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INTERNAL DOCUMENT 215

I.O.S.

HUTTON FIELD DEVELOPMENT -
WATER DEPTH MEASUREMENT
AND TIDE PREDICTION MODEL.
CONTRACT 13860-TS-55.

FINAL REPORT, JULY 1984.

GRAHAM ALCOCK.

NATURAL ENVIRONMENT RESEARCH COUNCIL
INSTITUTE OF OCEANOGRAPHIC SCIENCES

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CONTENTS

1. Introduction

Conoco is developing the Hutton Field located in the northern North Sea and utilising a single Tension Leg Platform (TLP) for drilling, production and personnel accommodation. Water level variations due to tide and storm surge have significant effects on the mean tension in the tension legs, therefore it is desirable for the operating personnel to have available reliable predictions of the tidal levels and variations due to storms.

The Institute of Oceanographic Sciences (IOS) is contracted to collect, analyse and interpret water level data, and to develop a tide prediction model and use it to calculate predicted tide levels for the Hutton Field for a twenty year period. Data acquisition, using two pressure gauges, was planned to take place over one year, with periodic recovery and redeployment of one gauge (number 445) to examine the data quality and to provide preliminary results.

This report concerns the processing and analysis of data from the full data collection periods of 31st October 1982 to 28th December 1983 (gauge number 445) and 31st October 1982 to 2nd May 1984 (gauge number 444). Some details from the previous IOS reports to Conoco (Refs. 1 and 2) are included for completeness.

2. Deployment and Recovery

Conoco provided two Aanderaa WLR-5 pressure gauges, serial numbers 444 and 445, and these were tested, modified and calibrated by IOS staff. (Modifications were made to improve the timing circuit of gauge 445 and to eliminate possible corrosion risks by removing the acoustic transducer on each gauge). IOS staff designed and manufactured mounting clamps to enable the gauges to be attached to the existing well head template at levels of 864.0 and 412.5 mm above the bottom deck level of the sensor tables for gauges 445 and 444 respectively.

J. Casson and A. Harrison of IOS travelled to Aberdeen on 3rd October 1982 with gauges and mountings and briefed Conoco and Comex personnel on the installation of the equipment. Unfortunately, the planned subsequent deployment could not take place due to accommodation problems on the "Dundee Kingsnorth" (DKN). J. Casson and D. Flatt of IOS travelled to DKN on 24th - 25th October 1982 but rough weather made an immediate installation impossible. As accommodation was not available for IOS personnel after 26th October, they briefed the Conoco Supervisor and Comex diving team on the installation of the equipment, started and checked the gauges and left DKN on 26th October. The mountings and gauges were later installed on 31st October by Comex divers under Conoco supervision.

It was planned to recover and redeploy gauge 445 during the first week of January 1983 and A. Harrison travelled to DKN on 1st January, but all recovery attempts were thwarted by bad weather. He made a further visit to DKN on 13th - 14th January, and gauge 445 was recovered and on board at 1742 GMT 14th January 1983. The gauge was checked and found to be in good working order. A new battery and tape were fitted, and the gauge finally redeployed at 2229 GMT 14th January, after several unsuccessful attempts due to snagging of the winch wire. A subsequent recovery of gauge 445 was made in May 1983 in order to provide six months' data for TLP design studies. D. Flatt travelled to the "Odin" vessel on 11th - 12th May but operational difficulties meant that the recovery was not attempted until 16th May. The gauge was on board at 0105 GMT 16th May, checked and found to be in good working order. A new battery and tape were fitted and the gauge redeployed at 0200 GMT.

In order to fit in with Conoco's drilling programme on the Hutton site, the final recovery of the two gauges was delayed until May 1984. In the event, both gauges and mountings were retrieved by divers under Conoco supervision on 1st May 1984 without the knowledge or participation of either the Conoco Contract Representative or the IOS Supervisor. Approximate time of recovery was 2355 GMT 1st May 1984. Both gauges were collected from Aberdeen by IOS staff and finally switched off at Bidston on 12th June 1984.

3. Bottom Pressure Data

The magnetic tapes from the pressure gauges were copied on to a 9 track magnetic tape and the channel counts listed using the CAMAC work station at IOS Bidston. It was evident from the block count channel on both gauges that they had been manually stopped and restarted whilst on board DKN prior to deployment, but after IOS personnel had left, leaving a gap of 2 days in the surface pressure record. Gauge 444 had no gaps in the bottom pressure record but 5 translation errors were corrected by interpolation. Gauge 445 had one translation error and 2 short gaps due to the 2 recoveries and redeployments, which were interpolated graphically (see later). Gauge 444 had recorded data up to the switch-off time, but the tape on gauge 445 had run out on 28th December 1983.

Pressure frequencies were calculated from the channel counts and the bottom pressure calculated from the pressure/frequency calibration and stored on disk. The $\frac{1}{2}$ hourly values of bottom pressure from gauge 445 are plotted in Figures 1 to 3 and show a good signal except for occasional "spikes" at some turning points and a particularly noisy period on 9th - 10th January 1983. (This period coincided with work done by Conoco in cleaning up the cell riser area of the seabed). The hourly values of bottom pressure from gauge 444 are plotted in Figures 4 and 5 and show a very good signal. There is a much smoother signal over 9th - 10th January

1983 and this may be due to the longer sampling interval (1 hour for 444 compared with $\frac{1}{2}$ hour for 445) and/or better mechanical stability of the gauge which was mounted lower in the instrument housing.

An interpolation programme was used to produce an output of hourly values, on the hour (GMT), of the bottom pressure record from gauge 445. This programme smoothed the data using a low-pass filter, FLP07, of half length 12 and cut-off frequency (half-power point) of 0.375 ch^{-1}; this reduces the amplitude response at the M_6 tidal frequency by 1% but had negligible effect at other tidal frequencies. The resulting series was then interpolated, using a cubic spline, to obtain the hourly values, on the hour (GMT). Timing corrections were applied to the record from 15th January to 15th May 1983 as exact times of scans at the beginning and end of the record were noted by IOS personnel prior to deployment and after recovery. This was not possible for the record from 31st October 1982 to 14th January 1983 because the exact time of switching on the recorder had not been noted when it had been restarted by non-IOS personnel prior to deployment. It was also not possible to apply timing corrections to the record from 16th May to 28th December 1983 because the tape had run out prior to final recovery. However, the recorder quartz-crystal clock had only gained 2 seconds over the middle 121 day deployment period from 15th January to 15th May 1983 and so timing errors for the other record periods are considered likely to be equally insignificant. Root mean square errors due to the interpolation method are of the order of 0.02 mb.

The resulting hourly bottom pressure records from gauge 445 were for the periods 1600 GMT 31st October 1982 to 1100 GMT 14th January 1983; 0500 GMT 15th January to 1700 GMT 15th May 1983; and 0800 GMT 16th May to 1100 27th December 1983. The gaps between these records were interpolated graphically using predicted values as a guide, and the complete hourly bottom pressure record obtained was therefore from 1600 GMT 31st October 1982 to 1100 27th December 1983.

The sampling interval (1 hour) and timing of the data from gauge 444 were such that the raw data could be considered to be hourly values, on the hour (GMT) without any interpolation being necessary. Timing corrections could not be applied because the exact time of switching on the recorder had not been noted when it had been restarted by non-IOS personnel prior to deployment on 31st October 1982. However knowledge of the switch-off time on 12th June 1984 and the expected gain/loss error of the quartz-crystal clock indicated that this assumption was justified. The complete hourly bottom pressure record obtained from gauge 444 was from 1100 GMT 31st October 1982 to 2300 GMT 01st May 1984.

4. Sea Level Data

Each hourly value of the bottom pressure obtained was the total pressure measured by the gauge, i.e. the sum of the pressures due to the water column and air column above the sensor. The latter was subtracted using hourly values of atmospheric pressure extracted from barometric chart records supplied by Conoco. Records from 11th November 1982 to 6th February 1983 were from the DKN, those from 7th February 1983 to 3rd June 1984 were from the Murchison platform. No calibration information was available for the DKN records and so data was extracted assuming that the pressure and time scales of the barometer chart recorder were correct. A correction was made to reduce the atmospheric pressures to mean sea level, assuming a barometric height of 20m.

Calibrations of the Murchison barometer by Marex in May and October 1983 were used to correct the barometer readings for pressure and time errors. Power failures or pen malfunctions caused gaps in the record of 6 hours on 20th February, 35 hours on 1st - 3rd April, 41 hours on 5th - 6th May, 27 hours on 5th - 6th August, 82 hours on 30th October - 2nd November, 52 hours on 13th - 15th November, 7 hours on 17th December 1983 and 162 hours on 5th - 12th January 1984. These gaps were interpolated using data from the Daily Weather Report (DWR) issued by the U.K. Meteorological Office. Two complete records of barometric records, from 7th September to 10th October 1983 and from 21st March to 26th April 1984 could not be supplied by Conoco. The former gap was interpolated using the DWR data but, as over 1 year of bottom pressure data had been obtained prior to March 1984, no attempt was made to interpolate the latter gap and the water pressure record for gauge 444 was computed only up to 1100 GMT 20th March 1984. A correction was made to reduce the Murchison atmospheric pressures to mean sea level, assuming a barometric height of 58.3m.

The computed water pressures were converted to elevations using the hydrostatic relation

$$H = P/\rho g \qquad (1)$$

where H is elevation (metres), P is pressure (pascals, 1Pa = 10^{-2}mb), ρ is sea water density (Kg m^{-3}), and g is acceleration due to gravity (m s^{-2}). A sea water density value of 1027.3 Kg m^{-3} or 1027.5 Kg m^{-3} was used for the first and second record respectively from gauge 445, as determined by O.E.S. in December 1982 (Ref. 3) and by IOS in May 1983 respectively. A value of 1027.4 Kg m^{-3} was used for the third record from gauge 445 and for the whole record from gauge 444.

The resulting hourly sea level elevation records obtained from gauges 445 and 444 both started at 0800 GMT 8th November 1982 and finished at 1100 GMT 27th December 1983 or 1100 GMT 20th March 1984 respectively.

5. Tide Levels

A tidal analysis of 365 days' period of the hourly sea level data from gauges 444 and 445 was carried out using the IOS TIRA programme which utilises the harmonic method of analysis and which performs a least-squares fit to the data. The method models the tidal level, ζ , as a finite number, N, of harmonic constituents with an amplitude H and angular speed, σ ,

$$\zeta(t) = Z_o + \sum_{n=1}^{N} f_n(t)\, H_n \cos(\sigma_n t + V_n + u_n - G_n) \qquad (2)$$

Z_o is the mean level referred to the sensor level, V is the initial phase at an arbitrary time origin t = 0 and G is the constituent's phase lag with respect to the equilibrium tide. f and u are slow modulating functions mostly with the period 18.6y of regression of the lunar nodes. The amplitude (H in cm) and phase lag (G in ^{o}) relative to Greenwich epoch of 62 constituents were computed, the time zone being GMT, and these are given for gauge 444 in Table 1. These constitutents were used in preference to either those from gauge 445 or those from a vector mean of the two analyses because of the uninterrupted and smooth character of the data from gauge 444. (Differences in amplitude and phase of the major constituents O_1, K_1, M_2 and S_2 from an analysis of a common 355 days' period were only 0.01 / 0.27, 0.04 / 0.11, 0.11 / 0.16, and 0.04 mm / 0.12^o respectively). The analysis included the terms MA_2 and MB_2, which are separated from M_2 by one cycle per year, and which are one of the causes of the seasonal modulation of M_2 (Ref. 4). The values of M_2 and S_2 have been used to compute the tidal parameters of Mean High Water Springs, Mean High Water Neaps, Mean Low Water Neaps and Mean Low Water Springs (MHWS, MHWN, MLWN, and MLWS respectively) with respect to the sensor level of gauge 444 and these are given in Table 2.

Hourly predictions of tidal height from July 1984 to December 2004 and times and heights of High and Low Water from July 1984 to December 1986 were computed using the harmonic constituents and equation 2. (Predictions were supplied on magnetic tape to Conoco together with computer listings up to December 1986 - Appendices 1 and 2 contain hourly heights and High and Low Waters respectively from July to December 1984 as an example).

The hourly predictions have been used to compute the tide frequency distribution shown in Figure 6. The distribution is bimodal with the two peaks, or modes, occurring near MHWN and MLWN. The modes are asymmetric, i.e. of different height, and this has been related both to the shallow water tides M_4 and S_4 which are at exactly twice the frequency of the main lunar and solar tides M_2 and S_2, and also to the fortnightly shallow water tide Ms_f which is locked in to the spring/neap cycle (Ref. 5, and J.M. Vassie, personal communication).

The distribution itself is nearly symmetrical with its upper and lower limits (Highest and Lowest Astronomical Tide) evenly distributed about the mean tide level. Values of HAT and LAT are given in Table 2 and were extracted from predicted High and Low Waters during 1994 and 2002, the years when the hourly predictions reached their extreme values.

