E. TYPHOON BILLIE 23 AUG 0500Z-31 AUG 1100Z

1. STATISTICS

a. Number of Warnings Issued - 34

b. Number of Warnings with Typhoon Intensity - 24

c. Distance Traveled During Warning Period - 1,697 MI

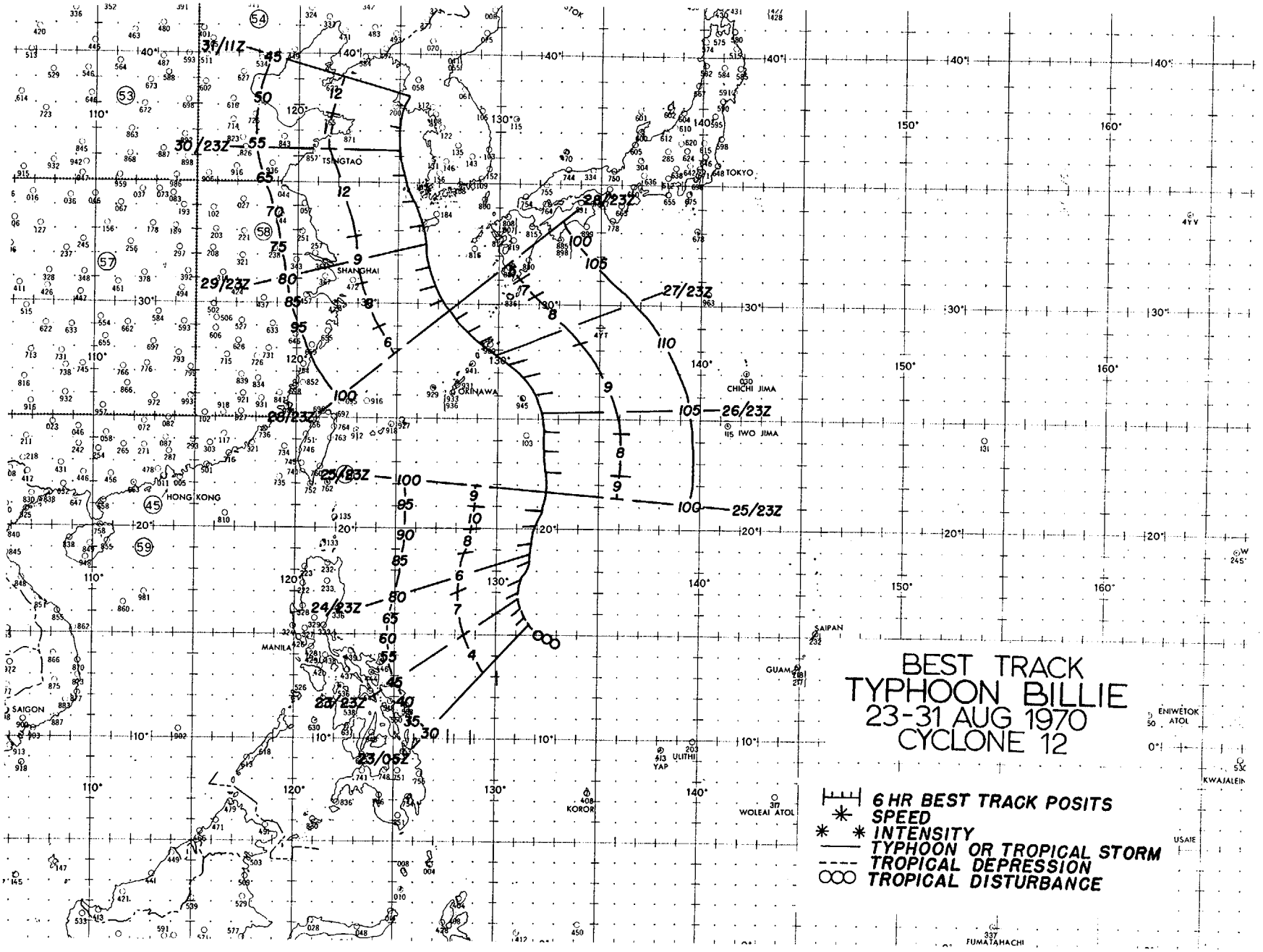
2. CHARACTERISTICS AS A TYPHOON

a. Minimum Observed SLP - 945 MBS at 28/0000Z

b. Minimum Observed 700 MB Height - 2624 M at 28/0000Z

c. Maximum Surface Wind - 110 KTS (From Best Track)

