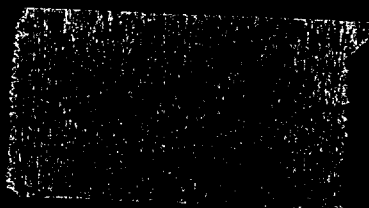


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R

A Holmes & Narver, Inc.
Engineers - Constructors
1949-50 HORIZONTAL CONTROL SURVEY
ENIWETOK ATOLL, MARSHALL ISLANDS
J/S 1123



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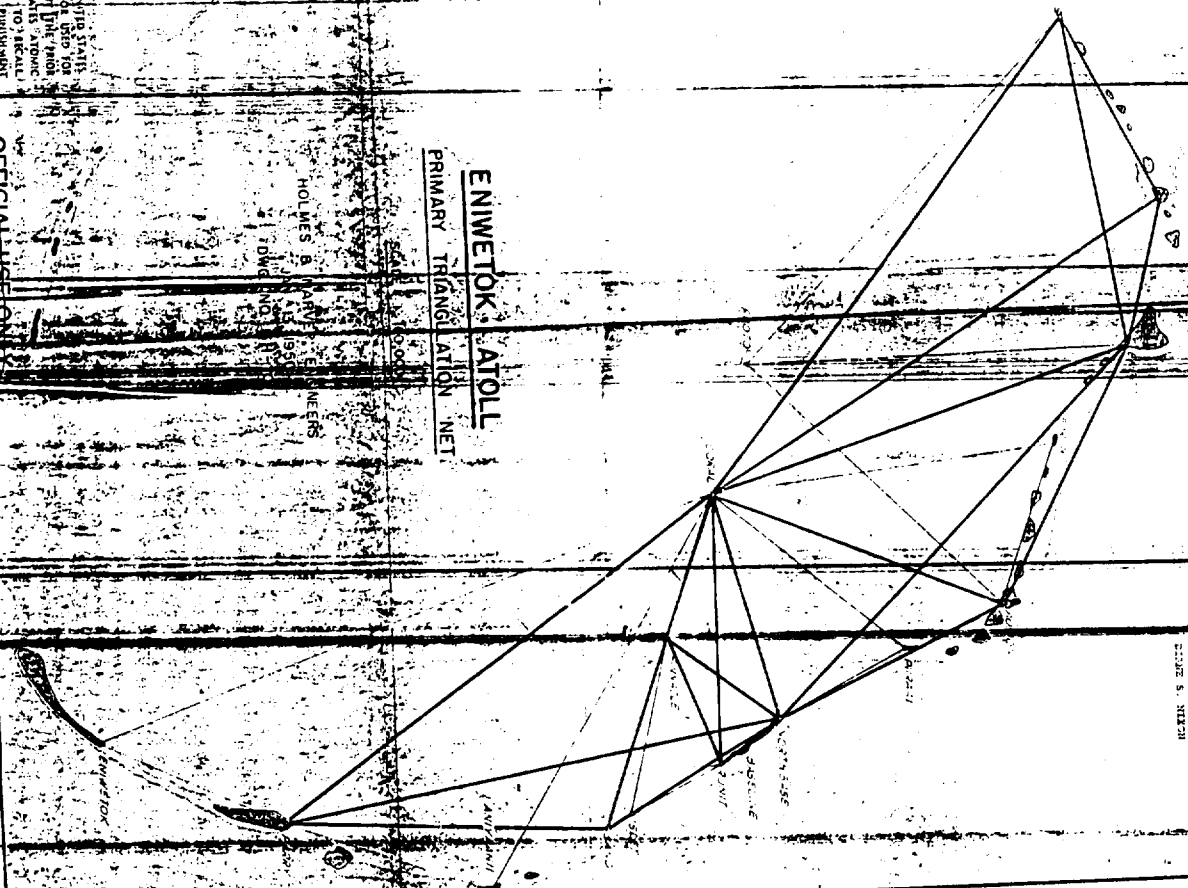
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EXEMPT FROM E.O. 13526
DATE 8/18/2010

ENIWETOK ATOLL
PRIMARY TRIANGULATION NET

HOLMES & NORTON ENGINEERS
1700 K STREET, N.W.
WASHINGTON, D.C. 20004

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HORIZONTAL CONTROL SURVEY
ENIWETOK ATOLL
MARSHALL ISLANDS
1949-50

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1949-50 HORIZONTAL CONTROL SURVEY
ENIWETOK ATOLL, MARSHALL ISLANDS J/S No. 3

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Summary of general features of the scheme
Location map
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Computation of geographic positions
Base line computations
Station discription and recovery notes
Vertical control

A scheme of second order triangulation composed of check figures was executed from a second order base line on Runit Island. The scheme extends northward to Bogallua Island and southward to Eniwetok Island. The survey was for the purpose of coordinating local surveys on project islands and to establish distances and azimuths between certain installations.

Standard procedure and specifications of the U.S. Coast and Geodetic Survey for second order triangulation was the criteria for this survey. The geometry of the scheme was checked by the Los Angeles Office of that organization before field work started and the results of observing the scheme were checked as to procedure in January of this year.

The scheme was so executed that it can be expanded to include the complete Patoll and where possible the permanency of station locations was considered. All station markers on project islands were referenced. Referencing of the two stations in the lagoon and on the sand spits south of Runit Were not practical.

Two previous surveys have been made of the eastern portions of the atoll. As stated in the reconnaissance report of January 7, 1949 these surveys were not readily adapted to the requirements of this project and were necessarily reoccupied to expand the present scheme.

The U.S.S. BOWDITCH SURVEY made in 1944 was of third order accuracy and covered the eastern portion of the atoll from Igurin to Bogumbogo. The apparent purpose was hydrographic charts of the atoll. It included a base line on Runit Island and control points on eleven other islands, also a station in the lagoon in the vicinity of the existing station, Coral. The geographical position of station North Base on Runit Island and the azimuth of the base line between stations North Base and South Base were determined by astronomical observations. As most of the stations on this survey were not on project islands and the reoccupation of its stations would have been necessary in any case for system expansion the values found in the U.S.S. Bowditch Survey were not incorporated into the present survey, except that the Joint Task Force Seven Survey determination of the latitude and longitude of station Runit was based on the original geographical position of station North

Base as established by this survey. Also, the azimuth of the line North Base-Sand was accepted.

The JOINT TASK FORCE SEVEN SURVEY made in 1947-48 and covering the eastern portion of the lagoon from Aniyaanii to Engebi, consisted of a limited scheme with stations on Engebi, Aoman, Runit and Aniyaanii and station Coral in the lagoon.

The scheme was stated to be of first order accuracy and first order procedure was used. However, the base expansion figure was not consistent with specifications of the U.S. Coast and Geodetic Survey and it was only because of the limited extent of the scheme that it could be considered of a high order of accuracy.

Of the seven stations included in this survey, station Graflex on Aoman Island had been destroyed and the station on Aniyaanii was of little value in expanding the scheme. To establish a new station on Aoman for the present survey required reoccupying three of the five remaining stations. It thus was apparent that the expanded requirements of the present survey involved re-establishment of a complete triangulation network.

Station South Base of the U.S.S. Bowditch Survey was not recovered and a new station "Runit" was established at the south end of the island. The line North Base-Runit became the base line of this survey.

The geographical position of station North Base and the azimuth of the line North Base-Sand as established by the U.S.S. Bowditch Survey were accepted and became the origin of position and azimuth. Although the original azimuth observations were made from station North Base to station South Base an examination of the corrections obtained for the angle in the U.S.S. Bowditch triangulations showed that but little accuracy would be lost by accepting the azimuth of the line from station North Base to station Sand as the basis of azimuths for the survey. Therefore it was considered that reobservation for azimuth was not justified.

The line North Base-Runit was measured to first order accuracy and the azimuth of the line was computed from its relation to the line N. Base-Sand.

The computations involved in establishing the azimuth of this new base line have been checked and are included here for reference purposes.

A copy of the Report of the Engineer, Joint Task Force Seven, Part 2 was made available to us and has been of great assistance in planning and executing this survey.

Location of Control Points

To meet the requirements of the present project, a horizontal net has been established consisting of fifteen stations, including five stations of the Joint Task Force Seven Survey. Two of these five were original stations of the U.S.S. Bowditch Survey, and an additional station of that survey on Eniwetok is also included. Stations are located so that all project islands are tied in directly to the scheme or can be tied in by local triangulation. A new station in the lagoon off the south end of Runit Island was established to strengthen the base expansion quadrangle.

Where practical, stations have been given the name of the island on which they are located. This was done to simplify reference to these stations. Some of the U.S.S. Bowditch and Joint Task Force Seven stations have been renamed and reference to this is made in the station recovery notes. The stations of the survey and location are as follows:

BOGA -----	Bogallua Island
Teiteir -----	Teiteiripucchi Island
Engebi -----	Engebi Island
Bokon -----	Bokonaarappu Island
Aomon -----	Aomon Island
Piiraai -----	Piiraai Island
North Base --	Runit Island
Runit -----	Runit Island
Coral -----	In lagoon
Pinnacle ----	In lagoon
Photo -----	Photo tower in lagoon
Islet -----	First sand island south of Runit
Sand -----	Third sand island south of Runit
Aniyaanii ---	Aniyaanii Island
Parry -----	Parry Island
Eniwetok ----	Eniwetok Island

The islands of Muzinbearikku, Kirinian and Aaraubiru will be tied in by local triangulation. Japtan is not included in present control requirements but can be tied in by the same method if desired.

Geographic Position and Azimuth

In the interests of economy and because we concurred with the Joint Task Force Seven Survey that little accuracy would be lost, it was our intention to accept the geographical position of station North Base and the azimuth of the new base line as the origin of position and azimuth for the present survey. Also the length of the base line would be accepted.

In observing for the present survey the base expansion quadrangle was observed last due to the necessity of constructing the new station, Pinnacle, in the lagoon. The results obtained indicated that the present location of the marker was eccentric to the position from which the Task Force Seven observations were taken and could not be accepted as the point of origin of the present survey. A computed difference of approximately four tenths of a foot in a northeasterly direction was found. This difference may have been caused by physical displacement of the monument.

The Los Angeles office of the U.S.C. & G.S. concurred in the conclusion that station North Base could not be accepted as being in its true position, also in the decision to measure the line from the present position of station North Base to station Runit to establish a base line for the present survey. The geographical position of station Runit and the azimuth of the line from station Runit to station Coral would be accepted for position and azimuth as the limited extent of the adjustments involved would not appreciably effect the accuracy requirements of this project.

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Field Procedure

A reconnaissance of all locations involved was made and markers set for the triangulation stations. Actual observing on this survey started in October, 1949.

The observing party consisted of an observer, recorder and a varying number of light tenders. The party was quartered on an L.C.T. which moved to convenient points in the lagoon as required. An L.C.M. and a DUKW were used for transportation to the stations, and when practical, planes were used between the islands having landing strips.

Four Bilby steel towers were available for the survey and were moved to new stations as the survey progressed. Where low towers could be used they were constructed of wood. The towers were adequately braced and little vibration was experienced. All observing was at night using lights for targets. A Wild T-2 theodolite was used for observing and found to be very satisfactory. Some difficulty was experienced with the exterior lighting probably due to moisture. Station lights were constructed from U.S. Navy battle lamps by installing a reostat. This made it possible to dim the lights to correct intensity and they made a satisfactory target.

Continuous inter-station communications were considered necessary due to the remote location of the stations. This was realized by using U.S. Army Type 619 portable radios. Considerable time was saved by this means of communication as the light intensity could be adjusted instantly and changes in plans could be transmitted to all personnel involved. This was often necessary due to weather conditions.

The observing was done at a period of the year when considerable rain and high wind velocity was experienced. Some time was lost due to weather both in being unable to get to the stations and poor visibility while occupying the stations.

Water transportation was adequate but necessarily slow and the personnel were usually away from the base of operations fourteen to sixteen hours.

Travel after dark in the lagoon was considered dangerous and the personnel were distributed before dark and picked up after sunrise in the morning.

Observing procedure consisted of adjusting the intensity of the station lights to the minimum which could be observed thereby obtaining a small target considering the distance involved. This was done as early in the evening as sufficient darkness was obtained and from one to three sets of six positions each were observed. Due to weather it was sometimes only possible to complete one satisfactory set in an evening. From two to five hours were spent in observing. When results obtained were within the specifications of the U.S. Coast and Geodetic Survey no attempt was made to obtain further refinement.

The strength of figures obtained for the net was an RI of 74.4 with a maximum of 130 allowed.

A maximum triangle closure of 2.5 seconds and an average closure of 1.3 seconds was obtained with the maximum of 8 seconds for one triangle and 3 seconds for the average closure allowed by specifications.

The RUNIT BASE LINE is a broken base consisting of four sections connecting the two stations, North Base and Runit. This was necessary due to the configuration of the island. Traverse Station Runit of the Joint Task Force Seven Survey is an angle point in this traverse and was also included in the former traverse.

Standard procedure of the U.S. Coast and Geodetic Survey for second order base line measurement was used. Angles were measured with the Wild T-2 theodolite and the measurement was made with three Lovar tapes using thermometers and stretcher apparatus of an approved type. The calibration certificates of these tapes are included in the record of the survey.

Stakes were set at fifty meter intervals for chaining points and the tapes were alternated so that in completing the forward and backward measurement all three tapes were used in each direction.

Due to the velocity of the wind at this period of the year it was necessary to use a wind break in order to obtain accurate results. This consisted of a thirty

six inch strip of canvas approximately fifty five meters long which was held parallel to the line as each measurement was made.

The computed probable error of the total measurement is 1 part in 648,000.
The allowable maximum probable error is one part in 500,000.

GEOGRAPHIC POSITIONS

LOCALITY ENIWETOK ATOLL MARSHALL ISLANDS		DATUM ENIWETOK ASTRONOMIC 1944		ORDER TRIANGULATION				
STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	BACK SIGHT ZIMUTH	TO STATION	DISTANCE		
						LOGARITHM METERS	METERS	FEET
North Base	11-33-23.267N		322-47-25.7	142-4-36.1	Runit	3.4136308	2591.9749	8503.84
	162-21-09.893E		327-56-56.1	147-3-19.5	Sand	3.8247895	6680.20	21916.6
			35-25-51.4	215-2-34.5	Pinnacle	3.6455679	4421.48	14506.1
			75-02-07.8	255-3-20.1	Coral	3.8747533	7494.68	24588.8
			156-30-13.8	336-9-53.3	Aoman	3.8906165	7773.50	25503.6
Runit			154-55-56.7	334-5-44.2	Piiradi	3.6491067	4457.66	14624.8
	11-32-16.080N		331-25-38.2	151-25-48.3	Islet	3.5087376	3226.54	10585.7
	162-22-01.621E		69-34-34.8	249-34-07.5	Pinnacle	3.6442259	4407.84	14461.4
			142-47-36.1	322-47-25.7	North Base	3.4136308	2591.9749	8503.84
Coral								
			255-01-20.1	75-32-07.9	North Base	3.8747533	7494.68	24588.8
	11-32-20.254N		289-02-53.4	109-14-04.5	Sand	4.0573318	11411.21	37438.3
	162-17-10.944E		289-36-26.8	109-16-57.6	Pinnacle	3.6959722	4965.61	16291.3
			300-55-07.4	120-36-28.8	Aniyaaniii	4.1585639	14406.68	47265.9
			324-04-06.6	144-35-13.0	Parry	4.2360560	17220.90	56498.9
			339-03-46.6	159-04-35.0	Eniwetok	4.3156485	20694.66	67862.9
			129-41-52.8	309-40-17.6	Baga	4.2705251	18643.40	61165.9
			148-59-31.2	328-38-32.4	Teiteir	4.2344911	17158.96	56295.7
			163-08-27.9	343-08-00.5	Engebi	4.1517262	14181.63	46527.6
			174-25-39.0	354-25-31.8	Bakon	4.0480178	11169.09	36643.9
			204-32-29.8	24-32-57.2	Aoman	3.9984988	9965.49	32695.1
			221-50-49.3	41-57-24.7	Piiradi	3.9041724	8019.96	26312.2

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DIRECTION COMPUTATIONS

LIST OF DIRECTIONS

STATION ANIYAANII (Kodak)DATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Parry	0° 00' 00.00"			0° 00' 00.00"	
Coral	101-54-26.6	-			
R.M. No. I 17.495 M	214-55-42.6	-			
Photo Tower 21.425 M	304-50-46.2	-			
R.M. No. 2 33.778 M	326-01-28.6	-			
No eccentricity of lights or instrument at this station					
Observations made from a 16 foot wood tower					
Reference marks were established by the Joint Task Force Seven Survey					

LIST OF DIRECTIONS

STATION AOMON (Aomon Trav. Sta.)DATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LSH

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
Photo	21-49-02.8	-			
Bokon	86-53-44.1	-			
Engebi	94-05-58.5	-			
R.M. No. 1 22.860 M	188-08-10.0	-			
R.M. No. 2 22.860 M	278-08-10.0	-			
N. Base	311-56-56.4	-			

No eccentricity of lights or instrument at this station

Observations taken from 40 foot steel tower

Reference marks are bronze disks in concrete blocks

LIST OF DIRECTIONS

STATION BOGADATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	EGG. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
Photo	6-48-04.0	-			
R.M. No. I 59.015 M	94-53-50.0	-			
R.M. No. 2 36.576 M	154-54-00.0	-			
Teiteir	293-21-24.7	-			
Engebi	311-03-56.3	-			
No eccentricity of lights or instrument at this station					
Observations made from 40 foot steel tower					
Reference marks are bronze disks in concrete blocks					

CHECKED BY LMP

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LIST OF DIRECTIONS

STATION CORALDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	EGG. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
N. Base	0° 00' 00.00"			0° 00' 00.00"	
Runit	15-48-14.6	-			
Sand	34-01-32.5	-			
Pinnacle	34-35-07.2	-			
Aniyaani	45-53-47.1	-			
Parry	69-02-46.3	-			
Eniwetok	84-03-20.2	-54.0			02-26.2
Boga	234-40-334	-			
Teiteir	253-58-12.8	-			
- Engebi	268-07-08.7	-			
Bokon	279-24-194	-			
Aomon	309-31-10.1	-			
- Piiraa	326-49-29.3	-			

No eccentricity of lights or instrument at this station

Observations made from a 14 foot wood tower set on existing
circular concrete cell

No reference marks set

LIST OF DIRECTIONS

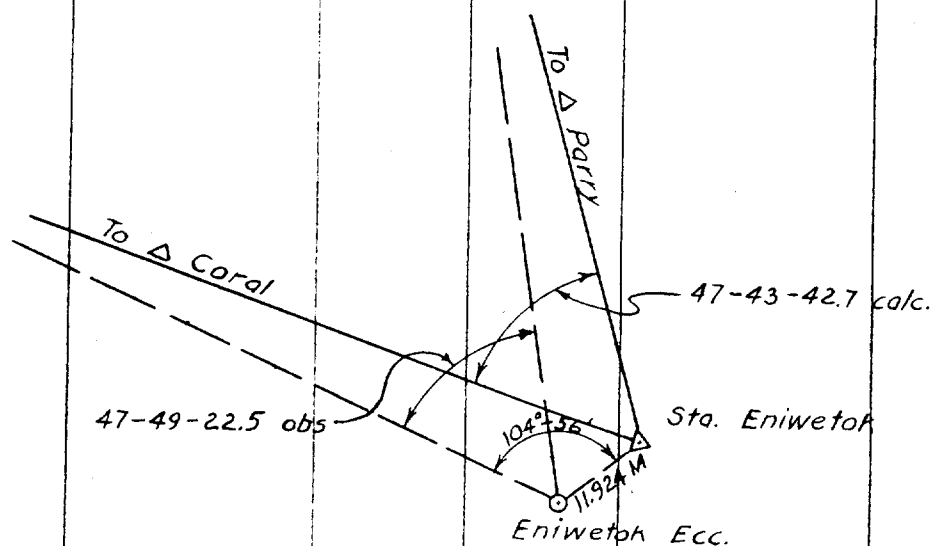
STATION ENGEBI (Elgin)DATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY FPC

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
Photo	17-01-02.5	-			
Boga	97-37-22.0	-			
Teiteir	120-21-30.3	-			
R.M. No. 1 15.240 M	105-11-10.0	-			
R.M. No. 2 15.240 M	195-11-10.0	-			
Aomon	315-30-01.4	-			
N. Base	322-33-45.3	-			
No eccentricity of lights or instrument at this station					
Observations made from 40 foot steel tower					
Reference marks are bronze disks in concrete blocks					

LIST OF DIRECTIONS

STATION ENIWETOK (Privilege)DATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	EGG. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
Parry	47-49-22.5	05'-39.8"			43-42.7
R.M. No. I 11.924 M	62-46-17.4	-			
R.M. No. 2 11.924 M	332-46-17.4	-			



Observations taken from eccentric station

Light was eccentric for observation from Coral

Light was at true station for observation from Parry

Observation was made from a 40 foot steel tower

Reference marks are bronze disks in concrete blocks

CHECKED BY LMP

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LIST OF DIRECTIONS

STATION NORTH BASEDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	EGG. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
Engebi	60-40-51.5	-			
Piiraa	79-53-48.5	-			
Aomon	81-28-05.5	-			
R.M. No. 3 45.686 M	101-59-20.0	-			
Runit	247-45-17.2	-			
Sand	252-54-49.1	-			
R.M. No. I 31.992 M	267-33-20.0	-			
Parry	274-44-59.7	-			
Pinnacle	320-23-43.0	-			
R.M. No. 2 25.233 M	340-35-50.0	-			
No eccentricity of lights or instrument at this station					
Observations made from 40 foot steel tower					
Reference marks are bronze disks set in reef ledge					