6. Mean Sea Levels

Tables 1 and 2 give the mean value (Z_o) of the sea level elevation above the sensor level of gauge 444 for the 1 year's period. This value should only be taken as an approximate guide to the long term mean sea level (msl) at the Hutton Field site i) because of the difficulties of obtaining absolute measurements of water levels with a bottom pressure gauge, and ii) because of the annual, seasonal and monthly variations of msl :

i) the difficulties are the accurate determination of a) the sensor level with respect to the seabed or known datum, b) the atmospheric pressure, so that bottom pressure can be converted to water column pressure, and c) water density, so that the pressure can be converted into a water level.

ii) Annual variations in msl are mainly dependent on a) time variations of wind stress and air pressure and b) time variations in oceanographic forces due to changes in temperature, salinity or currents. Seasonal changes in British msl are mainly due to density changes of the adjacent North Atlantic. Monthly changes can be related to the seasonal changes and to changes in local air pressure and to the influence of winds over the continental shelf. Ref. 6 contains a detailed analysis and explanation of variations in monthly British msl data.

The monthly msl values at Lerwick for the period October 1982 to December 1983 are plotted in Figure 7, together with the monthly mean values of Hutton sea level, from gauge 444, obtained by separate analyses of 29 days' data from each calendar month. Note that the msl curves are offset for clarity and do not imply that Hutton msl is "below" Lerwick msl. Msl variations at Hutton closely follow those at Lerwick and we therefore have some confidence in assuming that long term variations in msl will be similar at the two locations.

At Lerwick over the period 1957 - 1981, annual msl values had a standard deviation of 29 mm about the 25 year mean of 993 mm and monthly msl values had a s.d. of 185 mm. The February 1983 value of 813 mm at Lerwick has only been undercut on five occasions over the 25 year period (minimum = 771 mm during April 1974). The January 1983 value of 1187 mm has been exceeded on only six occasions (maximum = 1227 mm during October 1967). The January - February difference of 374 mm is the largest change between consecutive monthly values (next largest = 259 mm, January - February 1962).

The winter of 1982 - 1983 therefore appears to have been quite an exceptional one in terms of msl variations and illustrates the problems of using short period data to estimate long period means. The mean of Lerwick msl January - December 1983 was 990 mm, 3 mm lower than the 25 year mean of 993 mm. Application of the same difference to the Hutton 1 year value yields an estimate of 145163 mm as the long term mean.

Note that this mean sea level value at Hutton is given relative to the level of sensor 444, which was designed to be 412.5 mm above the bottom deck level of the sensor table. The long term mean sea level is therefore estimated to be 145575 mm relative to the deck. This compares with the long term estimate of 145508 mm relative to the deck using the 6 months' data from sensor 445 (Ref. 2); a difference of 68 mm. In order to investigate this discrepancy, common periods from the two gauges were analysed : 6 months 9th November 1982 - 10th May 1983, 6 months 1st June - 30th November 1983, and 355 days 1st January - 21st December 1983. After adjustment for the difference between the msl value at Lerwick over the appropriate period and the long term, the long term msl at Hutton based on the 444 data was 145569 mm, 145573 mm, and 145574 mm for the three periods; and 145508 mm, 145586 mm and 145565mm based on the 445 data.

The wide variation in values using the data from gauge 445 is probably due to datum differences between the data sets and could be explained by the gauge not being exactly repositioned at each of the two redeployments. The excellent agreement of the msl estimates using the data from the undisturbed gauge 444 supports this. The best estimate of long term msl at Hutton is therefore 145575 mm, i.e. based on the analysis of the 1 year data set from gauge 444 and adjusted for the difference between the msl at Lerwick during 1983 and the period 1957 - 1981.

There is usually a secular trend (i.e. very long term) in mean sea level at any site, due to climatic and/or geological effects :

a) a global warming (cooling) of the atmosphere will increase (decrease) the volume of water (and hence its height) through both melting (freezing) of the polar ice-caps and thermal expansion (contraction) of the water column,

b) any increase (decrease) in long term local mean atmospheric pressure will decrease (increase) mean sea level, through the inverse barometer effect,

and c) the vertical re-adjustment of the sea-bed to any long-term loading effects (e.g. post-glacial uplift) will increase or decrease mean sea level. (There is also a loading effect on the sea bed from any increase in water volume, but this is a secondary effect).

At Lerwick, the combination of these factors gives a trend in msl of -2.3 mm y^{-1} over the years 1957 - 78 (Ref. 7). A continuing trend of this magnitude at Hutton would reduce the annual msl by 46 mm over the 20y operating life of the TLP.

7. Surge Levels

Any instantaneous value of sea level, after averaging out waves, has three components : mean sea level, astronomical tidal level and meteorologically induced level. The latter, surge value (sometimes called the non-tidal residual), is the difference between the observed and predicted sea level :

Surge level = Observed level - Tidal level - Mean sea level. (3)

This equation was used to compute hourly values of the surge levels at Hutton for the period 1st November 1982 to 20th March 1984. Hourly observed levels from gauge 444 were used and the tidal levels hindcast, using the 1 year tidal analysis and equation (2). The mean sea level used was the mean of all the hourly observed values.

The frequency distribution of the resulting hourly surge levels is given in Figure 8. The distribution shows the same Gaussian appearance, with some asymmetry, as those from much longer data sets from other ports, including Lerwick (Ref. 5). There is a positive skewness indicating that extreme high levels (positive surges) were more probable than low levels (negative surges). The largest positive surge was 0.529m occurring on 12/01/84; the largest negative surge was -0.526m occurring on 7/2/83 ; and the standard deviation of the surge levels was 0.128m.

8. Extreme levels

The extreme high or low sea levels at the Hutton Field will be due to a combination of astronomical tide and meteorological surge. ("Astronomical" here means "due to the earth-moon-sun system" and not "extreme"!) In the long term, there will also be a contribution from any secular trend in mean sea level, as discussed in section 6.

The Joint- or Combined- Probability method (Refs. 5, 8) has been used to estimate the extreme high and low sea levels at the Hutton Field over the next 100 years. This method is based on the separation of hourly values of sea level into mean sea level, tide and surge components. Separate probability distributions are computed for tide and surge and the probabilities of obtaining tide and surge levels are combined together to obtain the probability of a particular sea level, and hence "return period" levels. The return period levels can be adjusted for any trends in msl if these are identifiable. The statistical method assumes that tide and surge are independent events; in practice, tide - surge interaction is only important in extreme shallow water areas and therefore the application of this method to the Hutton data is considered justified.

If $P_T(x)$ and $P_S(y)$ are the probability density functions (pdf) for tide and surge respectively, then the probability of occurrence of a particular sea level, $P(\zeta)$, is given by

$$P(\zeta) = \int_{-\infty}^{\infty} P_T(\zeta - y)\, P_S(y)\, dy. \qquad (4)$$

The probability of exceeding a particular level H is given by the cumulative distribution function

$$Q(H) = \int_{H}^{\infty} P(\zeta)\, d\zeta \qquad (5)$$

and the probability of exposure of a level is given by

$$R(H) = \int_{-\infty}^{H} P(\zeta)\, d\zeta. \qquad (6)$$

The tidal pdf at Hutton was generated from the 19 years' hourly predictions from 1985 to 2003 and therefore is fully representative of the tidal levels over the 18.6y nodal cycle. The surge pdf was generated from the computed surges from 1st November 1982 to 20th March 1984 and is therefore only a limited sample from the surge population at Hutton. Any seasonal or long-term variability in the storm surge climate may therefore not be adequately represented.

Probabilities of exceedance of extreme high and low levels and return periods are given in Table 3. Note that the return period is the average time between exceedances of an event, and that there is a finite risk that one such event will occur during a period equal to the return period. This risk (ri) is related to the return period (rp) and design life of the structure (L) by

$$ri = 1 - (1 - 1/rp)^L \quad (7)$$

Note that if L = rp, then ri = 0.63, i.e. there is a 63% probability that the return period event will occur during the life of the structure, (Ref. 8).

9. Conclusions

Very good quality bottom pressure data has been obtained from the Hutton Field site for the period 31st October 1982 to 1st May 1984, and has been processed to yield a hourly sea level record from 0800 GMT 8th November 1982 to 1100 GMT 20th March 1984.

1 year of sea level data has been analysed and predicted hourly values of tidal level relative to mean sea level have been computed from July 1984 to December 2004, together with times and heights of High and Low Water from July 1984 to December 1986.

Monthly mean sea level variations at Hutton closely followed those at Lerwick and indicated large inter-month variability. Msl variations at Lerwick over a 25 year period have been used to produce a best estimate of the long term msl at Hutton of 145163 mm relative to the sensor level of gauge 444, i.e. 145575 mm relative to the bottom deck level of the sensor table of the well head template. The significant difference between this value and the previously computed provisional value based on gauge 445 data (Ref. 2) is ascribed to changes in the sensor level of this gauge on the redeployments in January and May 1983. Errors due to instrumental accuracy and calibration are estimated to be 15 mm, those due to determination of atmospheric pressure and sea water density to be 40 mm.

The frequency distribution of hourly surges from November 1982 to March 1984 has been computed from the observed sea levels and predicted tide levels. The tide and surge distributions have been used to estimate the extreme high and low sea levels likely to occur at Hutton over the next 100 years. As only 16 months' surge data was available, the estimates are liable to have error bounds of approximately ± 0.15 m (Ref. 5).

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11. Acknowledgements

Thanks are due to John Casson, David Flatt and Alan Harrison for preparation, deployment and recovery of instruments, to Sylvia Asquith for the onerous task of extracting the atmospheric data, and to Joyce Richards and Linda Parry for drawing the figures and typing the manuscript respectively. Ed Stokes proved a very helpful and useful Conoco Representative. David Blackman computed the predictions and extreme level estimates.

12. Tables

1. Harmonic constants from analysis of 1 years' sea level data from gauge 444.

2. Tidal statistics at Hutton Field.

3. Probabilities of exceedance and return periods of extreme levels.

NO	NAME	SPEED	H(cm)	G(°)
1	Z0	0.	14515.9874	0.
2	SA	0.0410686	11.2352	245.996
3	SSA	0.0821373	4.3522	131.945
4	MM	0.5443747	1.7014	36.993
5	MSF	1.0158958	1.0385	144.798
6	MF	1.0980331	4.2158	182.090
7	2Q1	12.8542862	0.3629	288.975
8	SIG1	12.9271398	0.2706	323.450
9	Q1	13.3986609	1.7581	337.958
10	RO1	13.4715145	0.4552	358.463
11	O1	13.9430356	5.6891	37.593
12	MP1	14.0251729	0.2501	260.352
13	M1	14.4920521	0.3830	52.216
14	CHI1	14.5695476	0.0890	137.992
15	PI1	14.9178647	0.2441	90.094
16	P1	14.9589314	1.8033	148.599
17	S1	15.0000000	0.2682	69.905
18	K1	15.0410686	5.8652	169.266
19	PSI1	15.0821353	0.2417	152.275
20	PHI1	15.1232059	0.1731	270.330
21	TH1	15.5125897	0.1062	187.069
22	J1	15.5854433	0.3408	185.149
23	SO1	16.0569644	0.0236	105.774
24	OO1	16.1391017	0.2459	311.933
25	OQ2	27.3416964	0.2330	187.181
26	MNS2	27.4238337	0.3486	222.258
27	2N2	27.8953548	1.3797	246.709
28	MU2	27.9682084	1.6845	248.601
29	N2	28.4397295	10.2598	266.579
30	NU2	28.5125831	1.9095	272.429
31	OP2	28.9019669	0.0609	197.895
32	M2	28.9841042	51.0544	288.440
33	MKS2	29.0662415	0.0394	262.290
34	LAM2	29.4556253	0.4314	289.528
35	L2	29.5284789	1.5030	296.161
36	T2	29.9589333	0.9591	318.088
37	S2	30.0000000	18.3521	323.935
38	R2	30.0410667	0.2113	351.823
39	K2	30.0821373	5.3273	321.969
40	MSN2	30.5443747	0.1285	156.959
41	KJ2	30.6265120	0.2315	149.181
42	2SM2	31.0158958	0.0855	196.427
43	MO3	42.9271398	0.2374	166.798
44	M3	43.4761563	0.3883	175.764
45	SO3	43.9430356	0.1251	293.614
46	MK3	44.0251729	0.1958	319.611
47	SK3	45.0410686	0.1355	76.425
48	MN4	57.4238337	0.0109	177.444
49	M4	57.9682084	0.4912	241.666
50	SN4	58.4397295	0.0555	140.313
51	MS4	58.9841042	0.6827	343.336
52	MK4	59.0662415	0.2463	354.282
53	S4	60.0000000	0.1282	124.477
54	SK4	60.0821373	0.1209	108.301
55	2MN6	86.4079380	0.2066	225.045
56	M6	86.9523127	0.3974	257.497
57	MSN6	87.4238337	0.1243	299.114
58	2MS6	87.9682084	0.4909	306.869
59	2MK6	88.0503457	0.1510	320.100
60	2SM6	88.9841042	0.1190	0.597
61	MSK6	89.0662415	0.0638	352.496
62	MA2	28.9430356	0.2579	163.882
63	MB2	29.0251729	0.1145	330.178

TABLE 1 : HARMONIC CONSTANTS AT HUTTON FIELD

		(m)
Z_o	relative to sensor level	145.160
HAT	relative to Z_o	+1.05
MHWS		+0.69
MHWN		+0.33
MLWN		-0.33
MLWS		-0.69
LAT		-1.06

Note :

1) All statistics are based on analysis of 365 day period, 01/01/83 to 31/12/84, of water level data from sensor 444.

