (B)						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9 (C)	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]			

[illegible]

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 635

ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
9 (0)						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
6+25	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			
Bench △ Run 7	[illegible]	[illegible]	[illegible]			
Mark △ Run 7	[illegible]	[illegible]	[illegible]			

11—6136 GOVERNMENT PRINTING OFFICE

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET

LIST OF DIRECTIONS

Station NORTH BASE, U.S.N. 1944 State Marshall Is. Eniwetok Atoll

Chief of party Ralph L. Pfau Date 20 January 1944 Computed by R.L.P.

Observer G.R. Strode Instrument Repeater Checked by R.L.P.

11—9503

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
4 (A)	0 00 00.00			0 00 00.00	
RUNIT, U.S.C.&G.S. 1948	[illegible]				

No Eccentric reduction required

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* These columns are for office use and should be left blank

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Form 21A
Rev. Oct., 1932

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LIST OF DIRECTIONS

OFFICIAL USE ONLY

Station 4 (A) State [illegible] Atoll

Chief of party Ralph [illegible] Date 24 [illegible] Computed by R. L. P.

Observer G. R. Strooe Instrument [illegible] H-334 Checked by R. L. P.

U. S. GOVERNMENT PRINTING OFFICE 1931 11—9669

OBSERVED STATION	Observed direction		Sea level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	′ ″
28 (B)	0 00 00.00			0 00 00.00	
North Base, U.S.N. [illegible]	[illegible]				

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

SECRET

LIST OF DIRECTIONS

Station 28(B) State Marshall Is. ... Atoll

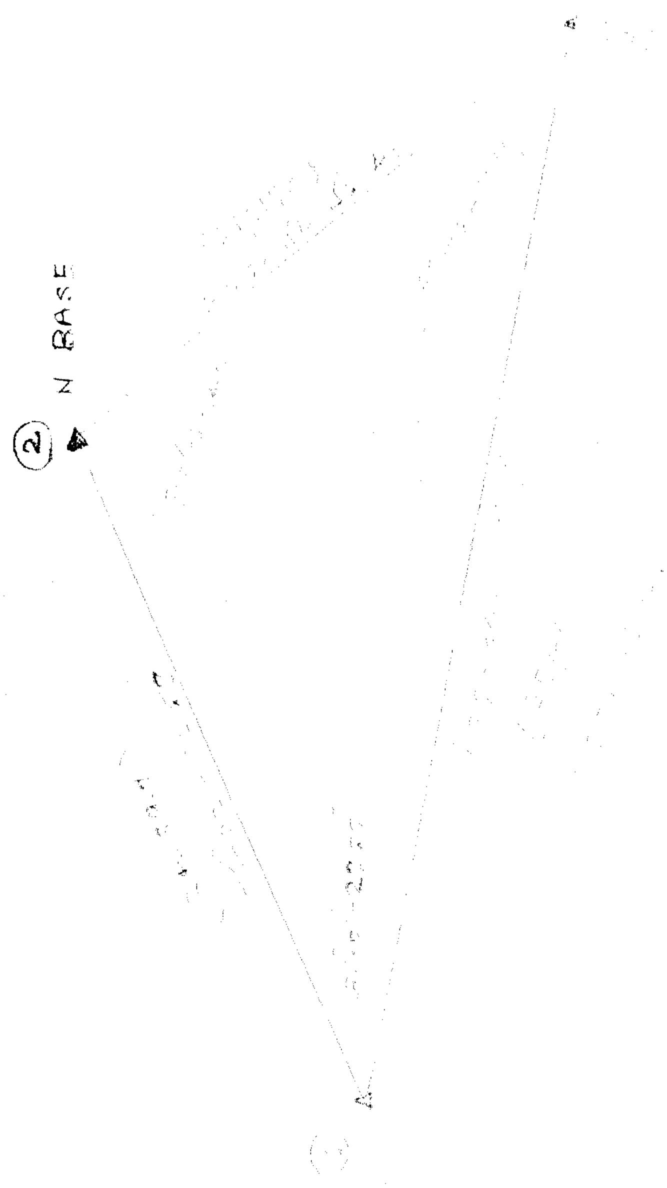
Chief of party Ralph L. Pta... Date 29 Jan ...

Computed by R.L.P.

Observer ...

R.L.G.

Adjusted direction*
° ′ ″



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LIST OF DIRECTIONS

Station 28(B) State Marshall Is [illegible] Atoll

Chief of party Ralph L Pten[illegible] Date 29 Jan [illegible] Computed by R.L.P.

Observer G.R. Strode Instrument 7" Repeater [illegible] 314 Checked by R.L.P.

GOVERNMENT PRINTING OFFICE 11—9503

OBSERVED STATION	Observed direction	Eccentric reduction	Sea-level reduction*	Corrected direction with zero initial	Adjusted direction*
19 (C)	[illegible]			0 00 00.00	
4 (A)	[illegible]				

[illegible]

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U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

LIST OF DIRECTIONS

Station 9 (C)
State Marshall Is. Eniwetok Atoll
Chief of party Ralph [illegible]
Date 29 [illegible] 1948
Computed by R.L.P.
Observer G. R. Strowe
Instrument Repeater # H-334
Checked by R.L.C.

OBSERVED STATION	Observed direction	[illegible]	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	′ ″
Runit, USC&GS [illegible]	0 00 00.00			0 00 00.00	
28 (B)	[illegible]				

[illegible]

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Page [illegible]

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

LIST OF DIRECTIONS

Station RUNIT, U.S.C&GS 194[illegible] State Marshall Is - [illegible] Atoll

Chief of party Ralph L. Pfau Date [illegible] Computed by R.L.P.

Observer G.R. Strode Instrument [illegible] Repeater # [illegible] 334 Checked by R.L.P.

=4A8

11—9503

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″		° ′ ″	′ ″
North Base, U.S.N. 1944	[illegible]			0 0 00.00	
9 (3)	[illegible]				

No [illegible]

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UNITED STATES DEPARTMENT OF [illegible]
WASHINGTON

National Bureau of Standards

Certificate

50 METER IRON NI[illegible]

(Low Expansion [illegible])
NBS No. [illegible]

U.S.C. & G.S. No. 921

United States Coast [illegible] Geodet[illegible]
Washington [illegible]

This tape has been compared with the standards of the United States under a horizontal tension of 15 kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C under the conditions given below.

Supported at the 0, 25 and 50 meter points [illegible] 550 meters

Supported at the 0, 12.5, [redacted] 37.5, and 50 meter points [illegible] and 37.5 meter points 6 inches above the plane of the 0 and 50 meter supports [illegible] 523 meters

Thermometers weighing 45 grams were attached [illegible] inside the terminal marks.

These comparisons were made on the section of the lines near the end on the edge of the tape marked with a small "x" or "v" or dots near the graduation.

The values for the lengths are not in error by more than [illegible] the probable error does not exceed 1 part in 1,500,000.

The values for the lengths were obtained from measurements made [illegible] and in reducing to 25 °C. the thermal expansion of +0.0[illegible] millimeter per 50 meters per degree centigrade was used.

The weight per meter of this tape previously determined [illegible]

[illegible]

Lewis [illegible]
Chief Length Sect[illegible]
Metrolog[illegible]

2.1/114409
Test completed October 14, 19[illegible]

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

[illegible] METER IRON NICKEL ALLOY TAPE

(Low Expansion Coefficient)
NBS No. [illegible]

[illegible] States Coast & Geodetic Survey,
Washington, D. C.

[illegible] has been compared with the standards of the United States under a horizontal [illegible] kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C. [illegible] conditions given below.

[illegible] and 50 meter points 49.99748 meters.

[illegible] [redacted] 37.5 and 50 meter points, with the 12.5- and 37.5-meter [illegible] above the plane of the 0 and 50 meter supports 49.99712 meters.

[illegible] weighing [illegible] grams were attached at points 1 meter inside the [illegible]

[illegible] comparisons were made on the section of the lines near the end on the edge of the [illegible] marked with a small [illegible] or "v" or dots near the graduation.

[illegible] values for the lengths are not in error by more than 1 part in 500,000, the [illegible] error does not exceed 1 part in 1,500,000.

[illegible] values for the lengths were obtained from measurements made at 22.6 °C., and in [illegible] C. the thermal expansion of +0.055 millimeter per 50 meters per degree [illegible] used.

[illegible] tape previously determined, is 35.6 grams.

For the Director,

Lewis V. Judson
Chief, Length Section
Metrology Division.

[illegible]

UNITED STATES DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

50 METER IRON NICKEL ALLOY [illegible]

(Low Expansion Coefficient)
NBS No. 324[illegible]

United States Coast & Geod[illegible]
Washington, [illegible]

This tape has been compared with the standards of the United States under a horizontal tension of [illegible] kilograms. The interval (0 to 50 meters) has the following lengths at 25 °C under the conditions given below.

Supported at the 0, 25 and 50 meter points [illegible] 99632 meters

Supported at the 0, 12.5, [redacted] 37.5, and 50 meter points [illegible] and 37.5 meter points [illegible] above the plane of the 0 and 50 meter supports [illegible] meters

Thermometers weighing [illegible] grams were attached at points [illegible] inside the terminal marks.

These comparisons were made on the section of the lines near the end on the edge of the tape marked with a small "x" or "v" or dots near the graduation.

The values for the lengths are not in error by more than [illegible] the probable error does not exceed 1 part in 1,500,000.

The values for the lengths were obtained from measurements made [illegible] and in reducing to 25 °C. the thermal expansion of +0.[illegible]52 millimeter per [illegible] per degree centigrade was used.

The weight per meter of this tape previously determined [illegible]

[illegible]

Lewis V. Judson
Chief, Length Se[illegible]
Metrolog[illegible]

[illegible]
Test completed [illegible]

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Form 579

SECRET

U. S. DEPARTMENT OF COMMERCE
WASHINGTON

National Bureau of Standards

Certificate

FOR

[illegible]0-Meter Steel [illegible]

NBS No. 83[illegible]5

OCT 6 1947

Maker's Identification Mark
The Lufkin Rule Co.
U.S.C.& G.S. No. 3661

SUBMITTED BY

United States Coast & Geodetic Survey,
Washington [illegible]

This tape has been compared with the standards of the United States. It complies with the specifications for a standard tape, and the intervals [illegible] have the following lengths at 68° Fahrenheit (20° centigrade) under the conditions given below:

Supported [illegible] horizontal [illegible] surface;

Tension: 4 1/2 [illegible]ograms

Interval	Length
(0 to [illegible] meters)	30.0[illegible] meters

Tension: 5 [illegible]

Interval	Length	Interval	Length
(0 to 1 meter)	1.000[illegible] meters	(0 to 1[illegible] meters)	16.0006 meters
(0 to 2 meters)	2.00[illegible] "	(0 to [illegible] meters)	17.0010 "
(0 to 3 meters)	3.0003 "	(0 to 18 meters)	18.0007 "
(0 to 4 meters)	4.000[illegible] "	(0 to [illegible] meters)	19.0009 "
(0 to 5 meters)	5.0004 "	(0 to [illegible] meters)	20.0008 "
(0 to 6 meters)	6.0000 "	(0 to [illegible]1 meters)	21.0007 "
(0 to 7 meters)	7.0007 "	(0 to [illegible] meters)	22.0008 "
(0 to 8 meters)	8.00[illegible] "	(0 to [illegible] meters)	23.0010 "
(0 to 9 meters)	9.00[illegible] "	(0 to [illegible] meters)	24.0010 "
(0 to 10 meters)	10.00[illegible] "	(0 to [illegible] meters)	25.0008 "
(0 to 11 meters)	11.00[illegible] "	(0 to [illegible] meters)	26.0012 "
(0 to 12 meters)	12.00[illegible] "	(0 to [illegible] meters)	27.0008 "
(0 to 13 meters)	13.00[illegible] "	(0 to [illegible] meters)	28.0012 "
(0 to 14 meters)	14.00[illegible] "	(0 to [illegible] meters)	29.0015 "
(0 to 15 meters)	15.00[illegible] "	(0 to [illegible] meters)	30.0017 "

Test No. 2.1/113718

SECRET

The comparisons of this tape with the [illegible] were made at a temperature of 24.9° Centigrade and in reducing to 68° Fahrenheit (20° c[illegible]) the coefficient of [illegible] is assumed to be 0.00000645 per degree Fahrenheit (0.0000116 per degree centigrade).

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[redacted]

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Tape Certificate Continued ....NBS No. 8305

When supported as indicated below:

Tension 5 kilograms

Points of Support	Interval	Length
0 and 5 meters	(0 to 5 meters)	5.0003 meters
0 and 10 meters	(0 to 10 meters)	10.0002 "
0 and 15 meters	(0 to 15 meters)	14.9997 "
0 and 20 meters	(0 to 20 meters)	19.9989 "
0 and 25 meters	(0 to 25 meters)	24.9971 "
0 and 30 meters	(0 to 30 meters)	29.9953 "

The above values for the lengths are not in error by more than 0.0002 meter.

The comparisons of this tape with the Bench Standards were made at the center of the ends of the lines farthest from the observer when the zero of the tape was at his left hand.

The weight per meter of this tape was found to be 12.0 grams.

For the Director,

Lewis V. Judson,
Chief, Length Section,
Metrology Division

Test No. 2.1/113715
Test completed: Sept. 25, 1947

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SECRET

V A. GENERAL METHOD ADOPTED [illegible] ESTABLISHMENT OF
OF STAKES FOR INSTALLAT[illegible] ALL ISLANDS.

The general method adopted [illegible] establishing stakes on all islands consisted of the [illegible] measurement of one line, using [illegible] standard base line procedure, and the establishment of other points by normal or chord off-sets from this line.

Since tape [illegible] not [illegible] on the stakes for the forward and [illegible] measurements, the tape ends of the forward measurement of the line [illegible] semi-permanently marked on the stakes to be used, and a proportional correction applied to distances as determined in the forward measurement of such magnitude [illegible] to make the resulting total length of line equal to the [illegible] of the forward and backward measurements.

In all cases, one of the [illegible] (Hartman, Gamma or Timing) radiating from the zero [illegible] was selected for precise measurement. Which of the [illegible] lines was selected was dictated by local conditions on [illegible] island.

Although the [illegible] line was [illegible] most economical line to measure, since the [illegible] stations could be established by [illegible] from the base line stakes, and necessitated the [illegible] of pre-computing, it was possible to [illegible] only on [illegible] of the islands.

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Since t[illegible] between the AEC lines on any [illegible], [illegible] used was well adapted to the [illegible], [illegible] necessity for the measurement [illegible] the posibility of a systema[illegible] been present in the direct [illegible] with inferior tapes and methods.

ENGEBI ISLAND

On Engebi Island, the line measured by standard base line procedure was the Zero Tower – triangulation station ELGIN line. This was the only one of the AEC lines which was not obstructed at the time. The probable error of the measurement was 1 part in [illegible].

The timing station is located on this line, and the timing station stake was established by [illegible] from stake No. 23 of the line.

The Gamma A and Gamma B station stakes were established by chord off-sets from the Zero Tower – Elgin line.

Stakes for the blast footings [illegible] including the footing at 3900 feet from Zero were established by chord off-sets from the Zero Tower – Elgin line. The blast footing stakes at 4200 and 4800 feet from Zero were established by prolonging the line beyond the 3900 foot stake. Distances beyond the 3900 foot stake were established by use of a 300 foot steel tape.

The centerline of the [illegible] was selected so as to run diagonally across the [illegible], thus affording a clear line of sight. From the Zero Tower a traverse was run along the centerline, ~~and~~ stakes set flush with the runway surface at the required distances from Zero, and chord off-set stakes set on either edge of the runway.

Measurements were made with a 300 foot steel tape.

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The orientation of the centerline was determined by an observed angle at the Zero Tower between the Bu. Y&D centerline and triangulation station [illegible].

A line of reference rods was [illegible] set in front of each line of Bu. Y&D units and two [illegible] measurements made to each of two marked points on each [illegible].

The 3000 foot north [illegible] stake on the Bu. Y&D was selected as determining the centerline of the Bu. S. units. With the instrument set over this stake and oriented back to Zero a traverse was run back toward Zero and stakes set at the required intervals.

A 300 foot steel tape was used for these measurements. The azimuth of the centerline as [illegible] by previously computed Bu. Y&D [illegible].

The O.C.E. building stake at [illegible] feet from Zero was established by direct measurement of [illegible] and distance from the Zero Tower [illegible].

The most northeasterly O.C.E. [illegible] stakes at 1500 and 2500 feet from Zero were established by [illegible] off-sets from the Bu. Y&D centerline. The [illegible] westerly stakes at these distances were established by [illegible] off-sets from the northeasterly stakes. A 300 foot steel tape was used for these measurements.

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Four ref[illegible] each of the O.C.E. buildings, with [illegible] exceptio[illegible] "J" structure at 2500 feet fro[illegible] [illegible]rements made to drill holes in eigh[illegible] [illegible]rcing [illegible] project horizontally from the buil[illegible] [illegible]s are on the front face of the buildi[illegible] [illegible] two near the top), and four are [illegible] back of the buildings.

All [illegible] O.C.E. buildings and to Bu. Y&D units [illegible] were made with steel tape No. [illegible] 5774. [illegible] was left in the area for use in making [illegible].

In order [illegible] O.C.E. buildings with reference to [illegible] which will [illegible] destroyed, a traverse line was run [illegible] Zero Tower [illegible] 2500 foot stake of the Bu. Y&D ce[illegible] [illegible]ference stakes set near each of [illegible] C.E. buildi[illegible] back to the Zero Tower. The traverse [illegible] were [illegible] to the reference stakes at each [illegible] was measured with a 300 foot steel ta[illegible].

Range pole No. [illegible] normal off-set from the Zero Tower [illegible] No. 2 and No. 3 were similarly [illegible] moved. Range pole No. 3 was moved 40 fe[illegible] normal to the original line [illegible] was moved 20 feet northeastward [illegible] line of poles. Thus the poles are [illegible] on a straight [illegible], but the line is no longer paral[illegible] the Zero - Timing Station line.

The s[illegible], as selected by Dr. Clark [illegible] [illegible]ved [illegible]gle and distance fro[illegible].

The winch [illegible] angle and distance from triangulation [illegible].

The tank [illegible] angle and distance from th[illegible] position of range pole No. 3.

A line [illegible] every [illegible] feet was run along th[illegible] for a distance of 500 feet [illegible]. This line is tied in to tri[illegible] other points in the vicinity [illegible].

Since the [illegible] line ext[illegible] [illegible] Island to Rojoa Island, [illegible] the [illegible] r of obstructions, it was selecte[illegible] standard base line procedure.

This line [illegible] over [illegible], making it necessary to carry the [illegible] by triangulation. This was a[illegible] by [illegible] short auxiliary base line - [illegible] standard base line procedure- on [illegible].

The proba[illegible] line, including sections deter[illegible] es not exceede 1 part in 850,000. [illegible] in this manner because in its [illegible] ary to use the two determinat[illegible] h water gap one of which dist[illegible] trically stronger figure the[illegible] the distance determined [illegible] as the distance across the gap, [illegible] used as a check only.

Gamma stat[illegible] ted by set ups or set backs from [illegible] Gamma A was set at 213[illegible] fe[illegible] the maximum distance o[illegible]

The blast footing stakes were established by chord off-sets from the measured Gamma line.

The **Timing** station stake was established by chord off-set from the 59[illegible] foot blast footing stake.

The range pole stakes were originally set by off-sets from the Zero Tower - Timing Station line and at the positions specified in the AE drawings. Range pole No. 1 was set in the specified position, but range poles No. 2 and No. 3 were not set in accordance with the plans. This change was made by the resident engineer because range pole No. 3 fell in front of the wind tees which had been spotted in by eye prior to the arrival of the survey party on the island.

The positions of range poles No. 2 and No. 3 as actually set were determined by measured angles and distances from stakes of the measured Gamma line. The poles as set are on a straight line, but the line is not parallel to the Zero Tower - Timing Station line.

Stakes for the [illegible] of the [illegible] M.P. units at each specified distance from zero were established by chord off-sets from the Gamma line. However, since starting this report Lieut. Comdr. [illegible], [illegible] advises that all of these stakes have been destroyed or removed. The section of computations relating to the M.P. [illegible] on Aomon, Biijiri and Rojoa [illegible] therefore [illegible] significance, and should be disregarded.

The [illegible] revetment which were in the pr[illegible] the survey party arrived on the isl[illegible] angles and distances from [illegible] a line.

The Photo to[illegible] angle and distance from triangulati[illegible].

The causeway [illegible] established by offset from the [illegible] purpose of orienting the AEC installati[illegible] being the only line availa[illegible] required.

One causeway [illegible] above high water line on Aomon I[illegible]. The distance between these s[illegible] deter[illegible] triangulation from an auxiliary base [illegible] steel tape. Additional [illegible] were later set on both Aomon [illegible].

A bench [illegible] ~~xxxxx elevation~~ the [illegible] upon an assumed ele[illegible] water line on the beach. Thi[illegible] for the Aomon bench mar[illegible] established on Biijiri I., [illegible] to the bench mark on Aomon I.

Pile cut-[illegible] determined by leveling from these [illegible] centerline and pile line stake[illegible].

[illegible] soundings [illegible] intervals [illegible] profile.

Pre-grading [illegible] Biijiri Islands, [illegible] the Gamma [illegible] centerline. Rod readings were [illegible] every [illegible] the centerline, and side shots [illegible] 100 feet [illegible] and [illegible] breaks in grade for a distance [illegible] feet [illegible] the centerline. These side shots were taken at [illegible] intervals along the centerline, [illegible] the centerline.

On Munit [illegible] were unobstructed and available [illegible] line was selected as th[illegible] because it was the most economical [illegible] the standpoint of establishing [illegible] and because it was so situated th[illegible] could be used as one section [illegible] base line.

The Hartma[illegible] sections. The first secti[illegible] the [illegible] station mark to stake 4(A). [illegible] one section of the first-or[illegible] stake 4(A) to stake 28(B). [illegible] sectio[illegible] from stake 28(B) to stake 33. [illegible] standard USC&GS triangulatio[illegible] concrete post and stamped "[illegible]

The Hartma[illegible] to stake 33 has a computed probab[illegible],275,0[illegible]. The probable error [illegible] line which was measured between [illegible] 1944 and newly established [illegible] the section titled "BASE [illegible]

The blast [illegible] by set ups or set backs fr[illegible] measurement.

The Timing [illegible] off-set from the [illegible].

The Gamma [illegible] off-sets from the Hartman line.

The 1000 foot [illegible] located by chord off-set from the [illegible] foot point [illegible] Timing station line.

The range pole [illegible] by chord off-sets from the Hartman [illegible] to the range pole [illegible] case the chord angle and distance [illegible] off-set from the 1500 foot point [illegible] line to range pole [illegible] on a line parallel to the [illegible].

The winch [illegible] angle and distance from [illegible] line. From this data the distance [illegible] Tower was computed.

The [illegible] observed angle and distance from [illegible] section of the first-order [illegible].

The Photo [illegible] angle and distance from [illegible], 1944.

A standard USC&GS triangulation disk stamped "TRAVERSE STA RUNIT" and set in a concrete post was established as a permanent mark to replace base (see Plate 28 B).

Pre-grading cross sections were run on Runit Island using the [illegible] line as a centerline. Rod readings were taken every [illegible] feet along the centerline, and side shots taken at [illegible] foot intervals and at breaks in grade for a distance of 300 feet out from the centerline. These side shots were taken at 100 foot intervals along the centerline, and along a line normal to the centerline.

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ENGEBI ISLAND

LOCATION OF STRUCTURES FROM ZERO TOWER

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO		
Timing Station	3900 ft.	325	39	12
Blast Footing	1200 "	316	27	53
" "	1500 "	"	"	"
" "	1800 "	"	"	"
" "	2100 "	"	"	"
" "	2400 "	"	"	"
" "	2700 "	"	"	"
" "	3000 "	"	"	"
" "	3300 "	"	"	"
" "	3600 "	"	"	"
" "	3900 "	"	"	"
" "	4200 "	"	"	"
" "	4800 "	"	"	"
Blast Building	4700 "	314	45	43
Gamma A Station	2250 "	314	01	41
" B "	4900 "	"	"	"
Ionization Sta.	5000 "	314	24	17
Ctr. of Line of Cubes Bu Y&D	3050 "	262	28	22
" " "	[illegible] "	"	"	"
" " "	3200 "	"	"	
" " "	[illegible] "	"	"	"
" " "	3000 "	"	"	"
" " "	3600 "	"	"	"

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[illegible]

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO *		
O.C.E. Type A	1000 ft.	289	22	42
" " A	[illegible]	281	33	51
" " B	1500	287	00	33
" " B	2500	279	44	01
" " C	2500 "	283	14	31
Range Pole # 1	1200	304	18	05
" " # 2	Distant from Pole #1 [illegible] ft. Az from Pole #1	312	53	22
" " # 3	[illegible]	"	"	"
Tank Revetment	[illegible] #3	~~348~~ 346	~~56~~ 29	~~22~~ 19
Winch Base	4401	311	02	32
Bu S Stakes	2200	257	02	48
" " "	2300	"	"	"
" " "	2400	"	"	"
" " "	2500	"	"	"
" " "	2600	"	"	"
" " "	2700	"	"	"
" " "	2800	"	"	"
" " "	2900	"	"	"
" " "	3000	"	"	"

* Except where stated otherwise

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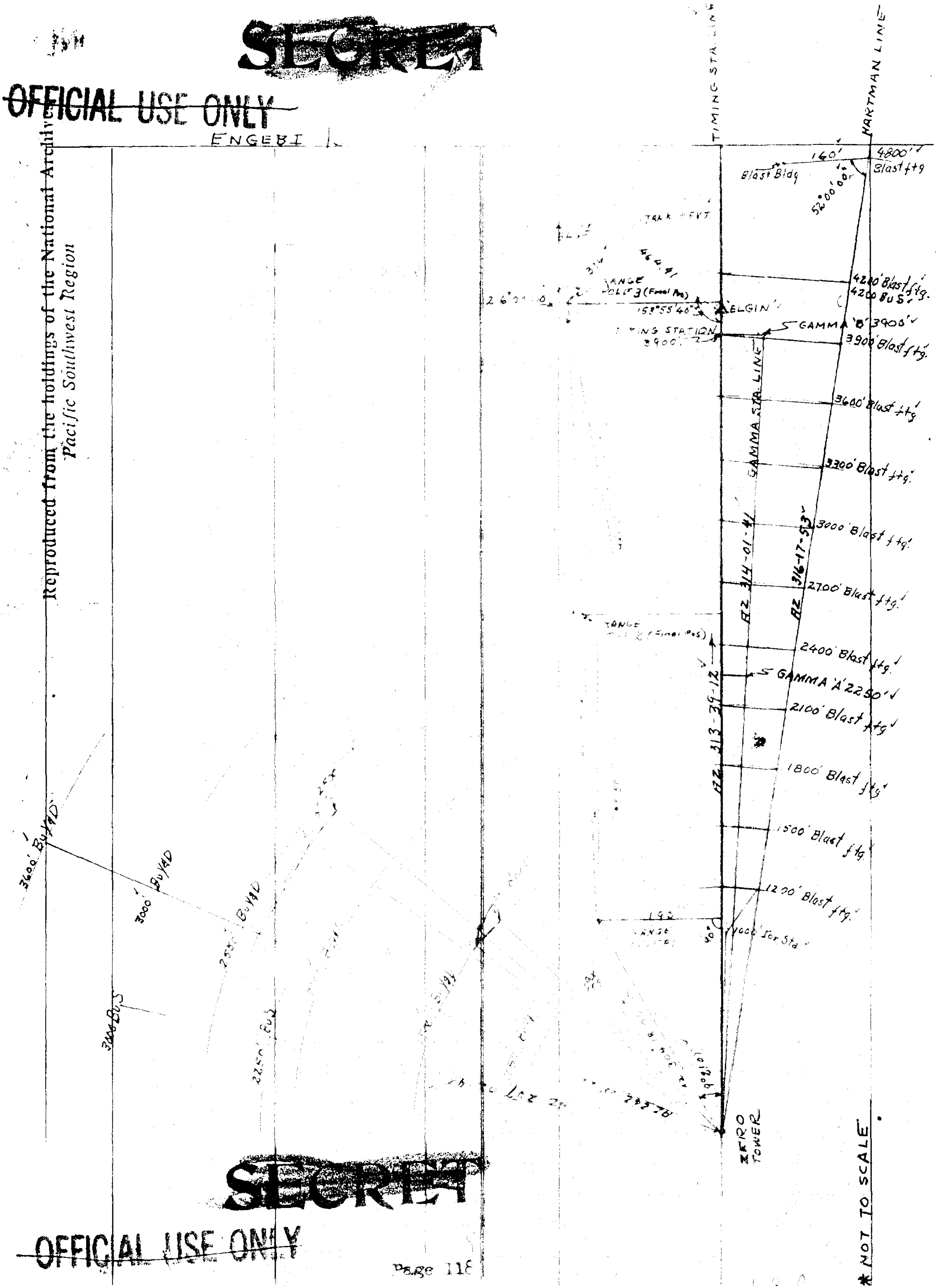