LIST OF DIRECTIONS

STATION PARRYDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	EGG. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
N. Base	25-42-13.5	-			
Sand	39-44-35.3	-			
R.M. No. 1 15.246 M	46-34-25.4	-			
Aniyaani	54-56-34.4	-			
R.M. No. 2 15. 224 M	181-37-20.4	-			
Eniwetok	242-43-22.6	-			
No eccentricity of lights or instrument at this station					
Observations made from 25 foot wood tripod in existing steel tower					
Reference marks are bronze disks in concrete blocks					

LIST OF DIRECTIONS

STATION PIIRAAIDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
N. Base	0° 00' 00.00"			0° 00' 00.00"	
R.M. No. 2 22.860 M	0-31-55.0	-			
Coral	66-55-40.3	-			
R.M. No. I 22.860 M	270-31-55.0	-			
No eccentricity of lights or instrument at this station					
Observations taken from 16 foot wood tower					
Reference marks are bronze disks in concrete blocks					

LIST OF DIRECTIONS

STATION PINNACLEDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FPCCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Coral	0° 00' 00.00"			0° 00' 00.00"	
N. Base	105-48-37.3	-			
Runit	139-57-10.4	-			
Islet	173-14-14.9	-			
No eccentricity of lights or instrument at this station					
Observations made from a steel tripod 10 feet above tide level					
No reference marks set at this station					

LIST OF DIRECTIONS

STATION RUNITDATE 3/17/50CHIEF OF PARTY LSHCOMPUTED BY LSHOBSERVER FECCHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
N. Base	0° 00' 00.00"			0° 00' 00.00"	
R.M. No. 1 15.520 M	8-37-19.4	-			
R.M. No. 2 14.650 M	107-02-33.4	-			
Islet	188-38-01.9	-			
Pinnacle	286-46-58.5	-			
Coral	308-02-56.2	-			
No eccentricity of lights or instrument at this station					
Observations made from 20 foot wood tower					
Reference marks shown were established by the Joint Task Force Seven Survey					

STATION SAND

DATE 3/17/90

CHIEF OF PARTY LSH

COMPUTED BY LSH

OBSERVER FPC

CHECKED BY LMP

OBSERVED STATION	OBSERVED DIRECTION	ECC. RED.	SEA LEVEL RED.	CORRECTED DIR. ZERO INITIAL	ADJ. DIR.
Parry	0° 00' 00.00"			0° 00' 00.00"	
Coral	105-14-13.1	-			
N. Base	144-07-27.3	-			
No eccentricity of lights or instrument at this station					
Observations made from 15 foot wood tower					
No reference marks set at this station					

STATION TEITEIR

DATE 3/17/50

CHIEF OF PARTY LSH

COMPUTED BY LSH

OBSERVER FPC

CHECKED BY LNP

34

Eccentric Station—ENIWETOK

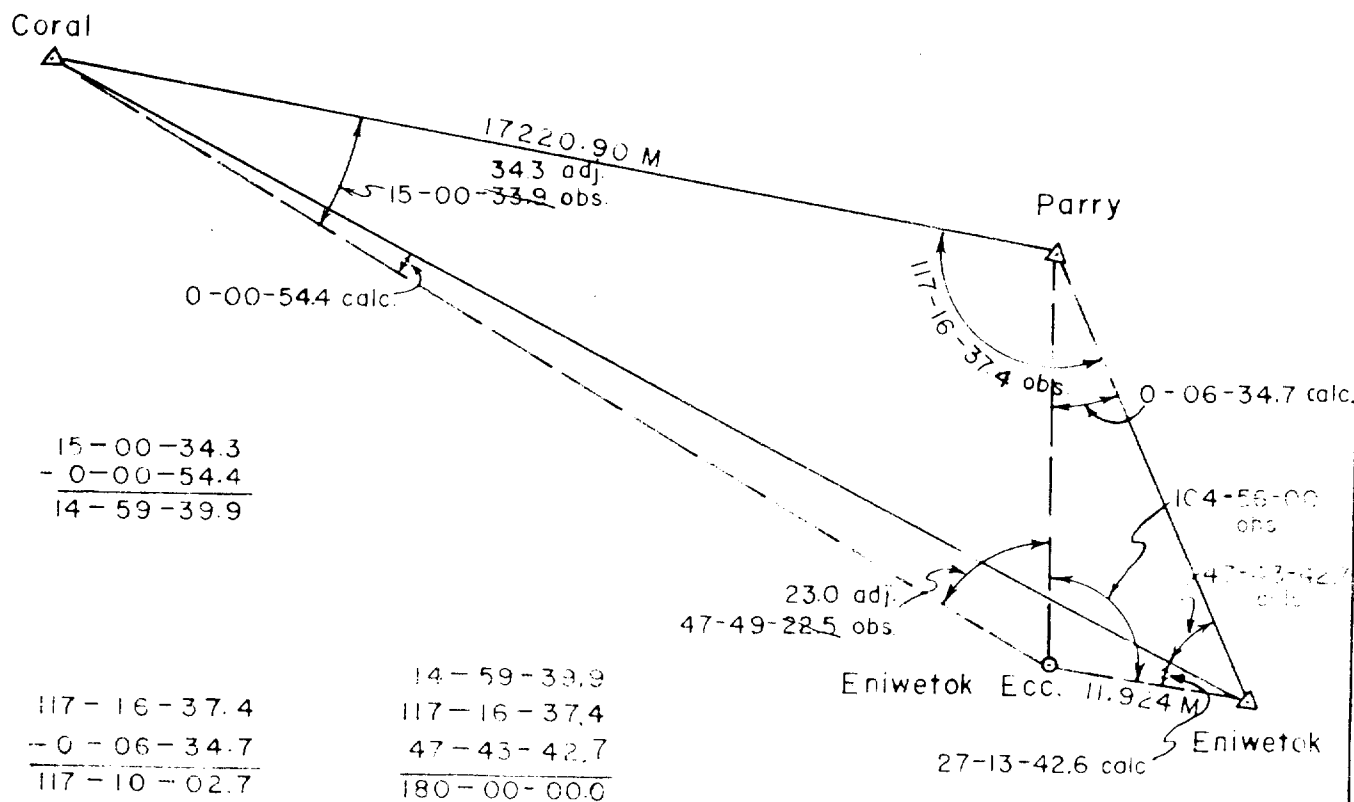
Log. d = 1.07642

colog Sin 1" = 5.31443

6.39085

d = 39.12 Ft. = 11.924 M.

	a °	Log. Sin a	Log s Meters	Log($\frac{\text{Sin } a}{s}$)	Log. red. in seconds	Reduction = C
Parry	255-04	9.98508	3.77967	6.20541	2.59626	394.7"
Coral	207-15	9.66075	4.31566	5.34509	1.73594	54.4"



ABSTRACT OF DIRECTIONS

STATION Aniwaanii COMPUTED BY L.S.H. DATE 12-14-49
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Parry</i>	<i>Coral</i>				
	INITIAL <i>0°-00'</i>	<i>101°-54'</i>				
1	<i>0.00"</i>	<i>27.0</i>				
2	<i>0.00"</i>	<i>29.5</i>				
3	<i>0.00"</i>	<i>24.1</i>				
4	<i>0.00"</i>	<i>26.1</i>				
5	<i>0.00"</i>	<i>29.3</i>				
6	<i>0.00"</i>	<i>23.4</i>				
7	<i>0.00"</i>					
8	<i>0.00"</i>					
SUM		<i>159.4</i>				
MEAN		<i>26.6</i>				
CORR. FOR ECC.						
DIRECTION		<i>26.6</i>				

ABSTRACT OF DIRECTIONS

STATION ADMAN COMPUTED BY L.S.H. DATE Nov. 16, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED				
	<i>Coral</i>	<i>Bokon</i>	<i>Engebi</i>	<i>North Base</i>	
	INITIAL 0°-00'	86°-53'	94°-05'	311°-56'	
1	0.00"	45.4	59.6	58.2	
2	0.00"	47.8	59.8	56.6	
3	0.00"	41.3	56.2	54.5	
4	0.00"	42.0	00.0	57.7	
5	0.00"	48.4	59.2	58.6	
6	0.00"	39.5	56.1	53.1	
7	0.00"				
8	0.00"				
	SUM	264.4	350.9	338.7	
	MEAN	44.1	58.5	56.4	
	CORR. FOR ECC.				
	DIRECTION	44.1	58.5	56.4	

ABSTRACT OF DIRECTIONS

STATION AOMAN COMPUTED BY L.S.H. DATE NOV. 29, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Photo</i>				
	INITIAL 0°-00'	21°-49'				
1	0.00"	02.1				
2	0.00"	02.2				
3	0.00"	03.2				
4	0.00"	02.6				
5	0.00"	05.4				
6	0.00"	01.4				
7	0.00"					
8	0.00"					
	SUM	16.9				
	MEAN	02.8				
	CORR. FOR ECC.					
	DIRECTION	02.8				

ABSTRACT OF DIRECTIONS

STATION Boga COMPUTED BY L.S.H. DATE Nov. 18, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Teiteir</i>	<i>Engebi</i>			
	INITIAL 0°-00'	293°-21'	311°-03'			
1	0.00"	25.0	59.0			
2	0.00"	25.9	57.1			
3	0.00"	24.0	54.7			
4	0.00"	23.2	54.5			
5	0.00"	26.2	58.9			
6	0.00"	23.8	53.7			
7	0.00"					
8	0.00"					
SUM		148.1	337.9			
MEAN		24.7	56.3			
CORR. FOR ECC.						
DIRECTION		24.7	56.3			

ABSTRACT OF DIRECTIONS

STATION BOGA COMPUTED BY L.S.H. DATE Oct. 31, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED	
	<i>Engebi</i>	<i>Photo</i>
	INITIAL 0.00	55°-44'
1	0.00"	09.3
2	0.00"	10.6
3	0.00"	04.7
4	0.00"	07.2
5	0.00"	11.5
6	0.00	02.7
7	0.00"	
8	0.00	
	SUM	46.0
	MEAN	07.7
	CORR. FOR ECC.	
	DIRECTION	07.7

ABSTRACT OF DIRECTIONS

STATION BOKON COMPUTED BY L.S.H. DATE Nov. 22, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Aoman</i>	<i>Coral</i>				
	INITIAL <i>0°-00'</i>	<i>62°-59'</i>				
1	<i>0.00"</i>	<i>26.2</i>				
2	<i>0.00"</i>	<i>25.3</i>				
3	<i>0.00"</i>	<i>25.7</i>				
4	<i>0.00"</i>	<i>23.1</i>				
5	<i>0.00"</i>	<i>23.9</i>				
6	<i>0.00"</i>	<i>24.1</i>				
7	<i>0.00"</i>					
8	<i>0.00"</i>					
	SUM	<i>148.3</i>				
	MEAN	<i>24.7</i>				
	CORR. FOR ECC.					
	DIRECTION	<i>24.7</i>				

ABSTRACT OF DIRECTIONS

STATION CORAL COMPUTED BY L.S.H. DATE Oct. 26, 1949OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	North Base	Photo				
	INITIAL 0°-00'	210°-39'				
1	0.00"	28.5				
2	0.00"	28.5				
3	0.00"	26.6				
4	0.00"	27.1				
5	0.00"	28.6				
6	0.00"	26.0				
7	0.00"					
8	0.00"					
	SUM	165.3				
	MEAN	27.5				
	CORR. FOR ECC.					
	DIRECTION	27.5				

ABSTRACT OF DIRECTIONS

STATION CORAL COMPUTED BY L.S.H. DATE Nov. 21, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED						
	<i>North Base</i>	<i>Boga</i>	<i>Teiteir</i>	<i>Engebi</i>	<i>Bokon</i>	<i>Aoman</i>	<i>Piirgai</i>
	INITIAL 0°-00'	234°-40'	253°-58'	268°-07'	279°-24'	309°-31'	326°-49'
1	0.00"	30.5	13.4	10.4	19.3	12.4	31.0
2	0.00"	33.5	11.5	07.4	23.5	09.1	27.5
3	0.00"	33.4	10.5	06.7	16.3	08.6	28.4
4	0.00"	34.6	15.8	11.0	18.7	10.0	28.6
5	0.00"	35.0	14.2	10.1	21.8	11.2	29.8
6	0.00"	33.2	11.3	06.9	16.9	09.4	30.3
7	0.00"						
8	0.00"						
SUM		200.2	76.7	52.5	116.5	60.7	175.6
MEAN		33.4	12.8	08.7	19.4	10.1	29.3
CORR. FOR ECC.							
DIRECTION		33.4	12.8	08.7	19.4	10.1	29.3

ABSTRACT OF DIRECTIONS

STATION CORAL COMPUTED BY L.S.H. DATE Dec. 5, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>North Base</i>	<i>Runit</i>	<i>Sand</i>	<i>Pinnacle</i>	<i>Parry</i>	
	INITIAL 0°-00'	15°-48'	34°-01'	34°-35'	69°-02'	
1	0.00"	15.0	31.2	09.7	45.1	
2	0.00"	14.3	34.6	07.6	48.8	
3	0.00"	16.9	32.5	07.1	47.0	
4	0.00"	13.5	30.9	07.8	46.9	
5	0.00"	13.1	34.6	07.3	46.3	
6	0.00"	14.8	31.4	04.0	43.7	
7	0.00"					
8	0.00"					
	SUM	87.6	195.2	43.5	277.8	
	MEAN	14.6	32.5	07.2	46.3	
	CORR. FOR ECC.					
	DIRECTION	14.6	32.5	07.2	46.3	

ABSTRACT OF DIRECTIONS

STATION CORAL COMPUTED BY L.S.H. DATE Dec. 14, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Parry</i>	<i>Aniyaanii</i>				
	INITIAL <i>0°-00'</i>	<i>336°-51'</i>				
1	<i>0.00"</i>	<i>00.4</i>				
2	<i>0.00"</i>	<i>00.0</i>				
3	<i>0.00"</i>	<i>02.0</i>				
4	<i>0.00"</i>	<i>00.7</i>				
5	<i>0.00"</i>	<i>00.9</i>				
6	<i>0.00"</i>	<i>00.9</i>				
7	<i>0.00"</i>					
8	<i>0.00"</i>					
SUM		<i>04.9</i>				
MEAN		<i>00.8</i>				
CORR. FOR ECC.						
DIRECTION		<i>00.8</i>				

ABSTRACT OF DIRECTIONS

STATION CORAL COMPUTED BY L.S.H. DATE Dec 22, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Parry</i>	<i>Eniwetok</i>				
	INITIAL 0°-00'	15°-00'				
1	0.00"	34.5				
2	0.00"	34.6				
3	0.00"	34.5				
4	0.00"	32.6				
5	0.00"	34.6				
6	0.00"	32.7				
7	0.00"					
8	0.00"					
	SUM	203.5				
	MEAN	33.9				
	CORR. FOR ECC.	- 54.0"				
	DIRECTION	14°-59'-39.9"				

ABSTRACT OF DIRECTIONS

STATION ENGEBI COMPUTED BY L.S.H. DATE Nov. 17, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Teiteir</i>	<i>Aoman</i>	<i>North Base</i>		
	INITIAL 0°-00'	120°-21'	315°-30'	332°-33'		
1	0.00"	31.8	03.4	44.3		
2	0.00"	32.6	01.0	48.3		
3	0.00"	28.6	00.7	44.0		
4	0.00"	30.0	00.0	43.8		
5	0.00"	30.8	02.8	48.4		
6	0.00"	28.0	00.2	43.2		
7	0.00"					
8	0.00"					
	SUM	181.8	08.1	272.0		
	MEAN	30.3	01.4 01.35	45.3		
	CORR. FOR ECC.					
	DIRECTION	30.3	01.4	45.3		

ABSTRACT OF DIRECTIONS

STATION ENGEBI COMPUTED BY LSH DATE NOV. 28, 1949
 OBSERVER F.P.C. CHECKED BY WEH. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Photo</i>	<i>Boga</i>			
	INITIAL 0°-00'	17°-01'	97°-37'			
1	0.00"	01.6	24.0			
2	0.00"	01.2	21.6			
3	0.00"	03.9	21.2			
4	0.00"	02.7	24.7			
5	0.00"	05.0	22.1			
6	0.00"	00.8	18.2			
7	0.00"					
8	0.00"					
	SUM	15.2	131.8			
	MEAN	02.5	22.0			
	CORR. FOR ECC.					
	DIRECTION	02.5	22.0			

ABSTRACT OF DIRECTIONS

STATION ENIWETOK COMPUTED BY L.S.H. DATE Dec. 19, 1949OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Parry</i>				
	INITIAL 0°-00'	47°-49'				
1	0.00"	20.2				
2	0.00"	20.3				
3	0.00"	24.6				
4	0.00"	20.4				
5	0.00"	22.2				
6	0.00"	27.0				
7	0.00"					
8	0.00"					
SUM		134.7				
MEAN		22.5				
CORR. FOR ECC.		- 5'-40.3"				
DIRECTION		47°-43'-42.2"				

ABSTRACT OF DIRECTIONS

STATION ISLET COMPUTED BY L.S.H. DATE Dec. 11, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Pinnacle</i>	<i>Runit</i>				
	INITIAL 0°-00'	48°-33'				
1	0.00"	59.5				
2	0.00"	01.9				
3	0.00"	55.5				
4	0.00"	59.0				
5	0.00"	01.5				
6	0.00"	56.2				
7	0.00"					
8	0.00"					
	SUM	353.6				
	MEAN	58.9				
	CORR. FOR ECC.					
	DIRECTION	58.9				

ABSTRACT OF DIRECTIONS

STATION NORTH BASE COMPUTED BY L.S.H. DATE Dec. 3, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED				
	<i>Coral</i>	<i>Engebi</i>	<i>Runit</i>	<i>Pinnacle</i>	
	INITIAL 0°-00'	60°-40'	247°-45'	320°-23'	
1	0.00"	55.2	20.8	47.2	
2	0.00"	48.5	16.0	42.8	
3	0.00"	52.3	17.6	38.8	
4	0.00"	51.9	17.6	42.4	
5	0.00"	51.4	15.8	47.6	
6	0.00"	49.9	15.1	38.9	
7	0.00"				
8	0.00"				
	SUM	309.2	102.9	257.7	
	MEAN	51.5	17.2 17.15	43.0 42.95	
	CORR. FOR ECC.				
	DIRECTION	51.5	17.2	43.0	

ABSTRACT OF DIRECTIONS

STATION NORTH BASE COMPUTED BY L.S.H. DATE Oct. 28, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED				
	<i>Coral</i>	<i>Aomon</i>	<i>Sand</i>	<i>Parry</i>	
	INITIAL 0°-00'	81°-28'	252°-54'	274°-44'	
1	0.00"	08.8	51.0	03.5	
2	0.00"	04.8	50.2	59.2	
3	0.00"	04.6	46.7	58.3	
4	0.00"	05.6	49.2	00.3	
5	0.00"	04.4	50.7	00.3	
6	0.00"	04.5	47.1	56.4	
7	0.00"				
8	0.00"				
	SUM	32.7	294.9	358.0	
	MEAN	05.5 05.45	49.1	59.7	
	CORR. FOR ECC.				
	DIRECTION	05.5	49.1	59.7	

ABSTRACT OF DIRECTIONS

STATION NORTH BASE COMPUTED BY L.S.H. DATE Nov. 30, 1949OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Piirgai</i>				
	INITIAL 0°-00'	79°-53'				
1	0.00"	47.2				
2	0.00"	49.8				
3	0.00"	46.1				
4	0.00"	49.0				
5	0.00"	50.2				
6	0.00"	48.5				
7	0.00"					
8	0.00"					
SUM		290.8				
MEAN		48.5				
CORR. FOR ECC.						
DIRECTION		48.5				

ABSTRACT OF DIRECTIONS

STATION PARRY COMPUTED BY L.S.H. DATE Dec. 13, 1949OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>North Base</i>	<i>Sand</i>	<i>Aniyaanii</i>	<i>Eniwetok</i>	
	INITIAL 0°-00'	25°-42'	39°-44'	54°-56'	242°-43'	
1	0.00"	16.0 18.6	35.7	36.0	23.0	
2	0.00"	14.0	35.8	32.1	24.3	
3	0.00"	15.2	34.7	37.1	25.3	
4	0.00"	10.6	33.9	35.5	18.9	
5	0.00"	10.7	35.6	31.5	19.2	
6	0.00"	14.8	35.9	34.0	24.9	
7	0.00"					
8	0.00"					
SUM		81.3 83.9	211.6	206.2	135.6	
MEAN		13.5 14.0	35.3	34.4	22.6	
CORR. FOR ECC.						
DIRECTION		13.5	35.3	34.4		