*2) Best estimate of long term msl at Hutton is 145163mm relative to sensor level, i.e. 145575mm relative to the bottom deck level of the sensor table (see text).

TABLE 2: TIDAL STATISTICS AT HUTTON FIELD

Exceedance Probability in a Year	Return Period (years)	High(+) and Low(-) Level (metres to msl)	
1/5	5	+1.35	-1.34
1/10	10	+1.38	-1.37
1/20	20	+1.41	-1.41
1/50	50	+1.45	-1.45
1/100	100	+1.48	-1.49

TABLE 3: EXTREME LEVELS AT HUTTON FIELD

13. Figures

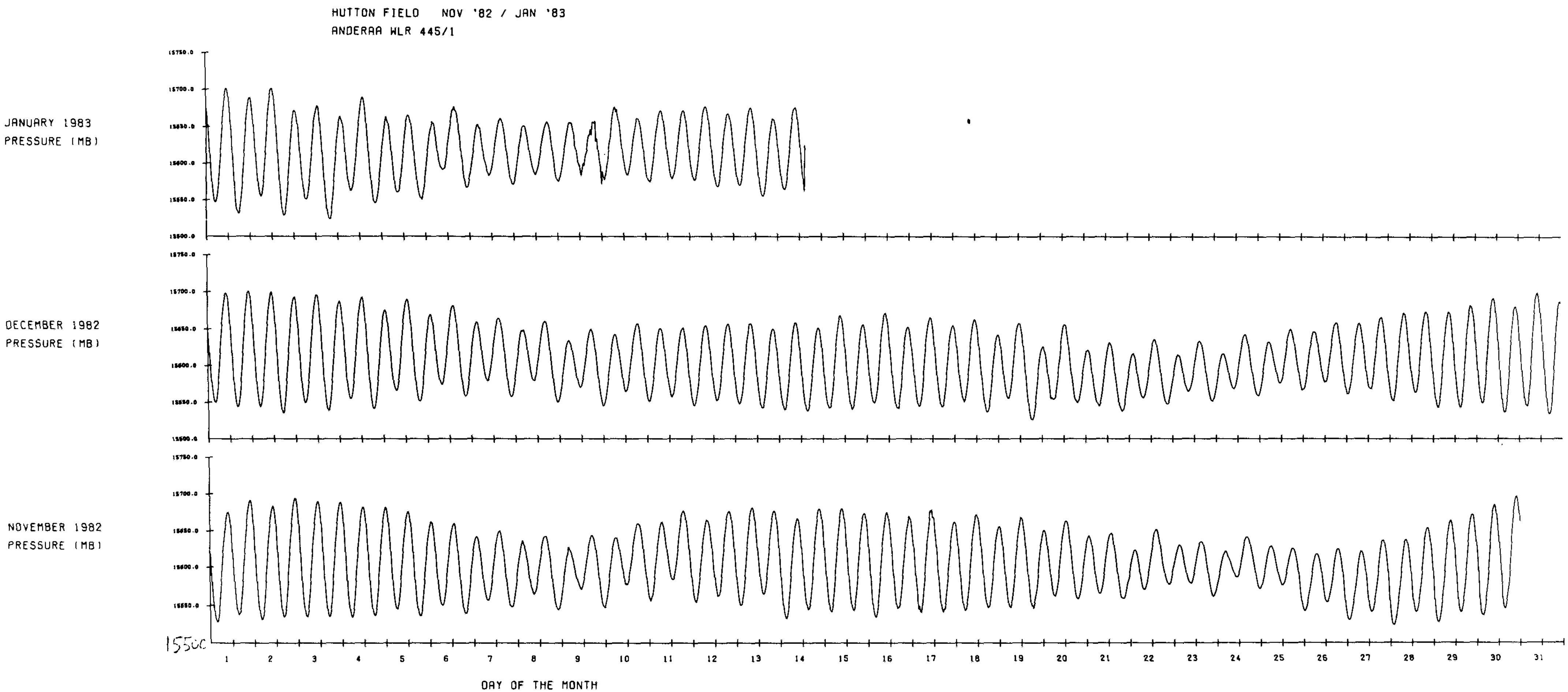

HUTTON FIELD NOV '82 / JAN '83
ANDERAA WLR 445/1
JANUARY 1983
PRESSURE (MB)
DECEMBER 1982
PRESSURE (MB)
NOVEMBER 1982
PRESSURE (MB)
15750.0
15700.0
15650.0
15600.0
15550.0
15500.0
15500
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DAY OF THE MONTH

Figure 1

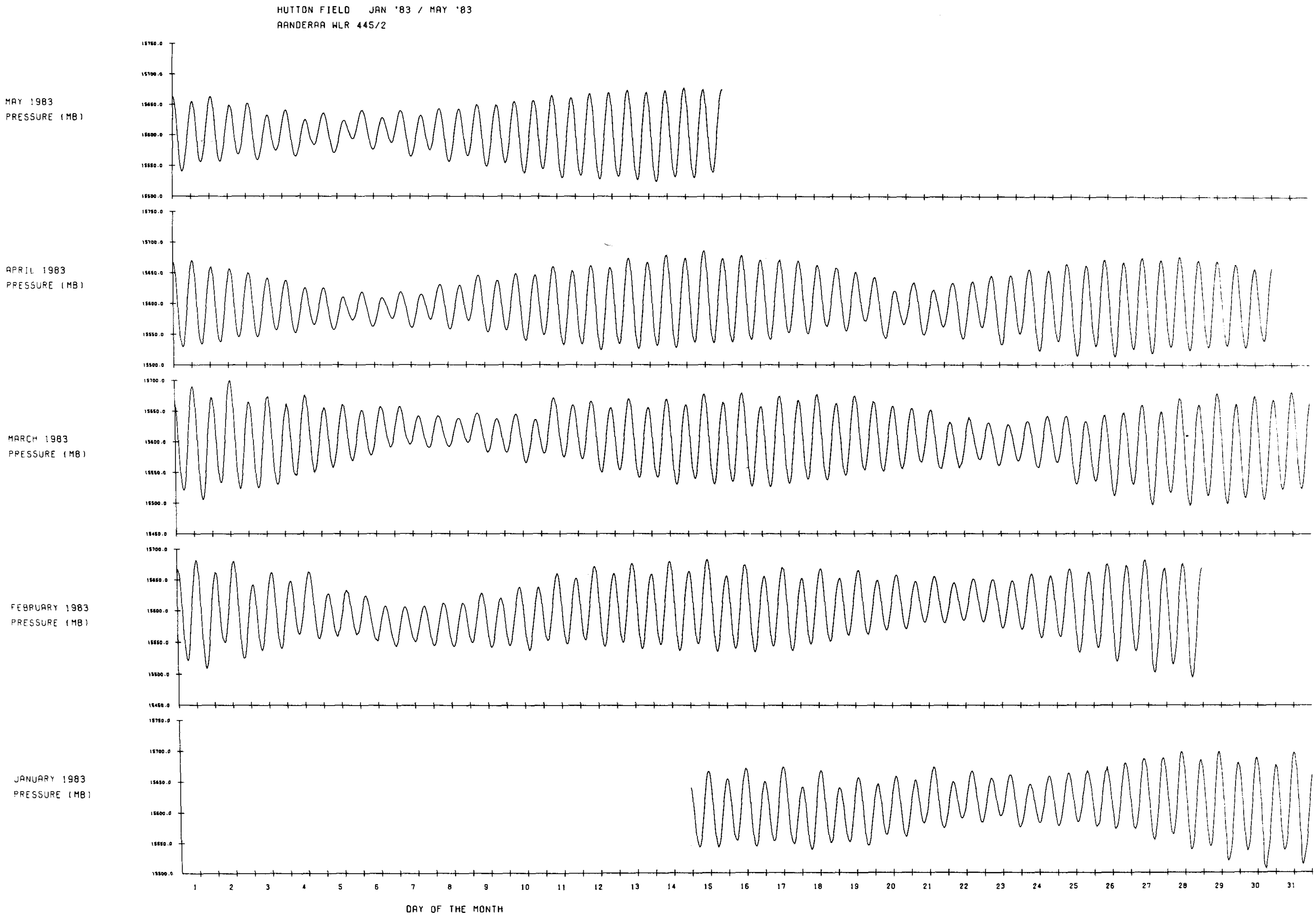
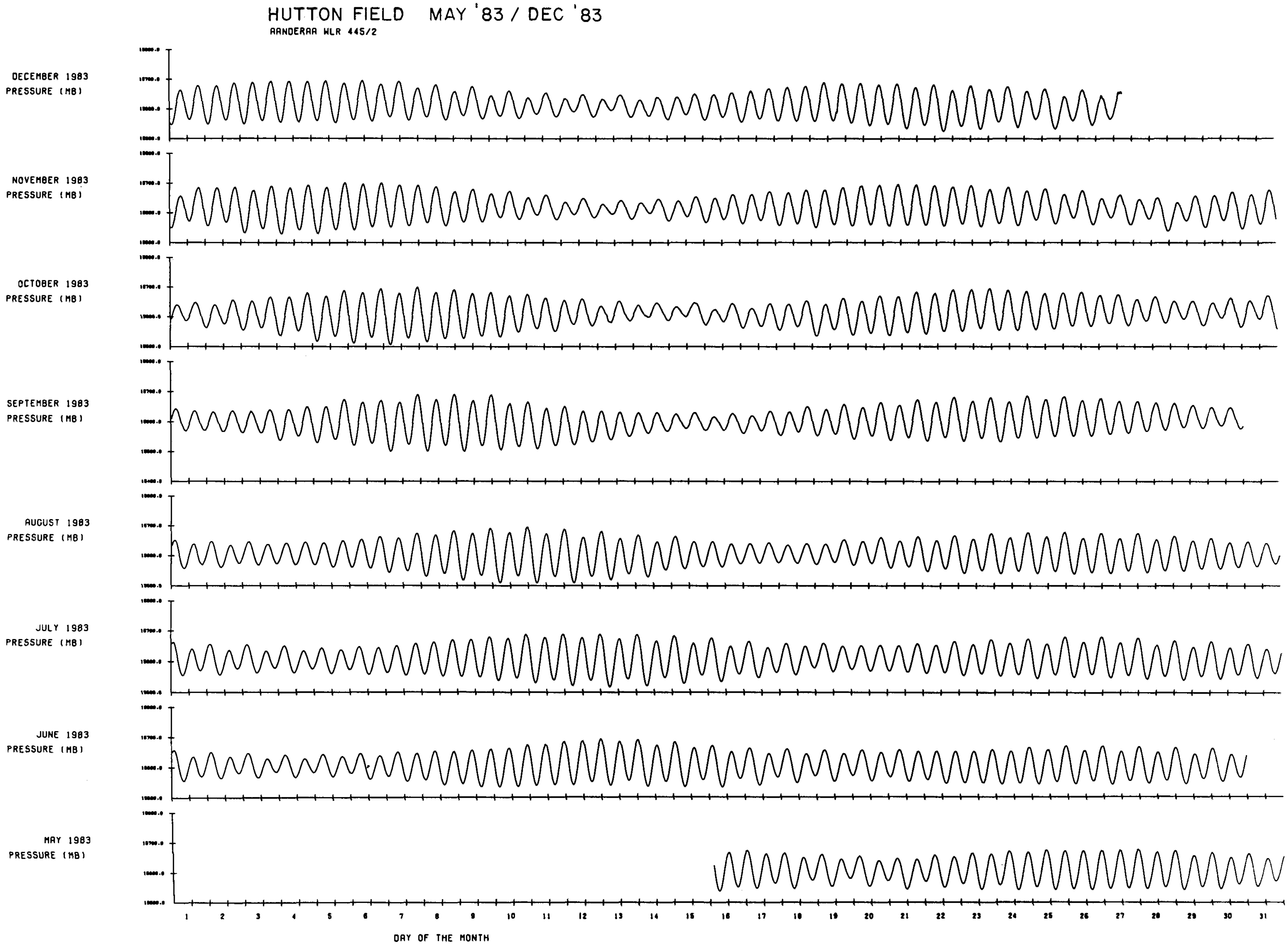

HUTTON FIELD JAN '83 / MAY '83
AANDERAA WLR 445/2
MAY 1983
PRESSURE (MB)
APRIL 1983
PRESSURE (MB)
MARCH 1983
PRESSURE (MB)
FEBRUARY 1983
PRESSURE (MB)
JANUARY 1983
PRESSURE (MB)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DAY OF THE MONTH