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COMPUTATIONS OF TRAVERSE BETWEEN

ENGEBI ZERO TOWER AND TRIANGULATION

STATION ELGIN

DISTANCES TO STAKES OF THE ABOVE

LINE USED IN ESTABLISHING OTHER

POINTS

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COMPUTATION OF ENGEBI TRAVERSE ~~BASE~~ LINE

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape lengths	UNCORRECTED LENGTH: Meters	TEMP.	CORRECTIONS: Temp. (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set-back (Meter)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	mm	mm
Bench ENGEBI ZERO	11-16-47	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	+ [illegible]	-0.0816	+ [illegible]	- [illegible]		[illegible]	[illegible]	[illegible]	[illegible]
To		F	92	2	[illegible]	[illegible]	[illegible]	+ [illegible]	-0.0017							
Bench A ELGIN		[illegible]	[illegible]				[illegible]	+ [illegible]	+0.0000	+ [illegible]						

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COMPUTATION OF ENGEBI TRAVERSE BASE LINE

SECTION From: Engebi Zero Bench To	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP	CORRECTIONS Temp. Meters	CORRECTIONS Tape and Catenary Meters	CORRECTIONS Set-up Set back Meters	CORRECTIONS Inclination Meters	CORRECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH* Meters	DISTANCE FROM ENGEBI ZERO (m) ~FEET~	DISTANCE TOWER (m) ~FEET~
Stake No 7	2-16-47	E	921	[illegible]	—	[illegible]	[illegible]	+0.0016	-0.0238	0.0000	-0.0029		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] 0306	[illegible]	-0.0042		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	E	921	[illegible]	18	900	29.5	+0.0046	[illegible] 0.0612	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
		E	921	2	[illegible]	[illegible]	30.0	+0.0001	-0.0017							
		F	3661	2	—	—	29.0	+0.0013	±0.0000	[illegible]						

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COMPUTATION OF ENGEBI TRAVERSE ~~BASE LINE~~

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape lengths	UNCORRECTED LENGTH: Meters	TEMP.	CORRECTIONS: Temp (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	DISTANCE FROM ZERO	DISTANCE FROM ENGEBI TOWER
From Engebi Zero to Sta. No. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]

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Form 635

ABS… LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	[illegible]	[redacted] [illegible]	[illegible]	Meters	Meters	
Mark ENGEBI ZERO				[illegible] (assumed)		
Bench ENGEBI ZERO		[illegible]				
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			Σ Crn = 2.4 mm
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			Σ Crn = 4.2 mm
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			Σ Crn = 7.4 mm
12	[illegible]	[illegible]	[illegible]			
13	[illegible]	[illegible]	[illegible]			Σ Crn = 10.6 mm
13 + 25	[illegible]	[illegible]	[illegible]			
13+25 Setup	[illegible]	[illegible]	[illegible]			Σ Crn = 11.3 mm
14	[illegible]	[illegible]	[illegible]			Σ Crn = 11.7 mm
15	[illegible]	[illegible]	[illegible]			Σ Crn = 11.7 mm
16	[illegible]	[illegible]	[illegible]			Σ Crn = 11.8 mm
17	[illegible]	[illegible]	[illegible]			Σ Crn = 11.9 mm
18	[illegible]	[illegible]	[illegible]			Σ Crn = 12.0 mm
19	[illegible]	[illegible]	[illegible]			Σ Crn = 12.1 mm
20	[illegible]	[illegible]	[illegible]			
21	[illegible]	[illegible]	[illegible]			Σ Crn = 12.3 mm
22	[illegible]	[illegible]	[illegible]			
23	[illegible]	[illegible]	[illegible]			Σ Crn = 20.0 mm
Bench Δ ELGIN	[illegible]	[illegible]	[illegible]			
Mark Δ ELGIN		[illegible]		[illegible]		

ABSTRACT OF WYE LEVELING — ENGEBI ZERO - △ ELGIN TRAVERSE 12/16/47

FROM Mark	TO Bench	Diff in Elevation 1st Running	Diff in Elevation 2nd Running	MEAN
ENGEBI ZERO	ENGEBI ZERO	[illegible]	+2.118	+2.[illegible]
Bench ENGEBI ZERO	1	[illegible]	+0.393	[illegible]
1	2	[illegible]	+0.520	[illegible]
2	3	[illegible]	[illegible]	[illegible]
3	4	[illegible]	+0.[illegible]	+0.[illegible]
4	5	[illegible]	[illegible]0.298	[illegible]
5	6	[illegible]	[illegible]0.083	[illegible]
6	7	[illegible]	[illegible]0.227	[illegible]
7	8	[illegible]	[illegible]0.656	[illegible]
8	9	[illegible]	[illegible]1.265	[illegible]
9	10	[illegible]	+0.611	[illegible]
10	11	[illegible]	+1.726	[illegible]
11	12	[illegible]	+1.221	[illegible]
12	13	[illegible]	[illegible]	[illegible]
13	13 + 25	[illegible]	[illegible]	[illegible]
13 + 25	13+25 Set up	[illegible]	[illegible]393	[illegible]
13+25 Set up	14	[illegible]	[illegible]0.697	[illegible]
14	15	[illegible]	+0.311	[illegible]
15	16	[illegible]	[illegible]0.277	[illegible]
16	17	[illegible]	[illegible]0.389	[illegible]
17	18	[illegible]	+0.31[illegible]	[illegible]
18	19	[illegible]	[illegible]0.335	[illegible]
19	20	[illegible]	[illegible]0.066	[illegible]
20	21	[illegible]	[illegible]0.428	[illegible]
21	22	[illegible]	[illegible]0.751	[illegible]
22	23	+2.[illegible]	+2.808	+2.[illegible]
23	Bench △ ELGIN	[illegible]	+0.058	[illegible]
Bench △ ELGIN	Mark △ ELGIN	[illegible]	[illegible]	[illegible]
MARK △ ELGIN	Water line at 1500 hrs	[illegible]		[illegible]

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MEAN TEMPERATURES [illegible] FULL TAPE LENGTHS (INVAR) ~ ENGEBI ZERO TOWER – Δ ELGIN.

~SEC.~ STAKE Nos.	FWD. Thermo. °C	[illegible]	[illegible]	
Bench Engebi Zero – 1	28 [illegible]	[illegible]	[illegible]	
1 – 2	28.5	[illegible]	[illegible]	
2 – 3	29.3	[illegible]	[illegible]	
3 – 4	29.5	[illegible]	[illegible]	
4 – 5	29.2	[illegible]	[illegible]	
5 – 6	29.5	[illegible]	[illegible]	
6 – 7	29.6	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #7
7 – 8	29.5	[illegible]	[illegible]	
8 – 9	29.5	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] to stake #9
9 – 10	29.3	[illegible]	[illegible]	
10 – 11	29.7	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #11
11 – 12	29.1	[illegible]	[illegible]	
12 – 13	[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #13
13 – 14	29.2	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #14
14 – 15	29.0	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #15
15 – 16	29.3	[illegible]	[illegible]	[illegible] stake #16
16 – 17	29.[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #17
17 – 18	31.0	[illegible]	62.0	
		[illegible]	[illegible]	[illegible] stake #18
18 – 19	[illegible]	[illegible]	[illegible]	[illegible] stake #19
19 – 20	29.5	[illegible]	[illegible]	
20 – 21	29.[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #21
21 – 22	[illegible]	[illegible]	[illegible]	
22 – 23	[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] stake #23
23 – Bench Δ Elgin	[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]	[illegible] Bench Δ Elgin

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COMPUTATIONS OF [illegible] SETBACKS
AND OFFSETS FROM THE [illegible]MING STATION
LINE FOR USE IN ESTABLISHING OTHER
POINTS

COMPUTATION OF SET UPS [illegible] OF THE ZERO TOWER – △ ELGIN (TIMING LINE) TRAVERSE TO PROPER DISTANCES FOR ESTABLISHING OTHER POINTS BY CHORD OFFSETS

OBJECT TO BE ESTABLISHED	DIST. FROM ZERO TOWER Feet	DIST. FROM ZERO TOWER Meters	Closest Sta. No.	Dist. Zero Tower to Closest Sta.	Set up from Closest Sta.	Set up from Closest Sta. Feet	SET BACK from Closest Sta. Meters	SET BACK from Closest Sta. Feet
Hartman Sta.	1200	365.76	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1500	457.20	[illegible]	450.0041	[illegible]	[illegible]	—	—
Hartman Sta.	1800	548.64	11	550.0012			1.3591	4.459
Hartman Sta.	2100	640.08	[illegible]	650.01			9.9368	32.601
Hartman Sta.	2400	731.52	[illegible]	[illegible]			5.5950	18.356
Hartman Sta.	2700	822.96	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3000	914.40	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3300	1005.84	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3600	1097.28	[illegible]	[illegible]	[illegible]	[illegible]	—	—
TIMING STA GAMMA "B" Hartman Sta.	3900	[illegible]	[illegible]	1152.082	[illegible]	[illegible]	—	—

COMPUTATION OF "SET UPS" AND SET BACKS FROM [illegible] THE ZERO TOWER – △ ELGIN TRAVERSE TO PROPER DISTANCE FOR ESTABLISHING [illegible] POINTS BY NORMAL OFFSETS

Object to Be Established	Distance from Zero Tower Ft.	Distance required on Z-T Line Ft.	Closest Stake No.	Dist. Zero To Closest Stake Ft.	Set Up Ft.	Set Back Ft.	Length of Normal offset Ft.
Range Pole #1	1200	1184.31	[illegible]	1148.347	[illegible]	[illegible]	195.0
GAMMA "A"	2250	2249.95	[illegible]	2227.324		[illegible]	14.71
*Range Pole #2	—	2684.11	[illegible]	2746.420		[illegible]	196.0
*Range Pole #3	—	4187.11	[illegible]	4058.75	[illegible]		195.0

* Poles No. 2 + No 3 were [illegible] range pole #3 fell on line between [illegible] by Dr. Clark, AEC, and Zero Tower. [illegible] Pole #2 [illegible] to original pole line. Pole #2 was [illegible] original pole line. This [illegible] parallel to the Zero Tower Timing [illegible] Line.

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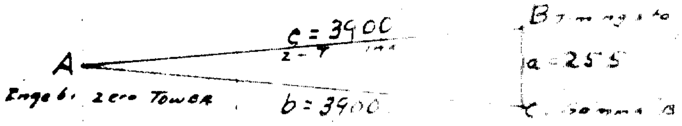
∡ Zero-Time to γ B

COMPUTATION OF CHORD ∡ B to Chord offset from 3900 point on zero-Time Line to Gamma "B"



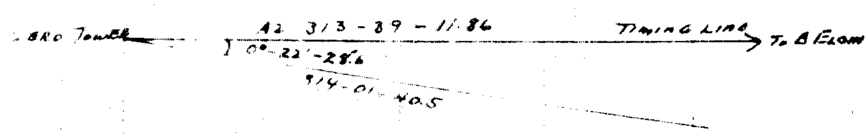
a = 25.5
b = 3900.0
c = 3900.0
2S = 7825.5
S = 3912.75

S-a = 3887.25
S-b = 12.75
S-c = 12.75

log S-a = 3.589 6425
" S-b = 1.105 5102
" S-c = 1.105 5102
5.800 6629
log S = 3.592 4822
2.208 1808
log r = 1.104 0904

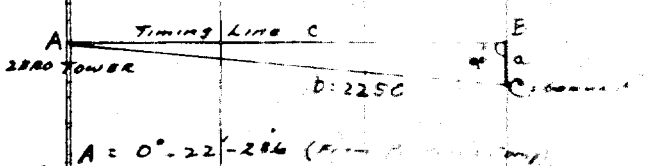
$\tan \frac{1}{2} A = \frac{r}{S-a}$

log r = 1.104 0904
log (S-a) = 3.589 6425
log tan ½A = 7.514 4479
½A = 0° 11' 14.3"
A = 0° 22' 28.6"



COMPUTATION of Prop. Dist. ... Normal offset from Z-T line to Gamma A at 2250' from ZERO Tower

Dist Z T Line to γ A



A = 0°-22'-28.6

a = b sin A
log 2250 = 3.352 1825
log sin = 7.815 4549
log a = 1.167 6374
a = 14.71

c = b Cos A
log 2250 = 3.352 1825
log Cos A = 9.999 9915
log c = 3.352 1740
c = 2249.96

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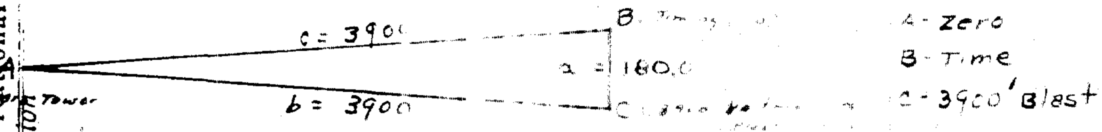
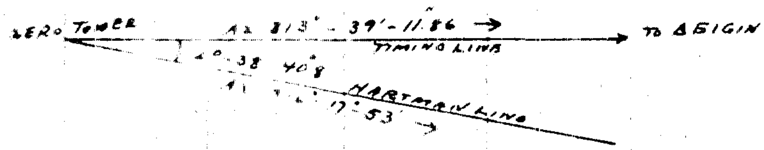
∠ Zero-Time Line to Blast Line

COMP. OF Chord ∠"B" for Chord Offsets from ZERO Time Line To Hartman stations (Blast footings)



a =	180 ✓
b =	3900 ✓
c =	3900 ✓
2s =	7980 ✓
s =	3990 ✓
s-a =	3810 ✓
s-b =	90 ✓
s-c =	90 ✓
log (s-a) =	3.580 9250 ✓
" (s-b) =	1.954 2425 ✓
" (s-c) =	1.954 2425 ✓
	7.489 4100 ✓
log s =	3.600 9729 ✓
	3.888 4371 ✓
log r =	1.944 2186 ✓



$\tan \frac{1}{2} A = \frac{r}{s-a}$

log r =	1.944 2186 ✓
log (s-a) =	3.580 9250 ✓
log tan ½ A =	8.363 2936 ✓
½ A =	1° 19' 20.4"
A =	2° 38' 40.8"

$\tan \frac{1}{2} B = \frac{r}{s-b} = \tan \frac{1}{2} C$

log r =	1.944 2186 ✓
log (s-b) =	1.954 2425 ✓
log tan ½ B =	9.989 9761 ✓
½ B =	44° 20' 19.8" ✓
B =	88° 40' 39.6" ✓
A	2 38 40.8
C =	88 40 39.6
Σ	180 00 00.0

check: $\cos A = \frac{b^2+c^2-a^2}{2bc}$

b^2 =	1521 0000
c^2 =	1521 0000
b^2+c^2 =	3042 0000 = 2bc
a^2 =	32400
	3038 7600

log 30387600	7.482 6964
log 30420000	7.483 1592
log Cos A	9.999 5372
A	2° 38' 41"

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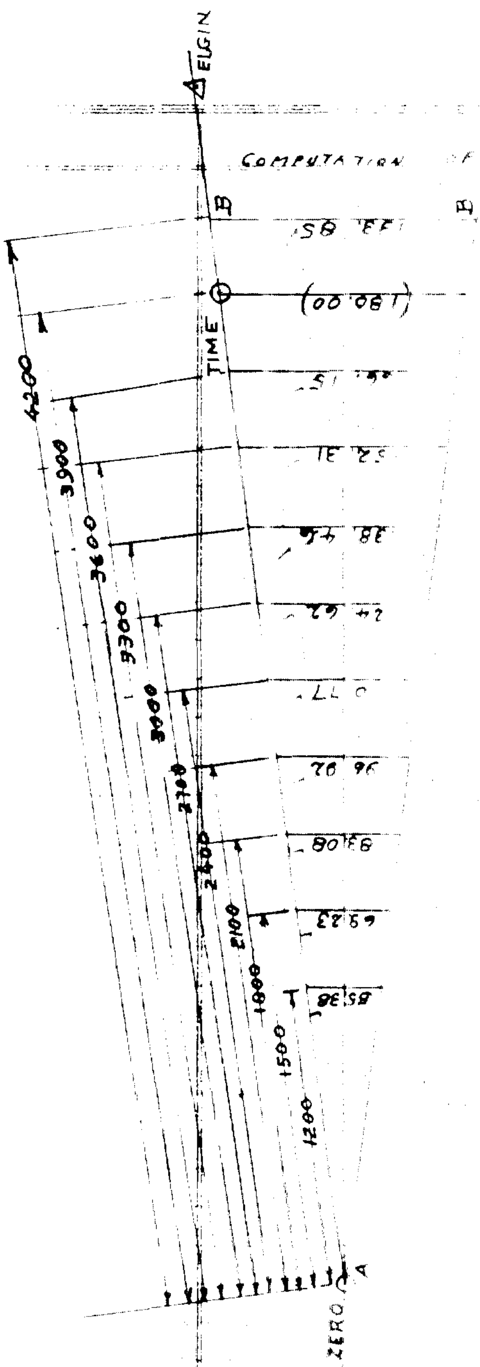
100 yd. Blast Stations



COMPUTATION OF CHORD DISTANCES [illegible] Hartman stations From Z–T Line

∠A [illegible] 38′ 40.8″

∠B [illegible] [illegible]° 40′ 39.6″

$a = \frac{b \sin A}{\sin B}$

log 200 [illegible] 18 [illegible]	log 2700 = 3.431 3638 ✓
log sin A 8.664 094 ✓	log Sin A = 8.664 0941 ✓
[illegible] 275[illegible] ✓	2.095 4579 ✓
log sin B [illegible] 8843 ✓	log Sin B = 9.999 8843 ✓
[illegible] 391[illegible] ✓	2.095 5736 ✓
1. dist. [illegible]5.38 ✓	6. dist. = 124.62 ✓
log 500 [illegible] 09 1[illegible] ✓	log 3000 = 3.477 1213 ✓
log sin A 8.664 094 ✓	log Sin A = 8.664 0941 ✓
[illegible] 1854 ✓	2.141 2154 ✓
log sin B [illegible] 8843 ✓	log Sin B = 9.999 8843 ✓
[illegible] 301[illegible] ✓	2.141 3311 ✓
2. dist. 69.23 ✓	7. dist. = 138.46 ✓
log 600 3.255 2725 ✓	log 3300 = 3.518 5139 ✓
log sin A 8.664 094 ✓	log Sin A = 8.664 0941 ✓
[illegible] 3666 ✓	2.182 6080 ✓
log Sin B 9.999 8843 ✓	log Sin B = 9.999 8843 ✓
[illegible] 4823 ✓	2.182 7237 ✓
3. dist. 83.08 ✓	8. dist = 152.31 ✓
log 2100 3.322 2193 ✓	log 3600 = 3.556 3025 ✓
log sin A 8.664 0941 ✓	log Sin A = 8.664 0941 ✓
[illegible] 3134 ✓	2.220 3966 ✓
log sin B [illegible] 8843 ✓	log Sin B = 9.999 8843 ✓
[illegible] 4291 ✓	2.220 5123 ✓
4. dist. [illegible]6.92 ✓	9. dist. = 166.15 ✓
log 2400 3.380 [illegible] ✓	log 4200 3.623 2493 ✓
log sin A 8.664 0941 ✓	log Sin A = 8.664 0941 ✓
[illegible] 3053 ✓	2.287 3434 ✓
log sin B [illegible] 8843 ✓	log Sin B = 9.999 8843 ✓
[illegible] 4210 ✓	2.287 4591 ✓
5. dist. [illegible] ✓	10. dist 193.85 ✓

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U. S. COAST AND GEODETIC SURVEY
Form 665
Ed. Dec. 1929

TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

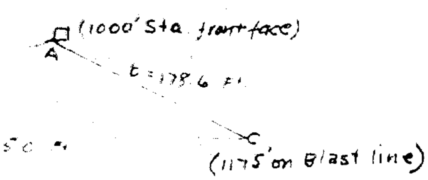
Comp of Dist. from Zero Tower To Near face of 1000 Ionization Station.

Pacific Sounds Region

C_s		Log a	[illegible] 639	Log m	
$\frac{\text{Sph. excess}}{3}$		Log b	[illegible] 84[illegible]	Log sin C_s	
C_p	10 3[illegible]	Log tan 45°	[illegible] 564	Log a	
$\frac{1}{2}C_p$	5 [illegible]	(45°+φ)	26	Log b	
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	84 [illegible]	φ	26	Log sph. ex.	
$\frac{1}{2}(A_p-B_p)$	8[illegible]	Log tan φ	[illegible]66 9438	Sph. excess	—
Sum $=A_p$	16[illegible]	Log tan ½ (A_p+B_p)	[illegible] 2146		
Diff $=B_p$	[illegible]	Log tan ½ (A_p-B_p)	[illegible]87 0284		
C_p	10 [illegible]		(Sketch)		

Log a	3.070 [illegible]
Log sin C_p	9.26[illegible]
Colog sin A_p	0.66[illegible] [illegible]
Log c	3.[illegible]

C = 1000.03 ft



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2–3					3.000 0147
1	[illegible]-39-42				0.732 8291
2	1-53-36				9.519 0254
3	16[illegible]-26-44				9.33[illegible] [illegible]41
1–3				178.595	2.251 8692
1–2				1175.00	3.070 0379
	180-00-0[illegible]				
2–3					
1					
2					
3					
1–3					
1–2					

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

77A

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Pole # from Z-T Line

Comp of Dist out ... Tower along ... for Normal offset to Range pole #1 (1200' from Z)

B Range pole #1

c = 1200

a = 145

A
ZERO Tower

Sin ...

log 145 = 2.16 0346
log 1200 = 3.079 1812
log Sin = 9.08 8534
A 9° 21' 07"

b = c Cos A

log 1200 = 3.079 1812
log Cos A = 9.994 2097
log b = 3.07 3909
b = 1184.11 Dist ... line for Normal offset to pole #1
1500.00 spacing ... between Poles (Pole line // to Z-T Line.)
2684.11 Dist ... for Normal offset to Pole #2 *
1500.00
4184.11 Dist ... for Normal offset to Pole #3 *

* ... #3 later Moved ~ Pole #3 moved Northerly
... ⊥ to ~~old~~ original line of poles
... moved Northerly 20.0 on line ⊥ to original
... poles ~ Thus poles are still on a straight
... line is no longer // to Z-T Line.
See next Sheet for Range Poles
#2 & #3 as re-set

Az 304 18-05 ...
9°-21'-07" ... Line ...
Az = 313 ...

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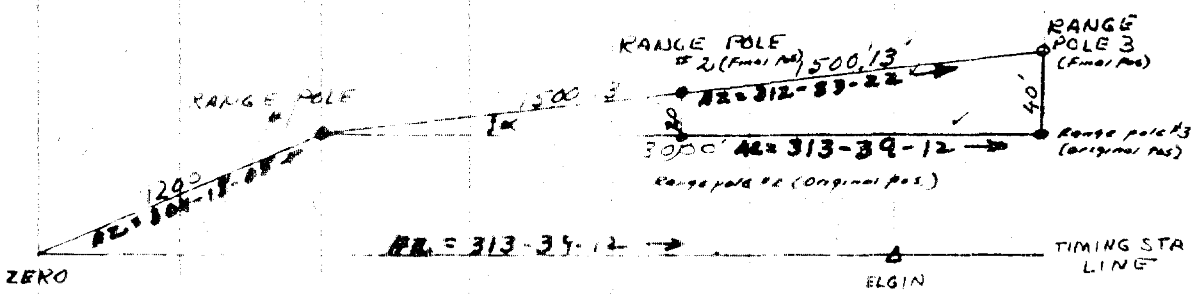
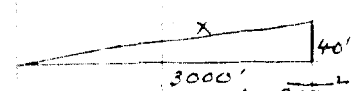
RANGE POLES, ENGEBI.

Distances + Azimuth Range Poles, after Poles #2 + #3 were re-set.



log 40
4000 3.477 1213
log Tan α [illegible]

α [illegible]



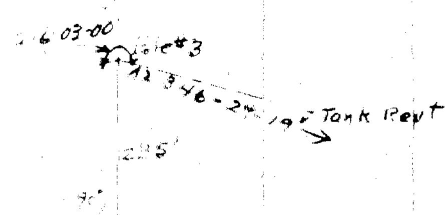
$x^2 = \overline{3000}^2 + \overline{40}^2$

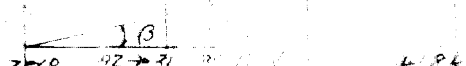
$\log x^2 = 6.9543197$

$x = 3.4771598$

$x = 3000.27$ FT.

Azimuth [illegible] 312° 53' 22"





log 235
4184
log tan β 8.749 4162
β [illegible] 53"

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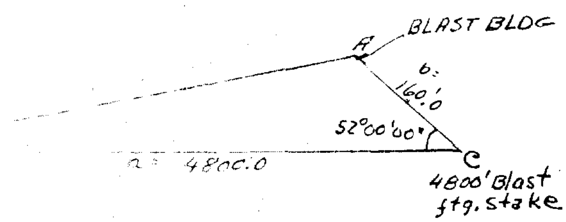
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$$\left[\frac{a}{b} = \tan(45^\circ + \phi \quad \ldots \quad \tan\phi \tan\tfrac{1}{2}(A_p + B_p); \qquad c = \frac{a \sin C_p}{\sin A_p}\right]^*$$

C_s	[illegible]	[illegible] 2412	Log m
$\frac{\text{Sph. excess}}{3}$	[illegible]	[illegible] 1200	Log sin C_s
C_p	[illegible]	[illegible] 1477 1212	Log a
$\frac{1}{2}$ C_p	[illegible]	[illegible] 27.0	Log b
$90^\circ - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]	[illegible] 270	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	[illegible] 2361	Sph. excess
Sum $= A_p$	[illegible]	[illegible] 8182	
Diff $= B_p$	[illegible]	[illegible] 8545	
C_p	[illegible]		(Sketch)

Log a	[illegible]
Log sin C_p	9.89[illegible]
Colog sin A_p	0.[illegible]
Log c	3.67[illegible]



CHECK COMPUTATION

No.	STA[illegible]	SIDES [illegible]	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3.672 3918
1					0.103 4679
2					8.428 2637
3	A				9.905 3815
1-3				160.0	2.204 1234
1-2				4800.0	3.681 2412
2-3			a blast ftg stake		
1					
2				→ Hartman Line	
3	2800 Tower				
1-3					
1-2					

*The subscripts s and p on this form refer [illegible] respectively.