ABSTRACT OF DIRECTIONS

STATION PINNACLE COMPUTED BY L.S.H. DATE Dec. 2, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED				
	<i>Coral</i>	<i>North Base</i>	<i>Runit</i>	<i>Islet</i>	
	INITIAL 0°-00'	105°-48'	139°-57'	173°-14'	
1	0.00"	36.6	12.8	13.7	
2	0.00"	39.7	10.3	18.1	
3	0.00"	37.8	11.1	12.1	
4	0.00"	35.5	13.1	16.1	
5	0.00"	37.4	08.6	18.2	
6	0.00"	36.6	06.5	11.5	
7	0.00"				
8	0.00"				
SUM		223.6	62.4	89.7	
MEAN		37.3	10.4	14.95	
CORR. FOR ECC.					
DIRECTION		37.3	10.4	14.9	

ABSTRACT OF DIRECTIONS

STATION PIIRAAI COMPUTED BY L.S.H. DATE Nov. 20, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	North Base	Coral				
	INITIAL 0.00	66°-55'				
1	0.00"	44.5				
2	0.00"	39.1				
3	0.00"	39.9				
4	0.00"	41.9				
5	0.00"	37.8				
6	0.00"	38.8				
7	0.00"					
8	0.00"					
	SUM	242.0				
	MEAN	40.3				
	CORR. FOR ECC.					
	DIRECTION	40.3				

ABSTRACT OF DIRECTIONS

STATION RUNIT COMPUTED BY L.S.H. DATE Dec. 4, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED				
	North Base	Islet	Pinnacle	Coral	
	INITIAL 0°-00'	188°-38'	286°-46'	308°-02'	
1	0.00"	03.6	03.6	57.3	
2	0.00"	02.3	59.5	00.3	
3	0.00"	59.8	54.2	53.9	
4	0.00"	01.8	59.3	54.1	
5	0.00"	03.0	57.6	59.5	
6	0.00"	00.9	57.0	52.3	
7	0.00"				
8	0.00"				
	SUM	371.4	351.2	337.4	
	MEAN	01.9	58.5	56.2	
	CORR. FOR ECC.				
	DIRECTION	01.9	58.5	56.2	

ABSTRACT OF DIRECTIONS

STATION SAND COMPUTED BY L.S.H. DATE Dec. 6, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	Parry	Coral	North Base			
	INITIAL 0°-00'	105°-14'	144°-07'			
1	0.00"	13.1	30.6			
2	0.00"	16.9	25.2			
3	0.00"	08.7	25.0			
4	0.00"	12.5	30.7			
5	0.00"	16.3	26.6			
6	0.00"	11.4	25.9			
7	0.00"					
8	0.00"					
SUM		78.9	164.0			
MEAN		13.15	27.3			
CORR. FOR ECC.						
DIRECTION		13.1	27.3			

ABSTRACT OF DIRECTIONS

STATION TEITEIR COMPUTED BY L.S.H. DATE Nov. 27, 1949
 OBSERVER F.P.C. CHECKED BY W.E.H. INST. Wild T-2

POSITION	STATIONS OBSERVED					
	<i>Coral</i>	<i>Boga</i>	<i>Engebi</i>			
	INITIAL 0°-00'	94°-03	314°-30'			
1	0.00"	48.0	31.3			
2	0.00"	50.3	26.9			
3	0.00"	47.5	31.1			
4	0.00"	46.0	24.6 23.2			
5	0.00"	44.4 50.5	29.3			
6	0.00"	48.9	27.3			
7	0.00"					
8	0.00"					
	SUM	285.1	170.5			
	MEAN	47.5	28.4			
	CORR. FOR ECC.					
	DIRECTION	47.5	28.4			

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TRIANGLE COMPUTATIONS

COMPUTATION OF TRIANGLES

COMPUTED BY L.S.H.CHECKED BY L.M.P.DATE March 7, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					2591.9749	3.4136308
1 Pinnacle	34-08-33.1	-0.1	33.0	-0.0	33.0	0.2508413
2 North Base	72-38-25.8	-0.1	25.7	-0.0	25.7	9.9797538
3 Runit	73-13- <u>01.5</u>	<u>-0.2</u>	01.3	<u>-0.0</u>	01.3	9.9810958
I-3	00.4	0.4		0.0		3.6442259
I-2						3.6455679
2-3						3.6455679
1 Coral	34-35-07.2	-0.5	06.7	-0.0	06.7	0.2459339
2 North Base	39-36-17.0	-0.5	16.5	-0.0	16.5	9.8044704
3 Pinnacle	105-48- <u>37.3</u>	<u>-0.4</u>	36.9	<u>-0.1</u>	36.8	9.9832515
I-3	01.5	-1.4		-0.1		3.6959722
I-2						3.8747533
2-3						3.4136308
1 Coral	15-48-14.6	-0.4	14.2	-0.0	14.2	0.5648783
2 North Base	112-14-42.8	-0.4	42.4	-0.0	42.4	9.9664106
3 Runit	51-57- <u>03.8</u>	<u>-0.4</u>	03.4	<u>-0.0</u>	03.4	9.8962414
I-3	01.2	-1.2		0.0		3.9449197
I-2						3.8747505
2-3						3.9449197
1 Pinnacle	139-57-10.4	-0.3	10.1	-0.0	10.1	0.1915065
2 Coral	18-46-52.6	-0.2	52.4	-0.0	52.4	9.5077958
3 Runit	21-15- <u>57.7</u>	<u>-0.2</u>	57.5	<u>-0.0</u>	57.5	9.5595450
I-3	0.7	-0.7		0.0		3.6442220
I-2						3.6959712

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 7, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.8747533
1 Aoman	48-03-03.6	+ 0.3	03.9	- 0.0	03.9	0.1285782
2 North Base	81-28-05.5	+ 0.4	05.9	- 0.1	05.8	9.9951673
3 Coral	50-28-49.9	+ 0.4	50.3	- 0.0	50.3	9.8872850
1-3	59.0	+ 1.1		- 0.1		3.9984988
1-2						3.8906165
2-3						3.9984988
1 Engebi	44-29-58.6	+ 0.6	59.2	- 0.1	59.1	0.1543401
2 Aoman	94-05-58.5	+ 0.6	59.1	- 0.1	59.0	9.9988873
3 Coral	41-24-01.4	+ 0.5	01.9	- 0.0	01.9	9.8204108
1-3	58.5	+ 1.7		- 0.2		4.1517262
1-2						3.9732497
2-3						3.8747533
1 Engebi	27-26-14.7	+ 0.9	15.6	- 0.1	15.5	0.3365036
2 North Base	60-40-51.5	+ 0.9	52.4	- 0.1	52.3	9.9404709
3 Coral	91-52-51.3	+ 1.0	52.3	- 0.1	52.2	9.9997659
1-3	57.5	+ 2.8		- 0.3		4.1517278
1-2						4.2110228
2-3						4.2110228
1 Aoman	142-09-02.1	+ 0.1	02.2	- 0.1	02.1	0.2121229
2 North Base	20-47-14.0	± 0.0	14.0	- 0.0	14.0	9.5501041
3 Engebi	17-03-43.9	± 0.0	43.9	- 0.0	43.9	9.4674744
1-3	00.0	+ 0.1		- 0.1		3.9732498
1-2						3.8906201

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 7, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.1517262
1 Boga	48-56-03.7	-0.2	03.5	-0.1	03.4	0.1226537
2 Engebi	97-37-22.0	-0.2	21.8	-0.2	21.6	9.9961452
3 Coral	33-26-35.3	-0.2	35.1	-0.1	35.0	9.7412367
1-3	01.0	-0.6		-0.4		4.2705251
1-2						4.0156166
2-3						4.1517262
1 Teiteir	45-29-31.6	+0.7	32.3	-0.0	32.3	0.1468152
2 Engebi	120-21-30.3	+0.9	31.2	-0.1	31.1	9.9359497
3 Coral	14-08-55.9	+0.8	56.7	-0.1	56.6	9.3881817
1-3	57.8	+2.4		-0.2		4.2344911
1-2						3.6867231
2-3						4.2344911
1 Boga	66-38-35.3	-0.6	34.7	-0.1	34.6	0.0371327
2 Teiteir	94-03-47.5	-0.7	46.8	-0.1	46.7	9.9989072
3 Coral	19-17-39.4	-0.6	38.8	-0.1	38.7	9.5190623
1-3	02.2	-1.9		-0.3		4.2705310
1-2						3.7906861
2-3						4.0156166
1 Teiteir	139-33-19.1	+0.4	19.5	0.0	19.5	0.1879479
2 Engebi	22-44-08.3	+0.3	08.6	0.0	08.6	9.5871283
3 Boga	17-42-31.6	+0.3	31.9	0.0	31.9	9.4831312
1-3	59.0	+1.0		0.0		3.7906928
1-2						3.6866957

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 8, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.8747533
1 Sand	38-53-14.2	+ 0.8	15.0	- 0.0	15.0	0.2021834
2 Coral	34-01-32.5	+ 0.8	33.3	- 0.0	33.3	9.7478528
3 North Base	107-05-10.9	+ 0.9	11.8	- 0.1	11.7	9.9803951
1-3	57.6	+ 2.5		- 0.1		3.8247895
1-2						4.0573318
2-3						4.0573318
1 Parry	39-44-35.3	- 0.6	34.7	- 0.1	34.6	0.1942652
2 Coral	35-01-13.8	- 0.6	13.2	- 0.1	13.1	9.7588110
3 Sand	105-14-13.1	- 0.7	12.4	- 0.1	12.3	9.9844590
1-3	02.2	- 1.9		- 0.3		4.0104080
1-2						4.2360560
2-3						3.8747533
1 Parry	25-42-13.5	+ 0.1	13.6	- 0.1	13.5	0.3627925
2 Coral	69-02-46.3	+ 0.1	46.4	- 0.1	46.3	9.9702860
3 North Base	85-15-00.3	+ 0.0	00.3	- 0.1	00.2	9.9985058
1-3	00.1	+ 0.2		- 0.3		4.2078318
1-2						4.2360516
2-3						4.2078318
1 Sand	144-07-27.3	+ 0.2	27.5	- 0.1	27.4	0.2320808
2 Parry	14-02-21.8	+ 0.1	21.9	- 0.0	21.9	9.3848717
3 North Base	21-50-10.6	+ 0.1	10.7	- 0.0	10.7	9.5704917
1-3	59.7	+ 0.4		- 0.1		3.8247843
1-2						4.0104043

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 10, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM	
2-3						3.9984988	
1 <i>Bokon</i>	62-59-24.7	+ 0.2	24.9	- 0.0	24.9	0.0501568	<i>Bokon</i>
2 <i>Aoman</i>	86-53-44.1	+ 0.3	44.4	- 0.1	44.3	9.9993622	
3 <i>Coral</i>	30-06- <u>50.7</u>	+ <u>0.1</u>	50.8	- <u>0.0</u>	50.8	9.7004647	
1-3	<u>59.5</u>	+ 0.6		- 0.1		4.0480178	
1-2						3.7491203	
2-3						3.8747533	
1 <i>Piiraa</i>	66-55-40.3	+ 0.2	40.5	- 0.0	40.5	0.0362062	<i>Piiraa</i>
2 <i>North Base</i>	79-53-48.5	+ 0.3	48.8	- 0.1	48.7	9.9932129	
3 <i>Coral</i>	33-10- <u>30.7</u>	+ <u>0.1</u>	30.8	- <u>0.0</u>	30.8	9.7381472	
1-3	<u>59.5</u>	+ 0.6		- 0.1		3.9041724	
1-2						3.6491067	
2-3						3.6442259	
1 <i>Islet</i>	48-33-58.9	0.0	58.9	0.0	58.9	0.1250993	<i>Islet</i>
2 <i>Pinnacle</i>	33-17-04.5	0.0	04.5	0.0	04.5	9.7394124	
3 <i>Runit</i>	98-08- <u>56.6</u>	<u>0.0</u>	56.6	<u>0.0</u>	56.6	9.9955925	
1-3	<u>00.0</u>	<u>0.0</u>		<u>0.0</u>		3.5087376	
1-2						3.7649177	
2-3						4.2360559	
1 <i>Aniyaanii</i>	101-54-26.6	- 0.0	26.6	- 0.1	26.5	0.0094470	<i>Aniyaanii</i>
2 <i>Parry</i>	54-56-34.4	- 0.0	34.4	- 0.1	34.3	9.9130610	
3 <i>Coral</i>	23-08- <u>59.2</u>	- <u>0.0</u>	59.2	- <u>0.0</u>	59.2	9.5945430	
1-3	<u>00.2</u>	- 0.0		- 0.2		4.1585639	
1-2						3.8400459	

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 11, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3				0.1		4.2360560
1 Eniwetok	47-43-42.2	+ 0.6	42.8	- 0.1	42.7	0.1307881
2 Coral	14-59-39.5	+ 0.4	39.4	- 0.0	39.9	9.4128382
3 Parry	117-16-37.4	+ 0.1	37.5	- 0.1	37.4	9.9488044
1-3	59.1	+ 1.2		- 2.0		3.7796823
1-2						4.3156485
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						

Eniwetok

COMPUTATION OF TRIANGLES

COMPUTED BY L. S. H.CHECKED BY L. M. P.DATE March 11, 1950

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.9732498
1 Photo	46-12-03.1	- 0.9	02.2	- 0.1	02.1	0.1416029
2 Engebi	61-31-01.2	+ 0.1	01.3	- 0.1	01.2	9.9439685
3 Aoman	72-16-55.7	+ 1.1	56.8	- 0.1	56.7	9.9788961
1-3	00.0	+ 0.3		- 0.3		4.0588211
1-2						4.0937487
2-3						4.0156166
1 Photo	43-39-32.7	+ 1.1	33.8	- 0.1	33.7	0.1609184
2 Boga	55-44-07.7	- 0.9	06.8	- 0.1	06.7	9.9172136
3 Engebi	80-36-19.6	+ 0.1	19.7	- 0.1	19.6	9.9941357
1-3	00.0	+ 0.3		- 0.3		4.0937486
1-2						4.1706707
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						

Photo

Photo

TRIANGLE SIDE CHECKS

		<u>a</u>	<u>b</u>
Quad. A	Coral-North Base	0.0000028	0.0000298
	Coral-Pinnacle	0.0000010	0.0000298
	Pinnacle - Runit	0.0000039	0.0000298
Quad. B	Aoman - Engebi	0.0000001	0.0000242
	Aoman - North Base	0.0000036	0.0000274
	Engebi - Coral	0.0000014	0.0000162
Quad. C	Boga - Coral	0.0000060	0.0000162
	Boga - Teiteir	0.0000067	0.0000240
	Teiteir - Engebi	0.0000274	0.0000334
Quad. D	Sand - North Base	0.0000052	0.0000337
	Sand - Parry	0.0000037	0.0000210
	Parry - Coral	0.0000044	0.0000175

a = Actual difference in logarithms of length of a side.

b = Allowable maximum - four times the tabular difference corresponding to one second in the logarithm of the Sine of the smallest angle entering into the computation of that side.

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GEOGRAPHIC POSITION COMPUTATIONS

FIRST ANGLE OF TRIANGLE

FIRST ANGLE OF TRIANGLE									
	°	'	"	°	'	"	°	'	"
2 Runit	90	50	32.7	162	22	01.621	11	32	16.080
3d L	+51	57	03.4	$\Delta\lambda$	-	51.728	33	23.267	North Base
2 Runit	142	47	36.1	λ'	162	21	09.893		
$\Delta\alpha$	-	10.4							
North Base to E Runit	180	00	00.0						
	322	47	25.7						
2 Runit	90	50	32.7	162	22	01.621	11	32	16.080
3d L	+51	57	03.4	$\Delta\lambda$	-	51.728	33	23.267	North Base
2 Runit	142	47	36.1	λ'	162	21	09.893		
$\Delta\alpha$	-	10.4							
North Base to E Runit	180	00	00.0						
	322	47	25.7						

HOLMES & NARVER ENGINEERS JOB N2 640

POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 North Base to 3 Runit	322	47	25.7	α	3 Runit	to 2 North Base	142	47	36.1
$\Delta\alpha$		+ 72	38	25.7	$\Delta\alpha$		8	- 73	13	01.3
α	North Base to 1 Pinnacle	35	25	51.4	α	3 Runit	to 1 Pinnacle	69	34	34.8
$\Delta\alpha$			-	16.9	$\Delta\alpha$				-	27.3
α'	Pinnacle to 2 North Base	180	00	00.0	α'	1 Pinnacle	to 3 Runit	180	00	00.0
α'	Pinnacle to 2 North Base	215	25	34.5	α'	1 Pinnacle	to 3 Runit	249	34	07.5
FIRST ANGLE OF TRIANGLE 34 - 08 - 33.0										
ϕ	11 33 23.267 2 North Base	λ	162	21	09.893	ϕ	11 32 16.080 3 Runit	λ	162	22 01.621
$\Delta\phi$	- 1 57.257	$\Delta\lambda$		- 1	24.586	$\Delta\phi$	- 0 50.070	$\Delta\lambda$		- 2 16.314
ϕ'	11 31 26.010 1 Pinnacle	λ'	162	19	45.307	ϕ'	11 31 26.010 Pinnacle	λ'	162	19 45.307
Logarithms Values in seconds										
s	3.6455679	$\frac{1}{2}(\phi+\phi')$	11 - 32	- 29.638	s	3.6442259				
$\cos \alpha$	9.9110599	Logarithms		Values in seconds	$\cos \alpha$	9.5427746				
b	8.5124992	s	3.6455679		b	8.5124998				
h	2.0691270	$\sin \alpha$	9.7632192		h	1.6995003	1st term	+ 50.0611		
s^2	7.29114	A'	8.5096676		s^2	7.28845				
$\sin^2 \alpha$	9.52644	$\sec \phi'$	0.0088442		$\sin^2 \alpha$	9.94361				
C	0.71736	$\Delta \lambda$	1.9272989	- 84.586	C	0.71664				
n^2	7.53494	$\sin^2(\phi+\phi')$	9.3005820		n^2	7.94860	2d term	+ .0089		
D	4.1382	$-\Delta \alpha$	1.2278809	+ 16.900	D	3.3990				
	1.9847					1.9845				
	6.1229	3d term	+ .0001			5.3835	3d term	+ .0000		
		$-\Delta \phi$	+ 117.2573				$-\Delta \phi$	+ 50.0700		
Logarithms Values in seconds										
$\frac{1}{2}(\phi+\phi')$	11 - 31 - 51.045									
$\log \sin \alpha$	9.9718035									
A'	8.5096678									
$\sec \alpha$	0.0088442									
$\Delta \lambda$	2.1345414	- 136.314								
$\sin(\phi+\phi')$	9.3008029									
$-\Delta \alpha$	1.4353443	+ 27.258								

HOLMES & NARVER ENGINEERS JOB NO 640

POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 North Base to 3 Pinnacle	35	25	51.4	α	3 Pinnacle to 2 North Base	215	25	34.5
β	8	+ 39	36	16.5	β	8	-105	49	36.9
γ	2 North Base to 1 Coral	75	02	07.9	γ	3 Pinnacle to 1 Coral	109	36	57.6
δ			-	47.8	δ			-	30.8
ϵ	1 Coral to 2 North Base	180	00	00.0	ϵ	1 Coral to 3 Pinnacle	180	00	00.0
ζ		255	01	20.1	ζ		289	36	26.8

FIRST ANGLE OF TRIANGLE 34 - 35 - 06.7

ϕ	11	33	23.267	2 North Base	λ	162	21	09.893	ϕ	11	31	26.010	3 Pinnacle	λ	162	19	45.307
$\Delta\phi$	- 1	03.013			$\Delta\lambda$	- 3	58.949	$\Delta\phi$				+ 54.244		$\Delta\lambda$	- 2	34.363	
ϕ'	11	32	20.254	1 Coral	λ'	162	17	10.944	ϕ'	11	32	20.254	1 Coral	λ'	162	17	10.944
VALUES IN SECONDS																	
s	3.8747533				s	3.8747533			s	3.6959722				s	3.6959722		
$\cos\alpha$	9.9419899				$\cos\alpha$	9.9850158			$\cos\alpha$	9.5259702				$\sin\alpha$	9.9740342		
B	8.5124996				B	8.5096676			B	8.5125006				A'	8.5096679		
h	1.7992428				h	1.7344430			h	1.7344430				$\sec\phi'$	0.0088685		
s^2	7.74951				s^2	7.39194			s^2	7.39194				$\Delta\lambda$	2.1885428	-154.363	
$\sin^2\alpha$	9.97003				$\sin^2\alpha$	9.94807			$\sin^2\alpha$	9.94807				$\sin^2(\phi+\phi')$	9.3005148		
C	0.71736				C	0.71610			C	0.71610				$-\Delta\alpha$	1.4890576	+30.765	
n^2	8.43690				n^2	8.05611			n^2	8.05611				$2d\text{ term}$	+ .0114		
D	3.5985				D	3.4689			D	3.4689				$3d\text{ term}$	+ .0000		
	5.5836					5.4528				5.4528				$-\Delta\phi$	-54.2441		

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 North Base to 3 Coral	75	02	07.9	α	3 Coral	to 2 North Base	255	01	20.1
2α	8	+ 81	28	05.9	3α		8	- 50	28	50.3
α	2 North Base to 1 Aoman	156	30	13.8	α	3 Coral	to 1 Aoman	204	32	29.8
$\Delta\alpha$			-	20.6	$\Delta\alpha$				+	27.4
		180	00	00.0				180	00	00.0
α'	1 Aoman to 2 North Base	336	29	53.8	α'	Aoman	to 3 Coral	24	32	57.2