Figure 2



HUTTON FIELD MAY '83 / DEC '83
AANDERAA WLR 445/2
DECEMBER 1983
PRESSURE (MB)
NOVEMBER 1983
PRESSURE (MB)
OCTOBER 1983
PRESSURE (MB)
SEPTEMBER 1983
PRESSURE (MB)
AUGUST 1983
PRESSURE (MB)
JULY 1983
PRESSURE (MB)
JUNE 1983
PRESSURE (MB)
MAY 1983
PRESSURE (MB)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DAY OF THE MONTH

Figure 3

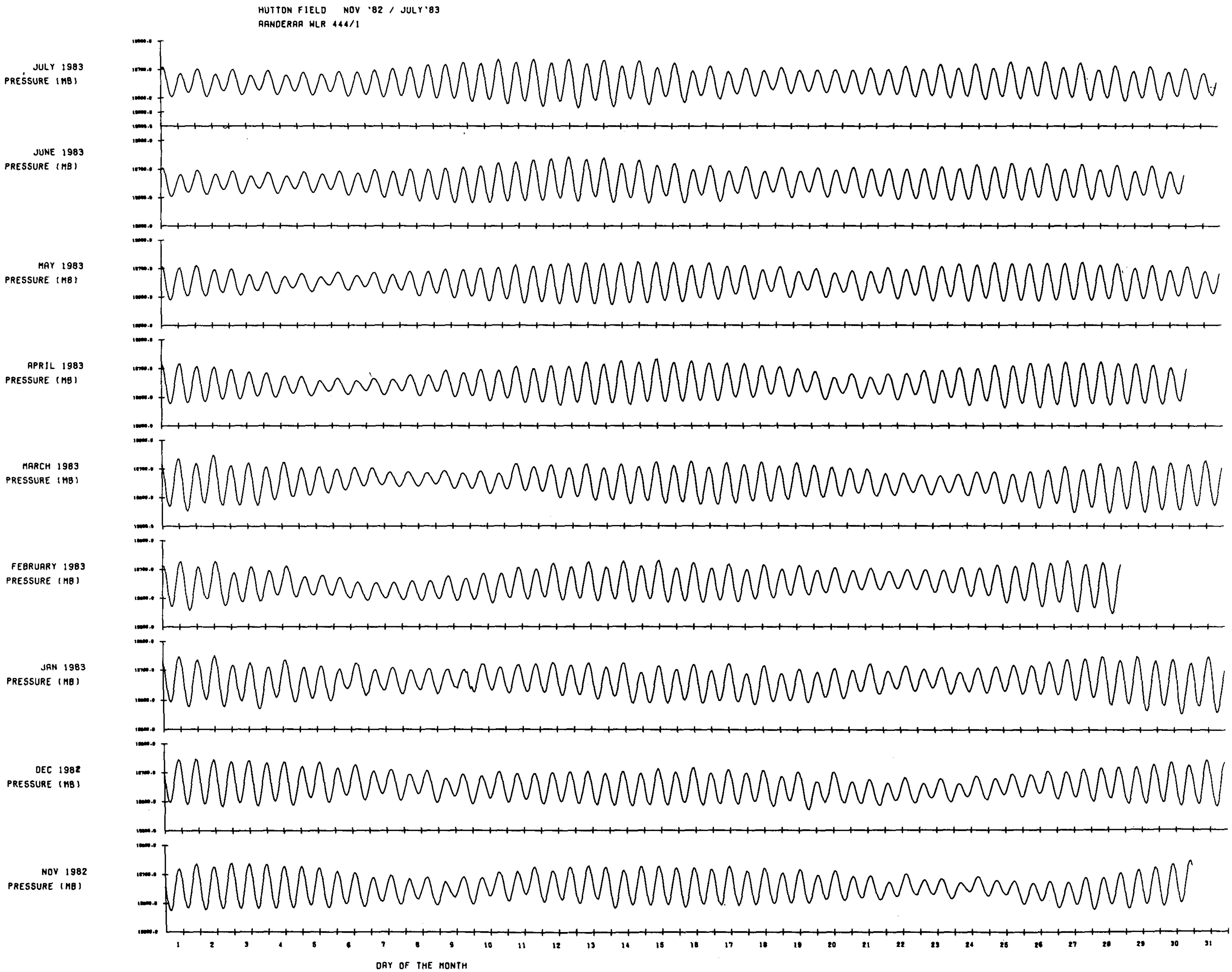

HUTTON FIELD NOV '82 / JULY'83
AANDERAA WLR 444/1
JULY 1983
PRESSURE (MB)
JUNE 1983
PRESSURE (MB)
MAY 1983
PRESSURE (MB)
APRIL 1983
PRESSURE (MB)
MARCH 1983
PRESSURE (MB)
FEBRUARY 1983
PRESSURE (MB)
JAN 1983
PRESSURE (MB)
DEC 1982
PRESSURE (MB)
NOV 1982
PRESSURE (MB)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
DAY OF THE MONTH

Figure 4

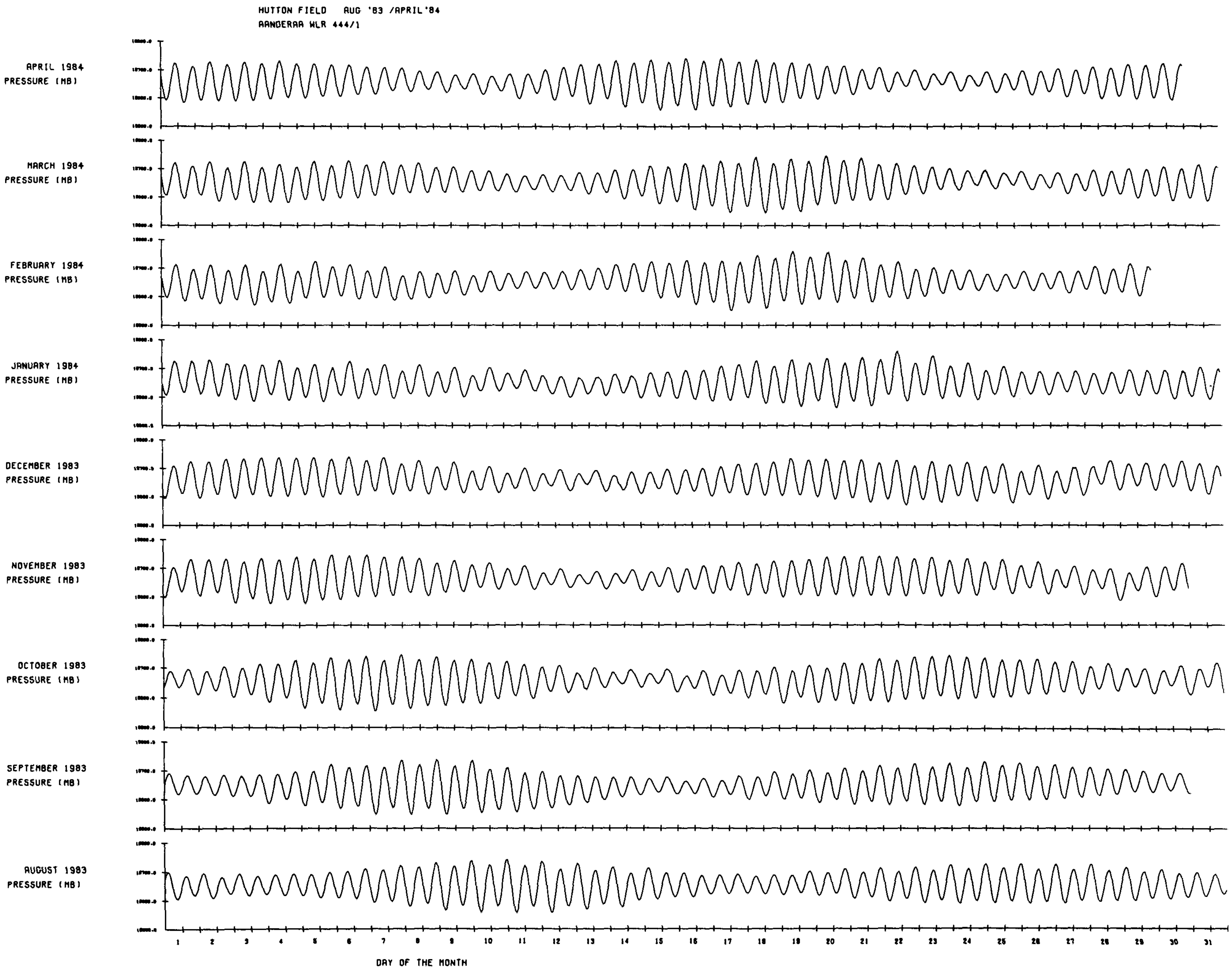

HUTTON FIELD AUG '83 /APRIL '84
AANDERAA WLR 444/1
APRIL 1984
PRESSURE (MB)
MARCH 1984
PRESSURE (MB)
FEBRUARY 1984
PRESSURE (MB)
JANUARY 1984
PRESSURE (MB)
DECEMBER 1983
PRESSURE (MB)
NOVEMBER 1983
PRESSURE (MB)
OCTOBER 1983
PRESSURE (MB)
SEPTEMBER 1983
PRESSURE (MB)
AUGUST 1983
PRESSURE (MB)
DAY OF THE MONTH

Figure 5

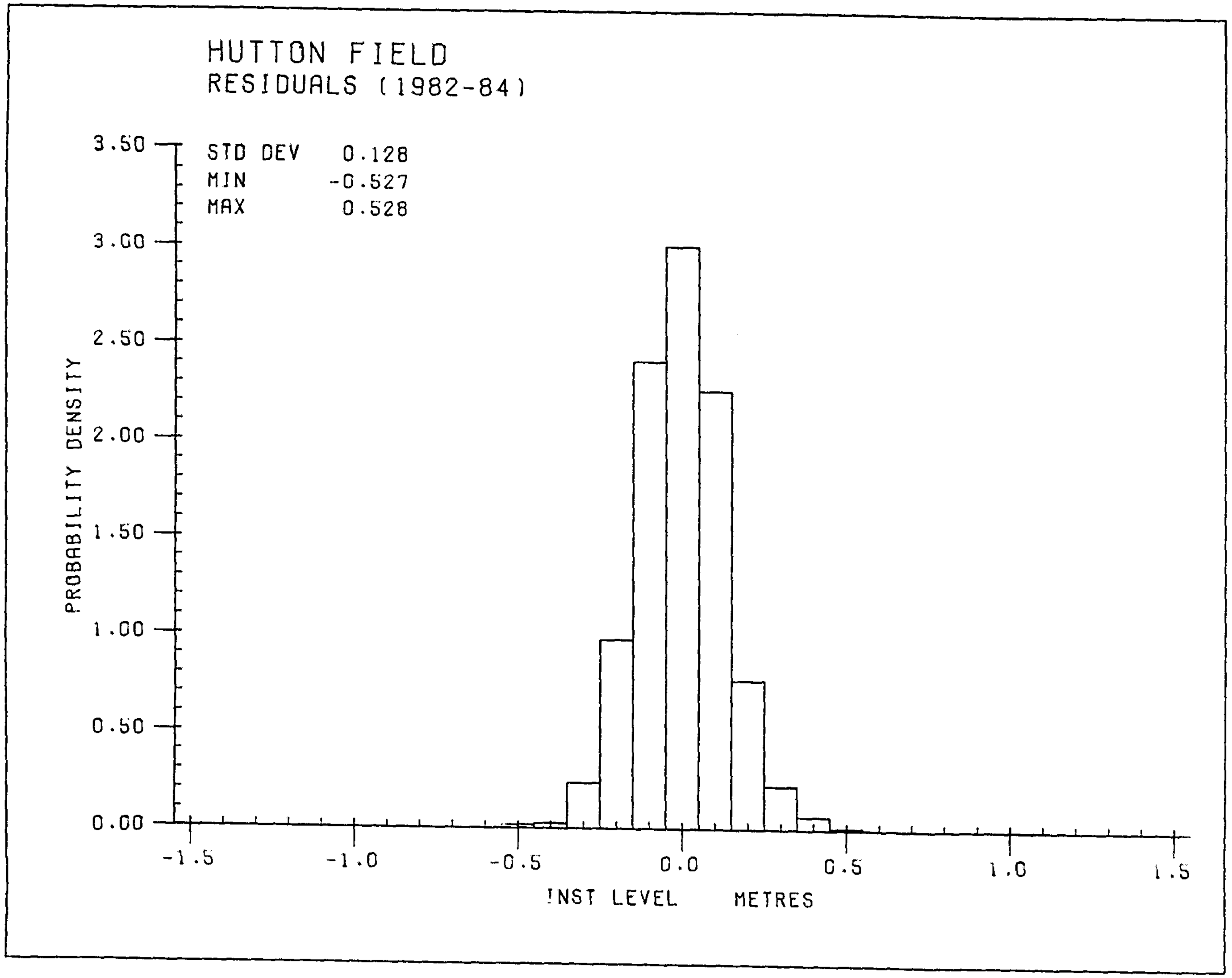

HUTTON FIELD
RESIDUALS (1982-84)
STD DEV 0.128
MIN -0.527
MAX 0.528
PROBABILITY DENSITY
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
INST LEVEL METRES