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[redacted]

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U. S. COAST AND GEODETIC SURVEY
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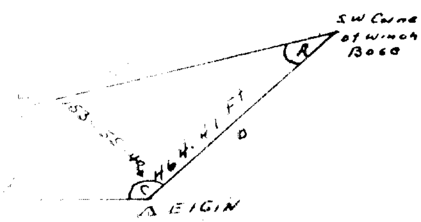
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side a) [illegible] $\tan\frac{1}{2}(A_p + B_p)$ [illegible] $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log a	[illegible]	Log m
$\frac{\text{Sph. excess}}{3}$		Log b	[illegible]	Log sin C_s
C_p	153 5 [illegible]	Log tan (45 + φ)	[illegible]	Log a
$\frac{1}{2} C_p$	[illegible]	(45°+φ)	[illegible]	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]		[illegible]	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log tan φ	[illegible]	Sph. excess
Sum $= A_p$	[illegible]	Log tan ½ (A + B)	[illegible]	
Diff $= B_p$	[illegible]	Log tan ½ (A − B)	[illegible]	
C_p	153 [illegible]		(Sketch)	

Log a	3.668 [illegible]
Log sin C_p	9.64[illegible]
Colog sin A_p	0.399 [illegible]
Log c	3.65[illegible] 3[illegible]



448[illegible]

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2–3				3.651 3315
	1 C				0.357 0374
	2 A				9.606 6235
	3 B				8.658 5293
	1–3				3.608 3924
	1–2			Winch Base (S.W. Corner)	2.666 8982
	2–3			To Δ EIGIN	
	1				
	2				
	3				
	1–3				
	1–2				

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

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19 A

1994

COMPUTATIONS AND MEASUREMENTS REQUIRED FOR LOCATING AND CHECKING THE Bu Y&D STRUCTURES

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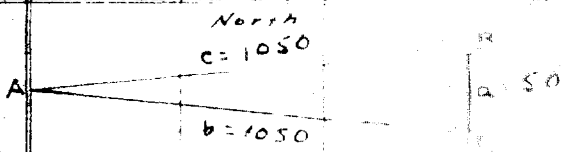
12-23-47 ENGEBI I

ENGEBI Z-BUY&D to chord or edge Runway.

COMPUTATION For Chord offset stake on N side of runway



a =	50
b =	1050
c =	1050
2s =	2150
s =	1075
s-a =	1025
s-b =	25
s-c =	25

log (s-a) =	3.010 7239
log (s-b) =	1.397 9400
log (s-c) =	1.397 9400
	5.806 6039
log s =	3.031 4085
	2.775 1954
log r =	1.387 5977

log r =	1.387 5977
log (s-a) =	3.010 7239
log tan ½A =	8.376 8738
½A =	1° 21' 51.5
A =	2° 43' 43.0

log r =	1.387 5977
log (s-b) =	1.397 9400
log tan ½B =	9.989 6577
½B =	44° 19' 04.1
B =	88 38 08.2

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ENGEBI I
12-23-47

ENGEBI Z-Bu Y$I [illegible] on edge of Runway.

COMPUTATION For Chord offset stakes [illegible] sides of runway

South		North	
c=1500	a=288	c=1500, b=1500	a=148
a =	288	a	148
b =	1500	b	1500
c =	1500	c	1500
2s =	3288	2s	3148
s =	1644	s	1574
s-a =	1356	s-a	1426
s-b =	144	s-b	74
s-c =	144	s-c	74
log (s-a) =	3.132 2597	log (s-a)	3.154 1195
log (s-b) =	2.158 3625	log (s-b)	1.869 2317
log (s-c) =	2.158 3625	log (s-c)	1.869 2317
	7.448 9847		6.892 5829
log s =	3.215 9018	log s	3.197 0047
	4.233 08[illegible]		3.695 5782
log r =	2.116 [illegible]	log r	1.847 7891
log r =	2.116 5415	log r	1.847 7891
log (s-a) =	3.132 2597	log (s-a)	3.154 1195
log tan ½ A =	8.984 28[illegible]	log tan ½ A	8.693 6696
½ A =	5° 30' [illegible]	½ A	[illegible]° 49' 35.8"
A =	11° 01' [illegible]	A	[illegible]° 39' 19.6"
log r =	2.116 5415	log r	1.847 7891
log (s-b) =	2.158 3625	log (s-b)	1.869 2317
log tan ½ B =	9.958 17[illegible]	log tan ½ B	9.978 5574
½ B =	42° 14' 44.	½ B	43° 35' 10.1"
B =	84 29 28	B	87° 10' 20.2"

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ENGEBI I

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12-23-[illegible]

[illegible] edge Runway

COMPUTATION For Chord offset stakes [illegible] sides of runway

SOUTH — c = 21[illegible]; A; b = 2100; 264

NORTH — c = 2100; b = 2100; B, a = 224, C

SOUTH			NORTH		
a	264		a	224	
b	[illegible]		b	2100	
c	[illegible]		c	2100	
2s	4464		2s	4424	
s	2232		s	2212	
s-a	1968		s-a	1988	
s-b	132		s-b	112	
s-c	132		s-c	112	
log (s-a)	3.294	[illegible]	log (s-a)	3.298	4164
log (s-b)	2.120	5[illegible]	log (s-b)	2.049	2160
log (s-c)	2.120	5[illegible]	log (s-c)	2.049	2160
	7.535	[illegible]		7.396	8524
log s	3.348	[illegible]	log s	3.344	7851
	4.18[illegible]	4[illegible]		4.052	0673
log r	2.093	2[illegible]	log r	2.026	0336
log r	2.093	2394	log r	2.026	0336
log (s-a)	3.294	[illegible]	log (s-a)	3.298	4164
log tan ½ A	8.79[illegible]	[illegible]	log tan ½ A	8.727	6172
½ A	3°	36' [illegible]	½ A	3° 03'	26.0
A	7°	12' [illegible]	A	6° 06'	52.0
log r	2.093	2394	log r	2.026	0336
log (s-b)	2.120	5339	log (s-b)	2.049	2180
log tan ½ B	9.97[illegible]	665[illegible]	log tan ½ B	9.976	8156
½ B	43°	11' [illegible]	½ B	43° 28'	17.0
B	86°	23' [illegible]	B	86° 56'	34.0

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ENGEBI I.
12-23-47

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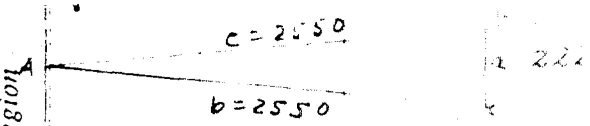
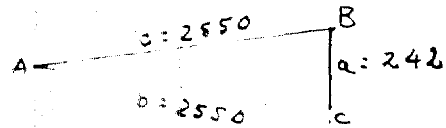
ENGEBI I. BH. Y & ℄ to Chords on edge Runway
COMPUTATION FOR Chord offset stakes on N & S Sides of Runway

SOUTH



NORTH



SOUTH		NORTH	
a =	222	a =	242
b =	2550	b =	2550
c =	2550	c =	2550
2s =	5322	2s =	5342
s =	2661	s =	2671
s-a =	2439	s-a =	2429
s-b =	[illegible]	s-b =	121
s-c =	[illegible]	s-c =	121
log (s-a) =	3.387 2118	log (s-a) =	3.385 4275
log (s-b) =	2.045 3230	log (s-b) =	2.082 7854
log (s-c) =	2.045 3230	log (s-c) =	2.082 7854
	7.477 8578		7.550 9983
log s	3.425 0449	log s	3.426 6739
	4.052 8129		4.124 3244
log r =	2.026 4065	log r =	2.062 1622
Log r =	2.026 4065	log r	2.062 1622
log (s-a) =	3.387 2118	log s-a	3.385 4275
log tan ½ A	8.639 1947	log tan ½ A	8.676 7347
½ A =	2° 29' [illegible]	½ A =	2° 43' 11.1"
A =	4° 59' [illegible]	A =	5° 26' 22.2
log r =	2.026 4065	log r	2.062 1622
log (s-b) =	2.045 3230	log (s-b) =	2.082 7854
log tan ½ B =	9.981 08[illegible]	log tan ½ B =	9.979 3768
½ B =	43 45 09.2	½ B =	43 38 24.4
B =	87° 30' 18.4	B =	87° 16' 48.8"

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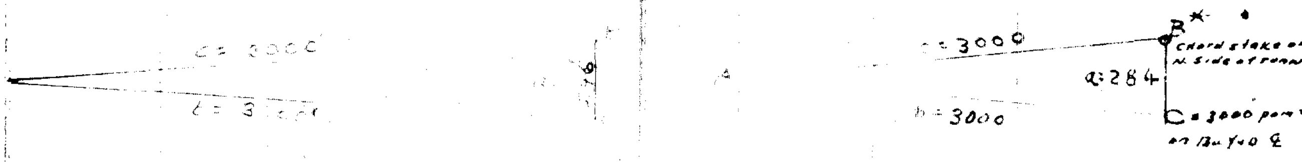
Pacific Southwest Region

... point on Edge of Runway
Comp for Chord off... stake... ...des of Runway.

SOUTH | NORTH



SOUTH	NORTH
a = 246	284
b = 3000	3000
c = 3000	3000
2s = 6246	6284
s = 3123	3142
s-a = 2877	2858
s-b = 123	142
s-c = 123	142
Log (s-a) = 3.458 93	3.456 0622
Log (s-b) = 2.089 90	2.152 2883
Log (s-c) = 2.089 90	2.152 2883
7.638 75	7.760 6388
Log s = 3.494 57	3.497 2062
4.144 17	4.263 4326
Log r = 2.072 08	2.131 7163

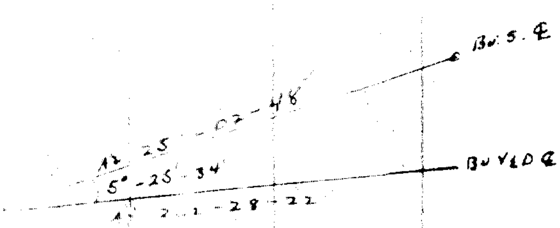
$\tan \frac{1}{2} A = \frac{r}{s-a}$

SOUTH	NORTH
Log r = 2.072 08	2.131 7163
Log (s-a) = 3.458 93	3.456 0622
Log tan ½ A 8.613 14	8.675 6541
½ A = 2° - 2	2° 43' 46.8
A = 4° - 4	5° 25' 33.6

$\tan \frac{1}{2} B = \frac{r}{s-b} = \tan$

SOUTH	NORTH
Log r = 2.072 08	2.131 7163
Log s-b = 2.089 90	2.152 2883
tan ½ B 9.982 18	9.979 4280
½ B = 43° - 49	43° 38' 36.6
87 -	87° 17' 13.2

This Chord stake Later used as 3000' ℄ stake of Bu.S. Line.



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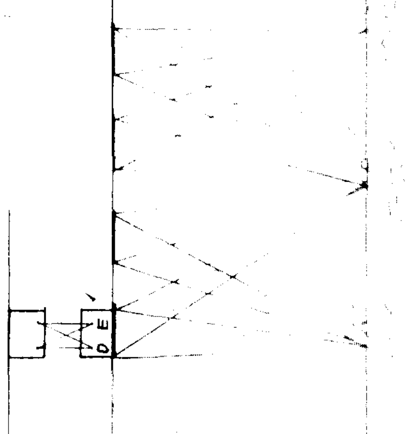
U.S.C.&G.S. Tape #3774

NOTE — [illegible] measurements are from the END [illegible] the tape and not from the zero [illegible] true distance ADD 0.4 [illegible] following

1050' CUBES

A-B 27.467' true distance
B-C 26.835' true distance

Feet



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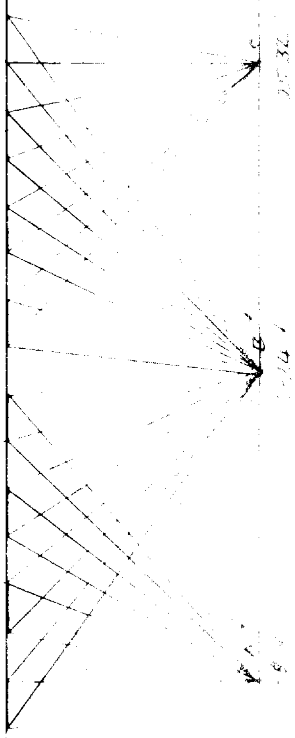
NOTE - [illegible]
from the [illegible]
from the [illegible]
ADD 0.4[illegible] the below [illegible]

[illegible] C.&G.S. Tape #3714

1500' CUBES

A-B 61.758 true distance
B-C 63.030 true distance



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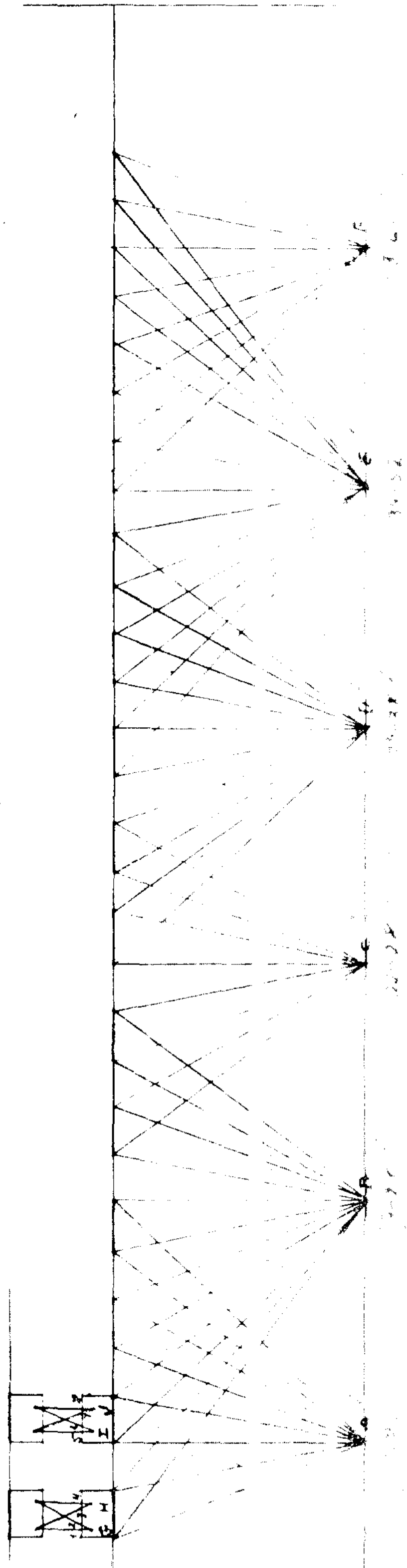
U.S.C.&G.S. Tape #3774

NOTE — These measurements [illegible] from the END [illegible] from the [illegible] ADD 0.4[illegible]



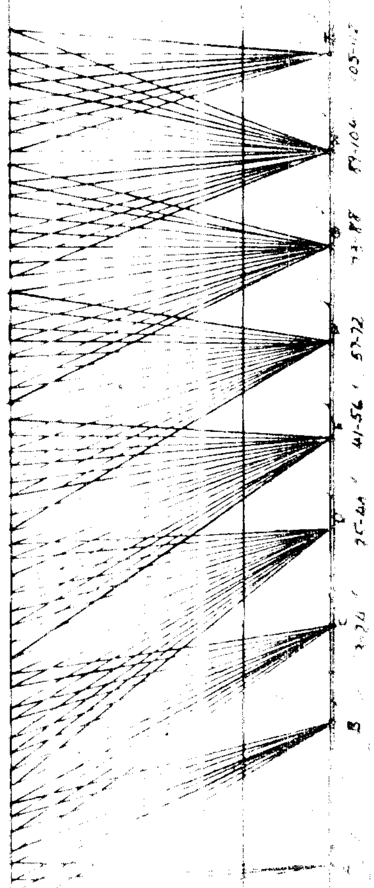
				2100' CUBES
[illegible]		23.[illegible]6	I	
1	[illegible]	20.46	5	6.04
[illegible]	2[illegible]	22.49	6	6.57
[illegible]	[illegible]	26.[illegible]7	J	
[illegible]	3[illegible]	34.37	7	6.80
[illegible]	[illegible]	37.08	8	5.82
[illegible]	4[illegible]			
7	[illegible]	64.9[illegible]		
[illegible]	[illegible]	56.[illegible]		
[illegible]	[illegible]	46.32		
[illegible]	45.[illegible]	28.54		
[illegible]	[illegible]	[illegible]		
11	[illegible]	2[illegible]		
12	3[illegible]	[illegible]		
13	[illegible]	[illegible]		
14	[illegible]	[illegible]		
15	[illegible]	22.82		
16	[illegible]	29.59		
17	[illegible]	32.16		
18	28.4	41.23		
19	36.8[illegible]	44.64		
20	4[illegible]			
[illegible]		54.80		
21	3[illegible]	56.1[illegible]		
22	[illegible]	46.[illegible]		
23	[illegible]	42.[illegible]		
24	[illegible]	33.89		
25	[illegible]	[illegible]		
26	[illegible]	34.[illegible]		
27	[illegible]	22.[illegible]4		
28	[illegible]			
[illegible]	[illegible]	13.9[illegible]		
29	[illegible]	6.6[illegible]		
30	46.6[illegible]			
31	2[illegible]3[illegible]	6.7[illegible]		
32	24.32	5.78		

A-B = 49.950 True dist
B-C = 49.980 " "
C-D = 49.945 " "
D-E = 50.013 " "
E-F = 47.950 " "

SECRET

 84

2550 CUBES



2550 RADIUS
LINE OF BU Y&D
CUBES

A-B	50.030'	true dist.
B-C	50.118	" "
C-D	49.775	" "
D-E	49.933	" "
E-F	49.990	"
F-G	49.840	
G-H	50.165	
H-I	50.042	

U.S.C.&G.S. Tape #3774

NOTE – These measurements [illegible]
from the END of the tape and [illegible]
from the Z[illegible] for the [illegible]
ADD 54 [illegible]

SECRET

2550' CUBES

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USC&GS TAPE
\# 3774

A		33	[illegible]	[illegible]	21.8[illegible]	[illegible]	45.03
1	19.65	34	[illegible]	68	22.88	[illegible]	50.[illegible]
2	20.65	35	[illegible]	69	29.[illegible]	[illegible]	60.34
3	23.58	36	[illegible]	70	31.[illegible]	[illegible]	[illegible]
4	25.72	37	[illegible]	7[illegible]	[illegible]		
B		38	[illegible]	72	[illegible]		[illegible]
5	56.11	39	[illegible]	[illegible]			[illegible]
6	53.24	40	[illegible]	[illegible]	[illegible]		32.[illegible]
7	41.57	E		[illegible]	[illegible]	[illegible]	[illegible]
8	39.31	41	[illegible]	[illegible]	[illegible]		[illegible]
9	29.30	42	[illegible]	[illegible]	[illegible]		[illegible]
10	26.92	43	[illegible]	[illegible]	[illegible]		31.33
11	20.80	44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]2.46
12	19.99	45	[illegible]	[illegible]	[illegible]		
C		46	[illegible]	80	[illegible]		
13	74.62	47	[illegible]	8[illegible]	[illegible]		
14	71.25	48	[illegible]	82	[illegible]		
15	60.84	49	[illegible]	83	[illegible]		
16	57.56	50	[illegible]	84	[illegible]		
17	47.57	51	[illegible]	85	[illegible]		
18	44.53	52	[illegible]	86	[illegible]		
19	35.21	53	[illegible]	87	[illegible]		
20	32.51	54	[illegible]	88	[illegible]		
21	24.61	55	[illegible]	H			
22	22.50	56	[illegible]	[illegible]	[illegible]		
23	19.72	F		[illegible]	[illegible]		
24	20.40	57	[illegible]	[illegible]	[illegible]		
D		58	[illegible]	[illegible]	[illegible]		
25	95.12	59	[illegible]	[illegible]	[illegible]		
26	91.75	60	[illegible]	[illegible]	[illegible]		
27	81.30	61	[illegible]	[illegible]	[illegible]		
28	77.97	62	[illegible]	[illegible]	[illegible]		
29	67.42	63	[illegible]	[illegible]	[illegible]		
30	63.39	64	[illegible]	[illegible]	[illegible]		
31	53.19	65	[illegible]	[illegible]	[illegible]		
32	49.42	66	[illegible]	100	[illegible]		

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SECRET

NOTE – [illegible] measurement [illegible] from the E[illegible] of the tape [illegible] from the [illegible] for true [illegible] ADD 0.4 [illegible] the [illegible]

U.S.C.&G.S. Tape # 3774

SAME AS SKETCH FOR 2100' CUBES

A-B	50.065 [illegible]
B-C	49.930
C-D	49.99[illegible]
D-E	50.185
E-F	49.92[illegible]

3000' CUBES.

[illegible]	[illegible]	2524	I	
[illegible]	24[illegible]	[illegible]299	5	5.91
[illegible]	[illegible]	[illegible]75	6	6.71
[illegible]	[illegible]	[illegible]34	J	
[illegible]	[illegible]	[illegible]360	7	6.69
[illegible]	[illegible]	[illegible]42	8	5.99
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]68		
[illegible]	[illegible]	[illegible]489		
[illegible]	[illegible]	[illegible]463		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	2565		
[illegible]	[illegible]	[illegible]057		
[illegible]	[illegible]	[illegible]83		
16	2315	2231		
[illegible]	30[illegible]	[illegible]464		
[illegible]	34[illegible]	[illegible]92		
[illegible]	43[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	22[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]422		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]89		

NOTE- [illegible] measurements [illegible] from the END of the tape and NOT from the zero mark. For true [illegible] ADD 0.4 [illegible] to the following

U.S.C&G.S. Tape # 3774

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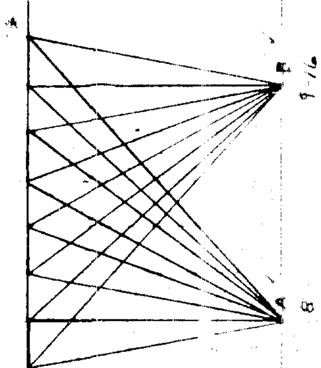
3600' CUBES

SECRET

21.96 ✓
19.[illegible]4 ✓
20.[illegible]0 ✓
23.[illegible]2 ✓
30.[illegible]8 ✓
35.[illegible]7 ✓
48.10 ✓
52.[illegible]5 ✓
63.[illegible]0 ✓
57.[illegible]9 ✓
47.[illegible] ✓
42.[illegible]8 ✓
32.[illegible]7 ✓
28.32 ✓
20.98 ✓
20.64 ✓



A-B [illegible] 860 true dist

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~~SECRET~~

~~OFFICIAL USE ONLY~~

[illegible] S[illegible]TIONS AND MEA[illegible]

[illegible] FOR LOCAT[illegible]

[illegible] B[illegible]LDIN[illegible]

[redacted]

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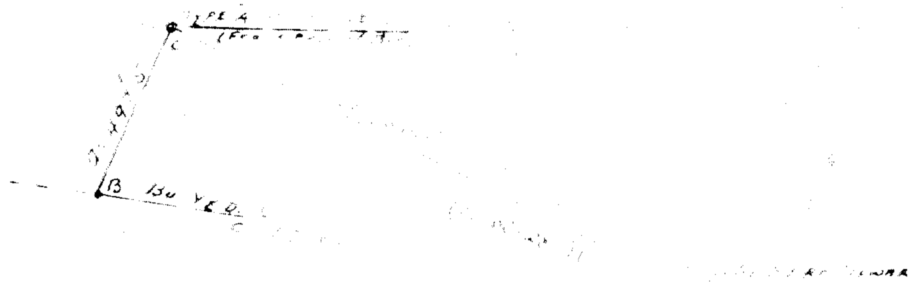
COMPUTATION OF ∠ F [illegible] on BLVD ℄ to OCE Bldg. Type A (1500' from ZERO)



a = 49[illegible] (s-a) = [illegible]

b = [illegible] (s-b) = [illegible]

c = 1500.0 (s-c) = [illegible]

2s = 3497.[illegible]

s = 1748.[illegible]

Log (s-a) 3.097 [illegible]

Log (s-b) 2.39[illegible]

Log (s-c) 2.39[illegible]

Σ 7.88[illegible]

Log s 3.242 [illegible]

4.646 [illegible]

Log r [illegible]

Log (s-a) 3.097 8[illegible]

Tan ½ A [illegible]

½ A = 9 [illegible]

A = 1[illegible]

[illegible] 2[illegible]

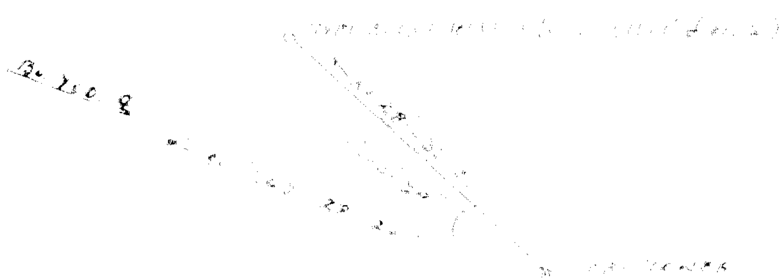
[illegible] 3 0[illegible]

[illegible] 15.6

[illegible] 15.6

[illegible] 28.6

[illegible] .8



DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 665
Ed. Dec. 1929

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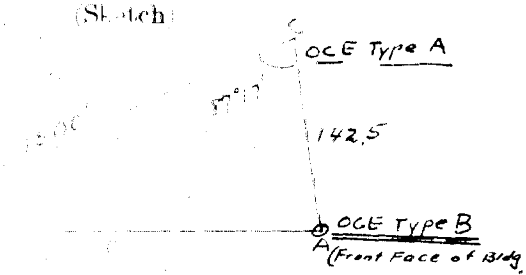
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) tan ½ (A_p − B_p) = tan φ tan ½ (A_p + B_p); $\left.c=\frac{a \sin C_p}{\sin A_p}\right]$*

COMP. OF Dist from ZERO + A from OCE BLDG A for OCE BLDG Type B stake set By 18th Engrs.
(stak originally set by USC&GS was knocked out [illegible] by 18th Engrs)

C_s		Log a	[illegible] 912	Log m
$\frac{\text{Sph. excess}}{3}$		Log b	3 [illegible] 49	Log sin C_s
C_p	87 [illegible]	Log b − a	2 [illegible] 64	Log a
½ C_p	43 [illegible] 300	(45°+φ)	4 23.5	Log b
90° − ½C_p = ½(A_p + B_p)	46 [illegible] 300	φ	4 3.5	Log sph. ex.
½ (A_p − B_p)	[illegible]	Log tan φ	[illegible] 2345	Sph. excess
Sum = A_p	67 11 [illegible]	Log tan ½(A+B)	[illegible] 5997	
Diff = B_p	25 [illegible]	Log tan ½(A−B)	9.937 8342	
C_p	87 [illegible]			

(Sketch)



Log a	3.[illegible]
Log sin C_p	9.[illegible]
Colog sin A_p	0.[illegible]
Log c	3.[illegible]

1500 [illegible]

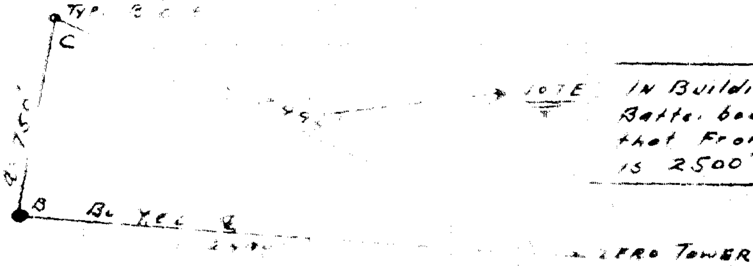
CHECK COMPUTATION

No.	STATION	OBSERVED ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2–3				
	1				
	2				
	3				
	1–3				
	1–2				
	2–3				Type "A" OCE Bldg stake (1500' from 2)
	1				
	2				
	3				
	1–3				Type "B" OCE BLDG STK (1500' from 2)
	1–2				

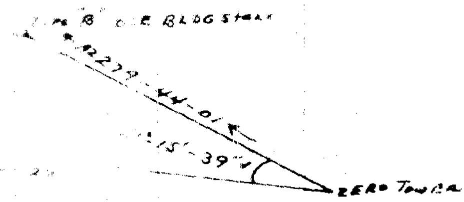
SECRET

*The subscripts s and p refer to spherical and plane angles respectively.