d. Maximum Radius of Surface Circulation - 600 MI


BEST TRACK
TYPHOON BILLIE
23-31 AUG 1970
CYCLONE 12
6 HR BEST TRACK POSITS
SPEED
INTENSITY
TYPHOON OR TROPICAL STORM
TROPICAL DEPRESSION
TROPICAL DISTURBANCE
TSINGTAO
SHANGHAI
TOKYO
OKINAWA
CHICHI JIMA
IWO JIMA
HONG KONG
MANILA
SAIGON
GUAM
SAIPAN
YAP
ULITHI
KOROR
WOLEAI ATOL
ENIWETOK ATOL
KWAJALEIN
FUMATAHACHI
31/11Z
30/23Z
29/23Z
28/23Z
27/23Z
26/23Z
25/23Z
24/23Z
23/23Z
23/05Z

3. TYPHOON BILLIE NARRATIVE

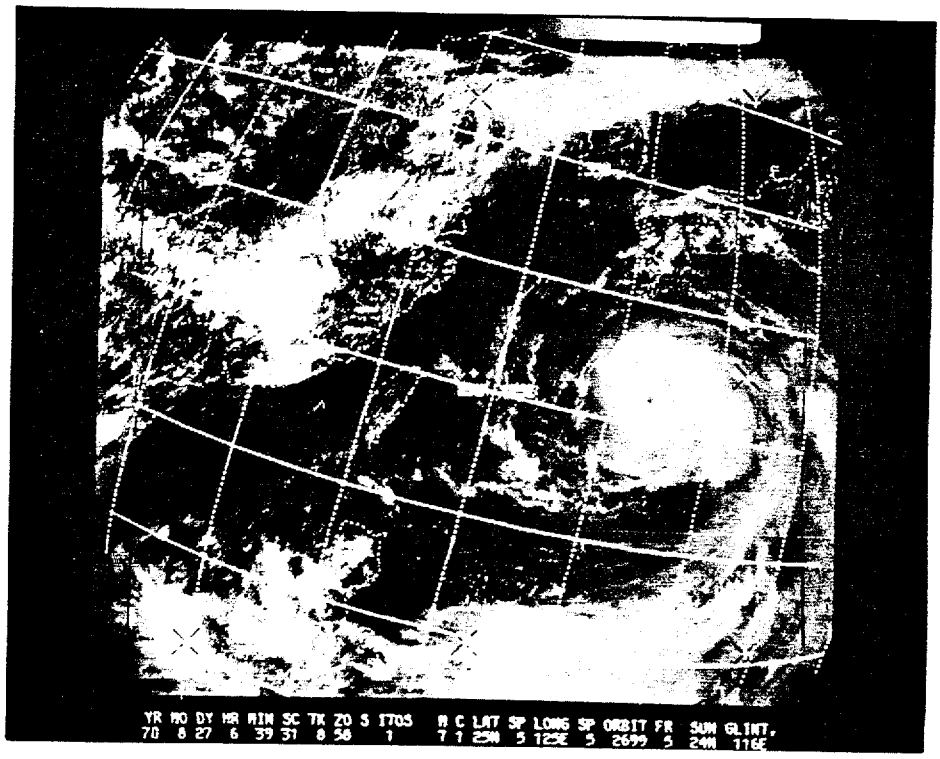
Billie formed in the Philippine Sea within the zone of the intertropical trough on August 22nd. Prior to this, extensive cloudiness had been depicted by satellite pictures for several days in this area. The enhanced convection appeared to be generated by increased southwest monsoon flow into the region which apparently had been triggered by the presence of Typhoon Anita in the Northern Philippine Sea.