Figure 8

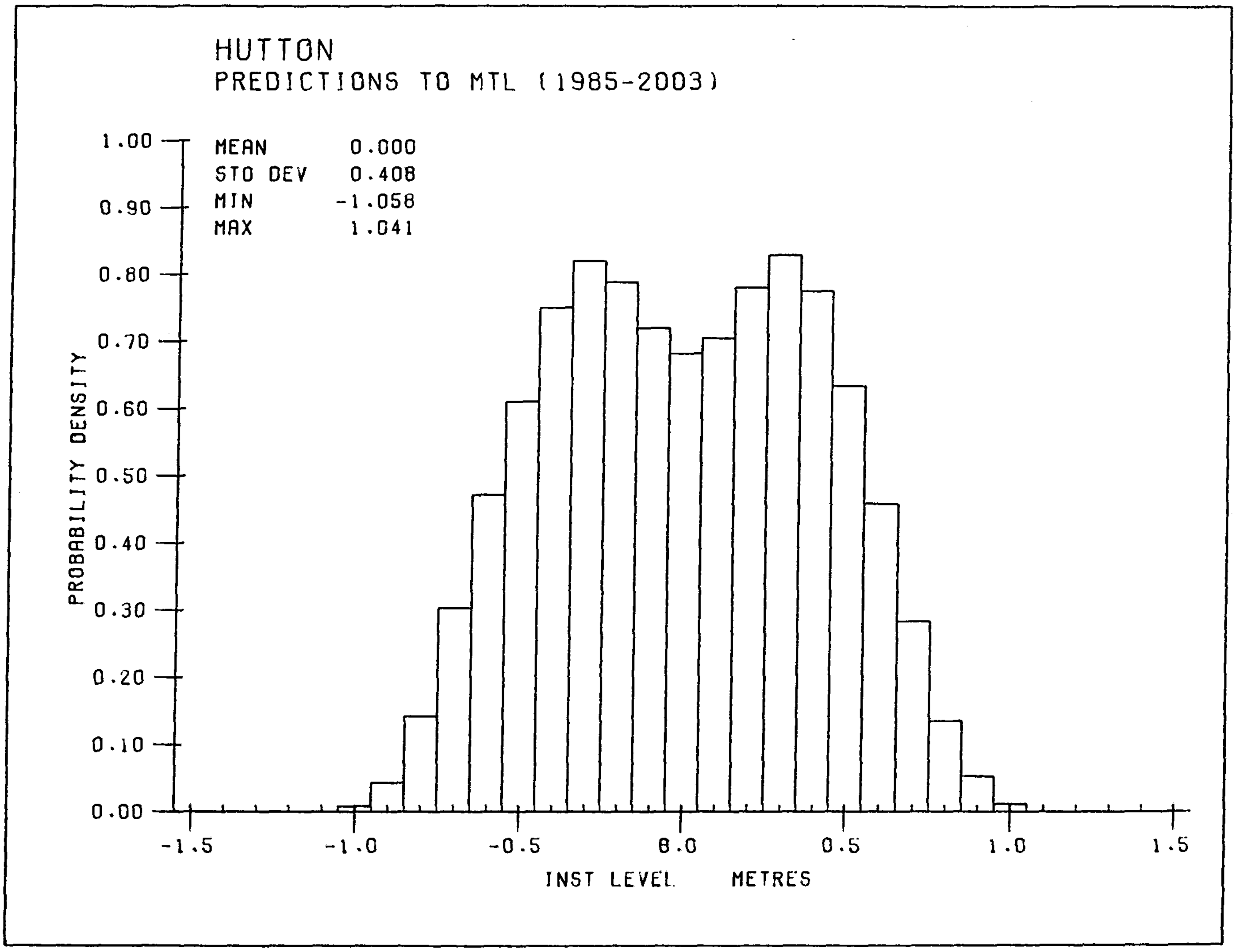

HUTTON
PREDICTIONS TO MTL (1985-2003)
MEAN 0.000
STD DEV 0.408
MIN -1.058
MAX 1.041
PROBABILITY DENSITY
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
INST LEVEL METRES

Figure 6

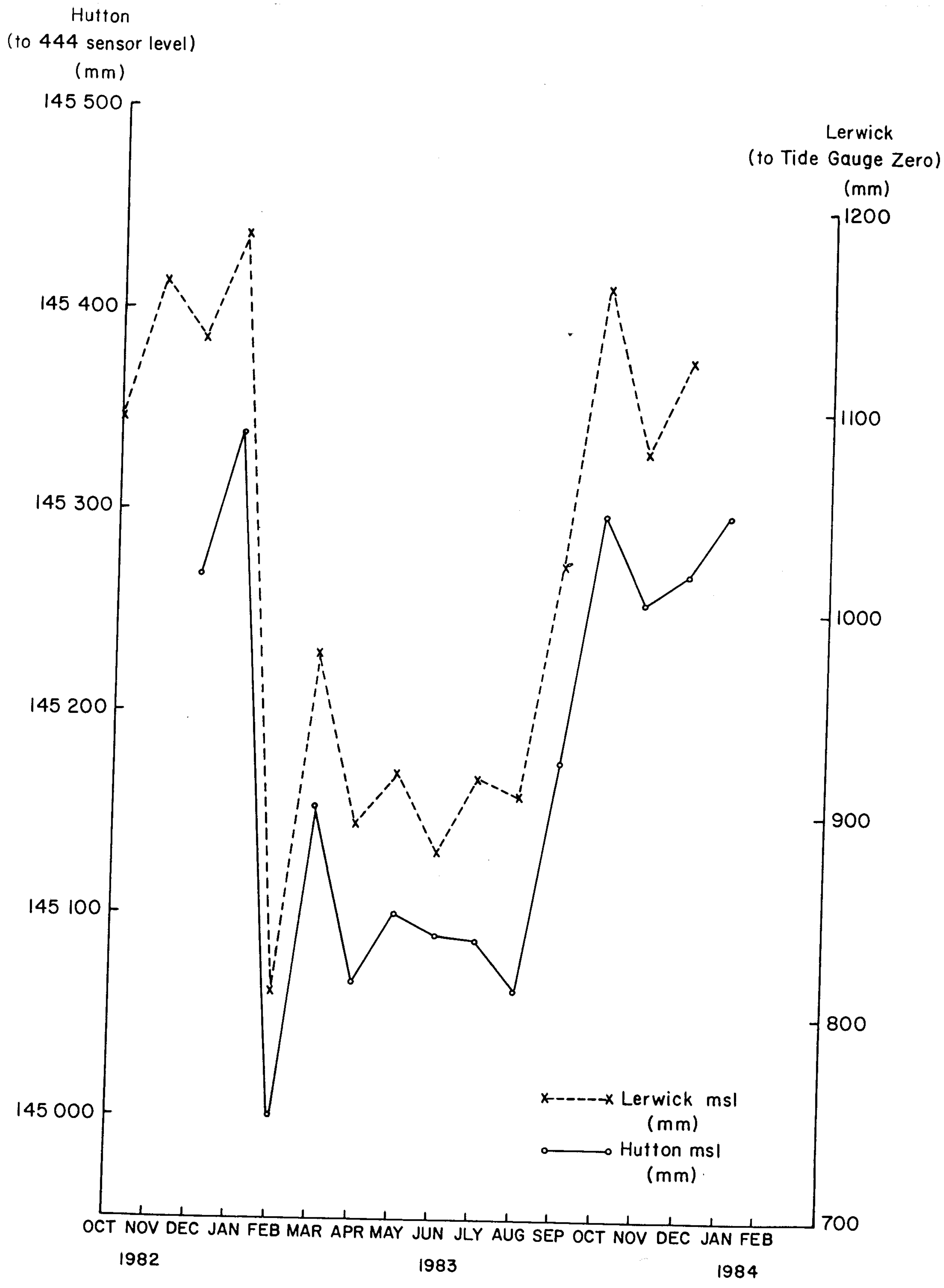


Figure 7: Mean sea levels at Hutton and Lerwick

14. APPENDIX 1 - Predicted Hourly Heights

NORTH SEA - HUTTON FIELD

TIME ZONE GMT　　　LAT 61 00 N　　LONG 1 24 E　　　UNITS METRES

JULY 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	SU	0.62	0.39	0.04	-0.32	-0.60	-0.76	-0.76	-0.59	-0.29	0.04	0.33	0.51	0.55	0.41	0.13	-0.19	-0.46	-0.61	-0.62	-0.48	-0.20	0.13	0.43	0.62
2	M	0.68	0.58	0.31	-0.06	-0.41	-0.67	-0.80	-0.77	-0.57	-0.26	0.07	0.34	0.49	0.50	0.34	0.05	-0.26	-0.50	-0.62	-0.59	-0.42	-0.14	0.18	0.45
3	TU	0.62	0.65	0.51	0.22	-0.14	-0.47	-0.71	-0.81	-0.75	-0.54	-0.24	0.07	0.32	0.45	0.43	0.25	-0.03	-0.31	-0.51	-0.60	-0.55	-0.37	-0.09	0.20
4	W	0.44	0.59	0.59	0.43	0.14	-0.20	-0.50	-0.70	-0.79	-0.72	-0.51	-0.22	0.06	0.28	0.40	0.36	0.18	-0.08	-0.32	-0.49	-0.56	-0.50	-0.33	-0.07
5	TH	0.20	0.41	0.53	0.52	0.37	0.09	-0.22	-0.49	-0.67	-0.74	-0.67	-0.48	-0.22	0.04	0.24	0.34	0.30	0.13	-0.09	-0.31	-0.46	-0.51	-0.46	-0.30
6	F	-0.08	0.16	0.36	0.47	0.46	0.32	0.07	-0.20	-0.45	-0.62	-0.69	-0.63	-0.45	-0.21	0.03	0.21	0.30	0.27	0.12	-0.08	-0.27	-0.41	-0.47	-0.44
7	SA	-0.31	-0.10	0.12	0.31	0.42	0.42	0.30	0.08	-0.17	-0.40	-0.56	-0.63	-0.58	-0.42	-0.20	0.03	0.21	0.30	0.28	0.15	-0.03	-0.22	-0.38	-0.46
8	SU	-0.44	-0.33	-0.14	0.08	0.27	0.39	0.40	0.31	0.11	-0.12	-0.35	-0.52	-0.59	-0.55	-0.40	-0.17	0.06	0.24	0.34	0.32	0.21	0.02	-0.19	-0.36
9	M	-0.47	-0.47	-0.37	-0.18	0.04	0.25	0.38	0.41	0.33	0.15	-0.09	-0.32	-0.49	-0.57	-0.52	-0.36	-0.13	0.11	0.31	0.41	0.40	0.27	0.05	-0.18
10	TU	-0.38	-0.50	-0.52	-0.42	-0.22	0.02	0.25	0.40	0.44	0.36	0.17	-0.08	-0.32	-0.49	-0.56	-0.50	-0.31	-0.06	0.20	0.40	0.50	0.47	0.31	0.06
11	W	-0.21	-0.43	-0.56	-0.58	-0.46	-0.23	0.03	0.27	0.43	0.47	0.38	0.16	-0.11	-0.35	-0.51	-0.55	-0.46	-0.25	0.03	0.30	0.50	0.58	0.52	0.32
12	TH	0.02	-0.27	-0.50	-0.63	-0.62	-0.47	-0.22	0.07	0.31	0.46	0.49	0.36	0.11	-0.17	-0.40	-0.54	-0.55	-0.42	-0.17	0.14	0.41	0.59	0.63	0.52
13	F	0.27	-0.06	-0.36	-0.59	-0.69	-0.65	-0.46	-0.17	0.12	0.36	0.48	0.47	0.30	0.03	-0.26	-0.47	-0.57	-0.53	-0.36	-0.07	0.24	0.50	0.64	0.64
14	SA	0.47	0.17	-0.17	-0.47	-0.66	-0.72	-0.63	-0.41	-0.11	0.18	0.39	0.47	0.41	0.20	-0.09	-0.36	-0.53	-0.58	-0.50	-0.27	0.04	0.34	0.55	0.64
15	SU	0.58	0.36	0.04	-0.30	-0.56	-0.71	-0.72	-0.58	-0.33	-0.03	0.23	0.39	0.43	0.31	0.06	-0.23	-0.46	-0.58	-0.57	-0.43	-0.17	0.14	0.40	0.57
16	M	0.60	0.48	0.22	-0.11	-0.42	-0.63	-0.73	-0.68	-0.50	-0.23	0.04	0.26	0.37	0.34	0.17	-0.09	-0.35	-0.53	-0.59	-0.53	-0.34	-0.07	0.22	0.44
17	TU	0.55	0.52	0.35	0.07	-0.25	-0.51	-0.67	-0.70	-0.61	-0.40	-0.14	0.10	0.26	0.32	0.24	0.03	-0.22	-0.44	-0.57	-0.57	-0.46	-0.24	0.02	0.27
18	W	0.43	0.49	0.41	0.21	-0.08	-0.35	-0.56	-0.66	-0.65	-0.52	-0.31	-0.07	0.13	0.24	0.25	0.12	-0.09	-0.31	-0.48	-0.56	-0.52	-0.37	-0.15	0.06
19	TH	0.29	0.41	0.42	0.30	0.08	-0.18	-0.42	-0.57	-0.62	-0.57	-0.43	-0.23	-0.02	0.14	0.21	0.17	0.03	-0.17	-0.36	-0.48	-0.51	-0.44	-0.29	-0.09
20	F	0.12	0.28	0.36	0.33	0.20	-0.01	-0.24	-0.43	-0.54	-0.56	-0.49	-0.35	-0.17	0.01	0.13	0.17	0.12	-0.02	-0.19	-0.34	-0.43	-0.44	-0.37	-0.23
21	SA	-0.05	0.13	0.26	0.31	0.26	0.13	-0.06	-0.26	-0.41	-0.49	-0.49	-0.42	-0.29	-0.13	0.02	0.13	0.16	0.10	-0.03	-0.17	-0.30	-0.37	-0.38	-0.31
22	SU	-0.19	-0.04	0.11	0.23	0.27	0.22	0.09	-0.07	-0.24	-0.37	-0.44	-0.44	-0.37	-0.25	-0.10	0.04	0.14	0.17	0.12	0.01	-0.12	-0.24	-0.32	-0.34
23	M	-0.30	-0.19	-0.05	0.10	0.21	0.25	0.21	0.10	-0.05	-0.20	-0.33	-0.41	-0.42	-0.35	-0.23	-0.07	0.08	0.18	0.22	0.18	0.08	-0.06	-0.20	-0.30
24	TU	-0.35	-0.32	-0.22	-0.07	0.09	0.21	0.26	0.24	0.14	-0.01	-0.18	-0.32	-0.41	-0.42	-0.35	-0.21	-0.03	0.14	0.26	0.30	0.26	0.14	-0.03	-0.21
25	W	-0.34	-0.40	-0.37	-0.26	-0.09	0.10	0.24	0.31	0.30	0.19	0.01	-0.18	-0.34	-0.44	-0.45	-0.35	-0.18	0.03	0.23	0.36	0.40	0.34	0.18	-0.04
26	TH	-0.26	-0.42	-0.49	-0.45	-0.31	-0.09	0.13	0.30	0.39	0.36	0.23	0.01	-0.22	-0.41	-0.50	-0.49	-0.36	-0.14	0.12	0.34	0.48	0.50	0.40	0.17
27	F	-0.11	-0.37	-0.55	-0.61	-0.54	-0.34	-0.07	0.19	0.38	0.47	0.42	0.24	-0.03	-0.29	-0.49	-0.58	-0.53	-0.35	-0.07	0.22	0.46	0.59	0.58	0.42
28	SA	0.13	-0.21	-0.50	-0.68	-0.73	-0.61	-0.35	-0.03	0.26	0.46	0.53	0.45	0.21	-0.10	-0.40	-0.59	-0.65	-0.56	-0.32	0.01	0.34	0.57	0.68	0.62
29	SU	0.39	0.04	-0.34	-0.64	-0.81	-0.82	-0.65	-0.34	0.03	0.33	0.53	0.57	0.44	0.15	-0.20	-0.50	-0.68	-0.71	-0.56	-0.26	0.11	0.44	0.66	0.74
30	M	0.63	0.33	-0.07	-0.47	-0.76	-0.91	-0.87	-0.65	-0.29	0.09	0.39	0.56	0.57	0.38	0.05	-0.32	-0.60	-0.74	-0.72	-0.52	-0.18	0.20	0.52	0.71
31	TU	0.75	0.59	0.25	-0.19	-0.58	-0.84	-0.95	-0.87	-0.60	-0.22	0.14	0.42	0.56	0.53	0.30	-0.06	-0.41	-0.66	-0.76	-0.69	-0.45	-0.09	0.28	0.56