COMPUTATION OF ∡ "B" for Chord offset from 2499 point on Bu YED ℄ To O.C.E BLDG. TYPE B (2499' from Z)



NOTE: In Building this structure Batter boards were set so that Front Face of structure is 2500' From ZERO TOWER.

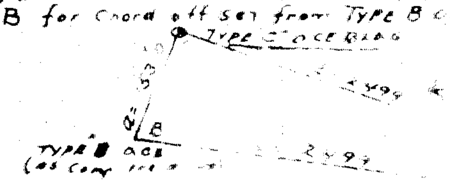


a: 750.0
b = 2499
c = 2499
2s = 5748
s = 2874

Log (s-a) = 3.327 1540
Log (s-b) = 2.574 0313
Log (s-c) = 2.574 0313
Σ 8.475 217
Log s 3.458 4868
5.016 7303
Log r = 2.508 3652

Log r 2.508 3652
Log (s-b) 2.574 0313
Log tan ½B 9.934 3339
½B 40 41 05.3
B 81 22 10.6
C 81 22 10.6
A 17 15 39.0
Σ 180 00 00.2

COMPUTATION OF ∡ "B" for Chord off set from Type B OCE Bldg (2499 from Z) To Type "C" OCE BLDG. (2499' from Z)



NOTE: In Building to this stake, Bldg was erected so as to have a dist. of 2500' to back of 4' Crown at top

a: 153'
b = 2499'
c = 2499'
2s = 5151
s = 2575.5
(s-a) = 2422.5
(s-b) = 76.5
(s-c) = 76.5

Log (s-a) = 3.384 2638
Log (s-b) = 1.883 6614
Log (s-c) = 1.883 6614
7.151 5866
Log s = 3.410 8616
3.740 7250
Log r = 1.870 3625

Log r 1.870 3625
Log (s-b) 1.883 6614
Log tan ½B 9.986 7011
½B 44°-07'-22.4
B 88 14 44.8
C 88 14 44.8
A 3 30 30.4
Σ 180 00 00.0

ENGEBI I

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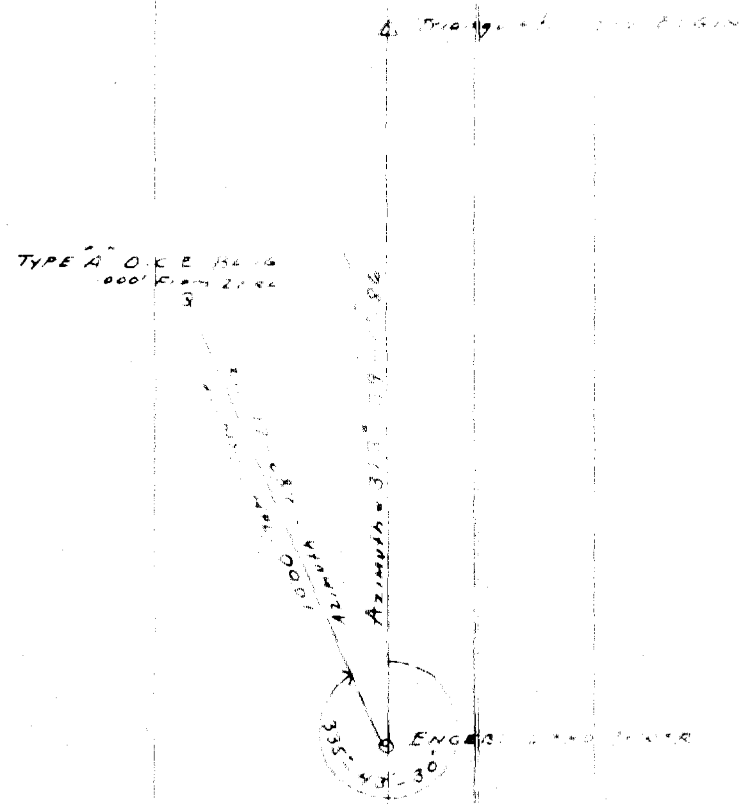
SKETCH SHOWING LOCATION OF TYPE A ... BLDG (1000 FROM ZERO TOWER)



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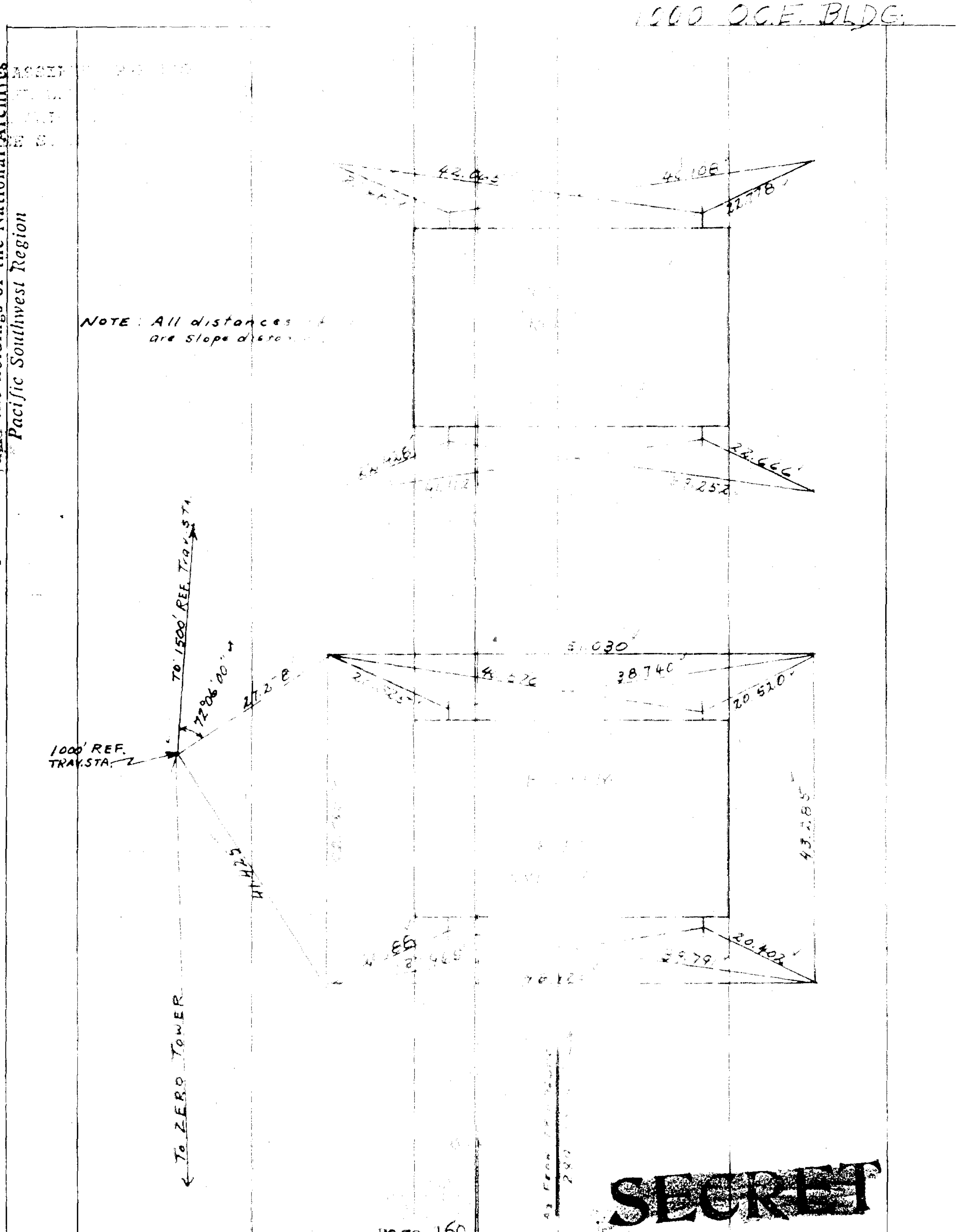
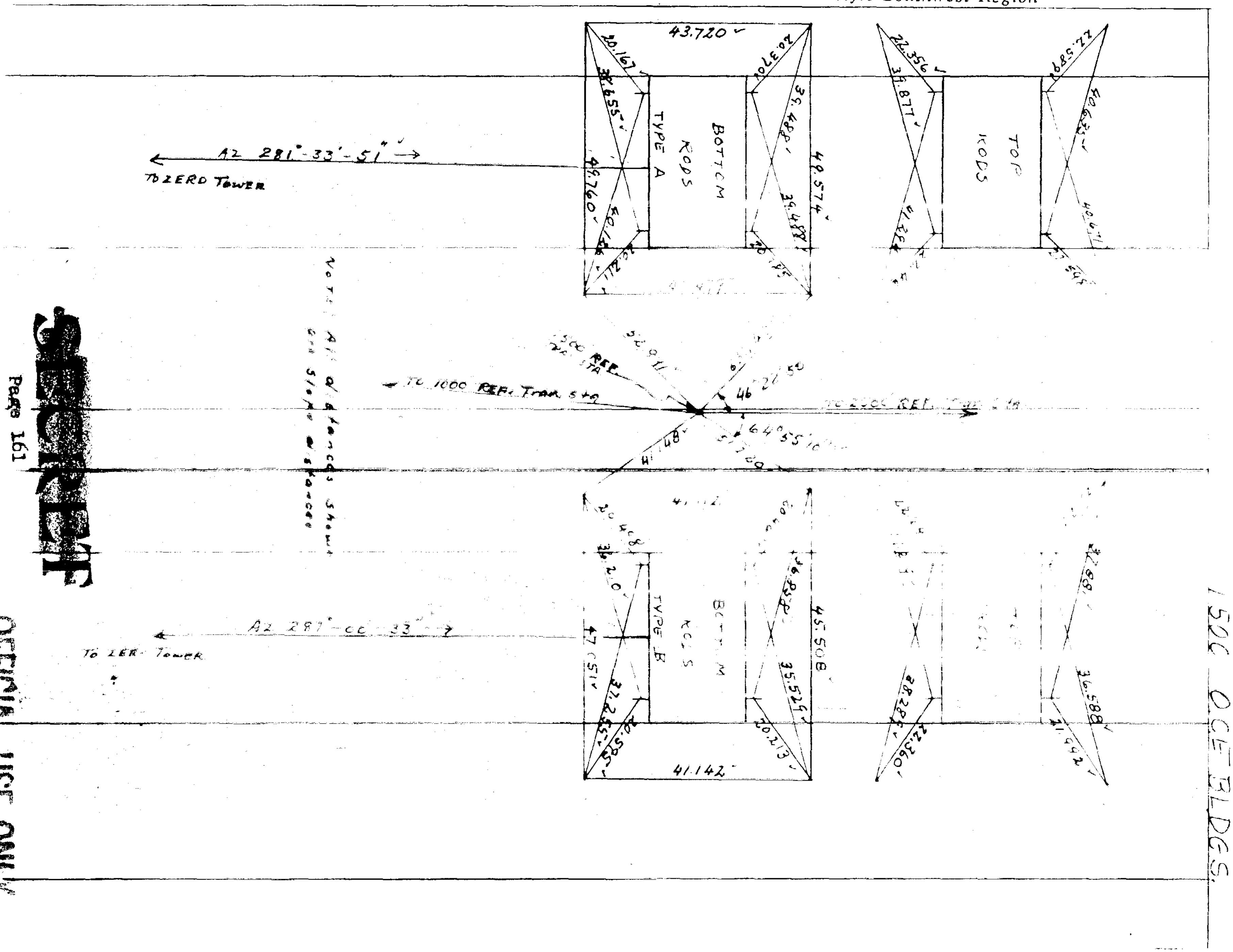

1000 O.C.E. BLDG.
NOTE: All distances
are slope dista
42.108
22.778
22.666
43.252
TO 1500' REF. TRAV. STA.
72°06'00"
1000' REF. TRAV. STA.
51.030
38.740
20.520
43.285
20.402
To ZERO TOWER



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SECRET

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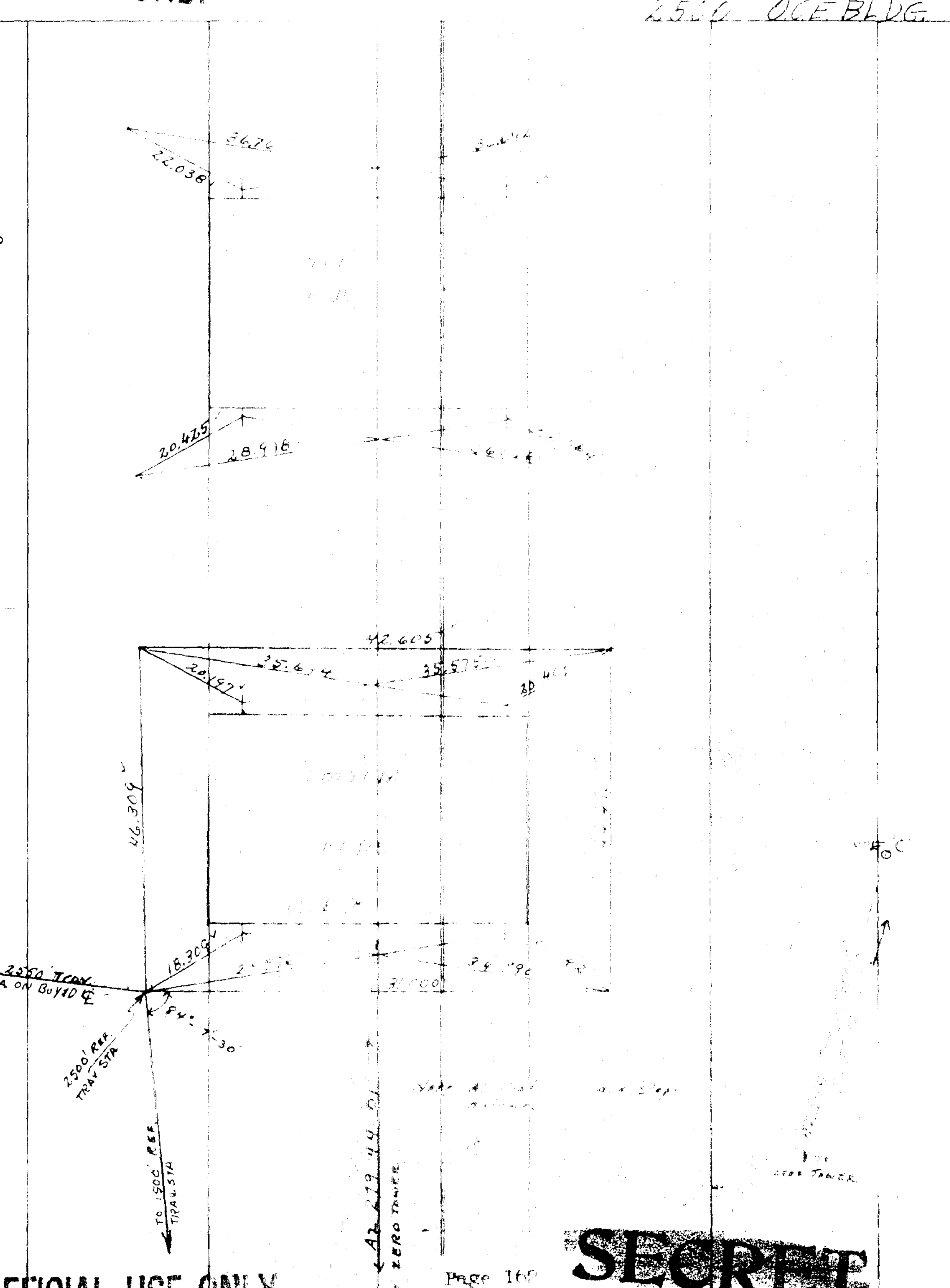
2500' O.C.E BLDG.
22.038
20.425
28.918
42.605
35.575
20.497
46.309
18.306
TO 2500' TRAV. STA ON BUYID ℄
2500' REF TRAV STA
TO 1500' REF TRAV STA
ZERO TOWER

SECRET

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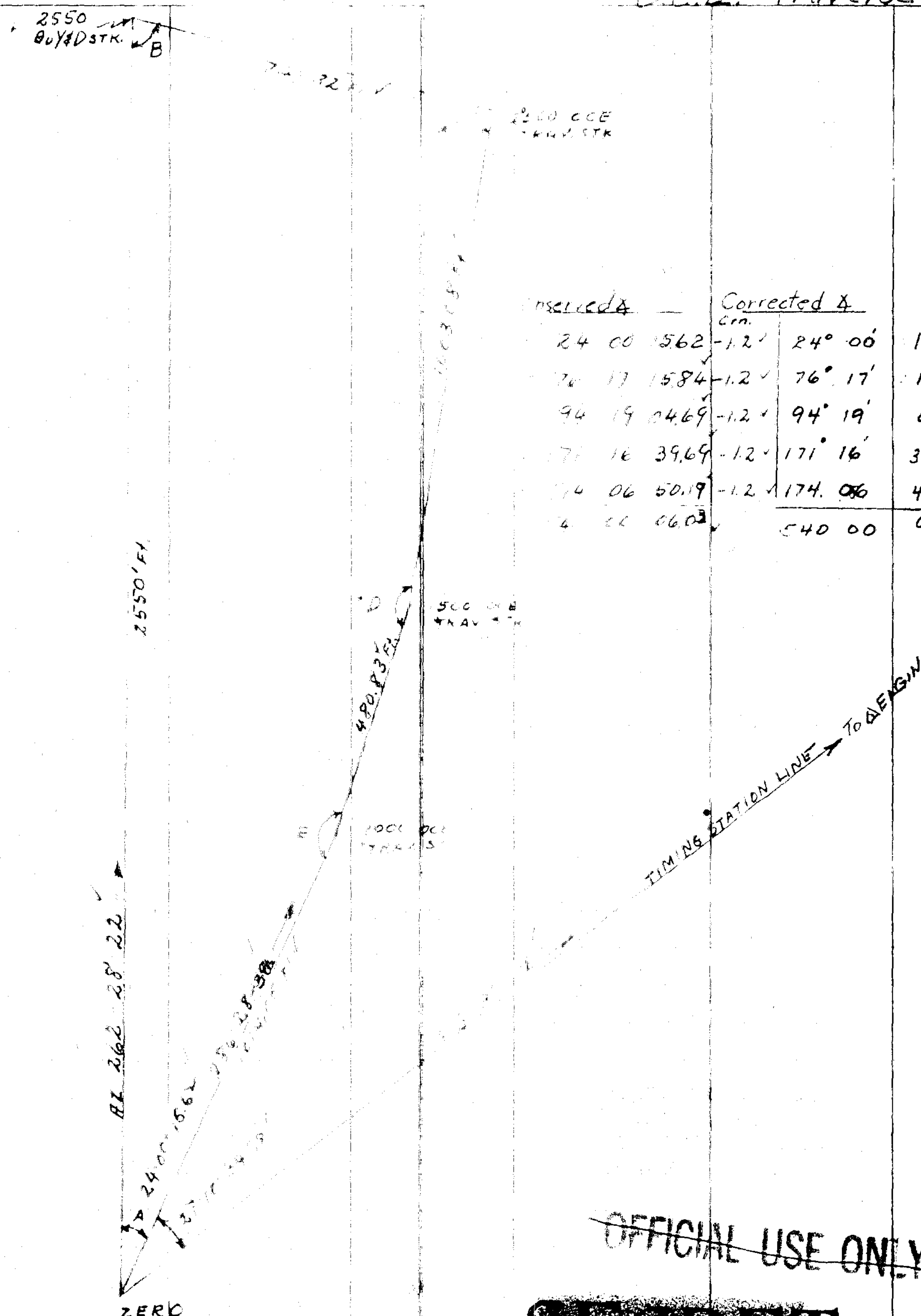
C.C.E. Traverse



Observed ∡			Crn.	Corrected ∡		
24	00	56.2	-1.2	24°	00'	14.4
[illegible]	[illegible]	15.84	-1.2	76°	17'	14.6
[illegible]	[illegible]	04.69	-1.2	94°	19'	03.5
[illegible]	[illegible]	39.69	-1.2	171°	16'	38.5
[illegible]	06	50.19	-1.2	174.	06	49.0
[illegible]	[illegible]	06.03		540	00	00.0

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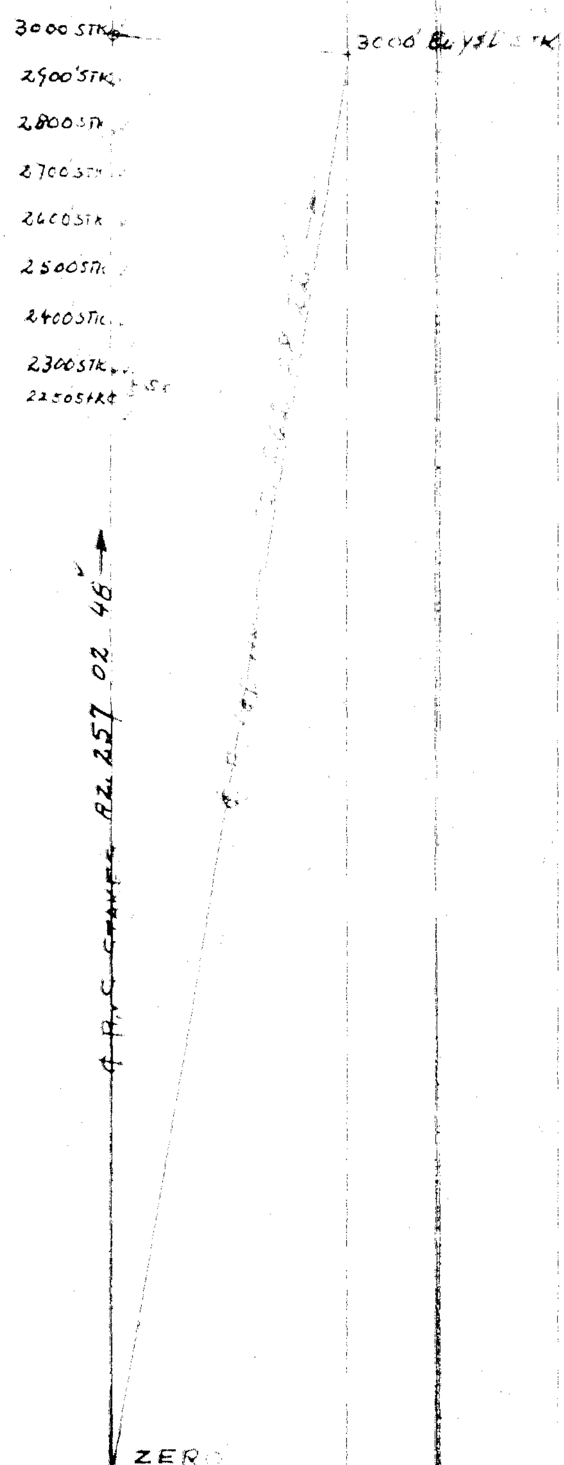
BuS LINE



The 3000' ℄ stake of the ... is the 3000 Chord stake ... the N. Side of the runway ... the Bu ŸE Line. (Computation ... Bu ŸE Section of Engebi Comps) ... this 3000' Chord stake, ... rods were set at ... intervals on line to ... as indicated ... sketch.

... the Bu Ship point ... the 4200' blast ...