FIRST ANGLE OF TRIANGLE 48-03-03.9

ϕ	11	33	23.267	2 North Base	λ	162	21	09.893	ϕ	11	32	20.254	3 Coral	λ	162	17	10.944	
$\Delta\phi$		+ 3	52.015		$\Delta\lambda$		- 1	42.309	$\Delta\phi$		+ 4	55.028		$\Delta\lambda$		+ 2	16.641	
ϕ'	11	37	15.282	1 Aoman	λ'	162	19	27.584	ϕ'	11	37	15.282	1 Aoman	λ'	162	19	27.584	
	Logarithms			Values in seconds		Logarithms			Values in seconds		Logarithms			Values in seconds		Logarithms		
s	3.8906165				$\frac{1}{2}(\phi + \phi')$	11 - 35 - 19.275				3.9984988				$\frac{1}{2}(\phi + \phi')$	11 - 34 - 47.768			
$\cos \alpha$	9.9624104				Logarithms	Values in seconds				9.9588790				Logarithms	Values in seconds			
B	8.5124992				s	3.8906165				8.5124997				s	3.9984988			
h	2.3655261				$\sin \alpha$	9.6006329				2.4698775				$\sin \alpha$	9.6184184			
g^2	7.78123				A'	8.5096676				7.99700				A'	8.5096678			
$\sin^2 \alpha$	9.20127				$\sec \phi'$	0.0089948				9.23684				$\sec \phi'$	0.0089948			
C	0.71736				$\Delta \lambda$	2.0099118				0.71669				$\Delta \lambda$	2.1355798 + 136.6409			
	7.69986				2d term	+ .0050				7.95053				2d term	+ .0089			
n^2	4.7311				$\sin^2(\phi + \phi')$	9.3029465				4.9398				$\sin^2(\phi + \phi')$	9.3026229			
C	1.9851				$-\Delta \alpha$	1.3128583 + 20.552				1.9845				$-\Delta \alpha$	1.4382027 - 27.429			
	6.7162				3d term	+ .0005				6.9243				3d term	+ .0008			
					$-\Delta \phi$	-232.0149								$-\Delta \phi$	-295.0280			

HOLMES & NARVER ENGINEERS JOB N2 640

POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 Aoman	to 3 Coral	24 32 57.2	α	3 Coral	to 2 Aoman	204 32 29.8
$\Delta\alpha$			+ 94 05 59.1	$\Delta\alpha$			- 41 24 01.9
α	Aoman	to 1 Engebi	118 38 56.3	α	3 Coral	to 1 Engebi	163 08 27.9
$\Delta\alpha$			- 55.0	$\Delta\alpha$			- 27.3
α'	1 Engebi	to 2 Aoman	180 00 00.0	α'	1 Engebi	to 3 Coral	180 00 00.0
α'	1 Engebi	to 2 Aoman	298 38 01.3	α'	1 Engebi	to 3 Coral	343 08 00.5

FIRST ANGLE OF TRIANGLE 44 - 29 - 59.2

ϕ	11 37 15.282	Aoman	λ	162 19 27.584	ϕ	11 32 20.254	3 Coral	λ	162 17 10.944
$\Delta\phi$	+ 2 26.682		$\Delta\lambda$	- 4 32.432	$\Delta\phi$	+ 7 21.710		$\Delta\lambda$	- 2 15.792
ϕ'	11 39 41.964	Engebi	λ'	162 14 55.152	ϕ'	11 39 41.964	Engebi	λ'	162 14 55.152
s	3.9732497	Logarithms	$\frac{1}{2}(\phi + \phi')$	11 - 38 - 28.623	s	4.1517262	Logarithms	$\frac{1}{2}(\lambda + \lambda')$	11 - 36 - 01.109
$\cos \alpha$	9.6807361	Values in seconds	$\cos \alpha$	9.9809219	$\cos \alpha$	9.9809219	Values in seconds	$\cos \alpha$	9.9809219
B	8.5124972		B	8.5124997	B	8.5124997		B	8.5124997
h	2.1664830		h	2.6451478	h	2.6451478		h	2.6451478
s^2	7.94650		s^2	8.30345	s^2	8.30345		s^2	8.30345
$\sin^2 \alpha$	9.88657		$\sin^2 \alpha$	8.92484	$\sin^2 \alpha$	8.92484		$\sin^2 \alpha$	8.92484
C	0.71984		C	0.71669	C	0.71669		C	0.71669
$\sin^2 \phi$	8.55291		$\sin^2 \phi$	9.3048860	$\sin^2 \phi$	9.3048860		$\sin^2 \phi$	9.3048860
h^2	4.3330		h^2	5.2903	h^2	5.2903		h^2	5.2903
D	1.9875		D	1.9845	D	1.9845		D	1.9845
$3d$	6.3205		$3d$	7.2748	$3d$	7.2748		$3d$	7.2748
$3d$	+ .0002		$3d$	+ .0019	$3d$	+ .0019		$3d$	+ .0019
$-\Delta\phi$	-146.6820		$-\Delta\phi$	-441.7100	$-\Delta\phi$	-441.7100		$-\Delta\phi$	-441.7100

✓

POSITION COMPUTATION SECOND ORDER TRIANGULATION

11

HOLMES & NARVER ENGINEERS JOB N2 640

POSITION COMPUTATION SECOND ORDER TRIANGULATION

2 Engebi	to 3 Coral	343	08	00.5	3 Coral	to 2 Engebi	163	08	27.9
		+120	21	31.2			-14	08	56.7
Engebi	to 1 Teiteir	103	29	31.7	3 Coral	to 1 Teiteir	148	59	31.2
				- 31.6					58.7
Teiteir	to 2 Engebi	180	00	00.0	Teiteir	to 3 Coral	180	00	00.0
		283	29	00.1			328	58	32.5
FIRST ANGLE OF TRIANGLE 45-29-32.3									
11 39 41.964	2 Engebi	162	14	55.152	11 32 20.254	3 Coral	162	17	10.944
+ 36.899				- 2 36.066	+ 7 58.609				
11 40 18.863	Teiteir	162	12	19.086	11 40 18.863	Teiteir	162	12	19.085
Logarithms Values in seconds									
3.6867231		Logarithms	11-40-00.414	Values in seconds	4.2344911		$\frac{1}{2}(\phi+\phi')$	11-36-19.564	Logarithms values in seconds
9.3679370					9.9330291		Sin α	9.7119402	
8.5124960					8.5124997		A'	8.5096678	
1.5671561	1st term -36.9110	Sin α	9.9878430		2.6800199	1st term -478.6520	Sec ϕ'	0.0090744	
7.37345		A'	8.5096665		8.46898		$\Delta \alpha$	2.4651735	-291.8592
9.97569		Sec ϕ'	0.0090744		9.42388		Sin $\frac{1}{2}(\phi+\phi')$	9.3035650	
0.72139		$\Delta \alpha$	2.1933070	-156.0655	0.71669		$-\Delta \alpha$	1.7687385	+58.714
8.07053	2d term + .0118	Sin $\frac{1}{2}(\phi+\phi')$	9.3058231		8.60955	2d term + .0407			
3.1343		$-\Delta \alpha$	1.4991301	+31.559	5.36600				
1.9888		D	1.9845		7.3445	3d term + .0022			
5.1231	3d term + .0000					$-\Delta \phi$			-478.6091

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 Coral	to North Base	255 01	20.1	α	3 North Base to 2 Coral	75 02	07.9
$\Delta \alpha$			+ 34 01	33.3	$\Delta \alpha$		-107 05	11.8
α	2 Coral	to Sand	289 02	53.4	α	3 North Base to 1 Sand	327 56	56.1
$\Delta \alpha$			+ 1 11.1		$\Delta \alpha$		+ 23.4	
α	1 Sand	to 2 Coral	180 00	00.0	α	1 Sand to 3 North Base	180 00	00.0
α	1 Sand	to 2 Coral	109 04	04.5	α		147 57	19.5

FIRST ANGLE OF TRIANGLE 38-53-15.0

ϕ	11 32 20.254	2 Coral	λ	162 17	10.944	ϕ	11 33 23.267	3 North Base	λ	162 21	09.893
$\Delta \phi$	- 2 01.269		$\Delta \lambda$	+ 5 55.926		$\Delta \phi$	- 3 04.282		$\Delta \lambda$	+ 1 56.977	
ϕ'	11 30 18.985	1 Sand	λ'	162 23 06.870		ϕ'	11 30 18.985	1 Sand	λ'	162 23 06.870	
Logarithms Values in seconds											
$\frac{1}{2}(\phi + \phi')$	4.0573318		$\frac{1}{2}(\phi + \phi')$	11 - 31 - 19.620		$\frac{1}{2}(\phi + \phi')$	3.8247895		$\frac{1}{2}(\phi + \phi')$	11 - 31 - 51.126	
$\cos \alpha$	9.5137013		$\cos \alpha$	9.9755442		$\cos \alpha$	9.9281783		$\cos \alpha$	9.7248287	
$\sin \alpha$	8.5124997		$\sin \alpha$	4.0573318		$\sin \alpha$	8.5124992		$\sin \alpha$	3.8247895	
Δ'	8.11466		Δ'	8.5096677		Δ'	7.64958		Δ'	8.5096676	
$\sec \alpha$	9.95109		$\sec \alpha$	0.0088155		$\sec \alpha$	9.44966		$\sec \alpha$	0.0088155	
$\Delta \lambda$	0.71669		$\Delta \lambda$	2.5513592	+355.9256	$\Delta \lambda$	0.71733		$\Delta \lambda$	2.0681013 + 116.9772	
2d term	8.78244	+ .0606	2d term	9.3004785		2d term	7.81657	+ .0066	2d term	9.3008037	
$-\Delta \phi$	4.1671		$-\Delta \phi$	1.8510377	-71.095	$-\Delta \phi$	4.5309		$-\Delta \phi$	1.3689050 -23.303	
Δ	1.9845		Δ			Δ	1.9851		Δ		
3d term	6.1516	+ .0001	3d term			3d term	6.5160	+ .0003	3d term		
$-\Delta \phi$		+121.2691	$-\Delta \phi$			$-\Delta \phi$		+184.2822	$-\Delta \phi$		

HOLMES & NARVER ENGINE

POSITION COMPUTATION SEC

α	2 Coral	103.5 and	289 02	53.4	α
$2d$		8	+ 35 01	13.2	342
α	2 Coral	101 Parry	324 04	06.6	α
$\Delta\alpha$			+ 1	06.3	$\Delta\alpha$
α'	1 Parry	102 Coral	144 05	13.0	α'

FIRST ANGLE OF TRIANGLE 39-44-34.6

ϕ	11	32	20254	2 Coral	λ	162 17	10.944	ϕ
$\Delta\phi$		- 7	33882		$\Delta\lambda$	- 5	33.350	$\Delta\phi$
ϕ'	11	24	46.372	1 Parry	λ'	162 22	44.294	ϕ'
Logarithms Values in seconds								
s	42360560				$\frac{1}{2}(\phi+\phi')$	11 - 28	33.313	s
$\cos\alpha$	99083344				Logarithms			$\cos\alpha$
B	85124997				s	42360560		B
h	26568901				$\sin\alpha$	97685032		h
s^2	847211				A'	85096677		s^2
$\sin^2\alpha$	953701				$\sec\phi'$	00086735		$\sin^2\alpha$
C	071669				$\Delta\lambda$	25229009	-333.3503	C
	872581				$\sin\frac{1}{2}(\phi+\phi')$	92987573		C
h^2	53138				$2d$ term	+ .0532		h^2
D	19845				$-\Delta\alpha$	18216582	- 66.322	D
	72983				$3d$ term	+ .0020		
					$-\Delta\phi$	+453.8819		

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

2 Coral	103 Parry	324	04	06.6	α	3 Parry	102 Coral	144	05	"
Δα	8	+ 14	59	40.0	30°	8		-117	16	13.0
2 Coral	101 Eniwetok	339	03	46.6	α	3 Parry	101 Eniwetok	26	48	37.5
Δα			+ 48.4		Δα					35.5
1 Eniwetok	102 Coral	180	00	00.0	α'			180	00	17.7
1 Eniwetok	103 Parry	159	04	35.0	α'	1 Eniwetok	103 Parry	206	48	00.0
										17.8

FIRST ANGLE OF TRIANGLE 47-43-42.8										
11	32	20254 2 Coral	162	17	10.994	φ	11	24	46.372	3 Parry
Δφ	-10	28.789	Δλ	+ 4	03.781	Δφ		- 2	54.907	
φ'	11	51.465	λ'	162	21	14.725	φ'	11	51.465	1 Eniwetok

VALUES IN SECONDS										
s	4.3156485	1/2(φ+φ')	11-27	-05.860	s	3.7796823	VALUES IN SECONDS	1/2(φ+φ')	11-23	-18.919
cos α	9.9703346	Logarithms			cos α	9.9506122	VALUES IN SECONDS	Logarithms		Values in seconds
b	8.5124997				B	8.5123035		s	3.7796823	
h	2.7984828	1st term	+628.7570		h	2.2427980		Sin α	9.6542065	
g ²	8.63130				s ²	7.55936		A'	8.5096690	
α	9.10617				Sin ² α	9.30844		Sec φ'	0.0085993	
l	0.71669				C	0.71179		Δλ	1.9521571	-89.5689
	8.45416	2d term	+ .0286			7.57959		Sin 1/2(φ+φ')	9.2954837	
	5.5970					1.6848489		-Δα	1.2476408	+17.686
	1.9845									
	7.5815	3d term	+ .0038							
		-Δφ	+628.7894							

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

2 Pinnacle	to 3 Runit	249	34	07.5	α	3 Runit	to 2 Pinnacle	69	34	34.8
	B	+ 33	17	04.5	34.2			98	08	56.6
2 Pinnacle	to 1 Islet	282	51	12.0	α	3 Runit	to 1 Islet	331	25	38.2
			+	37.4	$\Delta\alpha$				+	10.2
1 Islet	to 2 Pinnacle	180	00	00.0	α	1 Islet	to 3 Runit	180	00	00.0
		102	51	49.4	α			151	25	48.4

FIRST ANGLE OF TRIANGLE 48 - 33 - 58.9

11 31 26.010 2 Pinnacle	λ	162	19	45.307	ϕ	11 32 16.080 3 Runit	λ	162	22	01.621
$\Delta\phi$	$\Delta\lambda$		43	07.237	$\Delta\phi$		$\Delta\lambda$			
11 30 43.856 1 Islet	λ	162	22	52.844	ϕ	11 30 43.856 1 Islet	λ	162	22	52.543
Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms
3.7649177	$\frac{1}{2}(\phi + \phi')$	11 - 31 - 04.933	s	3.5087376	$\frac{1}{2}(\phi + \phi')$	11 - 31 - 29.968	s	3.5087376		
9.3472444	$\cos \alpha$	9.9889791	$\cos \alpha$	9.9435987	$\cos \alpha$	9.9435987	$\sin \alpha$	9.6796766		
8.5125002	B	8.5124998	B	8.5124998	B	8.5124998	A'	8.5096677		
1.6246623	h	1.9648361	h	1.9648361	h	1.9648361	$\sec \phi$	0.0088261		
7.52984	s^2	7.01748	s^2	7.01748	s^2	7.01748	$\Delta\lambda$	1.7069080	+ 50.9223	
9.97796	$\sin^2 \alpha$	9.35935	$\sin^2 \alpha$	9.35935	$\sin^2 \alpha$	9.35935	$\sin^2(\phi + \phi')$	9.3005854		
0.71610	$\Delta\lambda$	2.2723908	$\Delta\lambda$	2.2723908	$\Delta\lambda$	2.2723908	$-\Delta\phi$	1.0074934	- 10.174	
8.22390	2d term	+ .0167	2d term	+ .0167	2d term	+ .0167	3d term	+ .0000		
3.2493	$-\Delta\phi$	7.5727176	$-\Delta\phi$	7.5727176	$-\Delta\phi$	7.5727176	$-\Delta\phi$	- 92.2236		
1.9840										
5.2233	3d term	+ .0000	3d term	+ .0000	3d term	+ .0000				
	$-\Delta\phi$	+ 42.1536	$-\Delta\phi$	+ 42.1536	$-\Delta\phi$	+ 42.1536				

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

2 North Base to 3 Coral	75	02	07.9	3 Coral	10 2 North Base	255	01	20.1
+ 79	53	48.8			8	- 33	10	30.8
154	55	56.7		3 Coral	10 1 Piiraa	221	50	49.3
- 12.5								+ 35.4
180	00	00.0		1 Piiraa	10 3 Coral	180	00	00.0
334	55	44.2				41	51	24.7

FIRST ANGLE OF TRIANGLE 66-55-40.5

11	33	23.267	2 North Base	162	21	09.893	11	32	20.254	3 Coral	162	17	10.944
+ 2	11.412			Δ	- 1	02.341		+ 3	11.426		Δ	+ 2	56.608
11	35	34.679	1 Piiraa	162	20	07.552	11	35	34.679	1 Piiraa	162	20	07.552
Logarithms Values in seconds													
3.6491067							3.9041724						
9.9570365							9.8721147						
8.5124996							8.5124997						
2.1186428							2.2887868						
7.29821							7.80834						
9.25409							9.64844						
0.71736							0.71669						
7.26966							8.17347						
4.2373							4.5776						
1.9851							1.9845						
6.2224							6.5621						
Logarithms Values in seconds													
1st term	-131.4143						1st term	-194.4405					
2d term	+ .0019						2d term	+ .0149					
3d term	+ .0000						3d term	+ .0000					
-Δφ	-131.4124						-Δφ	-194.4256					
Logarithms Values in seconds													
1/2(φ+φ')	11-34-28.973						1/2(φ+φ')	11-33-57.467					
cos α	9.6270451						cos α	9.8242197					
sin α	8.5096676						sin α	8.5096677					
sec φ	0.0089513						sec φ	0.0089513					
Δλ	1.7947707						Δλ	2.2470111					
sin 1/2(φ+φ')	9.3024296						sin 1/2(φ+φ')	9.3021056					
-Δα	1.0972003						-Δα	1.5491168					
Logarithms Values in seconds													
1st term	+ .0000						1st term	+ .0000					
-Δφ	-131.4124						-Δφ	-194.4256					

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 Aoman	103 Coral	24	32	57.2	α	3 Coral	102 Aoman	204	32	29.8
$2^d L$			+ 86	53	44.4	$3^d L$		8	- 30	06	50.8
α	2 Aoman	101 Bokon	111	26	41.6	α	3 Coral	101 Bokon	174	25	39.0
$\Delta \alpha$				-	34.7	$\Delta \alpha$				-	07.2
α'	1 Bokon	102 Aoman	180	00	00.0				180	00	00.0
			291	26	06.9	α'	1 Bokon	103 Coral	354	25	31.8

FIRST ANGLE OF TRIANGLE 62 - 59 - 24.9

ϕ	11	37	15.282	2 Aoman	λ	162	19	27.584	ϕ	11	32	20.254	3 Coral	λ	162	17	10.944
$\Delta \phi$		+ 1	06.764		$\Delta \lambda$		- 2	52.446	$\Delta \phi$		+ 6	01.791		$\Delta \lambda$			- 35.806
ϕ'	11	38	22.046	1 Bokon	λ'	162	16	35.138	ϕ'	11	38	22.045	1 Bokon	λ'	162	16	35.138

s	3.7491203	s	4.0480178
$\cos \alpha$	9.5630135	$\cos \alpha$	9.9979427
B	8.5124992	B	8.5124997
h	1.8246330	h	2.5584602
g^2	7.49824	g^2	8.09604
$\sin^2 \alpha$	9.93768	$\sin^2 \alpha$	7.97449
C	0.71736	C	0.71669
	8.15328		6.78722
	3.6493		5.1169
	1.9851		1.9845
	5.6344		7.1014

1st term	-66.7779	1st term	-361.7930
2d term	+ .0142	2d term	+ .0006
3d term	+ .0000	3d term	+ .0013
$-\Delta \phi$	-66.7637	$-\Delta \phi$	-361.7911

$\frac{1}{2}(\phi + \phi')$	11-37-48.664	$\frac{1}{2}(\phi + \phi')$	11-35-21.150
$\sin \alpha$	9.9688423	$\sin \alpha$	8.9872425
A'	8.5096676	A'	8.5096677
$\sec \phi'$	0.0090237	$\sec \phi'$	0.0090237
$\Delta \lambda$	2.2366539	$\Delta \lambda$	1.5539517
$\sin^2(\phi + \phi')$	9.3044775	$\sin^2(\phi + \phi')$	9.3029656
$-\Delta \alpha$	1.5411314	$-\Delta \alpha$	0.8569173

Values in seconds	Values in seconds
1st term	1st term
2d term	2d term
3d term	3d term
$-\Delta \phi$	$-\Delta \phi$

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

α	2 Boga	to 3 Engebi	260	44	14.1	α	3 Engebi	to 2 Boga	80	45	22.3
$\Delta\alpha$		B	+55	44	06.8	$\Delta\alpha$		B	-80	36	19.7
α	2 Boga	to 1 Photo	316	28	20.9	α	3 Engebi	to 1 Photo	0	09	02.6
$\Delta\alpha$			+1	07.7		$\Delta\alpha$			-	00.2	
α'	1 Photo	to 2 Boga	180	00	00.0	α'	1 Photo	to 3 Engebi	180	00	00.0
α'	1 Photo	to 2 Boga	136	29	28.6	α'	1 Photo	to 3 Engebi	180	09	02.4