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

NORTH SEA - HUTTON FIELD

TIME ZONE GMT | LAT 61 00 N LONG 1 24 E | UNITS METRES

AUGUST 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	W	0.72	0.72	0.51	0.14	-0.28	-0.63	-0.86	-0.93	-0.81	-0.52	-0.16	0.18	0.42	0.53	0.45	0.19	-0.16	-0.47	-0.67	-0.72	-0.62	-0.36	-0.01	0.32
2	TH	0.57	0.69	0.65	0.42	0.05	-0.33	-0.64	-0.82	-0.85	-0.71	-0.42	-0.09	0.20	0.40	0.47	0.35	0.09	-0.22	-0.48	-0.63	-0.65	-0.52	-0.27	0.03
3	F	0.32	0.53	0.62	0.55	0.32	-0.01	-0.34	-0.59	-0.73	-0.73	-0.58	-0.33	-0.04	0.20	0.37	0.40	0.27	0.03	-0.23	-0.43	-0.55	-0.55	-0.44	-0.22
4	SA	0.05	0.29	0.46	0.53	0.45	0.25	-0.03	-0.29	-0.49	-0.60	-0.60	-0.47	-0.25	-0.01	0.20	0.33	0.34	0.22	0.03	-0.18	-0.35	-0.45	-0.46	-0.37
5	SU	-0.20	0.02	0.22	0.37	0.43	0.37	0.21	-0.01	-0.22	-0.39	-0.48	-0.49	-0.38	-0.21	0.00	0.18	0.30	0.32	0.23	0.07	-0.10	-0.26	-0.37	-0.41
6	M	-0.36	-0.23	-0.05	0.14	0.29	0.36	0.33	0.22	0.05	-0.13	-0.29	-0.39	-0.41	-0.34	-0.18	0.01	0.18	0.30	0.34	0.28	0.15	-0.02	-0.19	-0.33
7	TU	-0.40	-0.39	-0.29	-0.12	0.06	0.22	0.32	0.33	0.25	0.11	-0.07	-0.24	-0.36	-0.39	-0.33	-0.18	0.02	0.21	0.34	0.40	0.36	0.23	0.04	-0.16
8	W	-0.34	-0.45	-0.45	-0.36	-0.19	0.01	0.20	0.33	0.36	0.29	0.14	-0.06	-0.24	-0.37	-0.41	-0.34	-0.17	0.05	0.26	0.42	0.48	0.44	0.28	0.05
9	TH	-0.20	-0.40	-0.53	-0.53	-0.43	-0.23	0.01	0.22	0.36	0.40	0.32	0.13	-0.10	-0.30	-0.43	-0.46	-0.36	-0.15	0.10	0.34	0.50	0.56	0.48	0.27
10	F	-0.01	-0.29	-0.50	-0.62	-0.60	-0.46	-0.21	0.06	0.28	0.41	0.42	0.29	0.06	-0.20	-0.40	-0.51	-0.50	-0.35	-0.10	0.19	0.43	0.58	0.60	0.46
11	SA	0.20	-0.12	-0.41	-0.62	-0.70	-0.64	-0.43	-0.15	0.13	0.34	0.44	0.40	0.21	-0.06	-0.33	-0.52	-0.59	-0.52	-0.31	-0.01	0.29	0.52	0.62	0.58
12	SU	0.38	0.07	-0.27	-0.55	-0.72	-0.74	-0.61	-0.35	-0.05	0.22	0.40	0.44	0.33	0.08	-0.22	-0.47	-0.62	-0.63	-0.49	-0.22	0.11	0.39	0.57	0.62
13	M	0.51	0.25	-0.10	-0.43	-0.67	-0.77	-0.73	-0.53	-0.23	0.07	0.30	0.42	0.39	0.21	-0.09	-0.39	-0.60	-0.68	-0.61	-0.40	-0.09	0.23	0.47	0.60
14	TU	0.58	0.39	0.08	-0.28	-0.57	-0.74	-0.77	-0.65	-0.40	-0.10	0.17	0.35	0.40	0.30	0.05	-0.26	-0.52	-0.67	-0.68	-0.54	-0.27	0.05	0.33	0.52
15	W	0.58	0.49	0.24	-0.10	-0.43	-0.66	-0.75	-0.71	-0.53	-0.26	0.03	0.25	0.37	0.35	0.18	-0.10	-0.39	-0.60	-0.67	-0.61	-0.41	-0.13	0.17	0.40
16	TH	0.53	0.52	0.36	0.08	-0.25	-0.52	-0.68	-0.70	-0.59	-0.38	-0.11	0.13	0.29	0.35	0.27	0.05	-0.23	-0.47	-0.61	-0.62	-0.50	-0.27	0.00	0.26
17	F	0.43	0.50	0.43	0.23	-0.06	-0.35	-0.55	-0.63	-0.60	-0.45	-0.23	0.00	0.19	0.30	0.30	0.17	-0.06	-0.30	-0.48	-0.55	-0.51	-0.36	-0.14	0.10
18	SA	0.30	0.42	0.44	0.32	0.10	-0.16	-0.38	-0.51	-0.54	-0.47	-0.31	-0.11	0.08	0.22	0.29	0.25	0.10	-0.11	-0.30	-0.42	-0.45	-0.39	-0.24	-0.04
19	SU	0.15	0.30	0.38	0.36	0.22	0.02	-0.20	-0.36	-0.44	-0.43	-0.35	-0.21	-0.04	0.12	0.23	0.26	0.20	0.06	-0.11	-0.25	-0.34	-0.35	-0.29	-0.16
20	M	0.00	0.15	0.27	0.32	0.28	0.16	-0.01	-0.18	-0.29	-0.35	-0.34	-0.27	-0.14	0.00	0.13	0.22	0.24	0.19	0.07	-0.06	-0.18	-0.25	-0.27	-0.24
21	TU	-0.15	-0.02	0.11	0.22	0.26	0.24	0.14	0.01	-0.12	-0.22	-0.28	-0.29	-0.23	-0.13	0.00	0.12	0.22	0.25	0.22	0.13	0.01	-0.11	-0.20	-0.26
22	W	-0.26	-0.19	-0.08	0.05	0.17	0.24	0.24	0.18	0.07	-0.06	-0.18	-0.26	-0.29	-0.26	-0.16	-0.02	0.13	0.24	0.31	0.30	0.21	0.08	-0.08	-0.22
23	TH	-0.32	-0.35	-0.29	-0.16	0.00	0.15	0.26	0.30	0.25	0.14	-0.02	-0.18	-0.30	-0.36	-0.32	-0.21	-0.04	0.15	0.31	0.40	0.40	0.30	0.12	-0.10
24	F	-0.31	-0.45	-0.49	-0.41	-0.25	-0.03	0.18	0.33	0.39	0.34	0.19	-0.02	-0.23	-0.39	-0.46	-0.41	-0.26	-0.03	0.22	0.42	0.52	0.50	0.35	0.10
25	SA	-0.19	-0.45	-0.61	-0.64	-0.54	-0.31	-0.02	0.25	0.43	0.49	0.41	0.21	-0.08	-0.34	-0.52	-0.58	-0.50	-0.28	0.03	0.33	0.55	0.65	0.59	0.37
26	SU	0.03	-0.33	-0.62	-0.79	-0.79	-0.62	-0.31	0.04	0.35	0.54	0.57	0.44	0.16	-0.18	-0.48	-0.66	-0.69	-0.54	-0.24	0.13	0.46	0.68	0.75	0.64
27	M	0.34	-0.08	-0.49	-0.79	-0.93	-0.88	-0.64	-0.26	0.13	0.45	0.62	0.62	0.42	0.06	-0.32	-0.62	-0.77	-0.75	-0.53	-0.16	0.25	0.59	0.79	0.82
28	TU	0.63	0.26	-0.21	-0.63	-0.91	-1.01	-0.90	-0.59	-0.17	0.23	0.53	0.66	0.61	0.34	-0.06	-0.46	-0.72	-0.83	-0.74	-0.46	-0.04	0.37	0.69	0.85
29	W	0.82	0.58	0.15	-0.33	-0.72	-0.95	-1.00	-0.83	-0.48	-0.05	0.32	0.58	0.66	0.54	0.22	-0.19	-0.55	-0.77	-0.81	-0.67	-0.34	0.08	0.46	0.73
30	TH	0.85	0.77	0.48	0.03	-0.41	-0.74	-0.92	-0.91	-0.69	-0.33	0.06	0.39	0.59	0.62	0.44	0.09	-0.29	-0.59	-0.74	-0.73	-0.55	-0.21	0.17	0.50
31	F	0.72	0.79	0.67	0.35	-0.06	-0.43	-0.69	-0.80	-0.74	-0.51	-0.18	0.15	0.42	0.56	0.54	0.33	0.00	-0.33	-0.55	-0.65	-0.61	-0.42	-0.11	0.21