Upon initial detection of a weak depression by reconnaissance aircraft on the 23rd the storm intensified slowly while drifting northward and reached typhoon force early on the 25th. The westerlies were displaced near 40°N during the latter part of August and steering initially was weak. However, a high cell located east of Guam provided some steering and this combined with the storm's internal steering force for a northward movement of 8 to 9 knots through the 27th.

As heights began to build slowly across Japan, Billie swung to a northwesterly course during the afternoon of the 27th which caused the track to cross through the Ryukyu chain just south of Amami-o-Shima. Prior to passage of the island, Billie reached her lowest pressure of 945 mb and maximum strength of 110 knots.(Figure 5-10)

Heights continued to build over the Sea of Japan and the ridge line receded toward a higher latitude. The typhoon began to turn more northward which eventually took the storm just west of Chiejudo Island and into the Yellow Sea where it paralleled the South Korean coastline. As drier air began to enter the typhoon's circulation, Billie was reduced to tropical storm strength early on the 31st. The storm was being approached by a westerly trough which caused the storm's center to arrive on the Korean coastline west of Kaesong. The tropical system rapidly transformed to extratropical character and accelerated into Manchuria. At least 15 persons were reported killed due to flooding and landslides associated with the storm's rainfall over South Korea.

An unusual aspect during Billie's lifetime was that on five occasions a double wall cloud or concentric eye was observed by reconnaissance crews. The first three instances occurred during the 26th with the outer wall cloud 50 miles in diameter and the inner 7 miles. Later on the 29th, as the storm crossed the East China Sea, 2 cases were observed with an outer diameter of 80 and inner of 20 miles.