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ZERO TOWER

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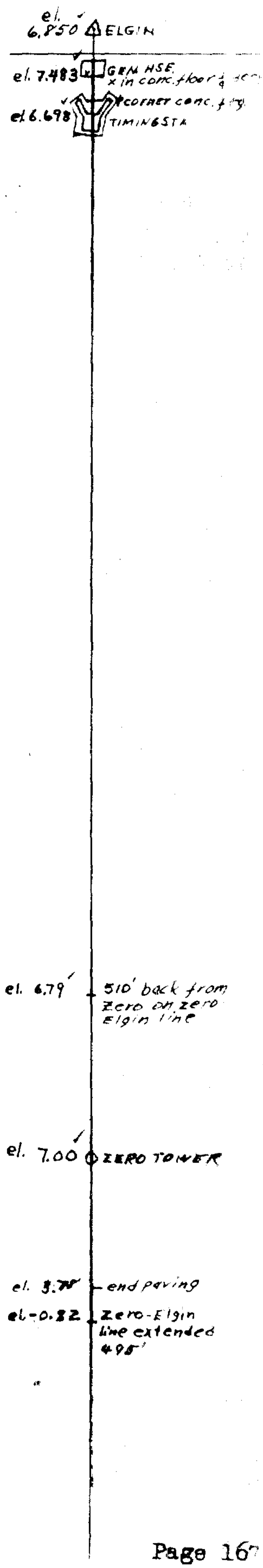

[illegible]		ELEVATIONS FOR [illegible] ON EXTEND [illegible] ZERO-ELGIN LINE	
[illegible]	[illegible]	7.[illegible]	* Assumed Elevation
[illegible]	[illegible]	6.9[illegible]	
[illegible]	[illegible]	6.7[illegible]	
[illegible]	[illegible]	6.63	
[illegible]	[illegible]	6.[illegible]	
[illegible]	[illegible]	6.01	
[illegible]	[illegible]	5.96	
[illegible]	[illegible]	5.95	
[illegible]	[illegible]	5.97	
[illegible]	[illegible]	6.0[illegible]	
[illegible]	[illegible]	5.9[illegible]	
[illegible]	[illegible]	5.8[illegible]	
[illegible]	[illegible]	5.7[illegible]	
[illegible]	[illegible]	5.76	
[illegible]	[illegible]	5.6[illegible]	
[illegible]	[illegible]	5.47	
[illegible]	[illegible]	5.42	
[illegible]	[illegible]	5.42	
[illegible]	[illegible]	5.36	
[illegible]	[illegible]	5.21	
[illegible]	[illegible]	5.02	
[illegible]	[illegible]	5.04	
[illegible]	[illegible]	4.91	
[illegible]	[illegible]	4.71	
[illegible]	[illegible]	4.2[illegible]	
[illegible]	[illegible]	4.1[illegible]	
[illegible]	[illegible]	4.16	
[illegible]	[illegible]	3.8[illegible]	
[illegible]	[illegible]	3.78 — end of oiled area	
[illegible]	[illegible]	2.47** sand, coral	
[illegible]	[illegible]	1.54	
[illegible]	[illegible]	0.76	"
6.54	[illegible]	0.04	"
6.65	49.[illegible]	-0.82	"
6.7[illegible]	5.[illegible]		

SECRET

SECRET

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SECRET

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95

[redacted]

[illegible] - [illegible] - [illegible]

Location of Structures from the Zero Tower

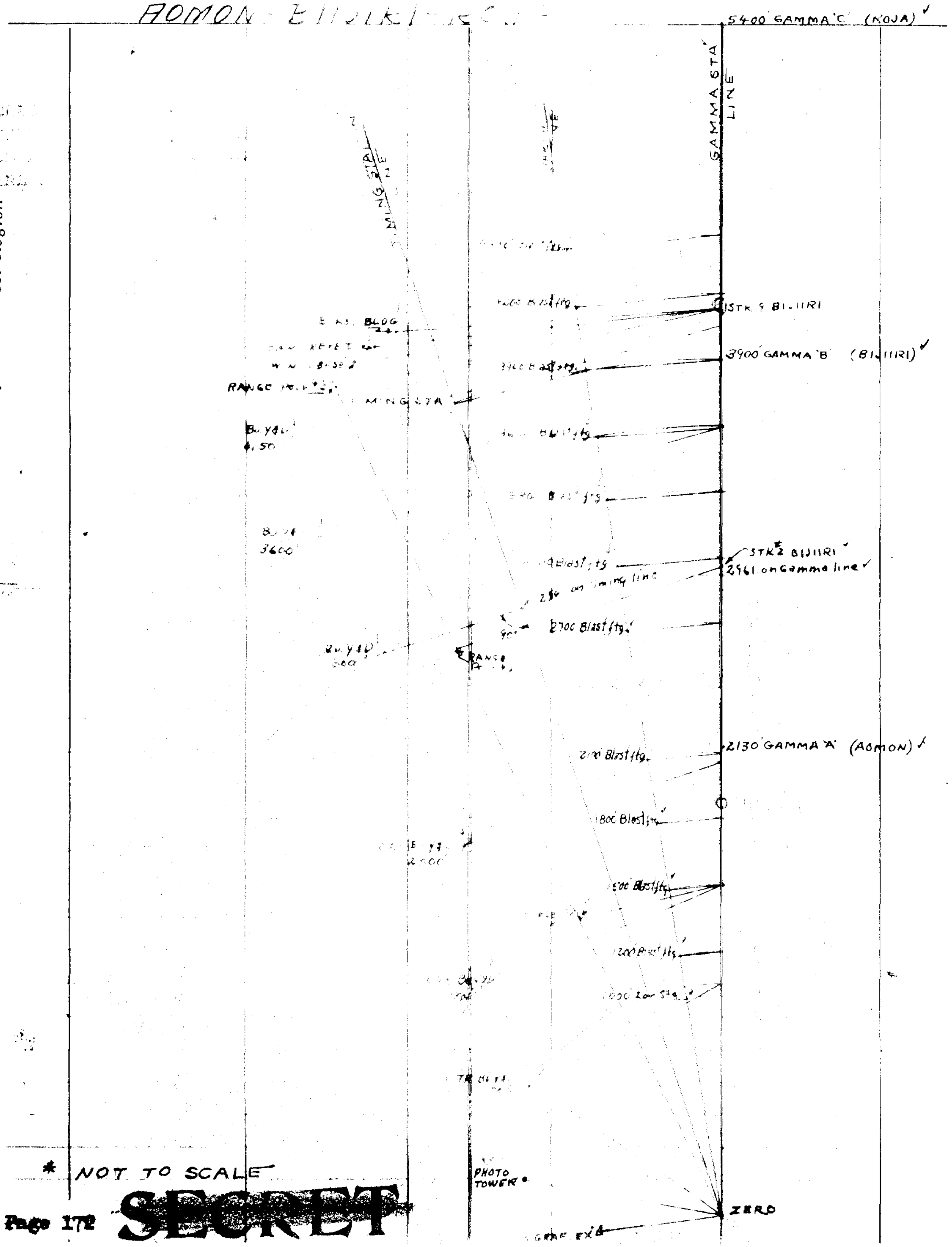
STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO		
Gamma Station A	2130 ft.	[illegible]06	17	38
" " B	5900	"	"	"
" " C	5400	"	"	"
Blast Footings	[illegible]	[illegible]04	05	24
" "	1500	"	"	"
" "	1800	"	"	"
" "	2100	"	"	"
~~" "~~	~~2400~~	~~"~~	~~"~~	~~"~~
" "	2700	"	"	"
" "	3000	"	"	"
" "	3300	"	"	"
" "	3600	"	"	"
" "	3900	"	"	"
" "	4200	"	"	"
" "	4450	"	"	"
Blast Building	4309	[illegible]01	[illegible]9	27
Timing Station	[illegible]	[illegible]01	[illegible]3	10
Center one of line of Bu Y&D conc. cubes	1000	275	08	07 *
" "	1500	285	53	41 *
" "	2000	287	39	13 *
" "	3000	~~[illegible]~~	~~05~~	~~13~~ 292° 40′ 45″
" "	3600	294	20	08 *
" "	4050	[illegible]	14	31 *
Ion. Station	[illegible]	[illegible]2	[illegible]	24
Range Pole #1	[illegible]500	[illegible]4	[illegible]5	57
" " #2	[illegible]84[illegible]	[illegible]7	45	02
" " #3	[illegible]19[illegible]	[illegible]8	[illegible]	19
Triang. Sta. Graflex	[illegible]	[illegible]	[illegible]	30
Photo Tower	[illegible]	[illegible]	[illegible]	52
Tank Revetment	[illegible] ft.	[illegible]	[illegible]	32
Winch Base	4240 "	[illegible]	[illegible]	12

[redacted]

* Since preparing this Tabulation, Lieut. Cmdr. [illegible] USN has reported that all of these stakes have [illegible] that location of Bu Y&D Units will be determined by [illegible]

GEOGRAPHIC POSITIONS

STRUCTURE	LATITUDE			LONGITUDE		
Zero Tower	11	37	[illegible]	162	19	11.614
Photo Tower	11	37	[illegible]	162	19	15.277
Traverse Station Aomon	11	37	[illegible]	162	19	27.578
Traverse Station Bjiiri	11	37	[illegible]	162	19	47.779
Triangulation Station Graflex	11	37	[illegible]	162	19	14.568


5400 GAMMA 'C' (ROJA)
GAMMA STA LINE
3900 GAMMA 'B' (BIJIRI)
STK 2 BIJIRI
2961 on Gamma line
2700 Blast ftg.
2130 GAMMA 'A' (AOMON)
1800 Blast ftg.
1200 Blast ftg.
PHOTO TOWER
ZERO
* NOT TO SCALE

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COMPUTATIONS OF SETUPS, SETBACKS AND OFFSETS FROM THE GAMMA STATION LINE FOR USE IN ESTABLISHING OTHER POINTS

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Aomon, Bijiri + Rojoa Is.

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COMPUTATION OF "SET UPS" AND "SETBACKS" FROM STAKES OF THE GAMMA LINE TRAVERSE TO PROPER DISTANCES FOR FOR ESTABLISHMENT [illegible] OTHER POINTS BY CHORD OFFSETS

OBJECT TO BE ESTABLISHED	DIST. FROM ZERO TOWER FEET	DIST. FROM ZERO TOWER METERS	CLOSEST STAKE NO.	DIST. ~ ZERO TOWER TO CLOSEST STK METERS	SET UP From Closest stk m.	SET UP From Closest stk Ft.	SET BACK from Closest stk m.	SET BACK from Closest stk Ft.
Ion STA	1000	304.8 [illegible]	[illegible]	299.[illegible]	[illegible]	[illegible] 8[illegible]	—	—
Bu. YED	1050	320.[illegible]	[illegible]	299.[illegible]	[illegible]	[illegible] 8[illegible]	—	—
Hartman Sta.	1200	365.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta. & Range Pole #1	1500	[illegible]	[illegible]	[illegible]		[illegible]	—	—
Hartman Sta.	1800	548.[illegible]	[illegible]	[illegible]		—	1.3743	4.509
Bu. YED	2050 *	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman sta	2100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
GAMMA A	2230	[illegible]	[illegible]	[illegible]		—	[illegible]	2.550
[illegible] ISLAND								
Hartman Sta	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman sta	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	3300	[illegible]	[illegible]	[illegible]		—	3.3985	11.150
Hartman Sta.	[illegible]	097.[illegible]	[illegible]	[illegible]		—	11.9532	39.216
~~Bu. S~~	~~[illegible]~~	[illegible]	[illegible]	[redacted]		—	[redacted]	[redacted]
TIMING STA. GAMMA "B" Hartman Sta	3900	188.[illegible]	[illegible]	[illegible]		—	[illegible]	67.382
HARTMAN STA	4200	280.[illegible]	[illegible]	[illegible]		68.58 (partial)	—	—
Bu. YED	4050	234.[illegible]	[illegible]	[illegible]		—	[illegible]	81.415
Hartman sta.	4500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
[illegible] ISLAND								
GAMMA C	5400	645.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		

* This stake [illegible] high [illegible] line to zero tower [illegible]

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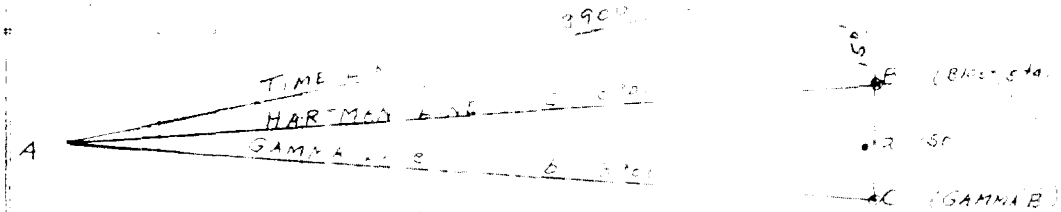
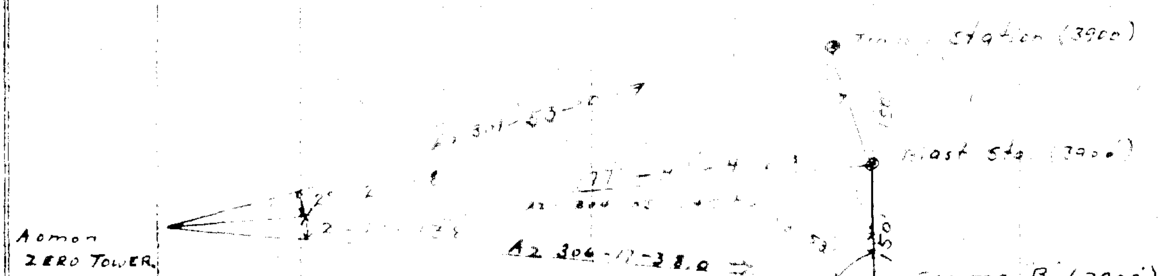
COMPUTATION OF ∠ FOR 150 Chord offset from 3900 Point on GAMMA LINE To 3900' Hartman sta. ⊕ Timing station



a = 150
b = 3900
c = 3900
2s = 7950
s = 3975

s-a = 382[illegible]
s-b = 7[illegible]
s-c = 7[illegible]

Log (s-a)	3.58[illegible]	[illegible]	[illegible]	Log r =	1.866 7084
Log (s-b)	1.875 [illegible]	[illegible]	3.582 [illegible]	Log (s-b)	1.875 0613
Log (s-c)	1.875 06[illegible]	tan ½ A	[illegible]	cotan ½ B	9.991 6471
Σ	7.332 [illegible]	A	[illegible]	½ B:	44°26' 56.55
Log s =	3.599 [illegible]	[illegible]	[illegible]	B	88 53 53.1
	3.733 [illegible]			C:	88 53 53.1
Log r =	1.866 [illegible]			A:	2° 12' 13.8"
					180 00 00.0



Timing station stake set by 150' chord offset from 3900 Hartman Sta. stake as shown in above sketch.

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CHORD DIST [illegible] GAMMA LINE TO Hartman Line

[illegible] HARTMAN LINE

Aomon Zero A — 2° 12' [illegible] — GAMMA LINE

B — a — c

A = 2° - 12' - 13"
B = 88° - 53' - 53"
C = 88° - 53' - 53"
180 00 0

[illegible] Arc dist GAMMA LINE To HARTMANLINE

Log 1200	3.079 18[illegible]	Log 1500	3.[illegible]	Log 1800	3.255 2725
Log Sin A	8.584 94[illegible]	Log Sin A	8.584 9[illegible]	Log Sin A	8.584 9491
Σ	1.664 13[illegible]	Σ	[illegible]	Σ	1.840 2216
Log Sin B	9.999 91[illegible]	Log Sin B	9.999 91[illegible]	Log Sin B	9.999 9197
Log Dist	1.664 2[illegible]	Log Dist	[illegible]	Log Dist	1.840 3019
Dist	46.154	Dist	57.693	Dist	69.231 ✓

Log 2100	3.322 2[illegible]	Log 2700	3.431 3638	Log 3000	3.477 1213 *
Log Sin A	8.584 94[illegible]	Log Sin A	8.584 94[illegible]	Log Sin A	8.584 9491 ✓
Σ	1.907 16[illegible]	Σ	2.[illegible] 3[illegible]	Σ	2.062 0704
Log Sin B	9.999 919[illegible]	Log Sin B	9.999 9[illegible]	Log Sin B	9.999 9197
Log Dist	1.907 248[illegible]	Log Dist	2.[illegible]	Log Dist	2.062 1507
Dist	80.770	Dist	103.8[illegible]	Dist	115.385 ✓

Log 3300	3.518 5[illegible]	Log 3600	3.[illegible]	Log 4500 *	3.653 2125 ✓
Log Sin A	8.584 94[illegible]	Log Sin A	8.584 9[illegible]	Log Sin A	8.584 9491
Σ	2.103 4[illegible]	Σ	2.[illegible]	Σ	2.238 1616
Log Sin B	9.999 9[illegible]	Log Sin B	9.999 9[illegible]	Log Sin B	9.999 9197
Log Dist	2.103 5[illegible]	Log Dist	2.14[illegible]	Log Dist	1.238 2419
Dist	126.92[illegible]	Dist	138.4[illegible]	Dist	173.078 ✓

(Dist [illegible] computation [illegible])

Log 4200	3.623 2493
Log Sin A	8.584 9491
Σ	2.208 1984
Log Sin B	9.999 9197
Log Dist	2.208 2787
Dist	161.540

3900' Blast Stat[illegible] [illegible] 150 chord dist from Gamma Line)

* This stake was set back 50.0 Towards Zero Tower by Island Comdr. giving a distance from Zero Tower of 4450 Feet.

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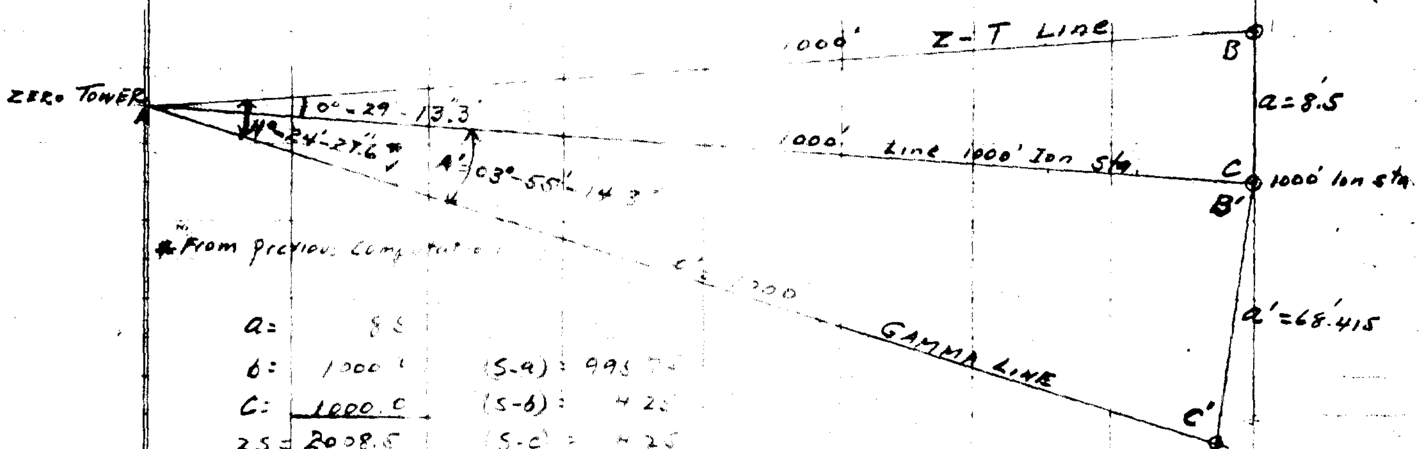
Comp. of Chord dist + ∠C' for Chord offset from GAMMA LINE to 1000' Ionization sta



* From previous computation

a: 8.5
b: 1000.0 (s-a) = 995.75
c: 1000.0 (s-b) = 4.25
2s = 2008.5 (s-c) = 4.25
s = 1004.25

Log(s-a)	2.998 1503	Log r =	0.626 5432	Log r =	0.626 5432
Log(s-b)	0.628 3889	Log(s-a)	2.998 1503	Log(s-b) =	0.628 3889
Log(s-c)	0.628 3889	Log tan ½A	7.628 3929	Log tan ½B	9.998 1543
Σ	4.254 9281	½A	0°-14'-36.63	½B:	44°-52'-41.72
Log s =	3.001 8418	A:	0°-29'-13.3	B:	89°-45'-23.4
	1.253 0863			C:	89-45-23.4
Log r =	0.626 5432			A:	0°-29'-13.3
					180 00 00.1

A': (03-55-14.3)
B': (88-02-22.8)
C': (88-02-22.8)

$a' = \frac{b \sin A'}{\sin B'}$

Log 1000: 3.000 0000
Log Sin A': 8.834 8952
Σ 1.834 8952
Log Sin B': 9.999 7458
Log a' = Dist = 1.835 1494
a = 68.415 Ft = Chord dist from 1000' point on GAMMA LINE To center of front of 1000' Ion Station Nearest Zero Tower.

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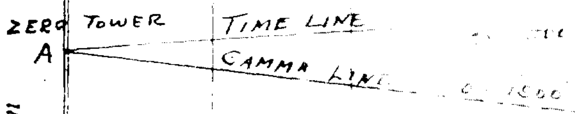
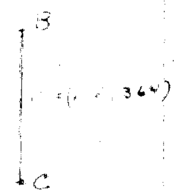
Aomon Island

Comp of Chord ∆s + offsets for location of Range pole #1





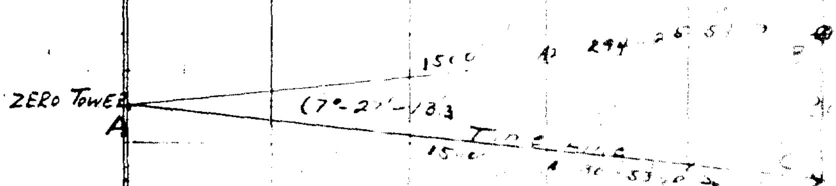
A = 4°-24-27.0 ← from [illegible]
B = (87-47-46.2)
C = (87-47-46.2)

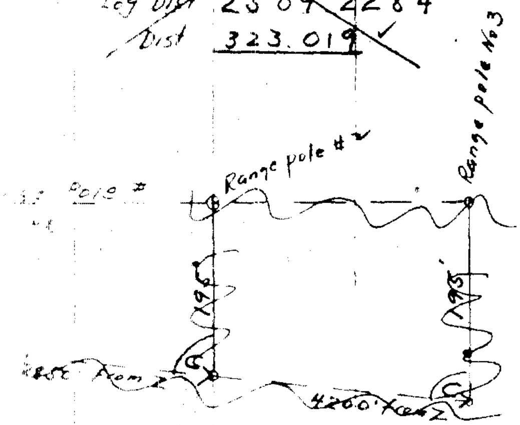
$a = \frac{b \sin A}{\sin B}$

[illegible] range poles, stakes were set as shown by [illegible] computations. HOWEVER, Range poles #2 + 3 were set in different positions by the Island Commander. ~ Measurements were [illegible] to actual positions of poles #2 + 3 [illegible] computes as shown on [illegible] pages (2 side + incl ∡ Comp)

Log 1500 =	3.176 0913	~~Log 2850~~	~~[illegible]~~	~~Log 4200~~	~~3.623 2493~~
Log sin A	8.885 6577	~~Log sin A~~	~~8.885 6577~~	~~Log sin A~~	~~8.885 6577~~
Σ	2.061 7490	~~Σ~~	~~2.340 5[illegible]6~~	~~Σ~~	~~2.508 9070~~
Log sin B	9.999 6786	~~Log sin B~~	~~9.999 67[illegible]6~~	~~Log sin B~~	~~9.999 6786~~
Log Dist	2.062 0704	~~Log Dist~~	~~2.34[illegible] 8[illegible]~~	~~Log Dist~~	~~2.509 2284~~
Dist	115.364	~~Dist~~	~~2[illegible]9.[illegible]~~	~~Dist~~	~~323.019~~ ✓

(Checked by Similar ∆)





a =	195	(s-a)	[illegible]
b =	1500	(s-b)	[illegible]
c =	1500	[illegible]	[illegible]
2s =	3195		
s =	1597.5		

Log (s-a) =	3.146 9025	[illegible]	[illegible]	Log a =	1.960 7356
Log (s-b)	1.989 0046	Log (s-b)	[illegible]	Log (s-b)	1.989 0046
Log (s-c) =	1.989 0046	Log tan ½A	88 [illegible]	Log tan ½B	9.971 7310
Σ	7.124 9117	½A	[illegible]	½B:	43-08-11.67
Log s =	3.203 440	A	7°-2[illegible]	B =	86°-16'-23.3
	3.921 471			C:	86 16 23.3
Log r =	1.960 7350			A:	7 27 13.3
					179° 59' 59.9

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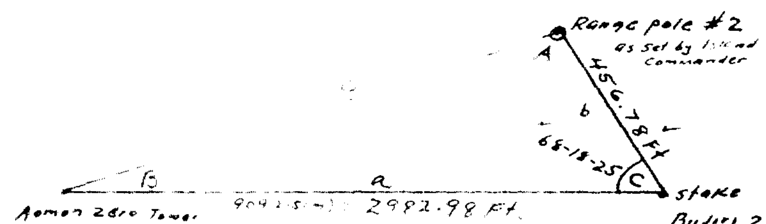
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call [illegible] tan [illegible] ϕ tan $\frac{1}{2}(A_p + B_p)$ $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

(A)

C_s		Log	[illegible]4 6504	Log m
$\frac{\text{Sph. excess}}{3}$		Log	[illegible]659 [illegible]071	Log sin C_s
C_p	68 [illegible]	Log [illegible]	[illegible]4 9433	Log a
$\frac{1}{2} C_p$	34 [illegible]	(45 [illegible]	[illegible] 18.39	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	5[illegible]	[illegible]	[illegible] 8 39	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log [illegible]	[illegible]865 9396	Sph. excess —
Sum $= A_p$	103 06 58.8	Log [illegible]	[illegible]68 5060	
Diff $= B_p$	08 34 36.2	Log [illegible]	[illegible] 4456	
C_p	68 18 25		(Sketch)	
	180 00 [illegible]			
Log a	3.474 6504			
Log sin C_p	9.968 [illegible]			
Colog sin A_p	0.0[illegible]			
Log c	3.454 2[illegible]			



c = 2845.9[illegible]

CHECK COMPUTATION

No.	STATION		SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.454 2296
1	C				6[illegible] 18 25	0.031 9014
2	B				[illegible] 34 36.2	9.173 5756
3	A				[illegible] 06 58.8	9.988 5194
1-3					[illegible]56.78	2.659 7066
1-2					[illegible]82.98	3.474 6504
2-3						
1						
2						
3						
1-3						
1-2						

*The subscripts s and [illegible] SECRET [illegible] plane angles respectively

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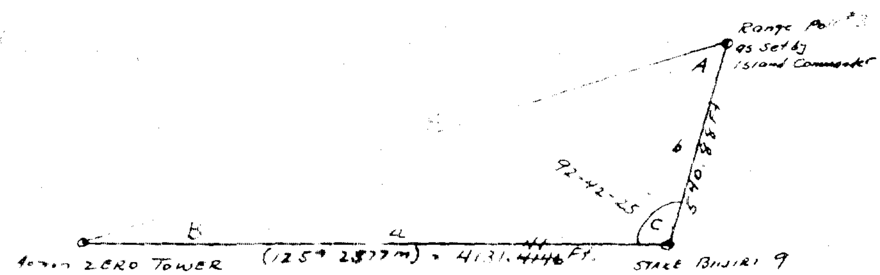
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45^\circ+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

C_s		Log a	3.616 0983	Log m	
$\frac{\text{Sph. excess}}{3}$		Log b	2.733 1009	Log sin C_s	
C_p	92-42-25	Log tan (45°+φ)	0.882 9974	Log a	
$\frac{1}{2}C_p$	46-21-12.5	(45°+φ)	82 28 25	Log b	
$90^\circ-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	43-38-47.5	φ	37 28 25	Log sph. ex.	
$\frac{1}{2}(A_p-B_p)$	36 14 29.9	Log tan φ	9.885 6289	Sph. excess	—
Sum $=A_p$	79 53 17.4	Log tan ½(A_p+B_p)	9.979 4741		
Diff $=B_p$	07 24 17.6	Log tan ½(A_p-B_p)	9.865 1030		
C_p	92 42 25				
	180 00 00				

(Sketch)

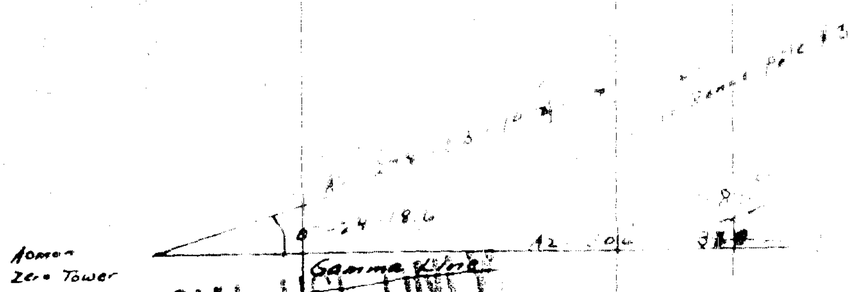


Log a	3.616 0983
Log sin C_p	9.999 4910
Colog sin A_p	0.006 7952
Log c	3.622 3945

c = 4191.74

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3.622 3945
1	C			92-42-25.0	0.000 5030
2	B			07-24-18.6	9.110 2024
3	A			79-53-16.4	9.993 2008
1-3				540.88	2.733 0999
1-2				4131.41	3.616 0983
2-3					
1					
2					
3					
1-3					
1-2					



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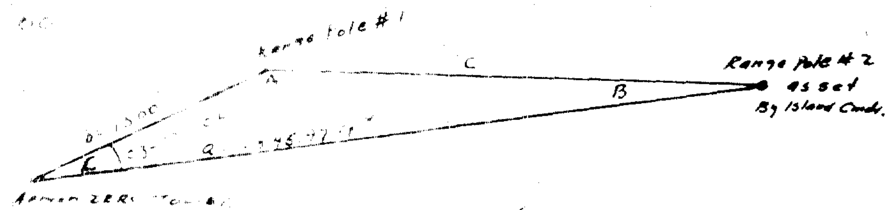
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side a): $\tan\frac{1}{2}(A_p - B_p) = \tan\phi \tan\frac{1}{2}(A_p + B_p)$: $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$* (C)

C_s		Log a	3.454 2296* ✓	Log m	
$\frac{\text{Sph. excess}}{3}$		Log b	3.176 0913 ✓	Log sin C_s	
C_p	03-17-04.70	Log tan (45° + φ)	0.278 1383 ✓	Log a	
$\frac{1}{2} C_p$	01 38 32.35 ✓	45° + φ	62° 12′ 28.76″ ✓	Log b	
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	88 21 27.65	φ	17 12 28.76 ✓	Log sph. ex.	
$\frac{1}{2}(A_p - B_p)$	84 42 [illegible] 76	Log tan φ	9.490 9475 ✓	Sph. excess	—
Sum $= A_p$	173 [illegible] 41	Log tan ½(A_p + B_p)	1.542 5461 ✓		
Diff $= B_p$	03 3[illegible] [illegible] 89	Log tan ½(A_p − B_p)	1.033 4936 ✓		
C_p	03 17 04.70				
	180 00 00.00				

(Sketch)

Log a	3.454 2296
Log sin C_p	8.758 [illegible]
Colog sin A_p	0.918 [illegible]
Log c	3.130 [illegible]



C = 1351.17 ft.