FIRST ANGLE OF TRIANGLE

α	11	38	47.715	2 Boga	α	11	39	41.964	3 Engebi	α	11	36	14	55.152
$\Delta\alpha$		-5	49.623		$\Delta\alpha$		-6	43.873		$\Delta\alpha$				-01.078
α'	11	32	58.098	1 Photo	α'	11	32	58.091	1 Photo	α'	11	36	14	54.074
Logarithms Values in seconds														
$\frac{1}{2}(\phi+\phi')$	4.1706707	11-35-52.903			$\frac{1}{2}(\phi+\phi')$	4.0937486	11-36-20.028			Logarithms values in seconds				
$\cos \alpha$	9.8603641	Logarithms			$\cos \alpha$	9.9999985	Logarithms			Logarithms values in seconds				
B	8.5124964	4.1706707			B	8.5124960	8.18750			Logarithms				
α	2.5435312	1st term +349.5674			α	2.6062431	1st term +403.8712			Logarithms				
α'	8.34134	8.5096666			α'	8.5096666	8.5096665			Logarithms				
$\sin \alpha$	9.67606	0.0088838			$\sin \alpha$	0.0088838	0.0088838			Logarithms				
α	0.72082	2.5272531 +336.7078			α	0.72139	0.72139			Logarithms				
α	8.73822	2d term +.0547			α	3.74900	2d term +.0000			Logarithms				
α'	5.0871	1.8305447 -67.693			α'	5.2125	5.2125			Logarithms				
α	1.9884				α	1.9888	1.9888			Logarithms				
α	7.0755	3d term +.0012			α	7.2013	3d term +.0016			Logarithms				
α		- $\Delta\phi$ +349.6233			α		- $\Delta\phi$ +403.8728			Logarithms				

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POSITION COMPUTATION SECOND ORDER TRIANGULATION

2 Engebi to 3 Aoman		298	38	01.3	α	3 Aoman	102 Engebi	118	38	56.3
		+ 61	31	01.3	3dL			-72	16	56.8
Engebi to 1 Photo		0	09	02.6	α	3 Aoman	101 Photo	46	21	59.5
				- 0.2	Δα					- 54.9
Photo to 3 Aoman		180	00	00.0				180	00	00.0
Photo to 1 Engebi		180	09	02.4	α'	1 Photo	103 Aoman	226	21	04.6

FIRST ANGLE OF TRIANGLE											
11	39	41.964	2 Engebi	162	14	55.152	φ	11	37	15.282	3 Aoman
Δφ		-6	43.873	Δλ		-01.077	Δφ	-4		17.191	
11	32	58.091	1 Photo	162	14	54.075	φ'	11	32	58.091	1 Photo

Logarithms				Values in seconds				Logarithms			
4.0937487				11 - 36 - 20.028				4.0588211			
9.9999985				Logarithms				9.8388758			
8.5124960				4.0937487				8.5124972			
2.6062432				7.4200540				2.4101941			
8.18750				8.5096665				8.11764			
4.84011				0.0088838				9.71920			
0.72139				0.0323580				0.71984			
3.74900				9.3035698				8.55668			
5.2125				9.3359278				4.8204			
1.9888				+0.217				1.9875			
7.2013								6.8079			
								+0.006			
								+257.1911			

1st term +403.8715				1st term +257.1545				2nd term +.0360			
8.18750				8.5096669				9.3028172			
4.84011				0.0088838				1.7397889			
0.72139				2.4369717				+54.927			
3.74900				9.3028172							
5.2125											
1.9888											
7.2013											

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BASE LINE COMPUTATIONS

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HOLMES & NARVER ENGINEERS JOB No. 640

COMPUTATION OF RUNT ISLAND BASE LINE

COMPUTED BY L.S.H. CHECKED BY L.M.P. DATE Feb. 28, 1950

SECTION	DATE	DIR OF MEAS	TAPE NO	TAPE SUPPORT	UNCORRECTED LENGTH		TEMP	C.O.R.		RECTIONS				REDUCED LENGTH	ALLOTTED LENGTH	V. MM	H. MM
					TAPE LENGTH	METERS		TEMP	METERS	TAPE AND CATEGORY	UP BACK	INCLINATION	SEA LEVEL				
							° C	METERS	METERS	METERS	METERS	METERS	METERS	METERS			
Δ North Base																	
Stake No. 2	2-24-50	F	6464	2		18.5349	38.0	+0.0001						18.5346			
" " 3		F		2	1/2	25	34.0	+0.0002						24.9423			
" " 4		F		3	1	50	32.0	+0.0002						49.9996			
" " 5		F		3	1	50	32.0	+0.0002						49.9962			
" " 6		F		3	1	50	32.0	+0.0002						49.9999			
" " 7A		F		3	1	50	32.0	+0.0002						49.9548			
														243.4274	243.4274		
Stake No. 7A																	
" " 6	2-24-50	B		3	1	50	30.0	+0.0002						49.9980			
" " 5		B		3	1	50	32.5	+0.0002						49.9999			
" " 4		B		3	1	50	34.0	+0.0003						49.9963			
" " 3		B		3	1	50	34.0	+0.0003						49.9563			
" " 2		B		2	1/2	25	34.0	+0.0002						24.9423			
Δ North Base		B		2		18.5349	38.0	+0.0001						18.5346			
														243.4274			

COMPUTATION OF RUNT ISLAND BASE LINE

COMPUTED BY L.S.H. CHECKED BY L.M.P. DATE Feb. 24, 1950

SECTION	DATE	DIR. OF MEAS.	TAPE NO	TAPE SUPPORT	UNCONNECTED LENGTH		TEMP ° C	COR -		- RECTIONS				REDUCED LENGTH METERS	ADJUSTED LENGTH METERS	(V)	(V V)
					TAPE LENGTH	METERS		TEMP METERS	TAPE AND CATERINARY	SET-UP SET-BACK	INCLINATION	SEA LEVEL					
Stake No. 7A	2-24-50	F	6621	3	1	50	34.5	+0.0003						49.9269			
" " 8		F		3	1	50	35.5	+0.0003		-0.0734	-0.0000			49.9983			
" " 9		F		3	1	50	35.0	+0.0003		+0.0526	-0.0000			50.0529			
" " 10		F		3	1	50	36.5	+0.0003			-0.0000			50.0003			
" " 11		F		3	1	50	36.0	+0.0003		-0.0627	-0.0001			49.9375			
" " 12		F		3	1	50	36.5	+0.0003			-0.0002			50.0001			
" " 13		F		3	1	50	33.5	+0.0003			-0.0005			49.9998			
" " 14		F		3	1	50	36.0	+0.0003			-0.0001			50.0002			
" " 15		F		3	1	50	34.5	+0.0003			-0.0000			50.0003			
" " 16		F		3	1	50	34.5	+0.0003			-0.0000			50.0003			
" " 17		F		3	1	50	34.5	+0.0003			-0.0000			50.0003			
" " 18		F		3	1	50	33.0	+0.0003			-0.0014			49.9989			
" " 19		F		3	1	50	36.5	+0.0003		-0.0356	-0.0001			50.0002			
" " 20		F		3	1	50	37.5	+0.0003			-0.0001			49.9646			
														649.8803	649.8766		
Stake No. 20	2-25-50	B	6619	3	1	50	34.0	+0.0003						49.9319			
" " 19		B		3	1	50	34.0	+0.0003		-0.0683	-0.0001			50.0413			
" " 18		B		3	1	50	33.0	+0.0003		+0.0411	-0.0001			49.9989			
" " 17		B		3	1	50	33.0	+0.0003			-0.0014			50.0003			
" " 16		B		3	1	50	31.0	+0.0002			-0.0000			50.0002			
" " 15		B		3	1	50	32.0	+0.0002			-0.0001			50.0001			
" " 14		B		3	1	50	32.0	+0.0002			-0.0005			49.9997			
" " 13		B		3	1	50	33.0	+0.0003			-0.0002			50.0001			
" " 12		B		3	1	50	34.0	+0.0003		-0.0759	-0.0001			49.9243			
" " 11		B		3	1	50	34.0	+0.0003			-0.0000			50.0003			
" " 10		B		3	1	50	32.0	+0.0002			-0.0000			50.0002			
" " 9		B		3	1	50	32.0	+0.0002			-0.0020			49.9982			
" " 8		B		3	1	50	32.0	+0.0002		-0.0229	-0.0000			49.9774			
" " 7A		B		3	1	50	33.0	+0.0003						649.8729			

HOLMES & NARVER ENGINEERS JOB NO. 640

COMPUTATION OF BASE LINE

RUXTON ISLAND

COMPUTED BY L.S.H. CHECKED BY L.M.P. DATE Feb. 28, 1950

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH		TEMP. °C	COR - TAPE AND CATERMANS		SECTIONS			REDUCED LENGTH METERS	ADOPTED LENGTH METERS	(V)	
					TAPE LENGTH	METERS		TEMP. METERS	TAPE AND CATERMANS METERS	SET-UP SET-BACK METERS	INCLINATION METERS	SEA LEVEL METERS			MIN.	MM.
Stake No. 20	2-24-50	F	6619	3	1	50	380	+0.0004			-0.0030		49.9974			
" " 21		F		3	1	50	380	+0.0004			-0.0002		50.0002			
" " 22		F		3	1	50	380	+0.0004			-0.0005		49.9999			
" " 23		F		3	1	50	360	+0.0003			-0.0001		50.0002			
" " 24		F		3	1	50	350	+0.0003			-0.0010		49.9993			
" " 25		F		3	1	50	330	+0.0003			-0.0001		50.0002			
" " 26		F		3	1	50	320	+0.0002			-0.0000		50.0002			
" " 27		F		3	1	50	300	+0.0002			-0.0000		50.0002			
" " 28		F		3	1	50	305	+0.0002			-0.0023		49.9979			
" " 29		F		3	1	50	305	+0.0002			-0.0005		49.9997			
" " 30		F		3	1	50	310	+0.0002			-0.0004		49.9998			
" " 31		F		3	1	50	310	+0.0002			-0.0014		49.9988			
" " 32		F		3	1	50	320	+0.0002			-0.0001		50.0001			
" " 33		F		3	1	50	300	+0.0002		No ±	-0.0000		50.0002			
" " 34B		F		3	1	50							699.9951	699.9988		
Stake No. 34B																
" " 33	2-25-50	B	6621	3	1	50	290	+0.0002			-0.0000		50.0002			
" " 32		B		3	1	50	285	+0.0002			-0.0001		50.0001			
" " 31		B		3	1	50	290	+0.0002			-0.0014		49.9988			
" " 30		B		3	1	50	290	+0.0002			-0.0004		49.9998			
" " 29		B		3	1	50	295	+0.0002			-0.0005		49.9997			
" " 28		B		3	1	50	300	+0.0002			-0.0023		49.9979			
" " 27		B		3	1	50	300	+0.0002			-0.0000		50.0002			
" " 26		B		3	1	50	280	+0.0002			-0.0000		50.0002			
" " 25		B		3	1	50	290	+0.0002			-0.0001		50.0001			
" " 24		B		3	1	50	290	+0.0002			-0.0010		49.9992			
" " 23		B		3	1	50	300	+0.0002			-0.0001		50.0001			
" " 22		B		3	1	50	300	+0.0002			-0.0005		49.9997			
" " 21		B		3	1	50	310	+0.0002			-0.0002		50.0000			
" " 20		B		3	1	50	300	+0.0002		+0.0094	-0.0030		50.0066			
													700.0026			

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HOLMES & NARVER ENGINEERS JOB NO 640

COMPUTATION OF RUNWAY ISLAND BASE LINE

COMPUTED BY L.S.H. CHECKED BY L.M.P. DATE Feb 28, 1950

SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH		TEMP. °C	C/A -		- RECTIONS				REDUCED LENGTH METERS	ADOPTED LENGTH METERS	(V)	(S)
					TAPE LENGTH	METERS		TEMP. METERS	TAPE AND CATENARY METERS	SET-UP METERS	INCLINATION METERS	SEA LEVEL METERS					
Stake No. 34B																	
" " 35	2-25-50	F	646A	3	1	50	370	+0.0003			-0.0006			49.9997			
" " 36		F		3	1	50	390	+0.0004			-0.0022			49.9982			
" " 37		F		3	1	50	380	+0.0004			-0.0001			50.0003			
" " 38		F		3	1	50	370	+0.0003			-0.0001			50.0002			
" " 39		F		3	1	50	380	+0.0004		-0.0409	-0.0002			49.9999			
" " 40		F		3	1	50	370	+0.0003			-0.0000			50.0003			
" " 41		F		3	1	50	390	+0.0004			-0.0027			49.9977			
" " 42		F		3	1	50	380	+0.0004		+0.0353	-0.0024			50.0335			
" " 43C		F		3	1	50	390	+0.0004		-0.0062	-0.0008			49.9934			
														449.9824	449.9832		
Stake No. 43C																	
" " 42	2-25-50	B	6621	3	1	50	390	+0.0004			-0.0008			49.9996			
" " 41		B		3	1	50	380	+0.0004			-0.0024			49.9980			
" " 40		B		3	1	50	380	+0.0004			-0.0027			49.9977			
" " 39		B		3	1	50	380	+0.0004			-0.0000			50.0004			
" " 38		B		3	1	50	370	+0.0003			-0.0002			50.0001			
" " 37		B		3	1	50	380	+0.0004			-0.0001			50.0003			
" " 36		B		3	1	50	390	+0.0004		-0.0165	-0.0001			49.9838			
" " 35		B		3	1	50	390	+0.0004			-0.0022			49.9982			
" " 34B		B		3	1	50	380	+0.0004		+0.0061	-0.0006			50.0059			
														449.9840			

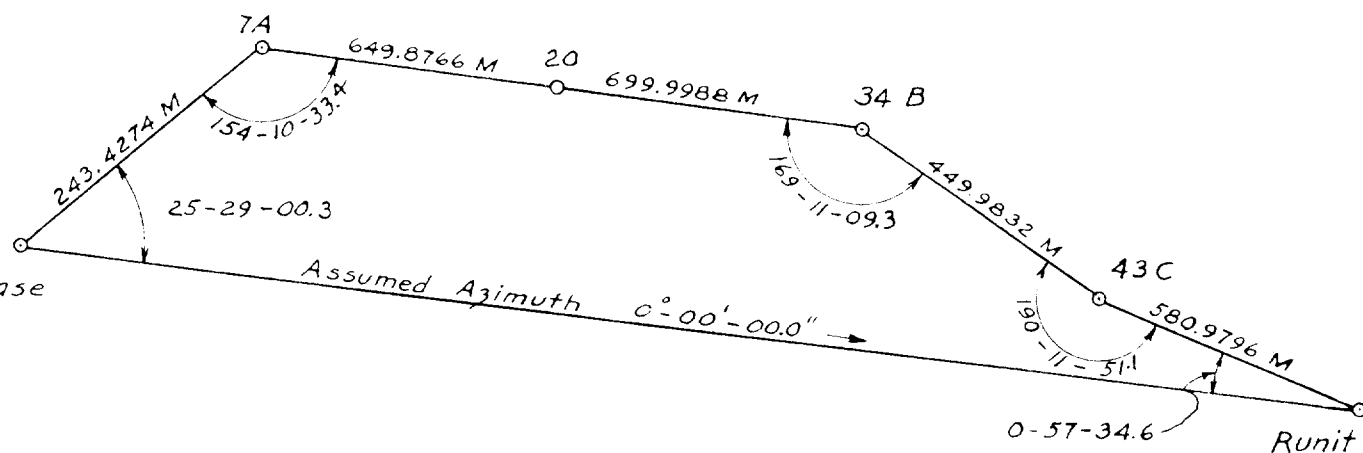
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HOLMES & NARVER ENGINEERS JOB NO. 640

COMPUTATION OF RUNIT ISLAND BASE LINE

COMPUTED BY L.S.H. CHECKED BY L.M.P. DATE Feb. 28, 1950

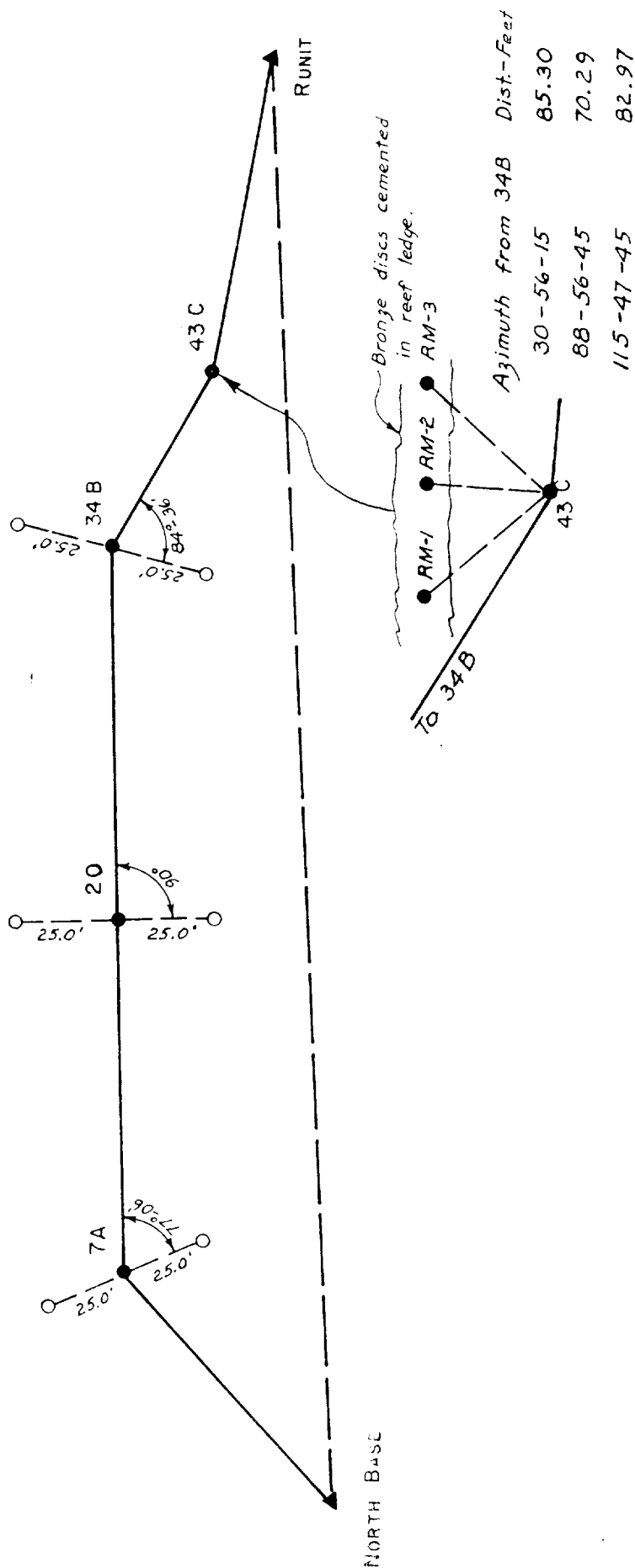
SECTION	DATE	DIR. OF MEAS.	TAPE NO.	TAPE SUPPORT	UNCORRECTED LENGTH		TEMP. °C	TEMP. CORRECTION		TAPES AND GATEWAY		SET-UP		INCLINATION		REDUCED LENGTH		ADJUSTED LENGTH		MM.	MM.
					TAPE LENGTH	METERS		METERS	°C	TAPE	METERS	SET-UP	METERS	METERS	METERS	METERS	METERS	METERS	METERS		
Stake No 43C																					
" " 44	2-25-50	F	6619	3	1	50	34.0	+0.0003				-0.0226		-0.0002		49.9775					
" " 45		F		3	1	50	34.0	+0.0003						-0.0000		50.0003					
" " 46		F		3	1	50	31.0	+0.0002				+0.0203		-0.0004		50.0201					
" " 47		F		3	1	50	36.0	+0.0003						-0.0004		49.9959					
" " 48		F		3	1	50	38.0	+0.0004						-0.0011		49.9995					
" " 49		F		3	1	50	41.0	+0.0004						-0.0061		49.9943					
" " 50		F		3	1	50	37.0	+0.0003				-0.0422		-0.0031		49.9950					
" " 51		F		3	1	50	40.0	+0.0004						-0.0033		49.9971					
" " 52		F		3	1	50	40.0	+0.0004						-0.0000		50.0004					
" " 53		F		3	1	50	34.0	+0.0003						-0.0055		49.9948					
" " 54		F		3	1	50	28.0	+0.0002				-0.0089		-0.0139		49.9863					
" " 55		F		2	1	25	29.0	+0.0002				+0.0652		-0.0006		6.0646					
Δ Runit				2												580.9769					
Δ Runit																					
Stake No 55	2-26-50	B	6621	2								+0.0652		-0.0006		6.0646					
" " 54		B		2	1	25	31.0	+0.0002				-0.0086		-0.0000		24.9916					
" " 53		B		3	1	50	30.0	+0.0002						-0.0139		49.9863					
" " 52		B		3	1	50	30.0	+0.0002						-0.0055		49.9947					
" " 51		B		3	1	50	32.0	+0.0002						-0.0000		50.0002					
" " 50		B		3	1	50	32.0	+0.0002				-0.0251		-0.0033		49.9718					
" " 49		B		3	1	50	32.0	+0.0002						-0.0031		49.9971					
" " 48		B		3	1	50	32.0	+0.0002						-0.0061		49.9941					
" " 47		B		3	1	50	32.0	+0.0002						-0.0011		49.9991					
" " 46		B		3	1	50	32.0	+0.0002						-0.0044		49.9958					
" " 45		B		3	1	50	32.0	+0.0003						-0.0004		49.9999					
" " 44		B		3	1	50	32.0	+0.0002						-0.0000		50.0002					
" " 43C		B		3	1	50	32.0	+0.0002				-0.0130		-0.0002		49.9870					
																580.9824					



North Base	25-29-00.3	-01.7	25-28-58.6
7-A	154-10-33.4	-01.7	154-10-31.7
34-B	169-11-09.3	-01.8	169-11-07.5
43-C	190-11-51.1	-01.8	190-11-49.3
Runit	0-57-34.6	-01.7	0-57-32.9
	<u>540°-00'-08.7"</u>		<u>540°-00'-00.0"</u>

N.B. - Runit	0-00-00.0		<u>2.0200827</u>	= + 104.7328
	+ <u>334-31-01.4</u>	Log Sin	25-28-58.6	9.6357132
N.B. - 7A	334-31-01.4	Log	243.4274	2.3863695
	+ <u>25-49-28.3</u>	Log Cos	25-28-58.6	<u>9.9555494</u>
7A - 34B	0-20-29.7		2.3419193	= + 219.7452
	+ <u>10-48-52.5</u>			
34B - 43C	11-09-22.2		<u>0.9056651</u>	= - 8.0476
	- <u>10-11-49.3</u>	Log Sin	0-20-29.7	7.7753714
43C - Runit	0-57-32.9	Log	1349.8754	3.1302937
		Log Cos	0-20-29.7	<u>9.9999923</u>
			3.1302860	= + 1349.8516
+ 104.7328				
- 8.0476			<u>1.9398410</u>	= - 87.0645
- 87.0645		Log Sin	11-09-22.2	9.2866447
- <u>9.7252</u>		Log	449.9832	2.6531963
$\Sigma = 0.1045$		Log Cos	11-09-22.2	<u>9.9917148</u>
			2.6449111	= + 441.4800
219.7452				
1349.8516			<u>0.9878995</u>	= - 9.7252
441.4800		Log Sin	0-57-32.9	8.2237386
<u>580.8981</u>		Log	580.9796	2.7641609
$\Sigma = 2591.9749 = \text{Log } 3.4136308$		Log Cos	0-57-32.9	<u>9.9999391</u>
			2.7641000	= + 580.8981

Length of North Base - Runit base line 2591.9749 M



RUNIT BASE LINE Reference Markers

- = Bronze discs in concrete blocks flush with surface.
 - = Bronze discs in concrete blocks 24" below surface.
- For North Base and Runit reference marks see descriptions of triangulation stations.