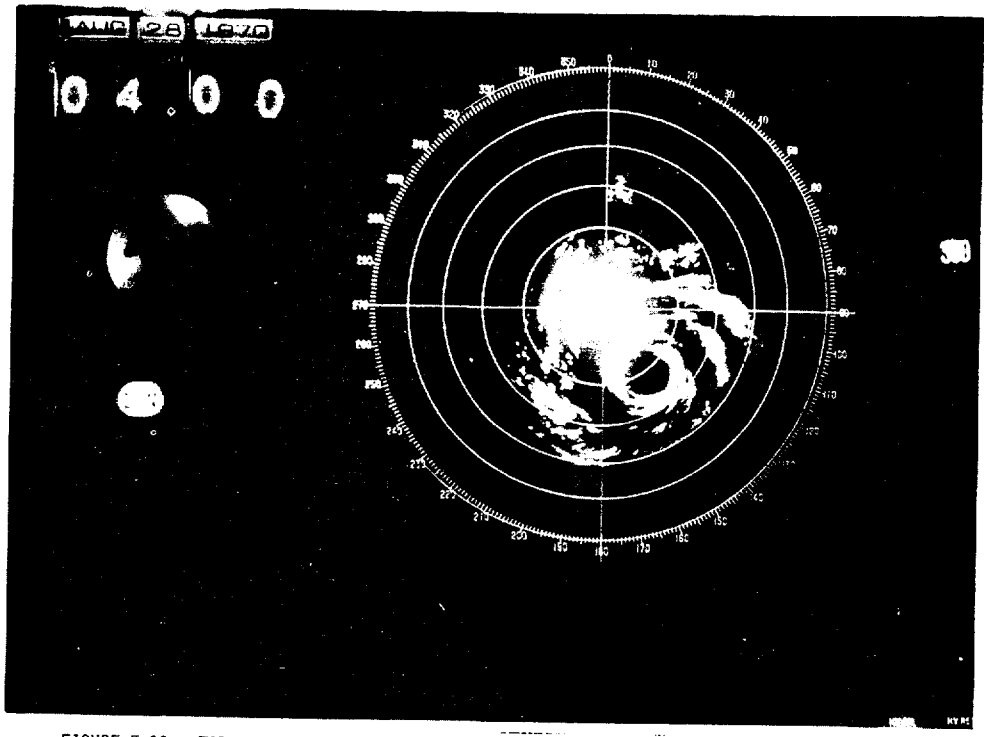


FIGURE 5-10 TOP - TYPHOON BILLIE AS SEEN BY ITOS-1 SATELLITE DURING THE AFTERNOON OF 27 AUGUST.
BOTTOM - THE EYE OF BILLIE ON 28 AUGUST 0400 (JST) - 27/1900 GMT AS VIEWED BY THE NAZE MITSUBISHI RADAR (10.4 CM) ON AMAMI-O-SHIMA ISLAND (COURTESY JAPAN METEROLOGICAL AGENCY). RANGE MARKS ARE AT 100 KM INTERVALS.