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

NORTH SEA - HUTTON FIELD

TIME ZONE GMT | LAT 61 00 N LONG 1 24 E | UNITS METRES

SEPTEMBER 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	SA	0.48	0.65	0.69	0.54	0.24	-0.10	-0.39	-0.57	-0.63	-0.55	-0.34	-0.06	0.21	0.41	0.51	0.45	0.24	-0.04	-0.29	-0.46	-0.52	-0.47	-0.31	-0.06
2	SU	0.20	0.41	0.54	0.55	0.41	0.17	-0.08	-0.29	-0.42	-0.46	-0.38	-0.21	0.02	0.23	0.38	0.44	0.38	0.20	-0.01	-0.20	-0.33	-0.39	-0.37	-0.25
3	M	-0.07	0.13	0.30	0.41	0.41	0.32	0.15	-0.02	-0.17	-0.27	-0.31	-0.26	-0.13	0.04	0.21	0.34	0.39	0.34	0.22	0.07	-0.09	-0.21	-0.30	-0.31
4	TU	-0.25	-0.13	0.03	0.18	0.29	0.32	0.28	0.18	0.06	-0.06	-0.17	-0.22	-0.21	-0.12	0.02	0.17	0.30	0.37	0.36	0.29	0.17	0.01	-0.14	-0.26
5	W	-0.33	-0.31	-0.22	-0.08	0.08	0.21	0.29	0.30	0.24	0.13	0.00	-0.13	-0.22	-0.23	-0.16	-0.02	0.14	0.29	0.39	0.43	0.37	0.25	0.06	-0.13
6	TH	-0.30	-0.40	-0.41	-0.32	-0.16	0.03	0.19	0.31	0.34	0.29	0.16	-0.01	-0.17	-0.28	-0.30	-0.22	-0.06	0.14	0.33	0.46	0.50	0.44	0.27	0.04
7	F	-0.20	-0.40	-0.51	-0.50	-0.39	-0.19	0.04	0.24	0.37	0.39	0.30	0.12	-0.10	-0.28	-0.39	-0.39	-0.27	-0.06	0.18	0.40	0.53	0.56	0.46	0.23
8	SA	-0.05	-0.33	-0.52	-0.61	-0.57	-0.40	-0.14	0.11	0.32	0.42	0.40	0.25	0.01	-0.24	-0.42	-0.50	-0.45	-0.27	0.00	0.27	0.49	0.60	0.58	0.41
9	SU	0.12	-0.21	-0.48	-0.65	-0.69	-0.58	-0.33	-0.04	0.22	0.40	0.46	0.37	0.14	-0.15	-0.41	-0.56	-0.58	-0.46	-0.21	0.11	0.39	0.58	0.64	0.54
10	M	0.29	-0.05	-0.38	-0.62	-0.74	-0.70	-0.51	-0.21	0.10	0.34	0.47	0.45	0.27	-0.03	-0.34	-0.56	-0.66	-0.60	-0.40	-0.08	0.25	0.50	0.64	0.63
11	TU	0.45	0.12	-0.24	-0.54	-0.73	-0.76	-0.64	-0.37	-0.05	0.24	0.43	0.49	0.38	0.12	-0.21	-0.50	-0.66	-0.68	-0.54	-0.26	0.08	0.39	0.59	0.66
12	W	0.56	0.30	-0.06	-0.41	-0.66	-0.76	-0.71	-0.50	-0.19	0.12	0.36	0.49	0.46	0.27	-0.05	-0.38	-0.61	-0.70	-0.63	-0.41	-0.09	0.25	0.50	0.64
13	TH	0.63	0.45	0.13	-0.24	-0.53	-0.70	-0.71	-0.57	-0.31	0.00	0.27	0.45	0.50	0.39	0.13	-0.20	-0.48	-0.64	-0.65	-0.50	-0.23	0.09	0.38	0.57
14	F	0.64	0.55	0.30	-0.04	-0.36	-0.58	-0.66	-0.59	-0.39	-0.11	0.16	0.38	0.49	0.46	0.28	-0.01	-0.31	-0.52	-0.59	-0.53	-0.33	-0.05	0.24	0.46
15	SA	0.59	0.58	0.43	0.14	-0.17	-0.42	-0.55	-0.55	-0.43	-0.20	0.06	0.28	0.43	0.48	0.39	0.17	-0.11	-0.35	-0.48	-0.49	-0.38	-0.17	0.09	0.32
16	SU	0.48	0.55	0.48	0.29	0.02	-0.24	-0.40	-0.46	-0.41	-0.25	-0.04	0.18	0.35	0.44	0.43	0.30	0.08	-0.15	-0.32	-0.39	-0.36	-0.23	-0.04	0.17
17	M	0.34	0.45	0.47	0.37	0.18	-0.05	-0.24	-0.33	-0.34	-0.26	-0.11	0.07	0.24	0.36	0.41	0.37	0.23	0.04	-0.13	-0.24	-0.28	-0.25	-0.14	0.01
18	TU	0.18	0.31	0.38	0.38	0.28	0.11	-0.06	-0.18	-0.24	-0.23	-0.16	-0.04	0.10	0.23	0.33	0.36	0.32	0.21	0.06	-0.07	-0.16	-0.20	-0.19	-0.12
19	W	-0.01	0.12	0.23	0.30	0.30	0.24	0.12	0.00	-0.10	-0.15	-0.17	-0.13	-0.04	0.07	0.19	0.28	0.33	0.32	0.24	0.13	0.01	-0.10	-0.18	-0.21
20	TH	-0.18	-0.10	0.02	0.14	0.24	0.28	0.26	0.18	0.08	-0.02	-0.11	-0.17	-0.17	-0.11	0.00	0.13	0.26	0.35	0.37	0.32	0.21	0.06	-0.10	-0.24
21	F	-0.32	-0.32	-0.24	-0.09	0.08	0.23	0.32	0.34	0.28	0.16	0.01	-0.14	-0.25	-0.27	-0.22	-0.08	0.10	0.28	0.42	0.47	0.43	0.29	0.08	-0.16
22	SA	-0.36	-0.48	-0.49	-0.38	-0.18	0.06	0.28	0.41	0.45	0.37	0.20	-0.03	-0.24	-0.38	-0.41	-0.33	-0.14	0.12	0.37	0.54	0.60	0.53	0.33	0.03
23	SU	-0.29	-0.54	-0.67	-0.65	-0.49	-0.21	0.11	0.37	0.53	0.56	0.43	0.18	-0.12	-0.38	-0.54	-0.55	-0.41	-0.14	0.20	0.50	0.69	0.73	0.61	0.32
24	M	-0.07	-0.44	-0.72	-0.84	-0.77	-0.53	-0.17	0.21	0.50	0.65	0.64	0.44	0.10	-0.26	-0.54	-0.68	-0.64	-0.43	-0.07	0.33	0.65	0.83	0.83	0.64
25	TU	0.26	-0.20	-0.60	-0.86	-0.94	-0.81	-0.49	-0.06	0.34	0.62	0.74	0.66	0.38	-0.03	-0.42	-0.68	-0.77	-0.67	-0.37	0.05	0.47	0.78	0.93	0.88
26	W	0.61	0.16	-0.33	-0.71	-0.93	-0.96	-0.75	-0.36	0.09	0.47	0.71	0.78	0.63	0.27	-0.17	-0.54	-0.76	-0.79	-0.62	-0.26	0.19	0.60	0.87	0.97
27	TH	0.86	0.52	0.04	-0.42	-0.76	-0.92	-0.87	-0.60	-0.19	0.24	0.57	0.76	0.76	0.54	0.14	-0.29	-0.61	-0.76	-0.73	-0.50	-0.12	0.31	0.67	0.89
28	F	0.94	0.77	0.40	-0.06	-0.46	-0.72	-0.81	-0.70	-0.40	0.00	0.37	0.64	0.77	0.78	0.42	0.03	-0.35	-0.60	-0.69	-0.61	-0.36	0.01	0.38	0.67
29	SA	0.84	0.84	0.64	0.28	-0.12	-0.43	-0.60	-0.63	-0.48	-0.19	0.15	0.45	0.66	0.72	0.60	0.31	-0.04	-0.34	-0.52	-0.57	-0.47	-0.23	0.08	0.38
30	SU	0.61	0.73	0.70	0.49	0.18	-0.12	-0.33	-0.44	-0.42	-0.27	-0.02	0.25	0.48	0.63	0.64	0.50	0.24	-0.04	-0.26	-0.39	-0.42	-0.34	-0.15	0.09

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

NORTH SEA - HUTTON FIELD

TIME ZONE GMT LAT 61 00 N LONG 1 24 E UNITS METRES

OCTOBER 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	M	0.32	0.50	0.58	0.54	0.37	0.14	-0.06	-0.20	-0.26	-0.24	-0.11	0.08	0.29	0.46	0.56	0.55	0.42	0.22	0.02	-0.15	-0.26	-0.30	-0.25	-0.13
2	TU	0.04	0.22	0.36	0.43	0.40	0.29	0.15	0.03	-0.07	-0.12	-0.11	-0.03	0.11	0.26	0.40	0.48	0.48	0.39	0.26	0.11	-0.04	-0.15	-0.23	-0.25
3	W	-0.17	-0.05	0.10	0.23	0.31	0.32	0.28	0.20	0.11	0.02	-0.05	-0.07	-0.03	0.06	0.19	0.32	0.41	0.44	0.41	0.32	0.19	0.04	-0.11	-0.22
4	TH	-0.28	-0.25	-0.15	-0.01	0.13	0.24	0.31	0.31	0.26	0.17	0.05	-0.05	-0.11	-0.10	-0.02	0.12	0.26	0.39	0.46	0.46	0.39	0.24	0.05	-0.14
5	F	-0.29	-0.37	-0.35	-0.24	-0.07	0.10	0.25	0.35	0.36	0.29	0.16	0.00	-0.14	-0.21	-0.20	-0.10	0.07	0.26	0.42	0.51	0.52	0.42	0.23	-0.01
6	SA	-0.23	-0.40	-0.47	-0.43	-0.28	-0.07	0.15	0.32	0.41	0.40	0.28	0.08	-0.12	-0.27	-0.34	-0.29	-0.14	0.08	0.31	0.49	0.58	0.55	0.40	0.15
7	SU	-0.13	-0.37	-0.53	-0.56	-0.46	-0.25	0.01	0.25	0.41	0.47	0.39	0.19	-0.05	-0.28	-0.42	-0.44	-0.34	-0.12	0.16	0.41	0.58	0.63	0.54	0.32
8	M	0.01	-0.29	-0.52	-0.63	-0.59	-0.41	-0.14	0.15	0.37	0.50	0.49	0.33	0.06	-0.22	-0.44	-0.53	-0.49	-0.31	-0.02	0.29	0.53	0.66	0.65	0.48
9	TU	0.18	-0.17	-0.46	-0.63	-0.67	-0.55	-0.29	0.02	0.30	0.50	0.56	0.46	0.21	-0.11	-0.39	-0.56	-0.59	-0.46	-0.20	0.14	0.44	0.64	0.71	0.62
10	W	0.36	0.00	-0.34	-0.58	-0.68	-0.63	-0.42	-0.11	0.21	0.46	0.59	0.57	0.37	0.06	-0.27	-0.52	-0.62	-0.56	-0.35	-0.03	0.31	0.58	0.72	0.71
11	TH	0.53	0.20	-0.17	-0.47	-0.64	-0.65	-0.51	-0.23	0.10	0.39	0.58	0.63	0.52	0.24	-0.10	-0.40	-0.57	-0.60	-0.46	-0.18	0.17	0.47	0.67	0.74
12	F	0.65	0.39	0.03	-0.31	-0.53	-0.61	-0.54	-0.32	-0.01	0.30	0.53	0.65	0.62	0.42	0.10	-0.23	-0.46	-0.56	-0.50	-0.29	0.01	0.33	0.58	0.71
13	SA	0.71	0.54	0.23	-0.11	-0.38	-0.52	-0.51	-0.37	-0.10	0.20	0.45	0.62	0.66	0.56	0.30	-0.03	-0.30	-0.46	-0.48	-0.36	-0.12	0.18	0.45	0.63
14	SU	0.69	0.62	0.40	0.08	-0.21	-0.39	-0.44	-0.37	-0.17	0.10	0.36	0.55	0.65	0.62	0.46	0.18	-0.11	-0.31	-0.40	-0.36	-0.21	0.03	0.29	0.49
15	M	0.61	0.62	0.50	0.26	-0.02	-0.23	-0.33	-0.32	-0.20	0.00	0.24	0.44	0.58	0.62	0.54	0.35	0.09	-0.13	-0.27	-0.31	-0.24	-0.09	0.12	0.32
16	TU	0.48	0.55	0.52	0.38	0.16	-0.06	-0.20	-0.24	-0.20	-0.07	0.11	0.31	0.46	0.55	0.55	0.46	0.27	0.06	-0.11	-0.20	-0.22	-0.16	-0.04	0.13
17	W	0.29	0.41	0.46	0.42	0.29	0.12	-0.03	-0.12	-0.14	-0.10	0.00	0.15	0.30	0.41	0.48	0.48	0.40	0.25	0.08	-0.05	-0.14	-0.18	-0.15	-0.06
18	TH	0.07	0.20	0.31	0.37	0.36	0.27	0.15	0.04	-0.04	-0.08	-0.07	0.00	0.10	0.23	0.34	0.42	0.44	0.39	0.28	0.14	0.00	-0.12	-0.20	-0.22
19	F	-0.16	-0.05	0.09	0.23	0.32	0.35	0.32	0.23	0.12	0.01	-0.07	-0.11	-0.08	0.01	0.14	0.28	0.40	0.46	0.45	0.36	0.21	0.03	-0.15	-0.29
20	SA	-0.35	-0.31	-0.18	-0.01	0.18	0.34	0.41	0.41	0.32	0.18	0.01	-0.13	-0.21	-0.20	-0.11	0.06	0.26	0.43	0.54	0.55	0.46	0.26	0.01	-0.24
21	SU	-0.43	-0.51	-0.46	-0.30	-0.06	0.20	0.41	0.52	0.52	0.40	0.19	-0.05	-0.25	-0.35	-0.34	-0.21	0.03	0.30	0.53	0.67	0.67	0.54	0.28	-0.06
22	M	-0.37	-0.59	-0.66	-0.58	-0.35	-0.03	0.28	0.52	0.64	0.61	0.43	0.14	-0.17	-0.39	-0.50	-0.45	-0.25	0.07	0.40	0.67	0.81	0.79	0.59	0.24
23	TU	-0.17	-0.51	-0.73	-0.77	-0.63	-0.33	0.06	0.41	0.66	0.75	0.66	0.40	0.03	-0.31	-0.54	-0.61	-0.50	-0.22	0.16	0.54	0.81	0.93	0.86	0.58
24	W	0.16	-0.28	-0.63	-0.81	-0.80	-0.59	-0.21	0.21	0.56	0.78	0.82	0.66	0.31	-0.10	-0.44	-0.64	-0.66	-0.49	-0.14	0.29	0.67	0.92	1.00	0.87
25	TH	0.53	0.06	-0.38	-0.68	-0.82	-0.74	-0.46	-0.04	0.38	0.70	0.87	0.85	0.61	0.20	-0.22	-0.53	-0.68	-0.65	-0.41	-0.01	0.41	0.76	0.97	1.00
26	F	0.82	0.43	-0.04	-0.43	-0.67	-0.73	-0.59	-0.27	0.15	0.54	0.80	0.91	0.82	0.51	0.09	-0.30	-0.56	-0.66	-0.57	-0.29	0.10	0.50	0.80	0.96
27	SA	0.94	0.71	0.31	-0.10	-0.42	-0.58	-0.58	-0.39	-0.05	0.33	0.65	0.85	0.90	0.74	0.40	0.00	-0.33	-0.53	-0.57	-0.45	-0.17	0.19	0.52	0.77
28	SU	0.88	0.82	0.57	0.21	-0.12	-0.35	-0.44	-0.39	-0.18	0.13	0.45	0.71	0.85	0.83	0.64	0.31	-0.03	-0.30	-0.44	-0.46	-0.33	-0.08	0.22	0.49
29	M	0.68	0.75	0.66	0.44	0.15	-0.09	-0.24	-0.28	-0.20	-0.01	0.25	0.51	0.70	0.78	0.73	0.53	0.25	-0.02	-0.22	-0.33	-0.34	-0.23	-0.04	0.19
30	TU	0.40	0.55	0.59	0.51	0.33	0.13	-0.02	-0.12	-0.13	-0.06	0.10	0.30	0.50	0.63	0.68	0.62	0.45	0.24	0.03	-0.13	-0.23	-0.25	-0.19	-0.05
31	W	0.13	0.29	0.41	0.45	0.39	0.28	0.16	0.05	-0.02	-0.03	0.02	0.13	0.28	0.43	0.54	0.58	0.53	0.41	0.26	0.09	-0.05	-0.16	-0.21	-0.19