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3.130 7086
1	C			03 17 04.70	1.241 8730
2	A			173 04 06.41	9.081 6480
3	B			03 38 48.89	8.803 5097
1-3				2845.97	3.4542296
1-2				1500.00	3.1760913
2-3					
1					
2					
3					
1-3					
1-2					

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

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TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

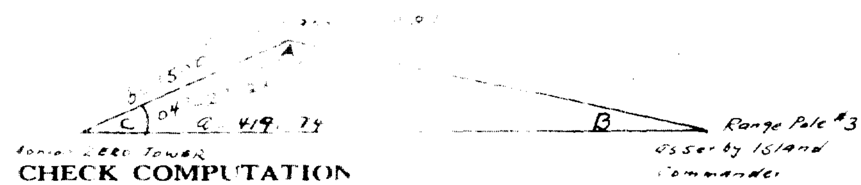
$\frac{a}{b} = \tan(45° + \phi)$ (Call longer side a) $\tan \frac{1}{2}(A_p - B_p) = \tan(\phi) \tan \frac{1}{2}(A_p + B_p)$; $c = \left[\frac{a \sin C_p}{\sin A_p}\right]$*

(D)

C_s		Log a	.945*	Log m
$\frac{\text{Sph. excess}}{3}$		Log b	[illegible]	Log sin C_s
C_p	04 27 22.3	Log tan (45°+φ)	0.446 3032*	Log a
$\frac{1}{2}C_p$	02 13 41.15	45°+φ	70 37 54	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	87 46 18.85	φ	25 37 54	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	85 17 48.0	Log tan φ	9.679 7881	Sph. excess
Sum $= A_p$	173 04 07.5	Log tan ½(A+B)	1.409 9696	
Diff $= B_p$	02 28 30.6	Log tan ½(A−B)	1.084 757	
C_p	04 27 22			
	180 00 00			
Log a	3.622 3945			
Log sin C_p	8.890 4030			
Colog sin A_p	0.918 3718			
Log c	3.431 1699			

* From previous comp.

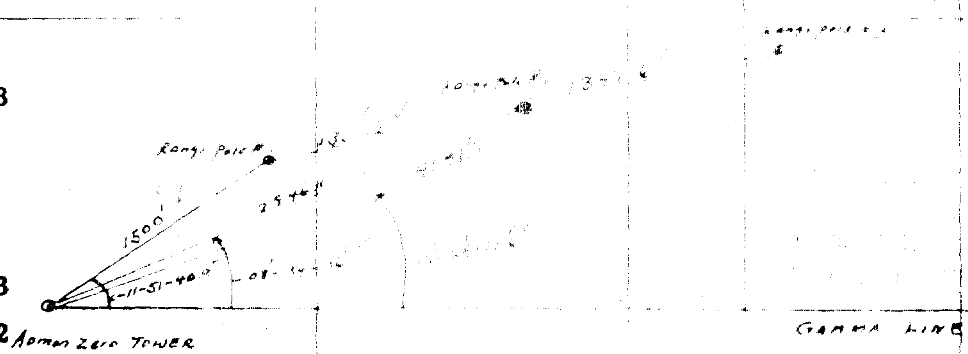
Sketch



c = 2698.80 ft. ✓

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3.431 1699
1	C			04 27 22.30	1.109 5964
2	A			173 04 07.65	9.081 6282
3	B			02 28 30.15	8.635 3248
1-3				4191.74	3.622 3945
1-2				1500.0	3.176 0911
2-3					
1					
2					
3					
1-3					
1-2					



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161 A

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Aomon II

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CHORD A · DISTANCE BURIED 1050' from Zero Tower. 14

Center one of 7 Buried Cubes

ZERO TOWER A

c = 105[illegible]

b = 105[illegible]

564

a =	564
b =	1050
c =	1050
2s	2664
s	1332

Log(s-a)	2.885 36.2
Log(s-b)	2 450 2491
Log(s-c)	2.450 2491
Σ	7.785 8594
Log s	3.124 5042
	4.661 3552
Log r	2 3306776

Log r =	2.330 6776
(s-b) =	2.450 2491
½B	9.880 4285
½B	37-12-37.30
B	74 25 -146
C =	74 25 -146
A:	31 09 308
	180-00-000

(stake)

Aomon ZERO TOWER

* Lieut [illegible]

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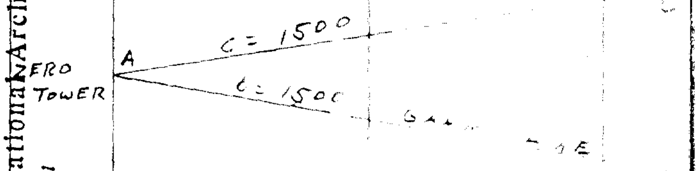
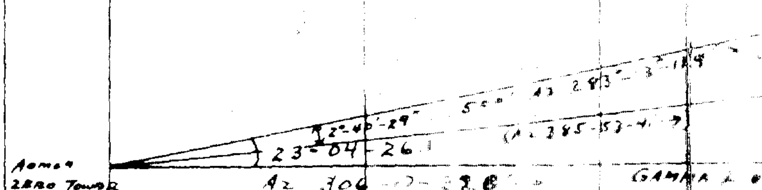
Aomon I

CHORD Az DIST COMP - Bu TED - 1500 from ZERO TOWER

Bu TED Cubes



a:	600				
b:	1500				
c:	1500				
2s:	3600				
s:	1800				
Log (s-a)	3. 079 1812	Log	2 389 0	Log r:	2.389 0756
Log (s-b)	2. 477 1213	Log (s-a)	3 079 1812	Log (s-b):	2.477 1213
Log (s-c)	2. 477 1213	Log tan ½A	9 309	Log tan ½B:	9.911 9543
Σ	8.033 4238	½A		½B:	39 13 53.47
Log s	3 255 2725	A:	23 04 26	B	78 27 46.9
	4.778 1513			C	78 27 46.9
Log r	2.389 0756			A	23 04 26.1
					179 59 59.9



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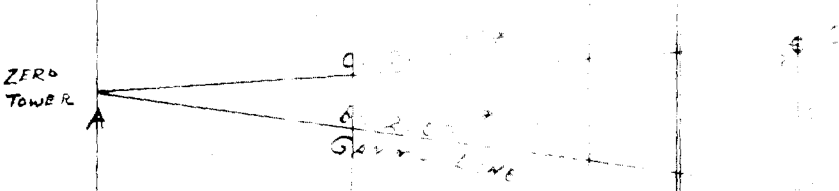
Computation of Chord ∡ + Dist. Bu Y&D ~ 2050* From ZERO TOWER ✓ in

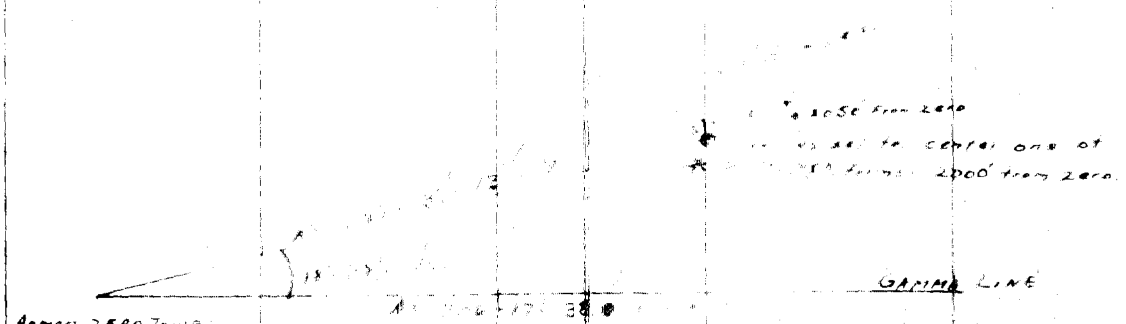
Center line of 21 Bu Y&D. Cu...



a = 664'
b = 2050'
c = 2050'
2s = 4764'
s = 2382'

Log(s-a)	3.235 0232		2.450 1788	Log r =	2.450 1788
Log(s-b)	2.521 138		3.235 0232	Log (s-b) =	2.521 1381
Log(s-c)	2.521 138		9.215 1556	Log tan ½B =	9.929 0407
Σ	8.277 2991		9-19-12.61	½B =	40 20 23.70
Log s =	3.376 9418		8 38 252	B =	80 40 47.4
	4.900 3573			C =	80 40 47.4
Log r =	2.450 1788			A =	18 38 252
					180 00 000

* Note: stake set as computed above fell off high part of Island. stake was set ... on line to ZERO TOWER giving Radius of 2000 ft. from Zero ... stake set at this point.



* Note: Lieut Cmdr Erickson CEC USN reports his stake as having been removed or destroyed.

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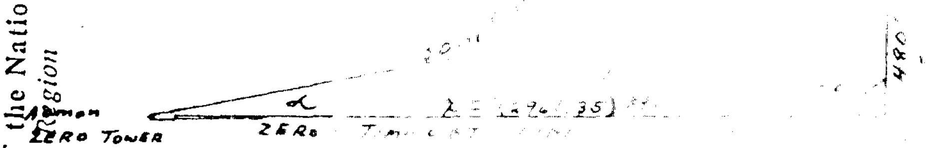
Bujiri I

~~[illegible]~~

Comp for Normal offset [illegible] 3000' from Zero Tower *

[illegible] center [illegible] of 21 Bo 480 units.



$\chi^2 = 3000^2 - (480)^2$ [illegible]

$= 9{,}000{,}000$ [illegible]

Log χ^2 [illegible]

Log χ [illegible]

$\tan \alpha = \frac{480}{2961.35}$

Log 480 = 2.68 [illegible]

Log 2961.35 = 3.471 489 [illegible]

Log tan α = 9. [illegible]

α = 9° [illegible]

Check [illegible]

$\sin \alpha = \frac{480}{3000}$

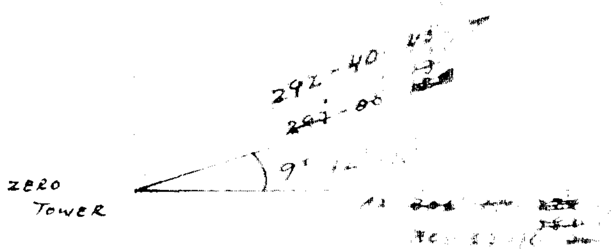
Log 480 = 2.68 [illegible]

Log 3000 = 3.47 [illegible]

Log sin α = 9.204 [illegible]

9° [illegible]

[illegible] Cap. R.L. [illegible]



~~[illegible]~~ TIMING STA. LINE

* Lieut Cmdr. Ericson [illegible] USN Reports This stake as having been removed [illegible] destroyed

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Bikini I

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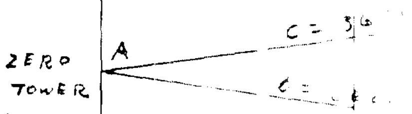
COMPUTATION OF ANGLE ∡ + DIST — Bu YFD ~ 3600′ From ZERO TOWER in * Center one of 3 Bu YFD units

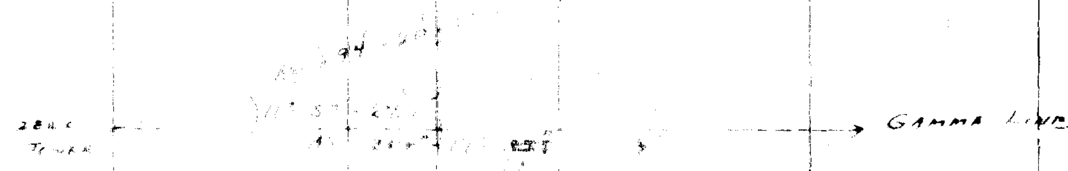


a =	750
b =	3600
c =	3600
2S =	7950
S =	3975

Log(s-a)	3.508 5297
Log(s-b)	2.574 0313
Log(s-c)	2.574 0313
Σ	8.656 5923
Log s =	3.599 3371
	5.057 2552
Log r :	2.528 6276

Log r :	2.528 6276
Log(s-b) :	2.574 0313
Log tan ½B :	9.954 5963
½B =	42 00 37.57
B =	84 01 15.0
C =	84 01 15.0
A =	11 57 29.9
	179 59 59.9

* Stake for Center one of 3 Bu YFD units



* Lieut Comdr [illegible], CEC USN reports this stake as having been [illegible] [illegible] [illegible]

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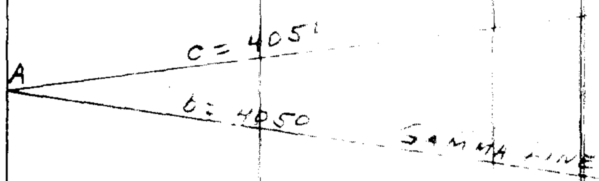
COMP. OF CHORD ∠ + DIST. BU YCD — 4050 from ZERO TOWER ✓

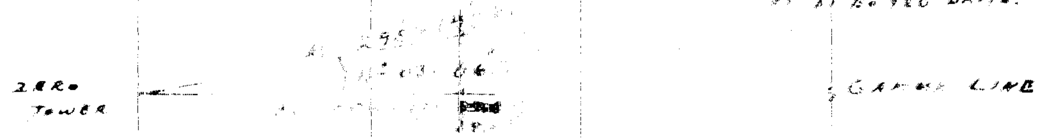
[illegible] 31 BU YCD Units



a =	780	(s-a) = [illegible]	
b =	4050	(s-b) = [illegible]	
c =	4050	(s-c) = [illegible]	
2s =	8880		
s =	4440		

Log(s-a)	3.563 4811	Log r	2.549 1136	Log r =	2.549 1136
Log(s-b)	2.591 0646	[illegible]	3.563 481	Log (s-b)	2.591 0646
Log(s-c)	2.591 0646	Log tan ½ A	8.985 6[illegible]	Log tan ½ B	9.958 0490
Σ	8.745 6103	½ A	[illegible]-31-[illegible]	½ B	42-14-13.30
Log s	3.647 3830	A	11-03-06	B	84 28 26.6
	5.098 2273			C	84 28 26.6
Log r	2.549 1136			A	11 03 06.7
					179 59 59.9

* Stake for center one of 31 BU YCD units.



* Lieut Cmdr [illegible] upon this stake as [illegible]

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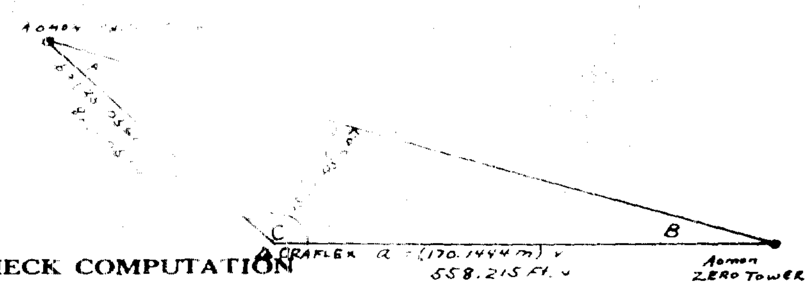
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side a) [illegible] $\tan \phi \tan \frac{1}{2}(A_p + B_p)$; $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log	[illegible] 8015	Log m
$\frac{\text{Sph. excess}}{3}$		Log	[illegible] 8982	Log sin C_s
C_p	[illegible]	Log tan [illegible]	[illegible] 9033	Log a
$\frac{1}{2} C_p$	[illegible]	45 + φ	[illegible] 21.40	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]	φ	[illegible] 21.42	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log tan	[illegible] 5513	Sph. excess
Sum $= A_p$	[illegible]	Log tan ½ (A+B)	[illegible] 2768	
Diff $= B_p$	[illegible]	Log tan ½ (A−B)	[illegible] 4281	
C_p	[illegible]		(Sketch)	



Log a	2.746	[illegible]
Log sin C_p	9.660	[illegible]
Colog sin A_p	0.393	[illegible]
Log c	2.801	[illegible]

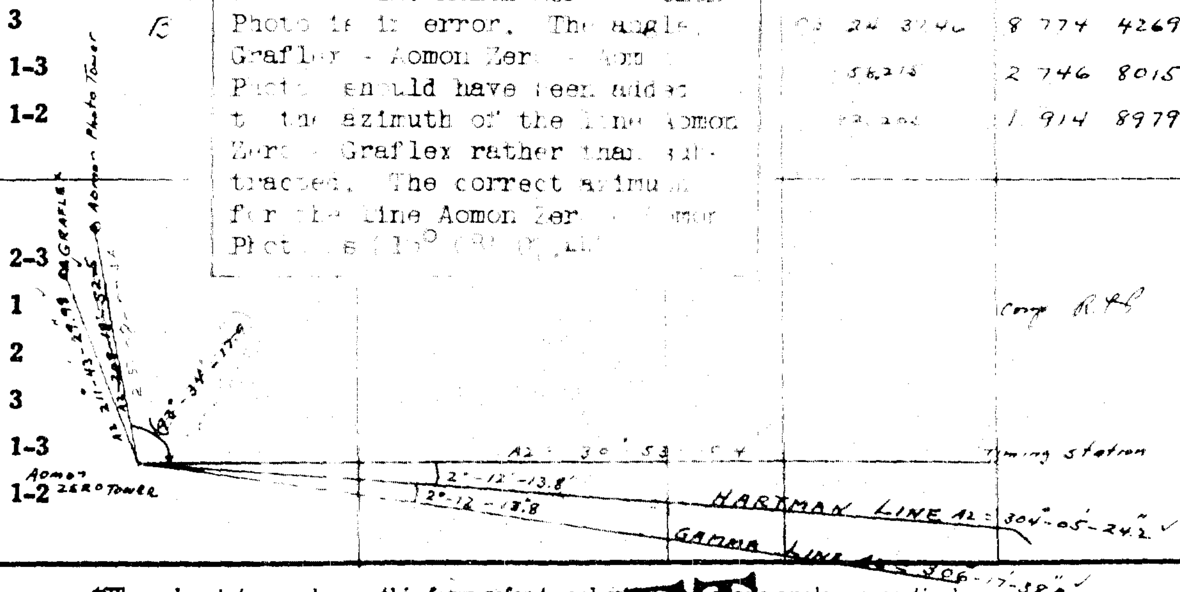
C = 632.43 Ft

CHECK COMPUTATION

No.	STATION		SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3					2.801 0095
	1	C			154 45 50.2	0 339 4615
	2	A			23 49 31.84	9 606 3305
	3	B			[illegible] 24 37.96	8 774 4269
	1-3				558.215	2 746 8015
	1-2				[illegible]	1 914 8979
	2-3					Comp R.H.
	1					
	2					
	3					
	1-3					Timing station
	1-2					

NOTE

The azimuth shown on this page for the line Aomon Zero - Aomon Photo is in error. The angle, Graflex - Aomon Zero - Aomon Photo should have been added to the azimuth of the line Aomon Zero - Graflex rather than subtracted. The correct azimuth for the line Aomon Zero - Aomon Photo is [illegible]



*The subscripts s and p on this form refer to spherical and plane angles respectively.

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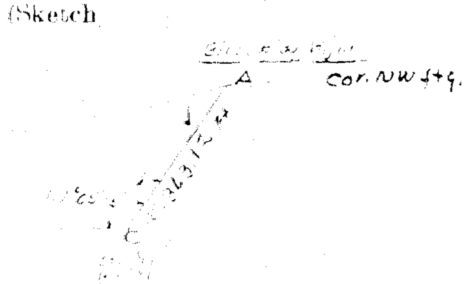
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\frac{c}{l}$ = tan (45° + φ) (Call longer side [illegible] tan ½ (A_p − B_p) = [illegible] tan ½ (A_p + B_p); [illegible] $\left[\frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log [illegible]	[illegible]	Log m
Sph. excess / 3		Log [illegible]	[illegible]	Log sin C_s
C_p	1 7 [illegible]	Log tan (45° [illegible])	[illegible]	Log a
½ C_p	5 8 [illegible]	(45° [illegible] φ)	[illegible]	Log b
90° − ½C_p = ½(A_p + B_p)	3 [illegible]		3 6 7	Log sph. ex.
½(A_p − B_p)	2 [illegible]	Log tan φ	[illegible] 4 2 3 4 5 7 3	Sph. excess
Sum = A_p	5 8 3 [illegible]	Log tan ½ (A_p − B_p)	[illegible] 6 5 7 4 7	
Diff = B_p	0 4 1 [illegible]	Log tan ½ (A_p + B_p)	[illegible] 1 6 0 3 7 0	
	1 1 7 [illegible]			

(Sketch)



Log a	3.616 098[illegible]
Log sin C_p	9.949 [illegible]
Colog sin A_p	0.068 7264
Log c	3.634 3672

4308.91'

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					3 634 3672
1	C				0 050 4577
2	B				8 875 2404
3	A				9 931 2734
1-3				[illegible]	2 [illegible] 0653
1-2				4131.41	3 [illegible] 0983
2-3					
1					
2					
3					
1-3					
1-2					

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*The subscripts *s* and *p* on this form refer to spherical and plane angles, respectively.

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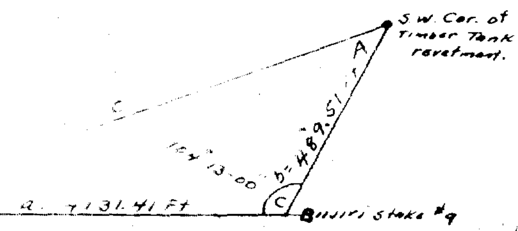
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ Cal[illegible] tan ϕ tan $\frac{1}{2}(A_p + B_p)$; $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log [illegible]	3.616 0983	Log m
$\frac{\text{Sph. excess}}{3}$		Log [illegible]	2.689 7616	Log sin C_s
C_p	[illegible]	Log tan [illegible]	9.926 3367	Log a
$\frac{1}{2}$ C_p	[illegible]	[illegible]	14' 34".1	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]		14 34.1	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log tan [illegible]	9.896 5994	Sph. excess
Sum $= A_p$	[illegible]	Log tan $\frac{1}{2}$ [illegible]	9.891 1165	
Diff $= B_p$	[illegible]	Log tan $\frac{1}{2}$ [illegible]	9.787 1159	
C_p	[illegible]			

(Sketch)

Log a	3.616 [illegible]
Log sin C_p	9.986 [illegible]
Colog sin A_p .	0.028 [illegible]
Log c	3.631 [illegible]
	42 [illegible]



CHECK COMPUTATION

No.	STATION	[illegible]	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.631 2435
	1				0.013 5087
	2				9.971 3461
	3				9.045 0165
	1-3			7131.41	3.616 0983
	1-2			489.51	2.689 7627
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				

Timber Tank revetment

GAMMA LINE

*The subscri[illegible] on this [illegible] [illegible] and plane angles respectively.

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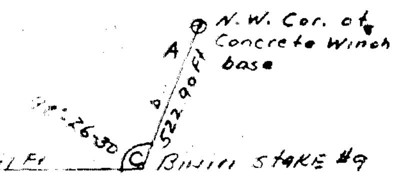
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\frac{a}{b}=\tan(45°+\phi)$ (Call longer side a) tan ½ $(A_p - B_p)$ … tan ½ $(A_p + B_p)$ $c=\frac{a \sin C_p}{\sin A_p}$]*

C_s		Log a	6788	Log m
$\frac{\text{Sph. excess}}{3}$		Log b	4126	Log sin C_s
C_p	98	Log tan $(45° + \phi)$	6799	Log a
$\frac{1}{2}C_p$	49	$(45° + \phi)$		Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	40			Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	33	Log tan ϕ	4738	Sph. excess
Sum $= A_p$	74	Log tan ½ $(A_p + B_p)$	7805	
Diff $= B_p$	07	Log tan ½ $(A_p - B_p)$	2533	
C_p	98		(Sketch)	

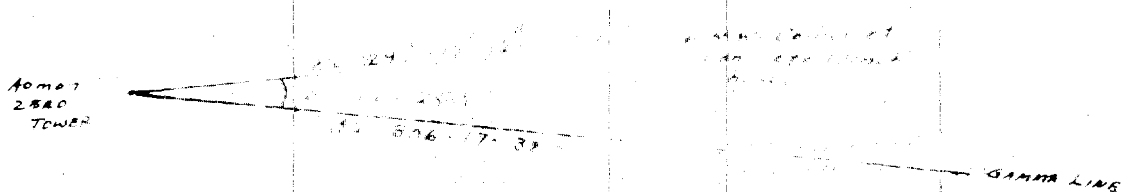
Log a	3.616 09[illegible]
Log sin C_p	9.995 26[illegible]
Colog sin A_p	0.015 98[illegible]
Log c	3627 34[illegible]

423[illegible].84



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.627 3495
	1 C				0.104 7309
	2 A				9.984 0179
	3 B				9.086 3367
	1-3			[illegible]	3.616 0983
	1-2			[illegible]	2.718 4[illegible]7
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				



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COMPUTATIONS FOR TRAVERSE
BETWEEN TRIANGULATION STA-
TION GRAFIX AND [illegible]
[illegible] TOWER

SECRET

[illegible]

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U. S. COAST AND GEODETIC SURVEY
Form 758
Rev. April 1933

[redacted]

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COMPUTATION OF △ GEARLEY – ACMON PHOTO TOWER ~~BASE~~ TRAVERSE LINE

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SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape lengths	UNCORRECTED LENGTH: Meters	TEMP	CORRECTIONS: Temp (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set-back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	(v) mm	(vv) mm
Bench △ Gearley to [illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]	[illegible]		
Bench Acmon Photo Tower	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	[illegible]			

Page [illegible]

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[redacted]

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U. S. COAST AND GEODETIC SURVEY
Form 635

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	mm	Meters	Meters	
Bench △ GRAFLEX						
Bench AOMON PHOTO TOWER	2[illegible]	[illegible]	[illegible]			

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109 ✓ [illegible]

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COMPUTATIONS FOR TRAVERSE BETWEEN
TRIANGULATION STATION [illegible] AND
AOMON [illegible]

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U. S. COAST AND GEODETIC SURVEY
Form 589
Rev. April 1935

[redacted]

COMPUTATION OF △ Grafler – Aoman [illegible] Tower ~~BASE~~ TRAVERSE LINE

(Aoman I)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP.	CORRECTIONS Temp	CORRECTIONS Tape and Catenary	CORRECTIONS Set-up Set back	CORRECTIONS Inclination	CORRECTIONS Sea level	REDUCED LENGTH	ADOPTED LENGTH	(v)	(vv)
							°C	Meters	Meters	Meters	Meters	Meters	Meters	Meters	mm	mm
Beach △ [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 0.[illegible]	[illegible]		[illegible]	[illegible]		
[illegible]		[illegible]	927	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ 0.0198[illegible]						
Beach [illegible]		[illegible]	[illegible]	[illegible]	—		[illegible]	[illegible]	[illegible]	[illegible]						
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+ [illegible]						
			[illegible]		—	—	[illegible]	[illegible]	[illegible]	[illegible]						

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111 111 111

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Form 635

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	[illegible]	Meters	Meters	
Mark Δ Graflex						
Bench Δ Graflex	[illegible]	[illegible]	[illegible]			
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
Bench Aomon Zero Tower	[illegible]	[illegible]	[illegible]			
Mark Aomon Zero Tower	[illegible]	[illegible]	[illegible]			
		Σ	[illegible]			

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√ [illegible] 112

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COMPUTATION OF AZIMUTH [illegible]

ROJOA ISLAND [illegible] DISTANCE [illegible]

STATE #1 TO ROJOA STATE [illegible]

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COMPUTATION OF *Auxiliary* BASE LINE

For determining distance from [illegible] To [illegible] "O" by [illegible]

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP. °C	CORRECTIONS: Temp. (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set up Set back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	(v) mm	(vv) mm
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0068	[illegible]	[illegible]		[illegible]	[illegible]		
To																
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28.0	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			

[redacted]

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ABSTRACT OF WIRE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	[redacted] feet	mm	Meters	Meters	
Rojoa 'O						
BL 1	[illegible]	[illegible]	[illegible]			
BL 2	[illegible]	[illegible]	[illegible]			
BL 3	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]			
				[illegible]		

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Station Bikini II State Marshall I. (Bikini Atoll)

Chief of party Ralph L. Pfau Date 7 February 194[illegible] Computed by R.L.P.