TYPHOON BILLIE

EYE FIXES CYCLONE 12

FIX NO.	TIME	POSIT	UNIT-METHOD-ACCY	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TD	EYE FORM	ORIEN-TATION	EYE DIA	CHARACTER WALL CLOUD
1	230215Z	15.6N 131.8E	54-R-05---		023	030	002	3106	26/23	----			NEG W/C
2	231100Z	16.3N 131.5E	54-R-08---	700MB	030	---	990	3015	13/10	----			APRNT W/C FORMG SE QUAD
3	240300Z	16.8N 131.1E	54-R-08---	700MB	042	040	986	2999	15/11	CIRC	----	25	NEG W/C
4	240546Z	17.0N 131.0E	SLTLS	STG X	DIA 07		CAT 2						----------
5	241240Z	17.5N 131.2E	VW-R-20---		---	---	---	---	--/--	----			----------
6	241322Z	17.6N 131.1E	VW-R-07---		---	035	---	---	--/--	CIRC	----	16	W/C FORMG S SEMICIR
7	241457Z	18.0N 131.5E	VW-R-04---	0450M	---	045	980	---	24/21	CIRC	----	24	W/C FORMG S QUAD, 5NM THK
8	242100Z	18.8N 131.6E	54-R-03---	700MB	055	060	966	2829	18/12	CIRC	----	08	W/C FORMG S QUAD
9	250300Z	19.0N 131.7E	54-R-05---	700MB	060	080	---	2813	18/13	CIRC	----	06	W/C BLDG N QUAD
10	250642Z	19.0N 132.5E	SLTLS	STG X	DIA 03		CAT 3						----------
11	250800Z	19.3N 132.7E	VW-R-05---		---	---	---	---	--/--	----			----------
12	250845Z	19.9N 131.9E	VW-R-05---	1500M	103	110	963	---	27/24	CIRC	----	35	8NM THK, OPEN SW
13	251230Z	20.6N 131.6E	VW-R-20---	700MB	095	---	---	---	--/--	CIRC	----	40	CLSD, 8-13NM THK
14	252100Z	21.7N 132.3E	54-R-05---	700MB	070	075	956	2743	18/10	CONC	----	50-7	OUTER-CLSD, INNER-OPEN SW
15	260000Z	22.1N 132.2E	54-R-05---	700MB	075	080	956	2740	17/10	CONC	----	50-8	OUTER-CLSD, INNER-OPEN SW
16	260300Z	22.6N 132.3E	54-R-03---	700MB	075	080	955	2740	18/11	CONC	----	50-6	OUTER CLSD, INNER-OPEN SW
17	260543Z	22.5N 132.0E	SLTLS	STG X	DIA 04		CAT 4						----------
18	260859Z	23.4N 132.1E	VW-R-05---		130	135	960	---	27/24	CIRC	----	35	CLSD, 10NM THK
19	261000Z	23.5N 132.1E	VW-R-05---		---	---	---	---	--/--	----			----------
20	261140Z	23.7N 132.2E	VW-R-05---	700MB	085	---	---	2746	20/12	CIRC	----	25	CLSD
21	261405Z	23.9N 132.3E	VW-R-05---	700MB	100	---	958	2743	19/13	CIRC	----	30	CLSD
22	262100Z	25.0N 132.2E	54-R-05---	700MB	075	085	950	2688	20/15	CIRC	----	35	OPEN SW QUAD
23	270100Z	25.7N 132.1E	LND RDR		---	---	---	---	--/--	----			----------
24	270200Z	26.0N 131.9E	LND RDR		---	---	---	---	--/--	----			----------
25	270300Z	26.0N 131.9E	54-R-05---	700MB	090	100	949	2667	18/14	CIRC	----	40	OPEN S QUAD
26	270400Z	26.1N 131.8E	LND RDR		---	---	---	---	--/--	----			----------
27	270500Z	26.2N 131.8E	LND RDR		---	---	---	---	--/--	----			----------
28	270640Z	26.0N 132.0E	SLTLS	STG X	DIA 0		CAT 4						----------
29	270900Z	26.9N 131.5E	LND RDR		---	---	---	---	--/--	----			----------
30	270924Z	27.0N 131.2E	VW-R-10---		---	---	---	---	--/--	----			----------
31	271013Z	26.8N 131.3E	VW-R-05---		---	085	947	---	27/23	CIRC	----	30	OPEN S, 8NM THK
32	271216Z	27.1N 131.2E	VW-R-10---		---	---	---	---	--/--	----			----------
33	271400Z	27.1N 130.9E	VW-R-05---		---	---	---	---	--/--	CIRC	----	30	OPEN S QUAD, WALL 4NM THK NW-E
34	271500Z	27.3N 130.5E	LND RDR		---	---	---	---	--/--	----			----------
35	271600Z	27.5N 130.4E	LND RDR		---	---	---	---	--/--	----			----------
36	271700Z	27.4N 130.3E	LND RDR		---	---	---	---	--/--	----			----------
37	271741Z	27.3N 130.4E	54-R-05---	500MB	060	---	---	---	03/-4	ELIP	NW-SE	45X3	CLSD
38	271800Z	27.2N 130.1E	LND RDR		---	---	---	---	--/--	----			----------
39	271800Z	27.5N 130.2E	LND RDR		---	---	---	---	--/--	----			----------
40	271900Z	27.8N 130.1E	LND RDR		---	---	---	---	--/--	----			----------
41	271900Z	27.6N 130.2E	LND RDR		---	---	---	---	--/--	----			----------
42	272100Z	27.8N 129.9E	54-R-05---	700MB	058	---	946	2637	17/13	CIRC	----	35	CLSD
43	272230Z	27.9N 129.7E	LND RDR		---	---	---	---	--/--	----			----------
44	272300Z	27.9N 129.6E	LND RDR		---	---	---	---	--/--	----			----------
45	280000Z	27.9N 129.6E	54-R-05---	700MB	085	090	956	2624	17/13	CIRC	----	40	CLSD
46	280000Z	27.9N 129.6E	LND RDR		---	---	---	---	--/--	----			----------
47	280300Z	28.1N 129.2E	54-R-03---	700MB	075	090	948	2634	18/12	CIRC	----	20	CLSD
48	280400Z	28.1N 129.1E	LND RDR		---	---	---	---	--/--	----			----------