PROBABLE ERROR COMPUTATION

HOLMES & NARVER ENGINEERS JOB NO.640

SECTION	MEASURED DISTANCE	Discrepancy between 2 Measurements of Section		Probable Error	
		$20\sqrt{\text{dist. in Km.}}$	Allowable Maximum m	Actual Difference m	$0.6745\sqrt{\frac{\sum V^2}{n(n-1)}}$ I Section m
North Base - 7A	F 243.4274	$20\sqrt{.2434274}$	0.0098	0.0000	0.6745×0.000
	B 243.4274 0.0000				
7A - 20	F 649.8803	$20\sqrt{.6498766}$	0.0161	0.0074	0.6745×0.0037
	B 649.8729 0.0074				
20 - 34 B	F 699.9951	$20\sqrt{.6999988}$	0.0167	0.0075	0.6745×0.00375
	B 700.0026 0.0075				
34B - 43C	F 449.9824	$20\sqrt{.4499832}$	0.0134	0.0016	0.6745×0.0008
	B 449.9840 0.0016				
43C - Runit	F 580.9769	$20\sqrt{.5809796}$	0.0152	0.0055	0.6745×0.00275
	B 580.9824 0.0055				

$\sum = 0.00001637 \quad \sqrt{} = 0.00405 M$
 $\left. \begin{array}{l} 0.0001^2 \\ 0.0025^2 \\ 0.0025^2 \\ 0.0005^2 \\ 0.0019^2 \end{array} \right\}$
 F 2624.2621
 B 2624.2693
 $\frac{0.0072}{0.0072} M$
 Actual difference 0.0072 = 1:364481
 Probable error 0.00405 = 1:647967

ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS.

POINT	DISTANCE	MEAN DIFF. OF LEVEL	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	METERS	FEET	MM	METERS	METERS	
<i>North Base</i>						
2	18.5349	+ 0.44	0.4			
3	25	- 0.19	0.0			
4	50	- 0.78	0.6			
5	50	+ 2.06	4.0			
6	50	- 0.54	0.3			
7A	50	+ 1.54	<u>2.2</u>			
			$\Sigma = 7.5$			
7A						
8	50	- 0.14	0.0			
9	50	+ 1.48	2.0			
10	50	+ 0.06	0.0			
11	50	+ 0.19	0.0			
12	50	+ 0.07	0.1			
13	50	- 0.48	0.2			
14	50	+ 0.75	0.5			
15	50	+ 0.32	0.1			
16	50	- 0.10	0.0			
17	50	+ 0.24	0.0			
18	50	- 1.20	1.4			
19	50	- 0.33	0.1			
20	50	- 0.34	<u>0.1</u>			
			$\Sigma = 4.5$			

ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS.

POINT	DISTANCE	MEAN DIFF. OF ELEV.	INCLINATION CORRECTION	ELEVATION	MEAN ELEVATION	REMARKS
	METERS	METERS-Feet	MM	METERS	METERS	
20						
21	50	+ 1.81	3.0			
22	50	- 0.43	0.2			
23	50	+ 0.75	0.5			
24	50	- 0.31	0.1			
25	50	+ 1.05	1.0			
26	50	+ 0.40	0.1			
27	50	+ 0.12	0.0			
28	50	+ 0.02	0.0			
29	50	- 1.56	2.3			
30	50	- 0.75	0.5			
31	50	+ 0.66	0.4			
32	50	- 1.20	1.4			
33	50	+ 0.34	0.1			
34 B	50	- 0.17	0.0			
			$\Sigma = 9.6$			
34B						
35	50	+ 0.80	0.6			
36	50	- 1.53	2.2			
37	50	- 0.35	0.1			
38	50	- 0.32	0.1			
39	50	- 0.49	0.2			
40	50	+ 0.21	0.0			
41	50	- 1.72	2.7			
42	50	- 1.59	2.4			
43C	50	- 0.95	0.8			
			$\Sigma = 9.1$			

ABSTRACT OF WYE LEVELS AND COMPUTATION OF INCLINATION CORRECTIONS.

POINT	DISTANCE	NEARER LEVEL	INCLINATION CORRECTION	ELEVATION	WYE ELEVATION	REMARKS
	METERS	FEET	MM	FEET	METERS	
43C						
44	50	+ 0.43	0.2			
45	50	- 0.03	0.0			
46	50	+ 0.67	0.4			
47	50	+ 2.15	4.4			
48	50	+ 1.08	1.1			
49	50	- 2.56	6.1			
50	50	- 1.84	3.1			
51	50	- 1.88	3.3			
52	50	+ 0.01	0.0			
53	50	- 2.44	5.5			
54	50	+ 3.87	13.9			
55	50	+ 0.07	0.0			
Runit	6.0652	- 0.27	<u>0.6</u>			
			Σ=38.6			

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K+E

KEUFFEL & ESSER CO.

Adams and Third Streets. Hoboken, N. J.

Telephone HOBoken 3-1100 . Teletype HOB 1414

Date February 1st, 1950

REPORT ON

K. & E. TAPE NO. 7698CM - 50 Meters

Nickel Steel Tape

LOVAR (Trademark)

Serial No. 6619

The above identified tape has been compared with our standard (which corresponds to the U. S. Standards at the National Bureau of Standards at Washington, D. C.) as was found to have the following length at 20° Centigrade (68° F.) under the conditions stated below:-

Supported on a horizontal flat surface:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
11 Kg.	0-50 M.	50.000 M.

Supported at the 0, 25 and 50 M. points:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
15 Kg.	0-50 M.	50.000 M.

The coefficient of expansion of the tape is assumed to be 0.000 000 4 per degree Centigrade (0.000 000 22 per degree Fahrenheit).

KEUFFEL & ESSER CO.

By /s/ A. W. Keuffel
Vice President

awk-fp

K+E

KEUFFEL & ESSER CO.
Adams and Third Streets, Hoboken, N.J.
Telephone HOboken 3-1180, Teletype HOB 1414

Date: February 1st, 1950

REPORT ON

K. & E. TAPE NO. 7698CM - 50 Meters Nickel Steel Tape
LOVAR (Trademark)

Serial No. 6621

The above identified tape has been compared with our standard (which corresponds to the U. S. Standard at the National Bureau of Standards at Washington, D. C.) and was found to have the following length at 20° Centigrade (68° F.) under the conditions stated below:-

Supported on a horizontal flat surface:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
11-1/4 Kg.	0-50 M.	50.000 M.

Supported at the 0, 25 and 50 M. points:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
15 Kg.	0-50 M.	50.000 M.

The coefficient of expansion of the tape is assumed to be 0.000 000 4 per degree Centigrade (0.000 000 22 per degree Fahrenheit).

KEUFFEL & ESSER CO.

By /s/ A. W. Keuffel
Vice President

awk-fp

K+E

KEUFFEL & ESSER CO
 Adams and Third Streets, Hoboken, N. J.
 Telephone HOBoken 3-1100 - Teletype HOB 1414

Date Sept. 16, 1949

REPORT ON

K. & E. TAPE NO. 7698CM - 50 Meters Nickel Steel Tape
 LOVAR (Trademark)

Serial No. 6464

The above identified tape has been compared with our standard (which corresponds to the U. S. Standard at the National Bureau of Standards at Washington, D. C.) and was found to have the following length at 20° Centigrade (68° F.) under the conditions stated below:-

Supported on a horizontal flat surface:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
11-1/2 Kg.	0-50 M.	50.000 M.

Supported at the 0, 25 and 50 M points:-

<u>Tension</u>	<u>Interval</u>	<u>Length</u>
15 Kg.	0-50 M.	50.000 M

The coefficient of expansion of the tape is assumed to be 0.000 000 4 per degree Centigrade (0.000 000 22 per degree Fahrenheit).

KEUFFEL & ESSER CO.

By /s/ A. W. Keuffel
 Vice President

awk-fp

6465
6466

1 February 1950

LSH:

Pls forgive me for the lateness of this dispatch (HM,09 received 29 Jan).

PENDING RECEIPT OF NEW SURVEY TAPES FOLLOWING INFO MAY BE OF VALUE CMA
TAPES SIX FOUR SIX FIVE HAVING FIFTEEN AND ONE QUARTER KILO PULL HAS
CORRECTED VALUE OF FOUR NINE POINT NINE NINE NINE SIX ONE METERS AT ONE
FIVE KILO TENSION CMA TAPE SIX FOUR SIX SIX HAVING FIFTEEN AND ONE HALF
KILO PULL HAS CORRECTED VALUE OF FOUR NINE PNT NINE NINE NINE TWO THREE
METERS AT ONE FIVE KILO TENSION.

#6465 = 49.99961 Meters at 15 Kilos

#6466 = 49.99923 " " " "

~~Pls forgive me for the lateness of this dispatch (HM,09 received 29 Jan).
PENDING RECEIPT OF NEW SURVEY TAPES FOLLOWING INFO MAY BE OF VALUE CMA
TAPES SIX FOUR SIX FIVE HAVING 15 AND ONE QUARTER KILO PULL HAS~~

LSH:

1 February 1950

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION AOMAN LOCATION Aoman Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Coral	-	-	0-00-00.0	
R.M. No. 1	22.860	75.00	188-08-10.0	
R.M. No. 2	22.860	75.00	278-08-10.0	

ELEV. OF MARK ABOVE MLW 10.0'
 HEIGHT OF TELESCOPE ABOVE MARK 40.5'
 HEIGHT OF LIGHT ABOVE MARK 40.5'

DETAILED DESCRIPTION:

This station is located on Aoman Island approximately 200 feet west of the west end of the Aoman-Bijjiri causeway and 90 feet from the high water mark on the lagoon side. It is Traverse Station Aoman of the Joint Task Force Seven Survey and is a standard USC&GS triangulation disk set in a concrete block flush with the surface.

Reference marks are standard Holmes & Narver bronze disks in concrete blocks set flush with the surface.

This station was disturbed. See Recovery Note of June 7, 1951.

DESCRIBED BY: FPC

MARKED BY: 108
L.S. Hammond

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION BOGA LOCATION Bogallua Island
 CHIEF OF PARTY LSH Eniwetok Atoll
 DATE 1949-50 Marshall Islands

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Coral	-	-	0-00-00.0	
R.M. No. 1	59.015	193.62	94-53-50.0	
R.M. No. 2	36.576	120.00	154-54-00.0	

ELEV. OF MARK ABOVE M.L.W. 7.1'
 HEIGHT OF TELESCOPE ABOVE MARK 40.5'
 HEIGHT OF LIGHT ABOVE MARK 40.5'

DETAILED DESCRIPTION:

This station is located on Bogallua Island at the extreme east end of the island approximately 20 feet from the high water mark.

The mark is a standard Holmes & Narver bronze disk set in a concrete block flush with the surface.

The reference marks are standard Holmes & Narver bronze disks set in concrete blocks flush with the surface and are intersection points on the Bogallua topo traverse.

DESCRIBED BY **FPC**

MARKED BY

L.S. Hammond 109

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION BOKON LOCATION Bokonaarappu Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Aomon	-	-	0-00-00.0	
R.M. No. 1	15.240	50.00	207-24-12.2	
R.M. No. 2	15.240	50.00	279-24-12.2	

ELEV. OF MARK ABOVE MLW 10.4'

HEIGHT OF TELESCOPE ABOVE MARK 15.5'

HEIGHT OF LIGHT ABOVE MARK 15.5'

DETAILED DESCRIPTION:

This station is located on Bokonaarappu Island approximately 660 feet from the west end of the island and 56 feet from the high water mark on the lagoon side.

The station mark is a standard Holmes & Narver bronze disk set in a concrete block flush with the surface.

The reference marks are standard Holmes & Narver bronze disks set in concrete blocks flush with the surface.

DESCRIBED BY LEG

MARKED BY _____

R. S. Hammond 110

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION ISLET LOCATION South of Runit Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
None				

ELEV. OF MARK ABOVE MLW 8.0'
 HEIGHT OF TELESCOPE ABOVE MARK 11.5'
 HEIGHT OF LIGHT ABOVE MARK 11.5'

DETAILED DESCRIPTION:

This station is located on the first sand island south of Runit at approximately the center of the island.

The disk is a standard Holmes & Narver bronze disk set in a concrete block flush with surface.

Due to the limited area of the island no reference marks were set.

DESCRIBED BY: LEG

MARKED BY: 111

L. S. Hammer

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION NORTH BASE LOCATION Runit Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Coral	-	-	0-00-00.0	
R.M. No. 3	45.686	149.89	101-59-20.0	
R.M. No. 1	31.992	104.96	267-33-20.0	
R.M. No. 2	25.233	82.785	340-35-50.0	

ELEV. OF MARK ABOVE MLW 8.0'

HEIGHT OF TELESCOPE ABOVE MARK 40.5'

HEIGHT OF LIGHT ABOVE MARK 40.5'

DETAILED DESCRIPTION:

This station is located at the north end of Runit Island approximately 200 feet from the end of the island and 65 feet from the high water mark on the lagoon.

The marker is a standard USC&GS triangulation station disk in a concrete block. This marker has been disturbed and is not in the location recorded in the Report of the Engineer, Joint Task Force Seven.

Reference marks are standard Holmes & Narver bronze disks cemented into the surface of the reef ledge at tide range.

DESCRIBED BY: FPC

MARKED BY: _____

112
 L.S. Hammond

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION PARRY LOCATION Parry Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Coral	-	-	0-00-00.0	
R.M. No. 1	15.246	50.02	46-34-25.4	
R.M. No. 2	15.224	49.95	181-37-20.4	

ELEV. OF MARK ABOVE MLW 10.0'

HEIGHT OF TELESCOPE ABOVE MARK 24.5'

HEIGHT OF LIGHT ABOVE MARK 24.5'

DETAILED DESCRIPTION:

This station is located on Parry Island approximately 450 feet from the north end of the island. The mark is set at the intersection of the diagonals of the opposite legs of a four leg steel communication tower.

A twenty-four foot wood instrument tripod and a platform at the required height on the tower was constructed for observation.

The station is marked with a standard Holmes & Narver bronze disk in a concrete block flush with the surface.

The reference monuments are standard Holmes & Narver bronze disks in concrete blocks flush with the surface.

DESCRIBED BY: LEG

MARKED BY: _____

L.S. Hammond

113

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION PIIRAAI LOCATION Piiraa Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
N. Base	-	-	0-00-00.0	
R.M. No. 2	22.860	75.00	0-31-55.0	
R.M. No. 1	22.860	75.00	270-31-55.0	

ELEV. OF MARK ABOVE MLW 8.8'
 HEIGHT OF TELESCOPE ABOVE MARK 15.5'
 HEIGHT OF LIGHT ABOVE MARK 15.5'

DETAILED DESCRIPTION:

This station is located on Piiraa Island approximately 350 feet from the south end of the island and 75 feet from the high water mark on the lagoon side.

The station marker is a standard Holmes & Narver bronze disk set in a concrete block flush with the surface.

The reference marks are standard Holmes & Narver bronze disks set in concrete blocks flush with the surface.

DESCRIBED BY FPCMARKED BY J.S. Hammond 114

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION PINNACLE LOCATION Eniwetok Lagoon
 CHIEF OF PARTY LSH Eniwetok Atoll
 DATE 1949-50 Marshall Islands

DISTANCES AND DIRECTIONS TO REFERENCE MARKS			
OBJECT	DISTANCE		AZIMUTH
	METERS	FEET	
None			

ELEV. OF MARK ABOVE M.W. 8.0'
 HEIGHT OF TELESCOPE ABOVE MARK 5.0'
 HEIGHT OF LIGHT ABOVE MARK 5.0'

DETAILED DESCRIPTION:

This station is a prefabricated steel tripod which was set in place on a coral reef approximately 2.7 statute miles west of the south end of Runit Island. The station was occupied at low water and under favorable weather conditions.

This is not a permanent station and will be removed as it is considered a navigation hazard.

DESCRIBED BY LEG

DRAWN BY

K. S. Narver

DESCRIPTION OF TRIANGULATION STATION

NAME OF STATION TEITEIR LOCATION Teiteiripucchi Island
 CHIEF OF PARTY LSH Eniwetok Atoll
Marshall Islands
 DATE 1949-50

DISTANCES AND DIRECTIONS TO REFERENCE MARKS				
OBJECT	DISTANCE		DIRECTION	AZIMUTH
	METERS	FEET		
Coral	-	-	0-00-00.0	
R.M. No. 1	15.240	50.00	125-23-00.0	
R.M. No. 2	15.240	50.00	215-23-00.0	

ELEV. OF MARK ABOVE MLW 8.6'

HEIGHT OF TELESCOPE ABOVE MARK 40.5'

HEIGHT OF LIGHT ABOVE MARK 40.5'

DETAILED DESCRIPTION:

This station is located on Teiteiripucchi Island approximately 800 feet from the west end of the island and 120 feet from the high water mark on the lagoon side.

The mark is a standard Holmes & Narver bronze disk set in a concrete block flush with the surface.

Reference marks are standard Holmes & Narver bronze disks in concrete blocks flush with the surface.

DESCRIBED BY FPC

MARKED BY L. S. Hammond

RECOVERY NOTE TRIANGULATION STATION

Name of Station CORAL Location Eniwetok Lagoon
Eniwetok Atoll
 Established by J.T.F.-7 Year 1947-48 Marshall Islands

Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and found to be in good condition.

The station is located atop a circular concrete cell that is fifteen feet in diameter, about 2 miles east-southeast of the Reef Photo Tower, about 5 miles west of Runit Island and 0.15 mile west of buoy No. 15. The disk is a standard USC&GS station disk set in the center of the structure about 11 feet above M.L.W. stamped CORAL, and is surrounded by a sheet metal wall that projects 3 feet above the deck of the structure.

A 14 foot wooden tower was used for observations at this station.

RECOVERY NOTE TRIANGULATION STATION

Name of Station ELGIN (Engebi) Location Engebi Island
Eniwetok Atoll
Established by J.T.F.-7 Year 1947-48 Marshall Islands
Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and found to be in good condition.

The station is located on Engebi Island approximately 900 feet north of south end of island, 500 feet west of seaward side and 300 feet east of the lagoon, 130 feet south of a concrete building. The disk is a standard USC&GS station disk set in a 12 X 12 inch concrete block flush with surface and is stamped ELGIN.

This station has been re-named "ENGEBI" and is also bench mark No. 1 for this island.