Observer G.R. Strode Instrument [illegible] Checked by R.L.P.

11—9503

OBSERVED STATION		Observed direction	Eccentric reduction	Sea-level reduction	Corrected direction with zero initial	Adjusted direction*
		° ′ ″	″	″	° ′ ″	° ′ ″
Rojoa	"O"	0 00 00.0			0 00 00.00	
Rojoa	BL 3	[illegible]				
Rojoa	BL 2	[illegible]				

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Station Rojoa RL 3 State Marshall Is. (Eniwetok Atoll)

Chief of party Ralph L. Pfau Date 7 February 1948 Computed by R.L.P.

Observer G.R. Strode Instrument H-234 Checked by R.H.

11—9503

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″		″	° ′ ″	′ ″
Rojoa "O"	0 00 00.00			0 00 00.00	
Biijiri 11	[illegible]				

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Station Rojoa BL 2 State Marshall (Eniwetok Atoll)

Chief of party Ralph L Pfau Date 7 Feb

Observer G.R. Strode Instrument

Computed by R.L.P.

Checked by R.L.P.

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OBSERVED STATION	Observed direction	Eccentric reduction	Observed direction reduced	Corrected direction with zero initial	Adjusted direction*
Rojoa "O"	0 00 00.00			0 00 00.00	
Biijiri "	[illegible]				

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Station Rojoa [illegible]

State [illegible] (Eniwetok Atoll)

Chief of party Ralph [illegible]

Date [illegible]

Computed by R. L. P.

Observer G. R. Strode

Instrument [illegible]

Checked by

U. S. GOVERNMENT PRINTING OFFICE 11—9543

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction*
			"	° ′ ″	′ ″
Biijiri 11	0 00 00.00			0 00 00.00	
Rojoa BL 2	[illegible]				
Rojoa BL 3	[illegible]				

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COMPUTATION OF TRIANGLES

MARSHALL

	STATION	OBSERVED ANGLE	CORR'N	SPHER'L ANGLE	SPHER'L EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3					49.9936 m	2.176 0727
	1 Bijji					044	0.278 2108
1st Δ	2 Rojoa BL3						9.942 7447
for dist.	3 Rojoa					391	9.999 3954
	1-3					49.4757 m	2.397 0282
	1-2						2.453 6789
	2-3					99.9956 m	1.999 98~~17~~ 09
	1 Bijji					249	0.421 9443
Check Δ	2 Rojoa					562	9.975 0983
	3 Rojoa					389	9.999 3954
	1-3					49.47~~84~~ 131	2.397 02~~43~~ 35
	1-2						2.421 32~~14~~ 06
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						

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COMPUTATIONS OF AUXILIARY BASE LINE
AOMON ISLAND AND DISTANCE AOMON STAKE
#1 TO BIJIRI STAKE A

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COMPUTATION OF AUXILIARY BASE LINE

(For determination of dist from Aux... 2 to B... "C")

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP.	CORRECTIONS: Temp (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set-back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	(v) mm	(vv) mm
Aux... 2 to BLC	2-5-48	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-0.0075	[illegible]		99.9893	99.9890		
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible] 9887	[illegible]	2	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	99.9886		

[redacted]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	[redacted]		Meters	Meters	
Aomen 12						
BL 1	[illegible]	[illegible]	[illegible]			
BL 2	[illegible]	[illegible]	[illegible]			
BL 2+25	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]			

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12 [illegible]

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Station Aomon "12" State Marshall Is. (Eniwetok Atoll) (Aomon I)
Chief of party Ralph L. Pfau Date 5 February '48 Computed by R.L.P.
Observer G.R. Strode Instrument 7" Repeater Checked by RLP

OBSERVED STATION	Observed direction	Eccentric reduction	Sea-level reduction	Corrected direction with zero initial	Adjusted direction*
	° ′ ″			° ′ ″	° ′ ″
Bijiri "O"	0 00 00.00			0 00 00.00	
BL 2	266 11 04.3				
BL 2+25	266 11 15.6				

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Station BL 2 State Marshall Is (Eniwetok Atoll) (Aomon I.)

Chief of party Ralph L Pfau Date 5 February 1948 Computed by R.L.P.

Observer C. R. Strode Instrument 7" Repeater Checked by R.L.P.

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
			"	° ' "	' "
Biijiri C	0 00 00.00			0 00 00.00	
Aomon 12	76 49 12.7				

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Station BL 2 +25 State MARSHALL Is. (ENIWETOK Atoll) (Aomon I.)

Chief of party Ralph L. Pfau Date 5 February 1948 Computed by R.L.P.

Observer G.R. Strode Instrument 7" Repeater Checked by R.L.P.

OBSERVED STATION	Observed direction	Eccentric reduction	Sea-level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	″	″	° ′ ″	° ′ ″
Bijiri "O"	0 00 00.0			0 00 00.00	
Aomon "12"	52 25 11.2				

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Station Biijiri O
State Marshall I. (Eniwetok Atoll) (Biijiri I)
Chief of party Ralph L. Pra...
Date 5 February 1948
Computed by R.L.P.
Observer G. R. Strode
Instrument ... Parkhurst
Checked by R.L.P.

11—9503

OBSERVED STATION	Observed directions		Sea-level reduction *	Corrected direction with zero initial	Adjusted direction *
	° ′ ″		″	° ′ ″	′ ″
Aomon "12"	0 00 00.00			0 00 00.00	
BL 2	[illegible]				
BL 2 +25	[illegible]				

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COMPUTATION OF TRIANGLES

State: Marshall Is [illegible]

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	STATION	OBSERVED ANGLE	CORREC-TION	SPHER. ANGLE	SPHER. EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3					24.9886m	2.096 8704
	1 Bigej [illegible]	[illegible]	[illegible]	[illegible]		[illegible]6.5	0.326 7454
Best Triangle	2 Aomon 1	[illegible]	[illegible]	[illegible]		[illegible]53	9.993 5996
(use for distance)	3 BL 2+25	[illegible]	[illegible]	[illegible]		[illegible]8.2 / [illegible]00	9.896 9563
	1-3		[illegible]				2.417 2154
	1-2					209.2050m	2.320 5721
	2-3					99.4890m	[illegible].999 9522
	1 Bigej 2	[illegible]	[illegible]	[illegible]		[illegible]29	0.398 7540
Check Triangle	2 Aomon 12	[illegible]	[illegible]	[illegible]		[illegible]40	9.993 5964
	3 BL 2	[illegible]	[illegible]	[illegible]		[illegible]3.1 / [illegible]00	9.921 8751
	1-3		[illegible]				2.392 3026
	1-2					209.2095m	2.320 5813
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						

[redacted]

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DISTANCES TO STAKES OF THE GAMMA
STATION LINE TRAVERSE AND OFFSETS
TO ESTABLISH OTHER POINTS

[redacted]

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COMPUTATION OF TRAVERSE GAMMA ~~BASE~~ LINE

Aomen I.

(Aomen Is)

SECTION	DATE	DIR. OF MEAS	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape lengths	UNCORRECTED LENGTH: Meters	TEMP.	COR: Temp. (Meters)	COR: Tape and Catenary (Meters)	RECTIONS: Set-up Set-back (Meters)	RECTIONS: Inclination (Meters)	RECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	mm	mm
Aomen Zero Tower To 6	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		
	[illegible]		[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		

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[redacted]

Aomon Zero Tower – Aomon 12 = 600.0164m
Aomon 12 – Biijiri "0" = 209.2050m
Aomon Zero Tower – Biijiri "0" = 809.2214m

COMPUTATION OF ~ Traverse ~ ~~BASE~~ LINE ~ BIIJIRI I

Gamma

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SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP	CORRECTIONS: Temp (Meters)	CORRECTIONS: Tape and Catenary (Meters)	CORRECTIONS: Set-up Set-back (Meters)	CORRECTIONS: Inclination (Meters)	CORRECTIONS: Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	DISTANCE from Aomon Zero Tower (Meters)
From Biijiri "0" To															
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0.00[illegible]	[illegible]		[illegible]	49.9[illegible]	8[illegible] .219[illegible] m
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	~~ELEVATION~~	MEAN ELEVATION	REMARKS
	Meters	~~Meters or~~ feet		~~Meters~~	Meters	
Mark Aomen Zero Tower				Σ [illegible]		
Bench Aomen Zero Tower	[illegible]	+2.[illegible]	[illegible]	0.0		
1	[illegible]	0.56[illegible]	[illegible]	0.3		
2	[illegible]	0.80[illegible]	[illegible]	0.9		
3	[illegible]	+0.0[illegible]	[illegible]	0.9		
4	[illegible]	+0.2[illegible]9	[illegible]	0.9		
5	[illegible]	+0.6[illegible]	[illegible]	[illegible]		
6	[illegible]	+0.066	[illegible]	[illegible]		
7	5[illegible]	0.226		[illegible]3		
8	5[illegible]	0.3[illegible]3		[illegible]4		
9	5[illegible]	0.4[illegible]0	[illegible]	[illegible]5		
10	5[illegible]	0.2[illegible]4	[illegible]	[illegible]5		
11	5[illegible]	0.9[illegible]2	[illegible]	[illegible]2		
12	5[illegible]	+0.[illegible]24	[illegible]	[illegible]		
13	[illegible]	+0.1[illegible]6	[illegible]	2.3		
		Σ	2.[illegible]			

Comp. R.X.B.
✓ R.X.B.

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters			Meters	Meters	
Bullet "O"						
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	50	[illegible]	[illegible]			
4	50	[illegible]	[illegible]			
5	50	[illegible]	[illegible]			
6	50	[illegible]	[illegible]			
7	50	[illegible]	0.3			
8	50	[illegible]	0.4			
9	50	[illegible]	0.6			
10	50	[illegible]	1.5			
11	50	[illegible]	0.2			
			0.7			

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MEAN TEMPERATURE [illegible] Gamma Line Traverse

[illegible]

Points	[illegible] Temp.	[illegible] Temp.		
Bikini to 1	36.[illegible]	34.5	[illegible]	
			[illegible]	mean 35.6 To stk #1
1-2	[illegible]	34.9	6[illegible]	
			Σ [illegible]	mean 34.9 to stk #2
2-3	[illegible]	32.9	[illegible]	
3-4	[illegible]	[illegible]	6[illegible]	
			[illegible]	mean 34.6 to stk #4
4-5	[illegible]	[illegible]	[illegible]	
5-6	[illegible]	[illegible]	6[illegible]	
			[illegible]	mean 34.0 to stk #6
6-7	[illegible]	[illegible]	6[illegible]	
7-8	[illegible]	[illegible]	6[illegible]	
			[illegible]	mean 33.8 to stk #8
8-9	[illegible]	[illegible]	64	
			[illegible]	mean 33.7 to stk #9
9-10	[illegible]	[illegible]	6[illegible]	
10-11	[illegible]	[illegible]	62	
			[illegible]	mean 33.3 To stk #11

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MEAN TEMPERATURE [illegible] ~~[illegible]~~ [illegible] Line Traverse

SECTION Armon Zero Tower [illegible]

Point	Fwd Ther[illegible]	[illegible]			
Armon Zero Tower – 1	[illegible]	[illegible]		[illegible]	
1-2	32.[illegible]	[illegible]		[illegible]	
2-3	3[illegible].6	[illegible]		[illegible]	
3-4	3[illegible].8	[illegible]		[illegible]	
4-5	3[illegible]	[illegible]		65.[illegible]	
5-6	3[illegible].8	[illegible].4		65.2	
			Σ	39[illegible]	[illegible] to stk #6
6-7	3[illegible].2	[illegible]		66.2	
			Σ	45[illegible]	[illegible] to stk #7
7-8	32.[illegible]	[illegible]		6[illegible]	
8-9	3[illegible]	3[illegible].9		67.[illegible]	
			Σ	58[illegible].4	[illegible] 3[illegible].7 to stk #9
9-10	3[illegible].6	[illegible].2		6[illegible]	
10-11	3[illegible].6	[illegible]		65.2	
			Σ	7[illegible]	[illegible] 3[illegible].7 to stk No. 11
11-12	3[illegible]	[illegible]		64.2	
			Σ	78[illegible].4	[illegible] 2.6 to stk #12
12-13	30.[illegible]	[illegible]		63.4	
			Σ	846.[illegible]	[illegible] to stk #13

[illegible]

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COMPUTATIONS OF THE GATE STATION LINE TRAVERSE

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COMPUTATION OF Aomon – Bijiri – Rojoa ~~BASE~~ LINE traverse

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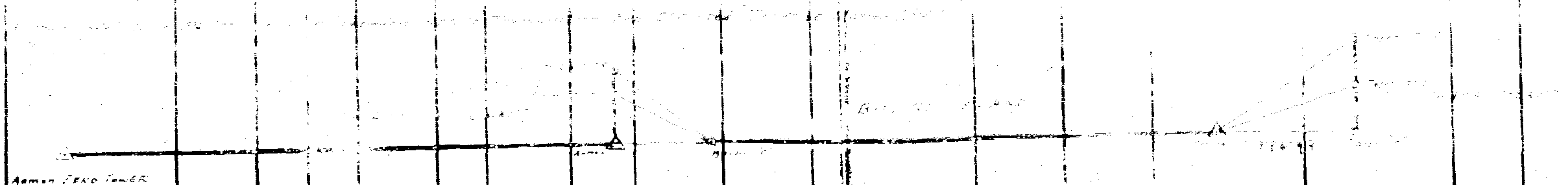
Fold to here

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape lengths	UNCORRECTED LENGTH: Meters	TEMP.	COR.: Meters	COR.: Tape and intervals, Meters	REDUCTIONS: Set-up Set-back, Meters	REDUCTIONS: Inclination, Meters	REDUCTIONS: Sea level, Meters	REDUCED LENGTH, Meters	ADOPTED LENGTH, Meters	DISTANCE FROM Aomon Zero Tower, Meters
Bench Aomon Zero Tower															



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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters or feet	mm	Meters	Meters	
Mark Aomon Zero Tower						
Bench Aomon Zero Tower	[illegible]	[illegible]	[illegible]			
1	[illegible]	[illegible]	[illegible]			
2	[illegible]	[illegible]	[illegible]			
3	[illegible]	[illegible]	[illegible]			
4	[illegible]	[illegible]	[illegible]			
5	[illegible]	[illegible]	[illegible]			
6	[illegible]	[illegible]	[illegible]			
7	[illegible]	[illegible]	[illegible]			
8	[illegible]	[illegible]	[illegible]			
9	[illegible]	[illegible]	[illegible]			
10	[illegible]	[illegible]	[illegible]			
11	[illegible]	[illegible]	[illegible]			
12	[illegible]	[illegible]	[illegible]			

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ABSTRACT OF LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters	mm.	Meters	Meters	
Busiri 0						
1	50	[illegible]	[illegible]			
2	50	[illegible]	[illegible]			
3	50	[illegible]	[illegible]			
4	50	[illegible]	[illegible]			
5	50	[illegible]	[illegible]			
6	50	[illegible]	[illegible]			
7	50	[illegible]	[illegible]			
8	50	[illegible]	[illegible]			
9	50	[illegible]	[illegible]			
10	50	[illegible]	[illegible]			
11	50	[illegible]	0.3			
			[illegible]			

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Location of Structures on Runit Island from Zero Tower

STRUCTURE	DISTANCE FROM ZERO	AZIMUTH FROM ZERO		
Blast Footing	1200 ft.	323	08	00
" "	1500	"	"	"
" "	1800	"	"	"
" "	2100	"	"	"
" "	2400	"	"	"
" "	2700	"	"	"
" "	3000	"	"	"
" "	3500	"	"	"
" "	3600	"	"	"
" "	3900	"	"	"
" "	4200	"	"	"
Blast Building	5250	"	"	"
Gamma Station A	2150	322	19	31
" " B	3900	"	"	"
" " C	5400	"	"	"
Timing Station	2800	321	51	02
Ion. Station	1000	322	00	15
Winch Base	5400	321	08	58
Tank Revetment	5010	324	54	25

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STRUCTURE	DISTANCE FROM [illegible]	AZIMUTH FROM ZERO		
Photo Tower	42[illegible] ft.	117	47	20
Triang. Sta. North Base	[illegible]54 "	110	58	50
Range Pole #1	[illegible]	316	44	28
" " #2 Dist. from #1	[illegible] Az. from #1	321	31	02
" " #3 " " "	[illegible] " "	"	"	"

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[redacted]

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[illegible] RUNIT ISLAND

STRUCTURE	LATITUDE	LONGITUDE
Triangulation Station North Base	11 33 [illegible]	162 21 09.890
Triangulation Station Runit	11 31 1[illegible]	162 22 01.621
Zero Tower	11 33 2[illegible]	162 21 16.041
Photo Tower	11 33 2[illegible]	162 21 11.202
Traverse Station Runit	11 32 44.[illegible]	162 21 43.761

[redacted]

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COMPUTATION OF HARTMAN LINE TRAVERSE

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COMPUTATION OF *TRAVERSE* *HARTMAN* ~~BASE~~ LINE

(RUNIT ISLAND)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP °C	CORRECTIONS: Temp (Meters)	Tape and Catenary (Meters)	Set-up Set-back (Meters)	Inclination (Meters)	Sea level (Meters)	REDUCED LENGTH (Meters)	ADOPTED LENGTH (Meters)	(v) mm	(vv) mm
Bench, RUNIT ZERO TOWER	1-26-48	F	927	3	4	200	32.8	+0.00[illegible]	0.0101	+0.0176	-0.0027	--	200.[illegible]	200.[illegible]		
to " (A)	1-27-48	R	933	3	4	200	32.9	+0.0015	-0.0147	+0.0244	-0.0017	--	200.[illegible]			

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COMPUTATION OF TRAVERSE HARTMAN ~~BASE~~ LINE

(RUNIT ISLAND)

Distance Runit ZERO Tower to 4(A) = 200.0075 m

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape Lengths	UNCORRECTED LENGTH Meters	TEMP. °	CORRECTIONS Temp. Meters	CORRECTIONS Tape and Catenary Meters	CORRECTIONS Set-up Set-back Meters	CORRECTIONS Inclination Meters	CORRECTIONS Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(+) Distance From Runit ZERO T. Meters	(−)
4(A) To:																
Stake No. 6	1 27 48	F	921	3	2	[illegible]	[illegible]	[illegible]	[illegible]0068	±0.0000	[illegible]	[illegible]	[illegible]	[illegible]	300.	0006
Stake No. 7	[illegible] 48	F	921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	±0.0000	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]
Stake No. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stake No. 28(B)	[illegible]	F	921	3	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Stake No. 28(B)	[illegible]	[illegible]	[illegible]	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			

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COMPUTATION OF ~~TRAVERSE~~ HARTMAN ~~BASE~~ LINE

(RUNIT ISLAND)

DISTANCES

Runit Zero Tower — 4(A) 200.0075 m
4(A) to 28(B) 1199.9485 m
Σ 1399.9560

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP °C	CORRECTIONS: Temp. Meters	CORRECTIONS: Tape and Catenary Meters	CORRECTIONS: Set-up Set-back Meters	CORRECTIONS: Inclination Meters	CORRECTIONS: Sea level Meters	REDUCED LENGTH Meters	ADOPTED LENGTH Meters	(v) DISTANCE FROM RUNIT ZERO TOWER METERS	(vv)
FROM 28(B) To:																
Stake No. [illegible]	[illegible] 48	[illegible]	92	[illegible]	[illegible]	[illegible]	28.3	+0.[illegible]	-0.[illegible]62	+0.[illegible]	-0.0033	—	[illegible]	[illegible]	[illegible]	9435
Stake No. 32	[illegible]	[illegible]	92	[illegible]	[illegible]	[illegible]	28.[illegible]	+0.[illegible]	-0.[illegible]36	+[illegible]	[illegible]4	—	[illegible]	[illegible]	[illegible]	[illegible]

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ABSTRACT OF WYE LEVELS
AND
COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	~~ELEVATION~~	MEAN ELEVATION	REMARKS
	Meters	~~Meters~~ feet	mm	~~Meters~~ mm	Meters	
28 (B)				2 [illegible] Cms		
29	50	0.59 ✓	[illegible] 3	3		
30	50	-1.79 ✓	3.0	3 ✓		
31	50	+0.10 ✓	0.0	3		
32	50	+0.28 ✓		4 ✓		
33	50	-0.45 ✓	0.2	4		
		Σ	[illegible] 6			

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

RUNIT Is.

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	[illegible]	mm.	[illegible]	Meters	
MARK RUNIT ZERO TOWER						
BENCH RUNIT ZERO TOWER	0	+ [illegible]	0			
1	50	[illegible]	[illegible]			
2	50	[illegible]	0 [illegible]			
3	50	[illegible]	[illegible]			
4 (A)	50	[illegible]	0 [illegible]			
		[illegible]	[illegible]			
					[illegible] A	
					[illegible] A	

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EVELS

COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	~~ELEVATION~~	MEAN ELEVATION	REMARKS
	Meters	~~Meters~~ feet	mm	~~Meters~~ mm	Meters	
4(A)				E-t Crns.		
5	50	+0 04	[illegible]	0 0		
6	50	-0 62	[illegible]	0.4		
7	50	+1 04	[illegible]	1 4		
8	50	+0.44	[illegible]	6		
9	50	+0.54		9		
10	50	-0.04	[illegible]	6		
11	50	0 40		2 [illegible]		
12	50	-1 6	[illegible]	3 2		
13	50	-0 6	[illegible]	3 2		
14	50	-0 0		3 2		
15	50	+1.38	[illegible]	5 0		
16	50	+0 79	[illegible]	5 6		
17	50	-0.58	[illegible]	5 9		
18	50	+0 50	[illegible]	6 [illegible]		
19	50	+0.95	[illegible]	6.9		
20	50	+0.42	[illegible]	7 [illegible]		
21	50	-0 18	[illegible]	7 [illegible]		
22	50	-0 54		7 4		
23	50	-0.74		9		
24	50	-0.3[illegible]		8 0		
25	50	-0.40		8 [illegible]		
26	[illegible]	-0 92		[illegible] 9		
27	[illegible]	+0.3[illegible]		9 [illegible]		
28(B)	[illegible]	-0.34	[illegible]	9 [illegible]		
		[illegible]	[illegible]			

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MEAN TEMPERATURE COMPUTATION (RUNIT ISLAND)

HARTMAN LINE TRAVERSE

SECTION 4(A) – 28(B) FORWARD MEAS

STAKE	Fwd. Therm	Rear Therm	Σ	
4A-5	26.9	[illegible]	[illegible]	
5-6	27.0	26.6	53.6	
			107.3	Mean 26.8 To stake No 6
6-7	27.1	26.7	53.8	
			161.1	Mean [illegible] To stake No [illegible]
7-8	27.1	[illegible]	[illegible]	
8-9	26.9	[illegible]	53.6	
			268.3	Mean 26.8 To stake No. 9
9-10	27.1	[illegible]	54.1	
10-11	26.9	[illegible]	53.9	
			376.3	Mean 26.8 To stake No 11
11-12	27.1	[illegible]	54.2	
12-13	27.1	[illegible]	54.6	
			485.[illegible]	Mean [illegible] To stake No. 13
13-14	27.2	[illegible]	54.3	
			539.4	Mean [illegible] To stake No 14
14-15	27.0	27.5	54.5	
			593.9	Mean [illegible] To stake No. 15
15-16	27.1	[illegible]	54.3	
			648.2	Mean [illegible] To stake No. 16
16-17	27.0	[illegible]	54.[illegible]	
17-18	27.0	[illegible]	54.2	
			[illegible]56.5	[illegible] To stake No 18
18-19	26.9	[illegible]	[illegible]	
19-20	27.2	[illegible]	54.7	
			[illegible]	[illegible] stake No. 20
20-21	27.1	[illegible]	[illegible]	
21-22	27.0	[illegible]	54.0	
			[illegible]	[illegible] To stake No 22
22-23	27.1	[illegible]	[illegible]	
23-24	27.4	[illegible]	55.[illegible]	
			[illegible]83.[illegible]	[illegible] stake No 24
24-25	27.7	[illegible]	[illegible]	
25-26	27.6	[illegible]	[illegible]	
			[illegible]	[illegible] stake No 26
26-27	27.9	[illegible]	[illegible]	
27-28(B)	27.4	[illegible]	[illegible]6.4	
			1309.5	Mean [illegible] To stake No. 28

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(RUNIT I)

MEAN TEMPERATURE COMPUTATION

~ HARTMAN LINE TRAVERSE ~

SECTION 28(B) – 33 ~ FORWARD MEAS.

STAKE	Fwd Therm	Rear Therm	Σ	
28(B) - 29	28.0	8 9	56.9	
29 - 30	27.8	8 [illegible]	56.3	
30 - 31	28.0	8 [illegible]	56.5	
		[illegible]	169.7	[illegible] 28.3 To stake No. 31
31 - 32	28.8	[illegible]	58.8	
		[illegible]	228.5	[illegible] 28.6 To stake No. 32
32 - 33	29.[illegible]	[illegible]	60.1	
			288.6	[illegible] [illegible]8[illegible] To stake No. 33

[illegible]

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COMPUTATION OF SETUPS, SETBACKS AND OFFSETS FROM STAKES OF THE HARTMAN LINE TRAVERSE TO ESTABLISHMENT OF OTHER POINTS

[redacted]

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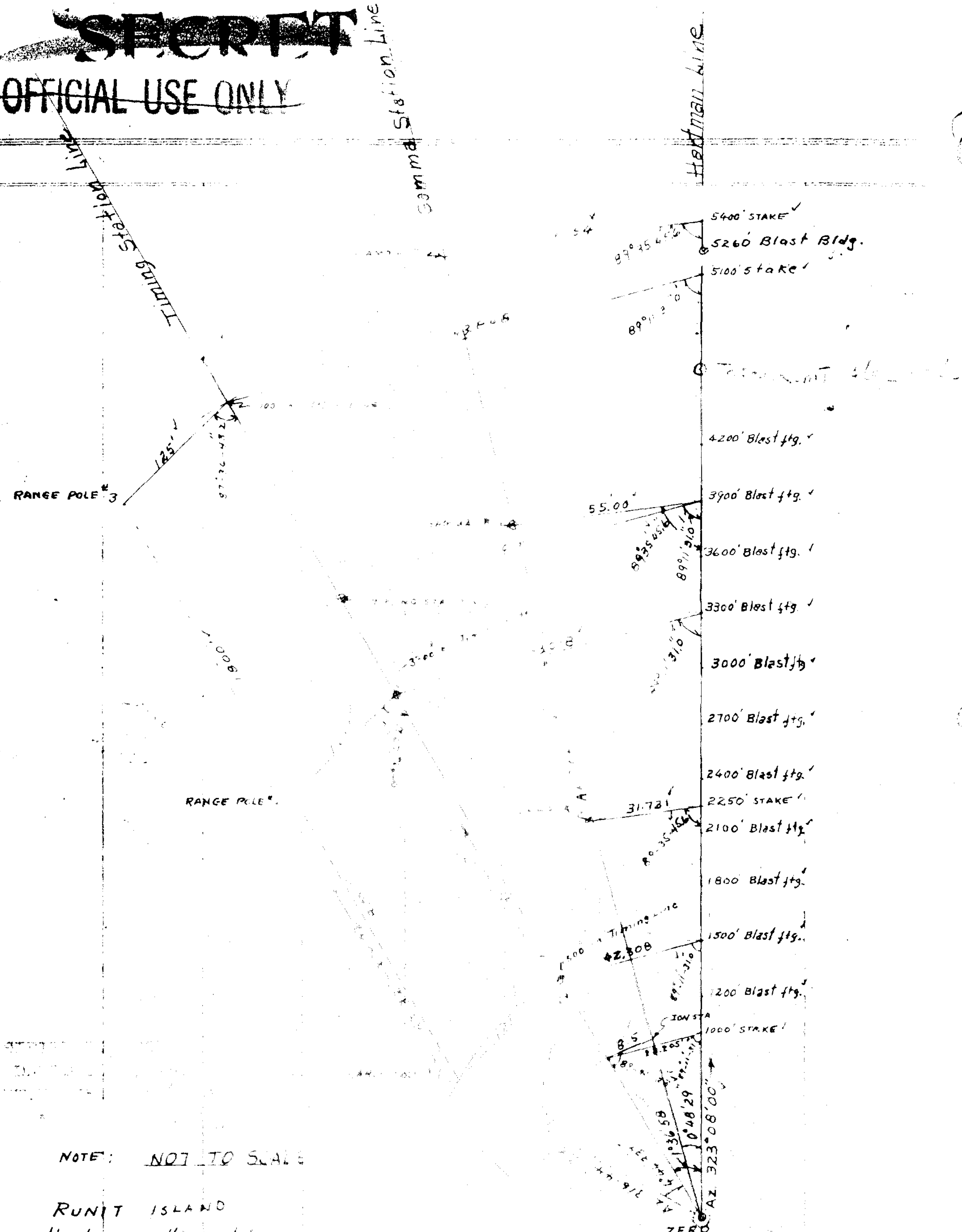

NOTE: NOT TO SCALE

RUNIT ISLAND
Method of setting stakes
by offset from
HARTMAN TRAVERSE LINE

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Computation "Set up [illegible] Set Backs" [illegible] of the HARTMAN LINE Traverse To proper distances [illegible] Points by Chord offsets.