TYPHOON DELILE

EYE EXXES CYCLONE 12

FIX NO.	TIME	POSIT	UNIT-METHOD _ACCY	FLT LVL	FLT LVL WND	OBS SFC WND	OBS MIN SLP	MIN 700MB HGT	FLT LVL TT/TO	EYE FORM	ORIEN-TATION	EYE DIA	CHARACTER WALL CLOUD
49	280500Z	28.2N 129.0E	LND RDR		---	---	---	---	--/--	----			----------
50	280514Z	28.5N 128.5E	SLTLS	STG X	DIA 04	CAT 3							----------
51	280600Z	28.5N 129.0E	LND RDR		---	---	---	---	--/--	----			----------
52	280700Z	28.5N 128.9E	LND RDR		---	---	---	---	--/--	----			----------
53	280840Z	28.6N 128.7E	54-R-02---	700MB	070	060	947	2630	19/15	CIRC	----	28	CLSD, SMALL OPENINGS S
54	280900Z	28.7N 128.7E	LND RDR		---	---	---	---	--/--	----			----------
55	280920Z	28.7N 128.6E	VW-R-05---	700MB	---	065	952	---	20/15	CIRC	----	27	WK W/C S QUAD
56	281100Z	28.8N 128.4E	LND RDR		---	---	---	---	--/--	----			----------
57	281200Z	29.0N 128.1E	VW-R-05---	700MB	070	---	---	2728	19/15	CIRC	----	27	----------
58	281200Z	28.8N 128.3E	LND RDR		---	---	---	---	--/--	----			----------
59	281400Z	28.9N 128.0E	LND RDR		---	---	---	---	--/--	----			----------
60	281500Z	29.0N 128.0E	LND RDR		---	---	---	---	--/--	----			----------
61	281500Z	29.2N 127.8E	VW-R-03---	700MB	070	---	958	2749	17/12	ELIP	NW-SE	20X17	6NM THK, OPEN S AND SE
62	281600Z	29.1N 127.9E	LND RDR		---	---	---	---	--/--	----			----------
63	281700Z	29.2N 127.8E	LND RDR		---	---	---	---	--/--	----			----------
64	281800Z	29.3N 127.7E	LND RDR		---	---	---	---	--/--	----			----------
65	281900Z	29.4N 127.5E	LND RDR		---	---	---	---	--/--	----			----------
66	282000Z	29.5N 127.4E	LND RDR		---	---	---	---	--/--	----			----------
67	282055Z	29.6N 127.6E	54-R-05---	700MB	085	---	949	2670	17/11	CONC		80-20	OUTER-CLSD, INNER-CLSD
68	282100Z	29.5N 127.5E	LND RDR		---	---	---	---	--/--	----			----------
69	282200Z	29.6N 127.3E	LND RDR		---	---	---	---	--/--	----			----------
70	282300Z	29.7N 127.3E	LND RDR		---	---	---	---	--/--	----			----------
71	290000Z	29.8N 127.4E	54-R-05---	700MB	065	065	949	2679	17/13	CONC		80-20	WALL DETERG
72	290200Z	29.9N 127.2E	54-R-05---	700MB	075	080	950	2676	18/13	CIRC	----	20	OPEN W
73	290637Z	30.5N 127.2E	SLTLS	STG X	DIA 0-	CAT 3							----------
74	290815Z	30.6N 127.0E	VW-R-03---		---	080	951	---	27/25	CIRC	----	30	OPEN S SEMICIR, NO SEP WALL
75	291130Z	31.1N 127.2E	LND RDR		---	---	---	---	--/--	----			----------
76	291230Z	31.2N 127.0E	LND RDR		---	---	---	---	--/--	----			----------
77	291330Z	31.4N 126.8E	LND RDR		---	---	---	---	--/--	----			----------
78	291400Z	31.0N 127.0E	VW-R-05---		---	---	---	---	--/--	CIRC	----	25	----------
79	291430Z	31.6N 126.8E	LND RDR		---	---	---	---	--/--	----			----------
80	292100Z	32.3N 126.3E	54-R-03---	700MB	085	---	958	2768	17/13	CIRC	----	80	OPEN W-NW, RDR PRESNT POOR
81	292100Z	32.4N 126.7E	LND RDR		---	---	---	---	--/--	----			----------
82	292155Z	32.3N 126.4E	54-R-05---		---	---	---	---	--/--	----			----------
83	292200Z	32.6N 126.7E	LND RDR		---	---	---	---	--/--	----			----------
84	292300Z	32.8N 126.8E	LND RDR		---	---	---	---	--/--	----			----------
85	300000Z	32.9N 126.8E	LND RDR		---	---	---	---	--/--	----			----------
86	300100Z	33.1N 126.4E	LND RDR		---	---	---	---	--/--	----			----------
87	300200Z	33.2N 126.4E	LND RDR		---	---	---	---	--/--	----			----------
88	300300Z	32.9N 126.2E	54-R-03---	700MB	002	---	970	2798	16/13	----			NEG W/C
89	300300Z	33.4N 126.4E	LND RDR		---	---	---	---	--/--	----			----------
90	300543Z	33.0N 126.0E	SLTLS	STG X	DIA 0-	CAT 2							----------
91	300600Z	33.7N 126.5E	LND RDR		---	---	---	---	--/--	----			----------
92	300700Z	33.8N 126.5E	LND RDR		---	---	---	---	--/--	----			----------
93	300900Z	34.2N 126.8E	LND RDR		---	---	---	---	--/--	----			----------
94	301210Z	34.7N 126.9E	VW-R-25---	3050M	050	---	---	---	--/--	----			NEG W/C
95	302100Z	35.8N 126.0E	54-R-03---	700MB	045	---	977	2887	12/09	CIRC	----	05	NEG W/C