RM No. 1 was set at a distance of 50.00 feet 15.240 M from the station at an azimuth of 105°-11'-10".

RM No. 2 was set at a distance of 50.00 feet 15.240 M from the station at an azimuth of 195°-11'-10".

These reference marks are standard Holmes & Narver bronze disks set in concrete blocks flush with the surface.

A 40 foot steel tower was used for observations at this point.

Name of Station	GRAFLEX	Location	Aoman Island
			Eniwetok Atoll
Established by	J.T.F.-7	Year	1947-48
			Marshall Islands
Recovered by	LSH	Year	1949-50

Detailed description as to fitness of original description:

This station has been destroyed.

RECOVERY NOTE TRIANGULATION STATION

Name of Station KODAK (Aniyaanii) Location Aniyaanii Island
Eniwetok Atoll
Established by J.T.F.-7 Year 1947-48 Marshall Islands
Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station has been recovered and found to be in good condition. The station has been renamed Aniyaanii and is located about 600 feet south of the north edge 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 east of the high water mark on the lagoon beach and 755 feet north of the northwest leg of a 75 foot steel tower. The marker is a standard USC&GS station disc set in a concrete block flush with the surface and stamped KODAK.

Reference mark No. 1 is set at a distance of 57.398 feet 17.495 M from the station at an azimuth of $214^{\circ}55'42.6''$.

Reference mark No. 2 is set at a distance of 110.819 feet 33.778 M from the station at an azimuth of $326^{\circ}01'28.6''$.

These reference marks are standard USC&GS reference discs set in a concrete block flush with the surface.

Note: This station has been reset. See Restoration Note Triangulation Station of June 7, 1951.

RECOVERY NOTE TRIANGULATION STATION

Name of Station NORTH BASE Location Runit Island
Eniwetok Atoll
Established by USN Year 1944 Marshall Islands
Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and the results of the present survey determine that the marker has been disturbed.

The marker was used in its existing position and a new description and location of reference marks are included under description of triangulation stations.

RECOVERY NOTE TRIANGULATION STATION

Name of Station PHOTO (Reef Photo Tower) Location Eniwetok Lagoon
Eniwetok Atoll
 Established by J.T.F.-7 Year 1947-48 Marshall Islands
 Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station recovered and found to be in good condition.

The station is a 4 leg 75 foot steel tower constructed atop 4 steel piles encased in concrete at tide range, located on a coral reef approximately 7 statute miles south of Engeb1 Island, 7 miles west of the north end of Runit Island and 2 miles west-northwest of station Coral.

The marker is a nail set in the wood deck at the intersection of the diagonals of the opposite legs of the tower. This wood deck is approximately 10 feet above M.L.W.

The light was mounted on a wood tripod 4.5 feet above the deck.

This station was not occupied due to excessive vibration.

RECOVERY NOTE TRIANGULATION STATION

Name of Station PRIVILEGE (Eniwetok) Location Eniwetok Island
Eniwetok Atoll
Marshall Islands
 Established by USN Year 1944
 Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and found to be in good condition. The station has been renamed ENIWETOK and is also BM No. 1 for this island.

The station is located on the north end of Eniwetok Island, 225 feet from the north end of the island, 70 feet west of the high water line on the seaward side and 90 feet east of the high water mark on the lagoon side. It is 30 feet north of a large Quonset building and is under a steel tripod which is Beacon B.

The marker is a standard USN triangulation disk set in an 8 X 8 inch concrete block flush with the surface.

Reference mark No. 1 is set at a distance of 39.12 feet 11.924 M from the station and an azimuth of $62^{\circ}-46'-17.4''$.

Reference mark number 2 is set at a distance of 39.12 feet 11.924 M from the station and an azimuth of $332^{\circ}-46'-17.4''$.

These reference marks are standard Holmes & Narver bronze disks set in concrete blocks flush with the surface.

RECOVERY NOTE TRIANGULATION STATION

Name of Station RUNIT Location Runit Island
Eniwetok Atoll
 Established by J.T.F.-7 Year 1947-48 Marshall Islands
 Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and found to be in good condition.

The station is located approximately 900 feet north of the end of the sand spit at the south end of the island, 120 feet west of the high water mark on the seaward side of the island and 70 feet east of the high water mark on the lagoon side. The disk is a standard USC&GS station disk set in a 12 X 12 inch concrete block flush with the surface and is stamped RUNIT.

Reference mark No. 1 is 41.075 feet north-northwest of the station.

Reference mark No. 2 is 48.062 feet east of the station.

These reference marks are standard USC&GS reference disks set flush with the surface.

The station mark is approximately 9 feet above M.L.W. and a 20 foot wooden tower was used for observations.

RECOVERY NOTE TRIANGULATION STATION

Name of Station SAND Location So. of Runit Island
Eniwetok Atoll
 Established by USN Year 1944 Marshall Islands
 Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station was recovered and found to be in good condition.

The station is located on the third sand island south of Runit Island, about 450 feet south of the north end of the island and 68 feet east of the high water mark on the lagoon side. The disc is a standard USN triangulation disc set in an 8 X 8 inch concrete block flush with the surface.

A 14 foot wooden tower was used for observations at this station.

As this is a remote location with limited land area no reference marks were set.

RECOVERY NOTE TRIANGULATION STATION

Name of Station STEEL Location Parry Island
Eniwetok Atoll
Established by USN Year 1944 Marshall Islands
Recovered by LSH Year 1949-50

Detailed description as to fitness of original description:

This station located on the north end of Parry Island has been destroyed.

Station PARRY of the present survey is in the approximate location of this station.

Vertical Control

As no records are available of vertical control established here by previous surveys a temporary datum is being established on each of the project islands as surveys are made. This datum may be described as follows.

"A datum approximating mean low water springs was arrived at by applying corrections from the U.S. Coast and Geodetic publication "Tide Tables of the Pacific Ocean" to a series of tidal observations. This is a temporary datum but should be significant to less than a foot".

The procedure is to erect a tide staff at a suitable location at each island and take periodical observations as surveys are made at these islands. After applying corrections a mean of these corrected observations is accepted as the temporary datum. This datum is transferred to a permanent monument in the vicinity which becomes the point of origin of all vertical control on the particular island.

At a later date when personnel are available at these locations a longer series of observations will be taken and corrections applied to the datum. It is not anticipated that any temporary datum now in use will be refined by more than a few tenths of a foot.

When datums are established at all project islands a further check can be made by taking simultaneous observations at all tide staffs to check the relation between the individual datums. Due to little knowledge of currents in the lagoon it is doubtful if any refinement of the individual datums can be made by this method.

A list of the bench marks follows:

Aaraanbiru -- To be established at later date. Δ Lucy Elev. 8.44

Aomon -- Triangulation station Aomon - Elev. 8.61

Biljiri -- Traverse station Biljiri - Elev. 7.67

Bogallua -- Triangulation station Boga - Elev. 7.14

Bokonaarappu -- Triangulation station Bokon - Elev. 10.40

Engebi -- Triangulation station Engebi (Elgin) - Elev. 10.08

Eniwetok -- Triangulation station Eniwetok - Elev. 10.34

Kirinian -- To be established at later date.

Muzinbaarikku -- To be established at later date.

Parry -- Triangulation station Parry - Elev. 9.80

Piiraa -- Triangulation station Piiraa -- Elev. 8.80

Rojoa -- To be established at later date. Existing elevations are referenced to Traverse station Biijiri.

Runit -- Traverse station Runit - Elev. 12.95

Teiteiripucchi -- Triangulation station Teiteir - Elev. 8.60

The monuments at all points listed are bronze disks set in concrete blocks flush with the surface and these locations will be shown in topographical maps of the islands involved.

EXPANSION OF HORIZONTAL CONTROL SURVEY

ENIWETOK ATOLL

MARSHALL ISLANDS

1951

The primary horizontal control network furnished the basic controls from which the relations of test structures were determined. The scheme was expanded to include the photo stations at sites M, N, P and Q; C, E and V Zero points, and the islands of Bogon and Rigili. The islands of Muzin and Aaraanbiru were located from controls established in the local Zero areas.

General Features

The specifications and criteria for second order triangulation were followed in expanding the scheme. While the strength of figure was weak in some cases, additional observations were taken which offset the weakness.

All observations were made at night, and standard procedure was attempted throughout. Weather conditions and interference from construction and scientific work in the tower areas affected the survey, but the results are considered consistent with requirements.

A quadrilateral was developed including station Bokon, thereby increasing the strength of this station over the single triangle by which it was previously located. The adjusted values vary slightly from those recorded from the previous survey.

Station Islet was also strengthened by inclusion in a quadrilateral with no change in the values previously recorded.

The location of station Rigili is to third order accuracy, which conforms with instructions regarding location of this station.

Field Computations

Computations of the expanded scheme were made at the jobsite. While adjustments to balance out observing errors were not made, the results were within scientific requirements.

Photo Tower Triangulation Report

A report was issued on May 18, 1951, including the relation of the photo tower to the Zero points. The values are listed as computed from the control network and also from check computations based on observations made at the structure sites. This report is included.

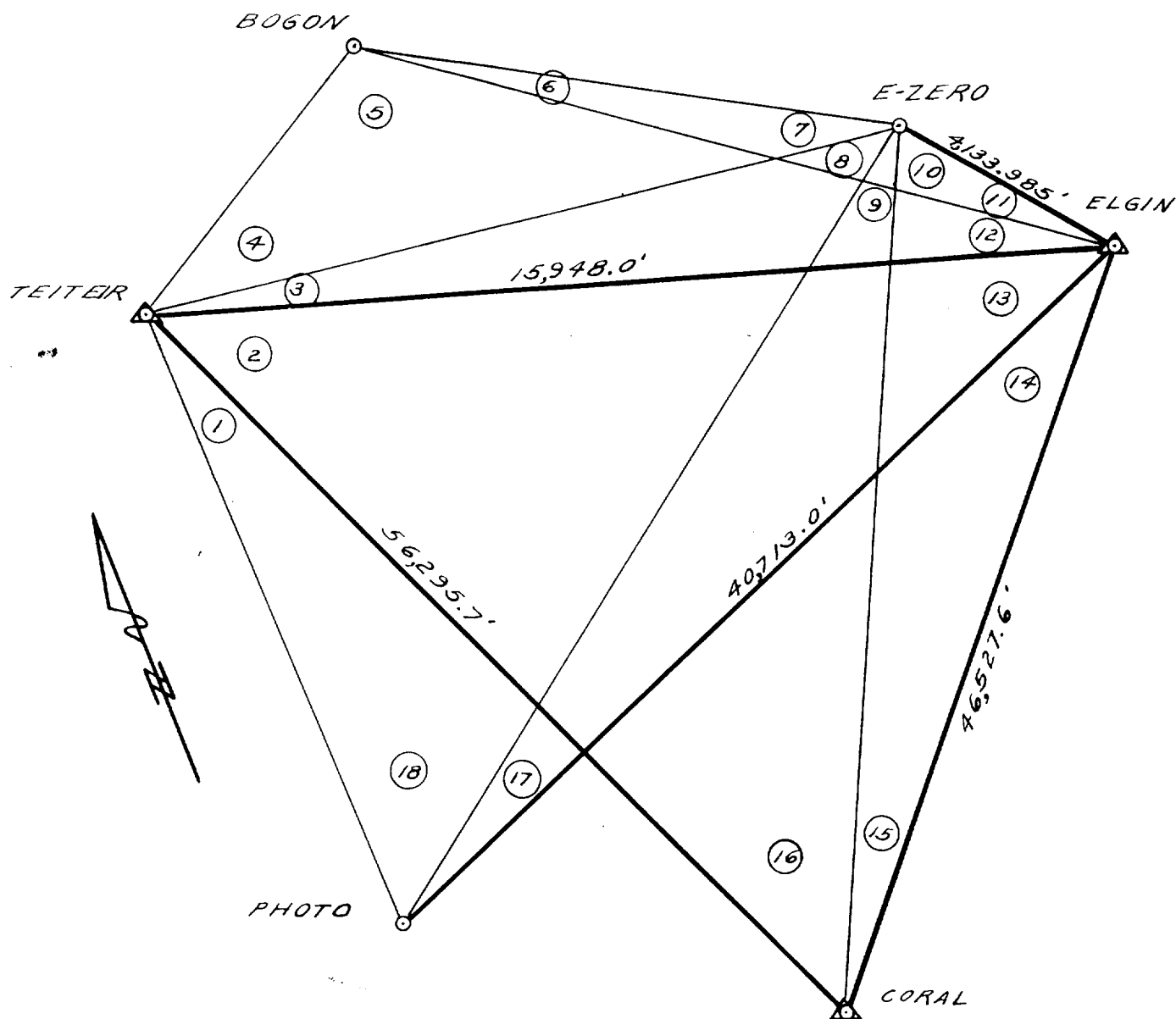
Adjusted Data

Adjusting of the expanded scheme has been completed, and the adjusted values are included in this report. The value of the length of each line is independent of the route followed in the computation.

All observations, including the check observations at the structure sites, were evaluated and used in the adjustments. While this data varies from the values given in the photo tower triangulation report, the differences are small and assure that the values given in this report are within requirements.

In the interests of economy, these computations are not included in this report. The sketches included record the adjusted values determining the inter-relation of the various stations.

The computations and field notes will be a part of the permanent survey records at the jobsite.



— PRIMARY TRIANGULATION
— SECONDARY TRIANGULATION

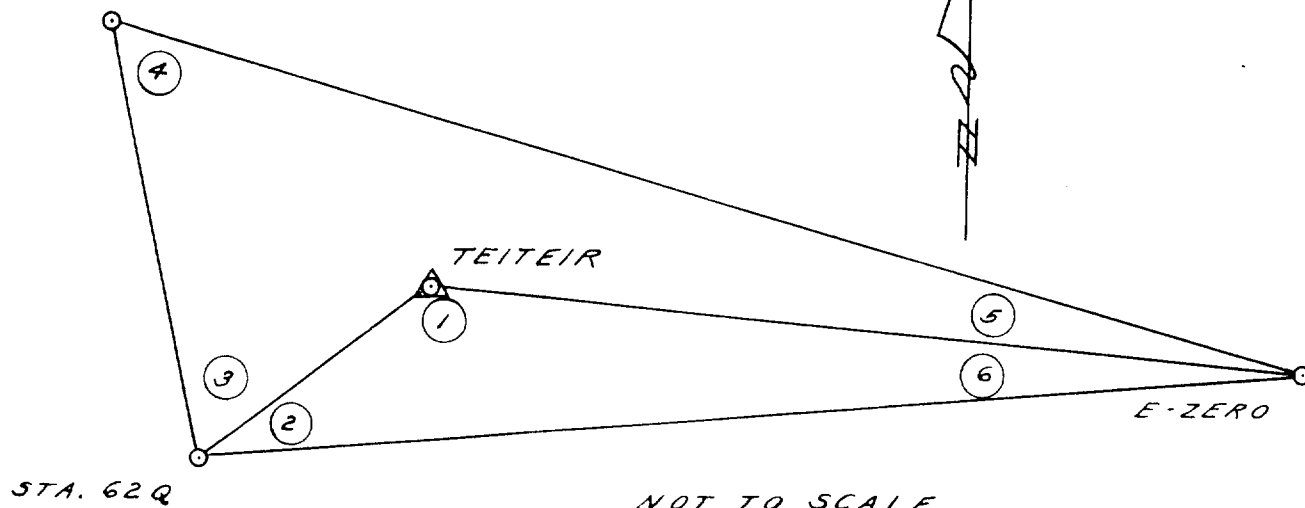
ADJUSTED ANGLES

①	11° - 53' - 57.0"	⑩	27° - 00' - 18.6"
②	45° - 29' - 32.3"	⑪	21° - 05' - 09.8"
③	9° - 34' - 12.5"	⑫	9° - 14' - 16.6"
④	15° - 27' - 04.3"	⑬	103° - 20' - 29.0"
⑤	145° - 44' - 26.6"	⑭	17° - 01' - 02.1"
⑥	10° - 22' - 23.1"	⑮	2° - 18' - 43.9"
⑦	8° - 26' - 06.0"	⑯	11° - 50' - 12.7"
⑧	97° - 41' - 52.4"	⑰	3° - 55' - 35.9"
⑨	15° - 24' - 10.1"	⑱	15° - 20' - 25.8"

ADJUSTED DISTANCES

E-ZERO - BOGON	8,260.1'
E-ZERO - TEITEIR	12,554.4'
E-ZERO - PHOTO	43,669.8'
E-ZERO - CORAL	50,172.9'
ELGIN - BOGON	11,982.3'
TEITEIR - BOGON	4,548.0'
TEITEIR - PHOTO	47,027.0'

STA. 60 Q

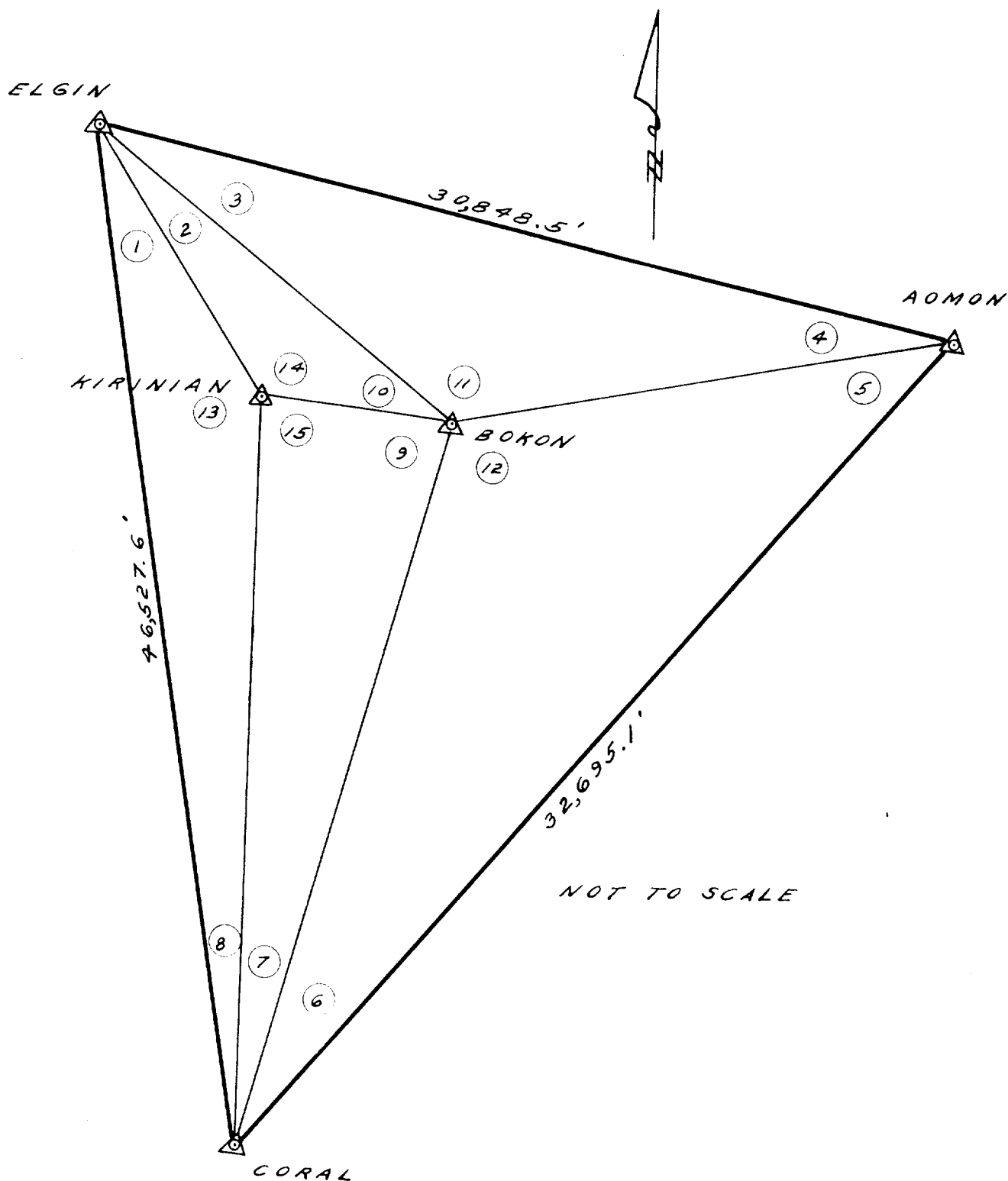


ADJUSTED ANGLES

①	$177^{\circ} - 08' - 02.5''$
②	$2^{\circ} - 49' - 17.6''$
③	$101^{\circ} - 54' - 50.0''$
④	$70^{\circ} - 18' - 23.5''$
⑤	$4^{\circ} - 54' - 49.0''$
⑥	$0^{\circ} - 02' - 39.9''$

ADJUSTED DISTANCES

TEITEIR - E-ZERO	12,554.4'
TEITEIR - 62 Q	191.62'
60 Q - 62 Q	1,170.0'
E-ZERO - 60 Q	13,092.3'
E-ZERO - 62 Q	12,745.8'