OBJECT TO BE ESTABLISHED	DIST. FROM ZERO TOWER Feet	DIST. FROM ZERO TOWER Meters	CLOSEST STAKE No.	DIST ZERO TOWER TO CLOSEST STAKE	SET UP FROM CLOSEST STK m	SET UP FROM CLOSEST STK Ft.	SET BACK FROM CLOSEST STK m	SET BACK FROM CLOSEST STK Ft.
Ionization Sta.	1000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]748	—	—
Hartman sta. & Range Pole #1	1500	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Hartman Sta.	1800	[illegible]	[illegible]	[illegible]	—	—	[illegible]3679	4.488
Hartman Sta.	2100	[illegible]	[illegible]	[illegible]	—	—	9.9199	32.546
Gamma A	2250	[illegible]	[illegible]	[illegible]	—	—	14.2225	46.662
Hartman Sta.	2400	[illegible]	[illegible]	[illegible]	—	—	18.4973	60.687
Hartman Sta.	2700	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]5.284	—	—
Hartman Sta.	3000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].224	—	—
Hartman sta. & Range Pole #2	3300	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].231	—	—
Hartman Sta.	3600	[illegible]	[illegible]	[illegible]	—	—	2.6915	8.830
TIMING STA. GAMMA B	3900	[illegible]	[illegible]	[illegible]	—	—	11.2442	36.890
HARTMAN Sta.	4200	[illegible]	[illegible]	[illegible]	—	—	19.7868	64.917
Hartman sta. & Range Pole #3	5100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]854	—	—
Gamma C	5400	[illegible]	[illegible]	[illegible]	—	—	4.0344	13.236
Hartman Sta.	[illegible]200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]720	—	—

Blast Bldg ~ Set 10.88 [illegible] stake #32 = 5260.0 from zero Tower [illegible] original location to [illegible]

CHORD ∡ For offset from HARTMAN LINE Stake to 3900' stake for Timing station.

a = 110
b = 3900
c = 3900
2s = 7910
s = 3955

RUNIT ZERO TOWER
3900 Timing Sta stake.
3900 stake on Hartman Line

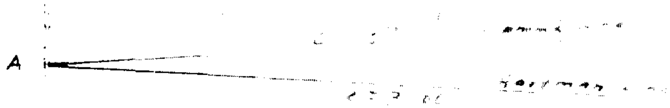
s-a = 3845
s-b = 55
s-c = 55

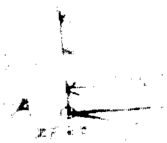
log (s-a) =	3.584 8963
log (s-b) =	1.740 3627
log (s-c) =	1.740 3627
	7.065 6217
log s =	3.597 1465
	3.468 4752
log r =	1.734 2376
log r =	1.734 2376
log (s-a) =	3.584 8963
log tan ½ A	8.149 34[illegible]
½ A =	0-48-29
A =	1°-36'-58"
log r =	1.734 2376
log (s-b) =	1.740 3627
log tan ½ B	9.993 8749
½ B	44-35-[illegible]
B=C=	89-11-31

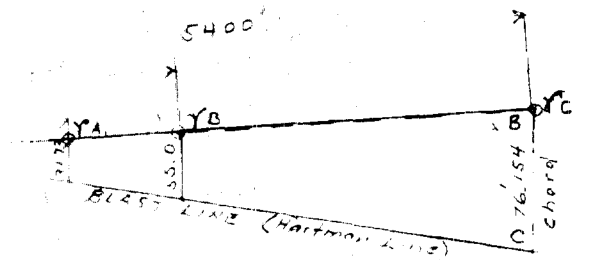
141-A

CHORD ∡ + Distances for offsets from Hartman Line Traverse to GAMMA A, B, + C.

B 3900 stake for Gamma sta B"







a = 55
b = 3
c = 3900
2S = 785
S = 3927

S-a = 387 2.5
S-b = 27.5
S-c = 27.5

Log S-a = 3.587
" S-b = 1.439
" S-c = 1.439
Σ 6.466
Log S 3.594
2.872
Log r = 1.436

$\tan \frac{1}{2} A = \frac{r}{S-a}$

Log r = 1.436
Log S-a = 3.587
Log tan ½ A = 7.848
½ A = 0° - 24
A = 0° - 48

Log r = 1.436
Log S-b = 1.439 33
Log tan ½ B = 9.996
½ B = 44° - 4
B = C = 89 - 35 - 4

A = 0° 48 - 28.9
B = 89° - 35' - 45.6
C = 89° - 35 - 45.6
180 00 00

$= \frac{b \sin A}{\sin B}$ = Chord dist ~ Blastline & Gamma

Log 2250 3.352 1825
Log Sin A = 8.149 2893 ✓
Σ 1.501 4718
Log Sin B 9.999 9892
Log dist = 1.501 4826
Dist = 31.731 Ft. ✓ GAMMA "A"

Log 5400 3.732 3938
Log Sin A 8.149 2893
Σ 1.881 6831
Log Sin B 9.999 9892
Log Dist 1.881 6939
Dist = 76.154 Ft. ✓ GAMMA "C"

(Dist Comp Checked by similar △)

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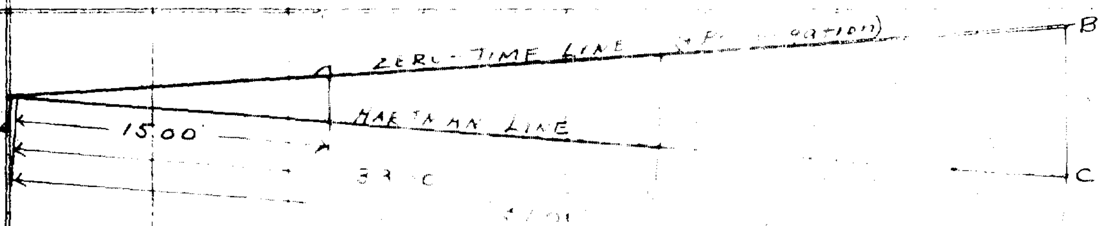
CHORD OFF SETS FROM Hartman Line To Z-T LINE (For use in setting Range Poles)

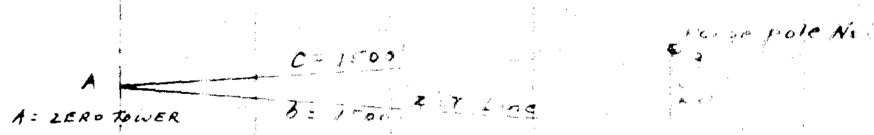


A = 1°-36'-58.0"
B = 89°-11'-31.0"
C = 89°-11'-31.0"
} From Previous Computation

$a = \frac{b \sin A}{\sin B}$ = Chord dist. Hartman Line to Z-T Line

Log 1500 = 3.176 0913	Log 3300 = [illegible]	Log 5100 = 3.707 5702
Log sin A = 8.450 2910	Log sin A 8.450 2910	Log sin A = 8.450 2910
Σ 1.626 38[illegible]	[illegible]	Σ 2.157 8612
Log sin B 9.999 9568	Log sin B 9.999 9568	Log sin B 9.999 9568
Log dist = 1.626 42[illegible]	Log Dist [illegible]	Log Dist 2.157 9044
Dist = 42.308 Feet	Dist 93.078 Feet	Dist = 143.848 Feet

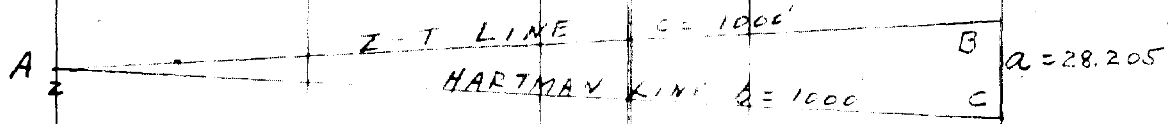
(Distance computed are Chord Offsets at A)



a =	125.0	[illegible]
b =	1500.0	62.5
c =	1500.0	62.5
2S =	3125.0	
S =	1562.5	

Log (s-a) = 3.157 60[illegible]	Log r = [illegible]	Log r = 1.777 7740
Log (s-b) = 1.795 8800	Log (s-a) = 3.15[illegible]	Log (s-b) = 1.795 8800
Log (s-c) = 1.795 8800	Log tan ½ A [illegible]	Log tan ½ B 9.981 8940
Σ 6.749 36[illegible]	½ A = [illegible]	½ B = 43°-48-21.6
Log s = 3.193 8200	A = [illegible]	B = 87°-36'-43.2"
3.555 5[illegible]		C = 87° 36' 43.2"
Log r = 1.777 7740		A = 04° 46' 33.7"
		Σ 180° 00' 00.1"

CHORD ∠ + Dist. from 1000' pt on HARTMAN LINE TRAVERSE To 1000' point on Zero-Timing Station Line



A = 1°-36'-58.0"
B = 89°-11'-31.0 > From previous computation
C = 89°-11'-31.0

a = b sin A / sin B — Chord dist Hartman Line to Time Line

Log 1000 = 3.000 0000
Log sin A = 8.450 2910
Σ = 1.450 2910
Log sin B = 9.999 9568
Log Dist = 1.450 3342
Dist = 28.205 (Checked by similar △)

CHORD ∠ + Dist From 1000' point on Zero-Timing Sta Line to 1000' stake for Ionization Structure.

a = 8.5 s − a 995.75
b = 1000.0 s − b = 4.25
c = 1000.0 s − c = 4.25
2s = 2008.5
s = 1004.25

Log (s−a) = 2.998 1503
Log (s−b) = 0.628 3889
Log (s−c) = 0.628 3889
Σ 4.254 928
Log s = 3.001 848
1.253 0860
Log r 0.626 5432

Log r = 0.626 5432
Log (s−a) 2.998 1503
Log tan ½A 7.628 3929
½A 0°-14'-36.63
A 0°-29'-13.3

Log r = 0.626 5432
Log (s−b) = 0.628 3889
Log tan ½B = 9.998 1543
½B = 44-52-41.72
B = 89-45-23.4
C = 89-45-23.4
A = 0-29-13.3
180 00 00.1

Chord dist is Computed to Center of Face of 7'x7' structure Nearest Zero Tower

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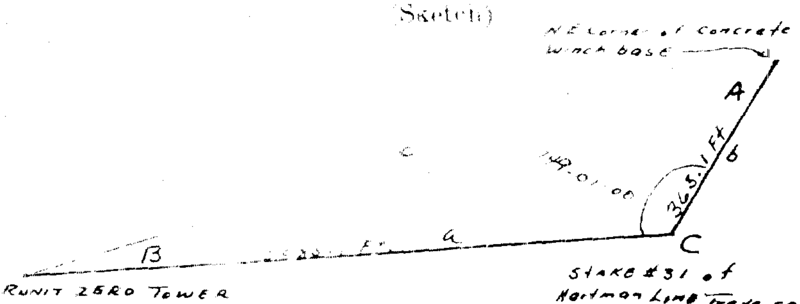
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side ... $\tan\frac{1}{2}(A_p + B_p) = \tan\phi \tan\frac{1}{2}(A_p - B_p)$; $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log a	706 2995	Log m
Sph. excess / 3		Log b	60 0262	Log sin C_s
C_p	149 01 00	Log tan (45 + φ)	46 2733	Log a
$\frac{1}{2} C_p$	74 30 30	(45 + φ)	85 54 56.68	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	15 29 30	φ	40 54 56.68	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	13 30 28.26	Log tan φ	27 8729	Sph. excess 0.0
Sum $= A_p$	28 59 58.26	Log tan ½ (A + B)	412 2430	
Diff $= B_p$	01 59 01.74	Log tan ½ (A − B)	0659	
C_p	149 01 00			
	180 00 00			

(Sketch)

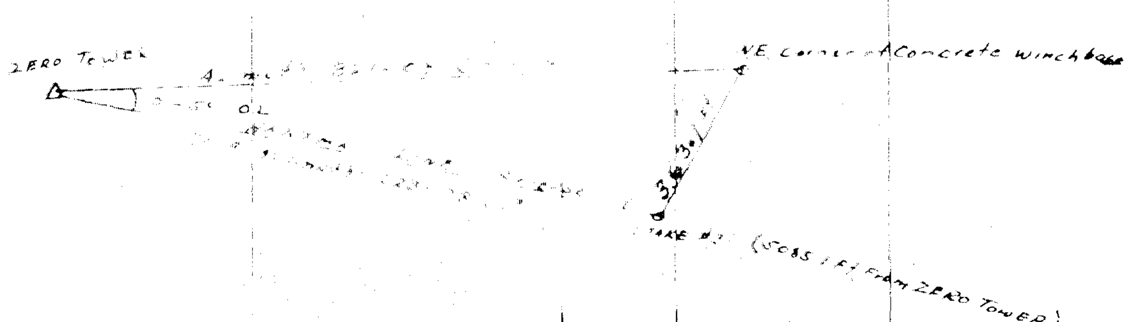


Log a	3 706 2995
Log sin C_p	9. 711 6290
Colog sin A_p	0 314 4354
Log c	3 732 3630

C = 5399.65 Ft

CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				3.732 3639
	1 C			149 01 00	0.288 3710
	2 B			01 59 01.74	8.539 2920
	3 A			28 59 58.26	9.685 5647
	1-3			363.1	2.560 0269
	1-2			5085.1	3 706 2996
	2-3				
	1				
	2				
	3				
	1-3				
	1-2				



*The subscripts s and p on this form refer ... respectively

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COMPUTATION FOR DETERMINING DISTANCE AND AZIMUTH

BETWEEN ZERO TOWER AND PHOTO TOWER

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Ed. Dec. 1929

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RUNIT I

TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

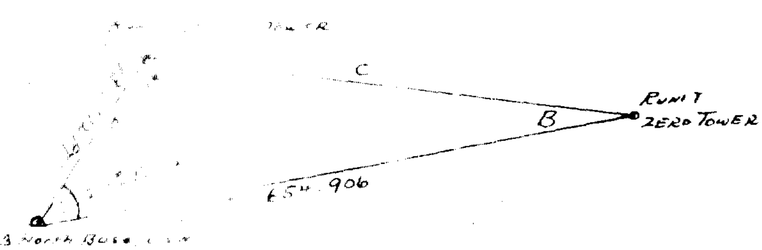
$\left[\frac{a}{b} = \tan(45° + \phi)\right.$ (Call longer side [illegible] $\tan\frac{1}{2}(A_p - B_p) = \tan\phi\ \tan\frac{1}{2}(A_p + B_p)$; $\left. c = \frac{a \sin C_p}{\sin A_p}\right]$*

C_s		Log a	[illegible] 790	Log m
$\frac{\text{Sph. excess}}{3}$		Log b	[illegible] 8231	Log sin C_s
C_p	29 [illegible]	Log tan (45° + φ)	[illegible] 96 3559	Log a
$\frac{1}{2} C_p$	14 3[illegible]	(45° + φ)	[illegible] 24.82	Log b
$90° - \frac{1}{2}C_p = \frac{1}{2}(A_p + B_p)$	[illegible]	φ	[illegible] 24.82	Log sph. ex.
$\frac{1}{2}(A_p - B_p)$	[illegible]	Log tan φ	[illegible] 822 860	Sph. excess
Sum $= A_p$	[illegible]	Log tan ½ ($A_p + B_p$)	0 [illegible] 2 8[illegible]54	
Diff $= B_p$	66 4[illegible]	Log tan ½ ($A_p - B_p$)	0 [illegible] 5 6[illegible]4	
C_p	29 [illegible]			

(Sketch)

Log a	2.816 1790
Log sin C_p	9.689 5[illegible]
Colog sin A_p	0.229 7[illegible]
Log c	2.735 4514

C = 543.82 ft



CHECK COMPUTATION

No.	STATION	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				2.735 4514
	1 C			29 [illegible] 247	0 310 4841
	2 A			[illegible]43 [illegible] 05.77	9 770 2435
	3 B			66 4[illegible] 29.53	9 073 8891
	1-3			654.906	2.816 1790
	1-2			[illegible] 772	2.119 8246
	2-3				
	1				
	2			✦ RUNIT ZERO TOWER	
	3				
	1-3				
	1-2				

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*The subscripts s and p in this form refer to spherical and plane angles respectively

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COMPUTATION OF TRAVERSE BETWEEN TRIANGULATION STATION NORTH BASE AND PHOTO TOWER

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Form 589
Rev. April 1935

[redacted] COMPUTATION OF BASE USA – [illegible] Tower TRAVERSE ~~BASE~~ LINE

(RUNIT ISLAND)

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH Tape lengths	UNCORRECTED LENGTH Meters	TEMP.	COR Temp.	COR Tape and Catenary	RECTIONS Set-up Set back	RECTIONS Inclination	RECTIONS Sea level	REDUCED LENGTH	ADOPTED LENGTH		
								Meters	Meters	Meters	Meters	Meters	Meters	Meters		
BASE USA 1944	[illegible]	F	92	[illegible]	[illegible]	[illegible]	28	[illegible]	0.0025	[illegible]	[illegible]		[illegible]	[illegible]		
To		F	366	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	– 9.9[illegible]						
[illegible] Tower																
			366	[illegible]		—	[illegible]	[illegible]	[illegible]	[illegible]						

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[redacted]

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	feet	mm	Meters	Meters	
Mark N. Base, U.S.N.						
Bench N. Base, USN	0	1.348	c			
1	50	-0.31	c			
Bench Runit Photo tower	9 83.	0.00	c			
Mark Runit Photo Tower	C	388	c			
		Σ	c			

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COMPUTATION OF TRAVERSE BETWEEN TRIANGULATION STATION NORTH BASE AND ZERO TOWER

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Form 589
Rev. April 19[illegible]

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COMPUTATION OF N Base, USN – Runit ZERO Tower TRAVERSE ~~BASE~~ LINE

U. S. GOVERNMENT PRINTING OFFICE 11—7[illegible] (RUNIT I)

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH		TEMP	CORRECTIONS					REDUCED LENGTH	ADOPTED LENGTH	(v)	(vv)
					Tape Lengths	Meters		Temp	Tape and Catenary	Set-up Set-back	Inclination	Sea level				
							°C	Meters	Meters	Meters	Meters	Meters	Meters	Meters	mm	mm
Bench N. Base USN 1944	2-1-48	F	921	3	4	[illegible]	28.1	+0.0001	-0.0101	+0.028[illegible]	-0.0014		199.6[illegible]	[illegible]99.6[illegible]6		
[illegible]		F	3661	2	-	--	28.4	±0.0000	±0.0000	-0.3940						
Bench Runit Zero Tower																
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0.0009	-0.0136	+0.0288	[illegible]		[illegible]			
		[illegible]	[illegible]	[illegible]		--	[illegible]	[illegible]	±[illegible]	[illegible]						

Page [illegible]

[redacted]

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U. S. COAST AND GEODETIC SURVEY
Form 685

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ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

(RUNIT I)

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	~~Meters or~~ feet	mm.	Meters	Meters	
Mark N. Base, USN						
Bench N. Base, U.S.N	0	+1.347	0 0			
1	50	+0.517	0 3			
2	50	+0.151	0 2			
3	50	+0.545	0 3			
4	50	+0.846	[illegible]			
Bench RUNIT ZERO	0 3940	-0.034	[illegible]			
MARK RUNIT ZERO	0	-1.870	0 0			
		Σ	4			

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[redacted]

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COMPUTATION FOR DETERMINING TANK REVETMENT LOCATION

[redacted]

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Rev. April 1935

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[redacted]

COMPUTATION OF 28(B) to Stk #5 Portion of 28(B) To 9(C) section BASE LINE

For comp. of Pos. of Tank revetment, Runway I.

SECTION	DATE	DIR. OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH: Tape Lengths	UNCORRECTED LENGTH: Meters	TEMP	CORRECTIONS: Length	CORRECTIONS: Tape and Catenary	CORRECTIONS: Set-up Set-back	CORRECTIONS: Inclination	CORRECTIONS: Sea level	REDUCED LENGTH	ADOPTED LENGTH	(v)	(vv)
								Meters	Meters	Meters	Meters	Meters	Meters	Meters	mm	mm
28(B) To stake No 5	[illegible] 28-48	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	250.05[illegible] ([illegible])		

[redacted]

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Form 685

ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS

POINT	DISTANCE	MEAN DIFFERENCE OF ELEVATION	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	Meters	Meters or feet	mm	Meters	Meters	
28 (B)						
1	50	-0.25	0.0			
2	50	-1.60	2.4			
3	50	-0.35	0			
4	50	-0.60	0.3			
5	50	+0.22	0.0			
			2.8			

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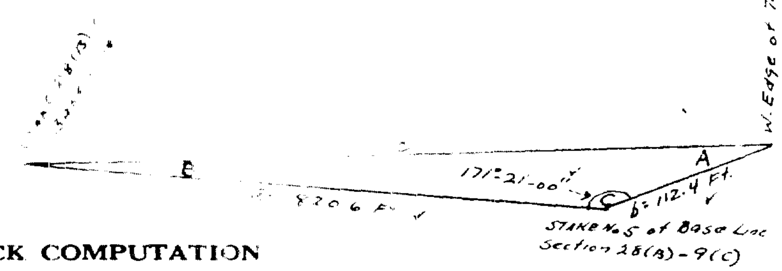
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$\left[\frac{a}{b}=\tan(45°+\phi)\right.$ (Call longer side a) $\tan\frac{1}{2}(A_p-B_p)=\tan\phi\tan\frac{1}{2}(A_p+B_p)$; $\left.c=\frac{a\sin C_p}{\sin A_p}\right]$*

	° ′ ″				
C_s		Log a	2.914 1315	Log m	
$\frac{\text{Sph. excess}}{3}$		Log b	2.050 7663	Log sin C_s	
C_p	171 21 00	Log tan (45° + ϕ)	0.863 3652	Log a	
$\frac{1}{2}C_p$	85 40 30	(45° + ϕ)	82 02 03	Log b	
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p+B_p)$	04 19 30	ϕ	37 02 03	Log sph. ex.	
$\frac{1}{2}(A_p-B_p)$	03 17 04.03	Log tan ϕ	9.880 2743	Sph. excess	—
Sum $=A_p$	07 36 38.03	Log tan $\frac{1}{2}(A_p+B_p)$	8.878 6895		
Diff $=B_p$	01 02 21.97	Log tan $\frac{1}{2}(A_p-B_p)$	8.758 9638		
C_p	171 21 00				
	180 00 00.00				

(Sketch)



Log a	2.914 1315
Log sin C_p	9.177 2425
Colog sin A_p	0.877 9836
Log c	2.969 3576

c = 931.88 Ft.

CHECK COMPUTATION

No.	STATION		SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2-3				931.9 Ft	2.969 3576
	1	C			171 21 00	0.822 7575
	2	B			01 02 21.97	8.258 6513
	3	A			07 36 38.03	9.122 0164
	1-3					2.050 7664
	1-2					2.914 1315
	2-3					
	1					
	2					
	3					
	1-3					
	1-2					

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*The subscripts s and p on this form refer to spherical and plane angles respectively.

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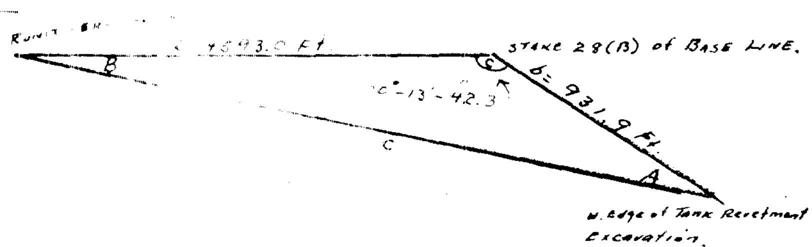
TRIANGLE COMPUTATION USING TWO SIDES AND INCLUDED ANGLE

$$\left[\frac{a}{b}=\tan(45°+\phi)\ \ (C\ldots\ \text{longer side } a);\ \ \tan\ldots\ \tan\phi\tan\tfrac{1}{2}(A_p+B_p);\ \ c=\frac{a\sin C_p}{\sin A_p}\right]^*$$

C_s		Log	3.622 0964	Log m
$\frac{\text{Sph. excess}}{3}$		Log	2.969 3576*	Log sin C_s
C_p	170 13 42.3	Log tan (45° + φ)	0.652 7388	Log a
$\frac{1}{2}C_p$	85 06 51.15	(45° + φ)	77 28.62	Log b
$90°-\frac{1}{2}C_p=\frac{1}{2}(A_p-B_p)$	4 53 08.85	φ	32 27 28.62	Log sph. ex.
$\frac{1}{2}(A_p-B_p)$	3 66 43 38	Log tan φ	9.803 4837	Sph. excess
Sum $=A_p$	7 59 52 21	Log tan ½ (A_p+B_p)	9.921 8667	
Diff $=B_p$	1 46 25.49	Log tan ½ (A_p-B_p)	8.735 3504	
C_p	170 13 42.3			

* Taken from previous Comp.

(Sketch)

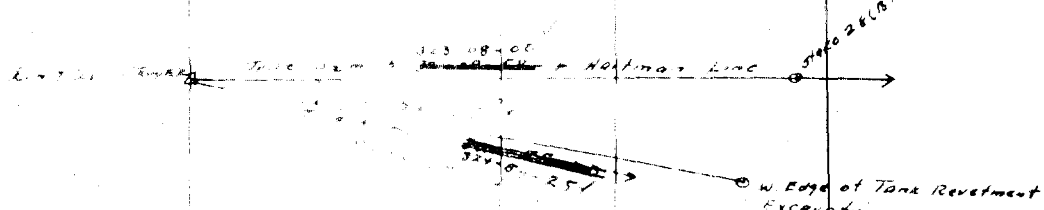


Log a	3.622 0964
Log sin C_p	9.229
Colog sin A_p	0.856
Log c	3.708

C = 5109.7 Ft

CHECK COMPUTATION

No.	STATION		SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
	2–3				5109.7 Ft.	3.708 3927
	1	C			170 13 42.3	0.770 2651
	2	A			07 59 52 21	9.143 4386
	3	B			01 46 25.49	8.490 6997
	1–3					3.622 0964
	1–2					2.969 3575
	2–3					
	1					
	2					
	3					
	1–3					
	1–2					



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