TYPHOON BILLIE

TROPICAL CYCLONE 12 -- 8/23/0500Z TO 8/31/1100Z
POSITION AND FORECAST VERIFICATION DATA

WARN NO.	DTG	WARNING POSIT LAT	WARNING POSIT LONG	BEST TRACK LAT	BEST TRACK LONG	24 HR FCST LAT	24 HR FCST LONG	24 HR ERROR DEG DIST	48 HR FCST LAT	48 HR FCST LONG	48 HR ERROR DEG DIST	72 HR FCST LAT	72 HR FCST LONG	72 HR ERROR DEG DIST
01	23/0500Z	15.8N	131.5E	15.5N	131.8E	17.3N	129.0E	~~281-0120~~	-----	------	--------	-----	------	--------
02	23/1100Z	16.2N	130.9E	15.8N	131.4E	17.6N	128.3E	270-0162	-----	------	--------	-----	------	--------
03	23/1700Z	16.1N	131.3E	16.1N	131.2E	16.9N	129.8E	229-0126	-----	------	--------	-----	------	--------
04	23/2300Z	16.3N	131.5E	16.5N	131.1E	17.7N	130.7E	217-0078	-----	------	--------	-----	------	--------
05	24/0500Z	17.1N	131.0E	16.9N	131.1E	19.8N	128.8E	280-0168	22.8N	125.9E	270-0354	-----	------	--------
06	24/1100Z	17.4N	131.0E	17.6N	131.2E	19.7N	129.6E	237-0150	22.0N	127.3E	252-0282	24.4N	124.3E	250-0402
07	24/1700Z	18.2N	131.4E	18.3N	131.5E	20.5N	130.7E	258-0084	22.7N	128.8E	243-0204	-----	------	--------
08	24/2300Z	19.0N	131.6E	18.8N	131.6E	22.0N	131.8E	296-0024	24.8N	131.4E	241-0048	27.6N	130.7E	104-0048
09	25/0500Z	19.0N	131.7E	19.3N	131.8E	20.6N	131.9E	189-0126	23.4N	131.7E	180-0156	-----	------	--------
10	25/1100Z	20.1N	132.0E	21.1N	131.9E	22.4N	132.1E	180-0086	25.9N	131.2E	180-0048	29.4N	130.0E	067-0090
11	25/1700Z	20.6N	131.8E	20.8N	132.2E	23.3N	131.8E	197-0060	26.8N	130.8E	161-0036	-----	------	--------
12	25/2300Z	21.9N	132.4E	21.8N	132.3E	25.1N	132.6E	108-0018	28.5N	131.3E	062-0084	31.9N	130.0E	044-0186
13	26/0500Z	22.9N	132.3E	22.7N	132.3E	26.5N	131.8E	000-0030	29.9N	130.6E	042-0126	-----	------	--------
14	26/1100Z	23.7N	132.1E	23.5N	132.2E	27.3N	131.4E	010-0036	30.7N	130.2E	039-0144	35.8N	130.4E	031-0354
15	26/1700Z	24.2N	132.1E	24.3N	132.2E	27.2N	131.4E	104-0048	30.6N	130.3E	059-0144	-----	------	--------
16	26/2300Z	25.3N	132.2E	25.2N	132.2E	28.5N	132.0E	070-0120	31.6N	132.0E	063-0258	36.5N	132.8E	053-0402