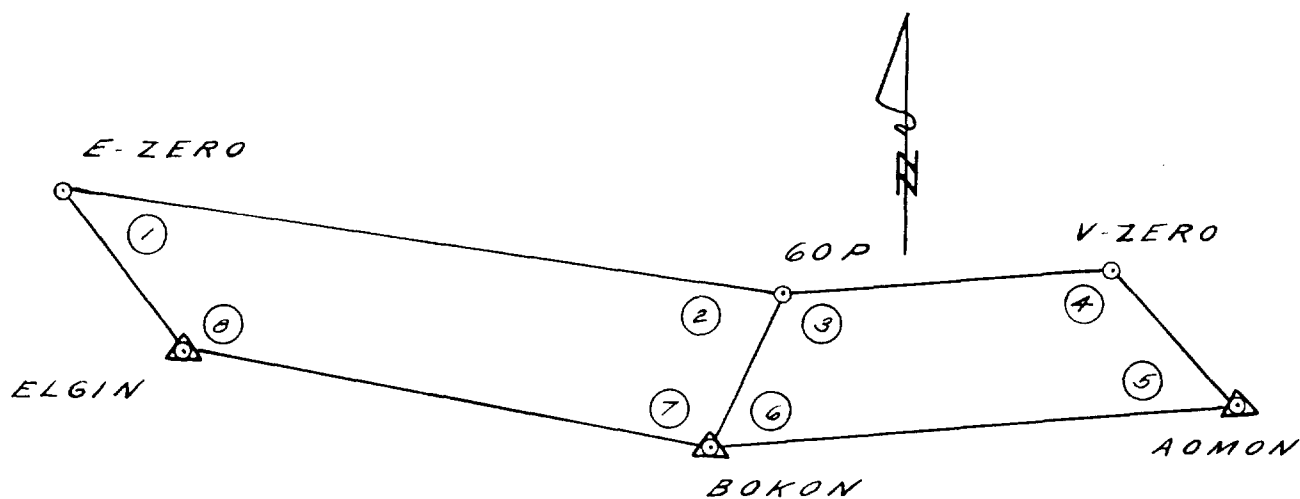
 PRIMARY TRIANGULATION
 SECONDARY TRIANGULATION

ADJUSTED ANGLES

①	24°-14'-40.9"	⑨	125°-39'-52.8"
②	9°-51'-23.2"	⑩	8°-56'-51.1"
③	10°-23'-55.0"	⑪	162°-23'-50.9"
④	7°-12'-14.1"	⑫	62°-59'-25.2"
⑤	86°-53'-44.9"	⑬	152°-12'-33.2"
⑥	30°-06'-49.9"	⑭	161°-11'-45.7"
⑦	7°-44'-26.1"	⑮	46°-35'-41.1"
⑧	3°-32'-45.9"		

ADJUSTED DISTANCES

BOKON	-	ELGIN	12,791.9'
BOKON	-	AOMON	18,412.0'
BOKON	-	CORAL	36,643.9'
BOKON	-	KIRINIAN	6,793.4'
KIRINIAN	-	CORAL	40,978.1'
KIRINIAN	-	ELGIN	6,172.3'

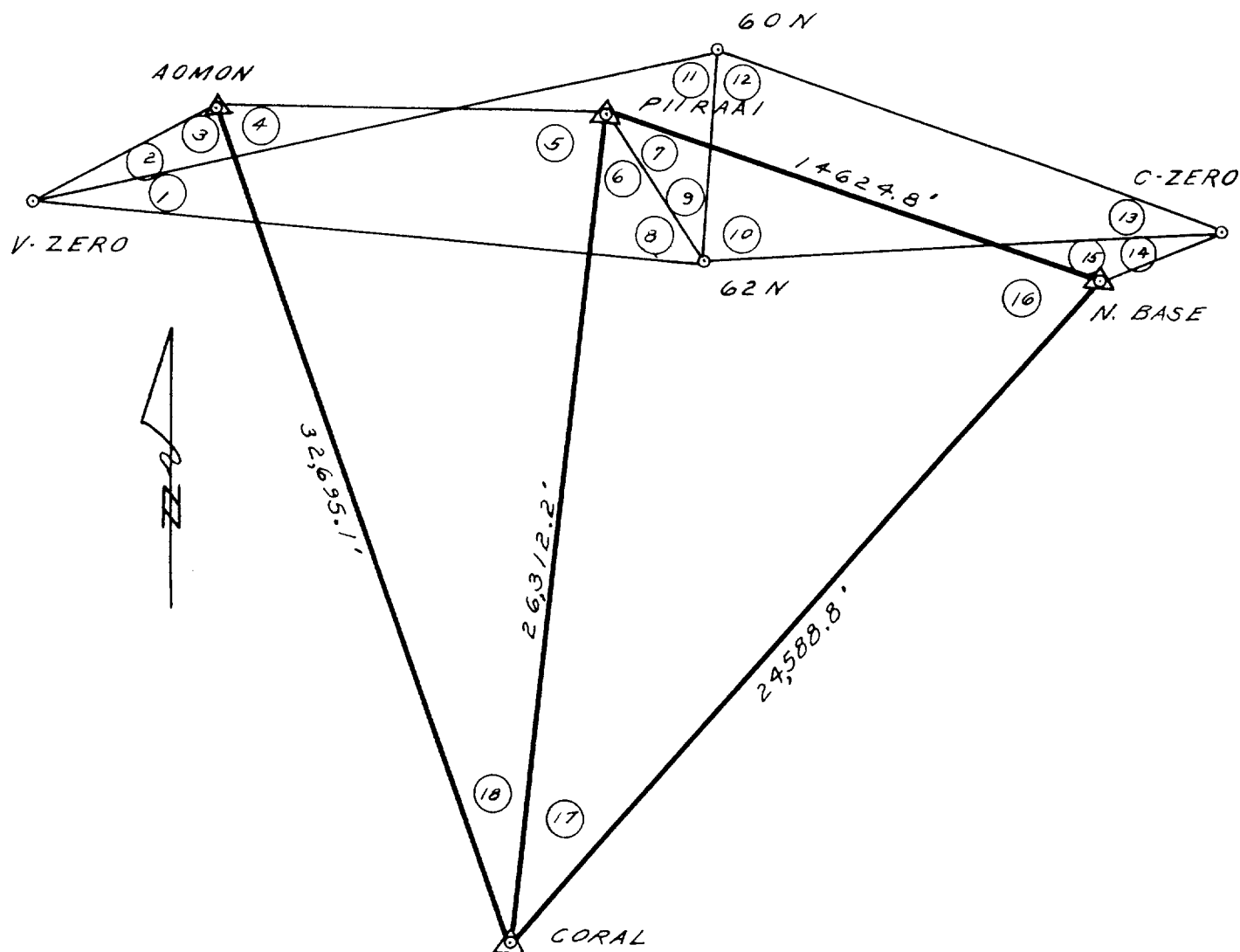


ADJUSTED ANGLES

①	4°-07'-18.6"	⑤	12°-32'-11.9"
②	84°-41'-40.0"	⑥	66°-25'-47.9"
③	116°-36'-55.9"	⑦	95°-58'-03.0"
④	164°-25'-04.3"	⑧	175°-12'-58.4"

ADJUSTED DISTANCES

60P - E-ZERO	16,928.2'
60P - V-ZERO	14,330.1'
60P - BOKON	150.0'
ELGIN - E-ZERO	4,133.985'
ELGIN - BOKON	12,791.9'
AOMON - BOKON	18,412.0'
AOMON - V-ZERO	4,140.9'



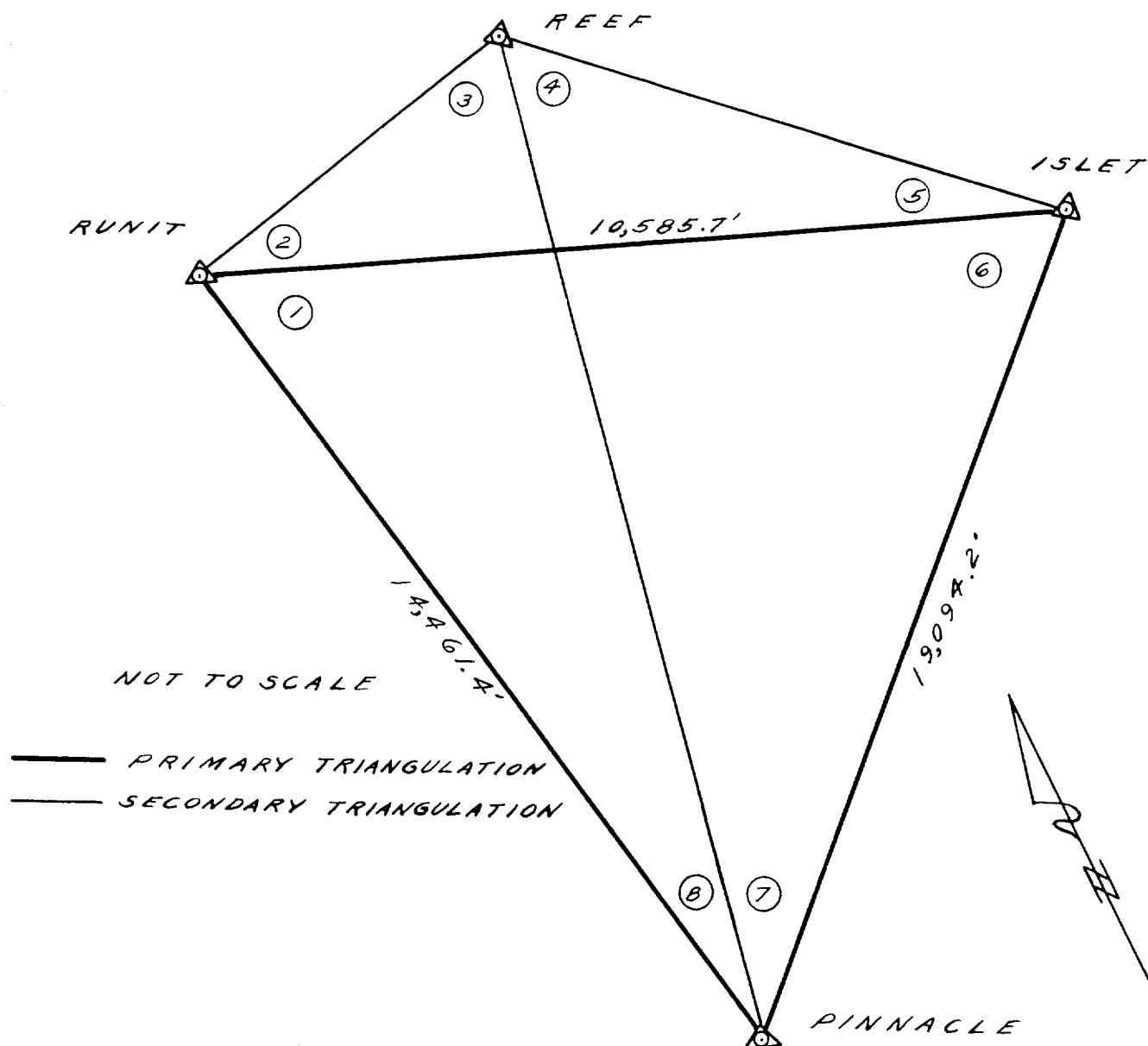
— PRIMARY TRIANGULATION
— SECONDARY TRIANGULATION

ADJUSTED ANGLES

①	4°-05'-06.5"	⑩	106°-30'-24.2"
②	21°-28'-00.5"	⑪	98°-55'-43.2"
③	99°-25'-56.8"	⑫	69°-42'-03.2"
④	45°-56'-26.9"	⑬	3°-47'-32.6"
⑤	116°-45'-13.6"	⑭	45°-41'-26.3"
⑥	38°-43'-21.4"	⑮	132°-24'-33.0"
⑦	28°-12'-19.1"	⑯	79°-53'-48.7"
⑧	33°-35'-54.3"	⑰	33°-10'-30.8"
⑨	43°-23'-16.0"	⑱	17°-18'-19.5"

ADJUSTED DISTANCES

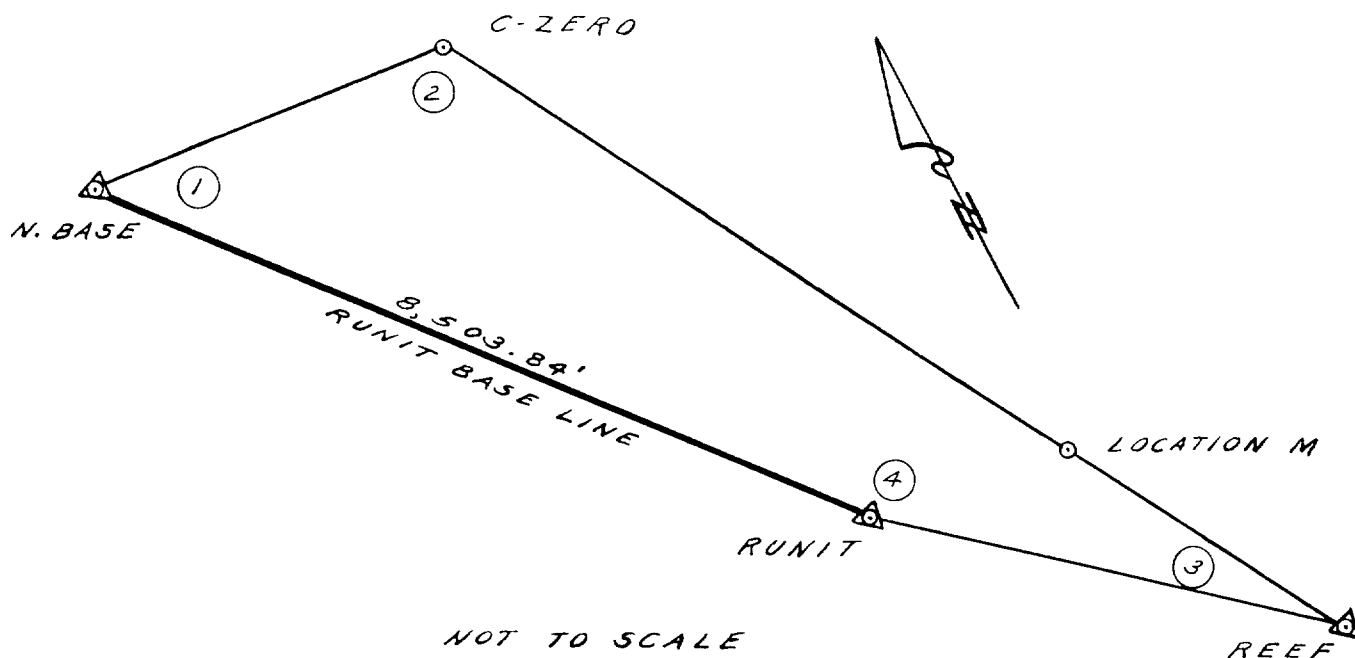
V-ZERO	- AOMON	4,140.9'
V-ZERO	- 60N	14,393.4'
V-ZERO	- 62N	14,593.9'
C-ZERO	- 60N	15,255.6'
C-ZERO	- 62N	14,923.1'
PIIRAAI	- 62N	123.28'
PIIRAAI	- AOMON	10,891.6'
60N	- 62N	1,052.4'
N. BASE	- C-ZERO	591.27'



ADJUSTED ANGLES			
①	98°-08'-56.6"	⑤	4°-22'-35.6"
②	7°-10'-07.2"	⑥	48°-33'-58.9"
③	60°-36'-29.4"	⑦	19°-12'-37.7"
④	107°-50'-47.8"	⑧	14°-04'-26.8"

ADJUSTED DISTANCES

REEF - RUNIT	4,036.2'
REEF - ISLET	6,600.3'
REEF - PINNACLE	16,008.2'



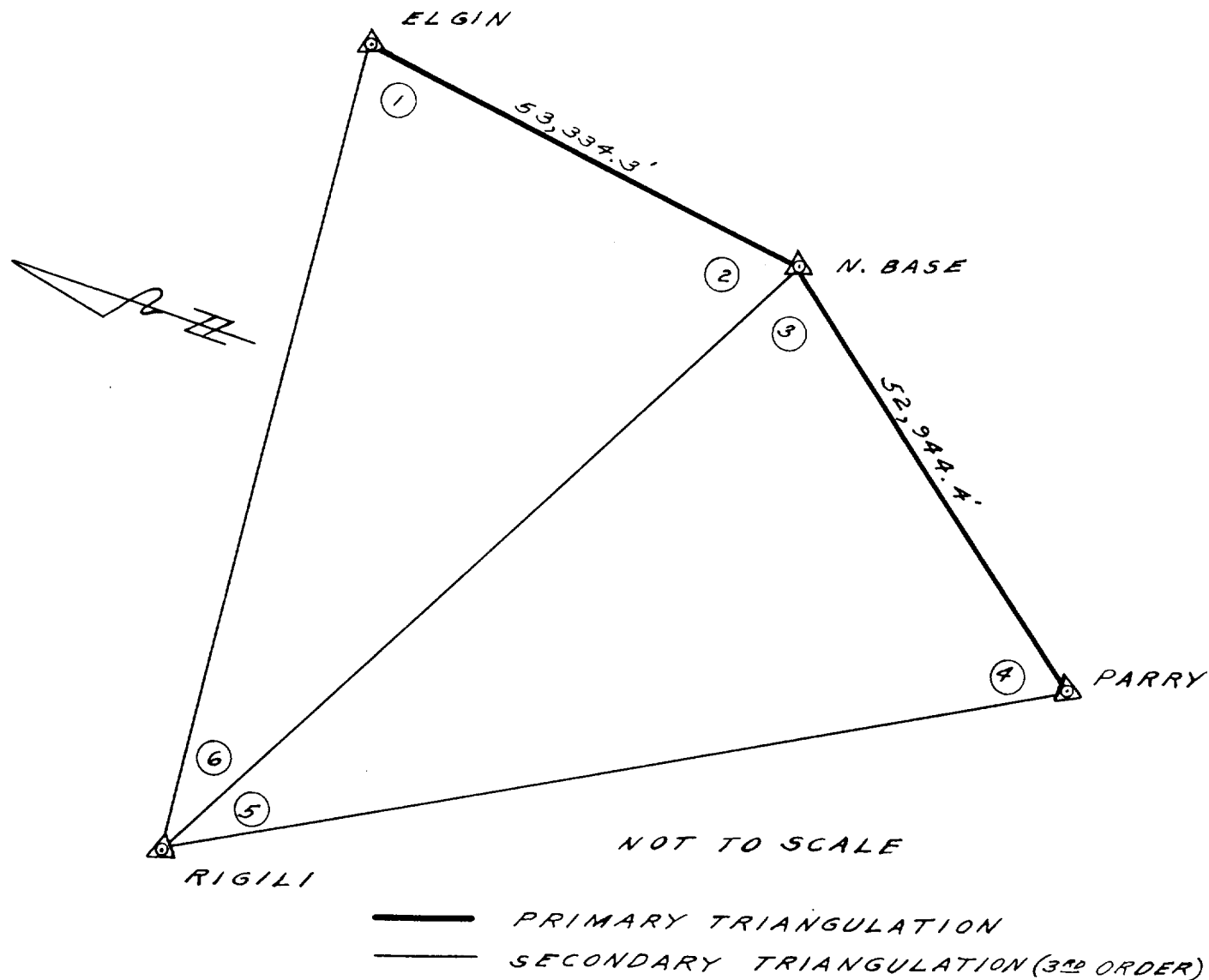
— PRIMARY TRIANGULATION
— SECONDARY TRIANGULATION

ADJUSTED ANGLES

- ① $35^{\circ}-26'-55.9''$
- ② $142^{\circ}-25'-55.4''$
- ③ $0^{\circ}-39'-13.8''$
- ④ $181^{\circ}-27'-54.9''$

ADJUSTED DISTANCES

N. BASE - C-ZERO	591.27'
C-ZERO - LOC. M	12,000.0'
LOC. M - REEF	65.27'
REEF - RUNIT	4,036.2'



ADJUSTED ANGLES

①	81°-04'-39.2"	④	69°-53'-17.5"
②	66°-20'-35.1"	⑤	30°-32'-11.1"
③	79°-34'-31.4"	⑥	32°-34'-45.7"

ADJUSTED DISTANCES

RIGILI - ELGIN	90,724.7'
RIGILI - N. BASE	97,849.7'
RIGILI - PARRY	102,483.7'

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CHECK COMPUTATION OF THE JOINT TASK FORCE SEVEN
SURVEY TO DETERMINE THE AZIMUTH OF THE BASE LINE
NORTH BASE-RUNIT OF THAT SURVEY.

POSITION COMPUTATION SECOND ORDER TRIANGULATION

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Check computation of Task Force Seven Survey

	327	56	52.40	α	3 Sand	to 2 North Base	147	57	15.78
Δ L	+107	05	20.48	3Δ		8	-38	53	11.73
α	75	02	12.88	α	3 Sand	to 1 Coral	109	04	04.05
$\Delta \alpha$		-00	47.84	$\Delta \alpha$				-01	11.10
α'	180	00	00.00				180	00	00.00
	255	01	25.04	α'	1 Coral	to 3 Sand	289	02	52.95

[illegible]

Check computation of Task Force Seven Survey

HOLMES & NARVER ENGINEERS JOB N2 640

HOLMES & NARVER ENGINEERS JOB N2 640HOLMES & NARVER ENGINEERS JOB N2 640

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LETTER DATED JULY 15, 1994
FROM ANTON I TO

~~OFFICIAL USE ONLY~~

JULY 15, 1994
FOR SINISCALE TO