17	27/0500Z	26.3N	132.0E	26.0N	131.8E	29.9N	131.7E	056-0168	33.5N	131.8E	051-0306	-----	------	--------
18	27/1100Z	27.0N	131.3E	26.7N	131.3E	30.4N	130.2E	044-0126	34.4N	130.0E	037-0270	39.9N	133.1E	047-0486
19	27/1700Z	27.6N	130.3E	27.4N	130.5E	30.5N	128.1E	010-0072	34.4N	128.9E	035-0210	-----	------	--------
20	27/2300Z	28.0N	129.7E	27.8N	129.8E	31.5N	127.8E	009-0114	36.1N	129.1E	032-0258	41.8N	135.0E	055-0576
21	28/0500Z	28.2N	128.9E	28.3N	129.0E	30.9N	127.4E	016-0042	35.5N	129.5E	052-0210	-----	------	--------
22	28/1100Z	28.9N	128.4E	28.8N	128.4E	31.7N	127.3E	022-0060	35.3N	127.7E	058-0108	40.6N	131.3E	064-0294
23	28/1700Z	29.4N	127.6E	29.3N	127.8E	32.5N	126.3E	354-0060	36.7N	127.5E	051-0138	-----	------	--------
24	28/2300Z	29.7N	127.4E	29.6N	127.4E	32.2N	126.3E	180-0012	36.1N	127.2E	093-0102	41.0N	131.8E	--------
25	29/0500Z	30.2N	127.1E	30.2N	127.1E	32.7N	126.2E	170-0036	36.6N	127.5E	106-0120	-----	------	--------
26	29/1100Z	30.8N	126.8E	30.7N	126.8E	33.9N	126.3E	128-0086	37.7N	127.9E	110-0120	42.1N	130.9E	--------
27	29/1700Z	31.6N	126.7E	31.5N	126.5E	35.0N	126.9E	098-0078	38.6N	128.0E	--------	-----	------	--------
28	29/2300Z	32.6N	126.4E	32.4N	126.3E	36.8N	128.1E	077-0150	42.3N	130.9E	--------	-----	------	--------
29	30/0500Z	33.2N	126.3E	33.3N	126.1E	36.9N	127.5E	098-0120	41.5N	130.1E	--------	-----	------	--------
30	30/1100Z	34.5N	126.0E	34.3N	125.7E	38.9N	127.3E	071-0034	-----	------	--------	-----	------	--------
31	30/1700Z	35.7N	126.1E	35.2N	125.3E	40.2N	128.2E	--------	-----	------	--------	-----	------	--------
32	30/2300Z	36.2N	125.1E	36.2N	125.0E	-----	------	--------	-----	------	--------	-----	------	--------
33	31/0500Z	37.2N	125.0E	37.2N	125.0E	-----	------	--------	-----	------	--------	-----	------	--------
34	31/1100Z	38.4N	125.6E	38.4N	125.5E	-----	------	--------	-----	------	--------	-----	------	--------

AVERAGE 24 HOUR ERROR - 0085 MI.
AVERAGE 48 HOUR ERROR - 0169 MI.
AVERAGE 72 HOUR ERROR - 0315 MI.