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

NORTH SEA - HUTTON FIELD

TIME ZONE GMT LAT 61 00 N LONG 1 24 E UNITS METRES

NOVEMBER 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	TH	-0.10	0.04	0.18	0.29	0.34	0.33	0.28	0.20	0.11	0.04	0.00	0.02	0.09	0.21	0.34	0.44	0.50	0.49	0.41	0.29	0.14	-0.02	-0.15	-0.25
2	F	-0.24	-0.17	-0.05	0.10	0.22	0.30	0.33	0.30	0.23	0.13	0.03	-0.04	-0.05	0.01	0.12	0.26	0.38	0.46	0.49	0.44	0.32	0.15	-0.04	-0.20
3	SA	-0.30	-0.31	-0.24	-0.10	0.06	0.22	0.33	0.37	0.34	0.23	0.09	-0.04	-0.13	-0.15	-0.08	0.05	0.22	0.38	0.48	0.52	0.46	0.32	0.11	-0.11
4	SU	-0.29	-0.39	-0.39	-0.28	-0.10	0.10	0.28	0.39	0.42	0.35	0.19	0.01	-0.15	-0.25	-0.25	-0.15	0.03	0.24	0.43	0.54	0.56	0.47	0.27	0.02
5	M	-0.22	-0.40	-0.47	-0.43	-0.26	-0.03	0.20	0.38	0.48	0.46	0.33	0.11	-0.12	-0.28	-0.36	-0.31	-0.15	0.08	0.33	0.52	0.62	0.60	0.44	0.16
6	TU	-0.11	-0.35	-0.50	-0.52	-0.40	-0.18	0.10	0.34	0.51	0.56	0.47	0.26	-0.01	-0.25	-0.40	-0.43	-0.32	-0.09	0.20	0.45	0.63	0.68	0.59	0.36
7	W	0.05	-0.25	-0.46	-0.55	-0.50	-0.31	-0.02	0.27	0.50	0.62	0.60	0.43	0.15	-0.15	-0.37	-0.48	-0.43	-0.25	0.04	0.34	0.59	0.72	0.71	0.54
8	TH	0.24	-0.09	-0.37	-0.53	-0.54	-0.41	-0.14	0.17	0.45	0.64	0.70	0.59	0.34	0.01	-0.28	-0.45	-0.49	-0.37	-0.12	0.20	0.49	0.70	0.77	0.68
9	F	0.44	0.10	-0.22	-0.44	-0.53	-0.46	-0.24	0.06	0.37	0.61	0.74	0.72	0.53	0.21	-0.12	-0.36	-0.48	-0.44	-0.25	0.05	0.36	0.62	0.76	0.76
10	SA	0.60	0.30	-0.04	-0.31	-0.46	-0.46	-0.31	-0.04	0.27	0.55	0.73	0.79	0.68	0.42	0.08	-0.22	-0.40	-0.45	-0.35	-0.11	0.20	0.49	0.69	0.77
11	SU	0.71	0.48	0.16	-0.14	-0.34	-0.41	-0.34	-0.13	0.16	0.45	0.67	0.79	0.77	0.59	0.29	-0.03	-0.28	-0.40	-0.38	-0.23	0.03	0.32	0.56	0.71
12	M	0.73	0.61	0.35	0.04	-0.20	-0.33	-0.33	-0.20	0.04	0.32	0.57	0.73	0.79	0.70	0.48	0.18	-0.10	-0.29	-0.35	-0.30	-0.12	0.13	0.38	0.57
13	TU	0.67	0.65	0.49	0.23	-0.03	-0.20	-0.27	-0.22	-0.06	0.17	0.42	0.61	0.72	0.73	0.61	0.37	0.09	-0.13	-0.27	-0.30	-0.23	-0.05	0.17	0.36
14	W	0.53	0.60	0.55	0.39	0.16	-0.04	-0.16	-0.19	-0.13	0.03	0.24	0.44	0.59	0.67	0.65	0.51	0.29	0.06	-0.13	-0.24	-0.26	-0.19	-0.04	0.15
15	TH	0.33	0.46	0.51	0.46	0.32	0.14	-0.01	-0.11	-0.13	-0.07	0.06	0.23	0.40	0.53	0.60	0.57	0.45	0.27	0.07	-0.10	-0.21	-0.26	-0.21	-0.09
16	F	0.08	0.25	0.38	0.44	0.42	0.31	0.17	0.04	-0.05	-0.09	-0.06	0.03	0.18	0.33	0.46	0.54	0.53	0.44	0.29	0.10	-0.08	-0.22	-0.30	-0.28
17	SA	-0.18	-0.02	0.16	0.32	0.41	0.42	0.35	0.23	0.09	-0.03	-0.10	-0.11	-0.04	0.09	0.26	0.41	0.52	0.55	0.49	0.34	0.14	-0.07	-0.26	-0.37
18	SU	-0.38	-0.29	-0.11	0.11	0.30	0.44	0.48	0.43	0.30	0.12	-0.05	-0.17	-0.20	-0.14	0.01	0.21	0.41	0.56	0.62	0.57	0.41	0.17	-0.10	-0.35
19	M	-0.47	-0.49	-0.38	-0.16	0.10	0.35	0.52	0.57	0.51	0.34	0.11	-0.11	-0.26	-0.31	-0.24	-0.05	0.20	0.46	0.64	0.72	0.66	0.46	0.16	-0.16
20	TU	-0.42	-0.57	-0.57	-0.42	-0.15	0.17	0.45	0.63	0.68	0.58	0.35	0.06	-0.21	-0.37	-0.41	-0.30	-0.06	0.25	0.55	0.75	0.82	0.74	0.48	0.13
21	W	-0.23	-0.51	-0.64	-0.61	-0.40	-0.07	0.29	0.58	0.75	0.77	0.61	0.31	-0.03	-0.32	-0.48	-0.48	-0.33	-0.02	0.34	0.65	0.85	0.91	0.77	0.47
22	TH	0.07	-0.30	-0.56	-0.66	-0.57	-0.31	0.07	0.44	0.72	0.86	0.83	0.60	0.24	-0.13	-0.41	-0.55	-0.51	-0.30	0.05	0.43	0.74	0.92	0.94	0.76
23	F	0.41	0.00	-0.35	-0.57	-0.61	-0.47	-0.16	0.24	0.60	0.85	0.94	0.84	0.55	0.15	-0.22	-0.48	-0.57	-0.50	-0.24	0.13	0.50	0.79	0.95	0.92
24	SA	0.70	0.33	-0.07	-0.37	-0.52	-0.51	-0.32	0.02	0.41	0.73	0.93	0.97	0.80	0.46	0.06	-0.28	-0.50	-0.56	-0.44	-0.16	0.20	0.55	0.80	0.91
25	SU	0.85	0.59	0.24	-0.11	-0.34	-0.44	-0.37	-0.14	0.20	0.55	0.81	0.96	0.93	0.72	0.36	-0.01	-0.31	-0.48	-0.50	-0.36	-0.09	0.25	0.54	0.75
26	M	0.83	0.73	0.47	0.15	-0.12	-0.28	-0.33	-0.22	0.02	0.33	0.63	0.84	0.92	0.85	0.61	0.27	-0.06	-0.30	-0.43	-0.43	-0.28	-0.03	0.25	0.50
27	TU	0.67	0.70	0.59	0.36	0.10	-0.10	-0.21	-0.21	-0.09	0.14	0.41	0.64	0.80	0.84	0.73	0.49	0.20	-0.07	-0.26	-0.36	-0.35	-0.22	0.00	0.23
28	W	0.43	0.56	0.56	0.45	0.26	0.07	-0.07	-0.14	-0.11	0.01	0.20	0.42	0.61	0.72	0.72	0.61	0.40	0.16	-0.06	-0.22	-0.30	-0.29	-0.18	-0.01
29	TH	0.19	0.35	0.44	0.44	0.35	0.20	0.06	-0.04	-0.08	-0.05	0.05	0.21	0.39	0.53	0.61	0.61	0.50	0.33	0.14	-0.04	-0.18	-0.26	-0.26	-0.17
30	F	-0.03	0.13	0.27	0.35	0.35	0.29	0.18	0.07	-0.01	-0.05	-0.03	0.05	0.17	0.32	0.45	0.52	0.51	0.44	0.30	0.13	-0.03	-0.17	-0.25	-0.26

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
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NORTH SEA - HUTTON FIELD

TIME ZONE GMT — LAT 61 00 N LONG 1 24 E — UNITS METRES

DECEMBER 1984

D		0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300
1	SA	-0.19	-0.07	0.08	0.21	0.29	0.31	0.27	0.18	0.08	-0.01	-0.06	-0.06	0.00	0.11	0.25	0.38	0.45	0.47	0.41	0.29	0.13	-0.04	-0.18	-0.27
2	SU	-0.29	-0.22	-0.10	0.06	0.20	0.30	0.33	0.29	0.20	0.08	-0.03	-0.10	-0.12	-0.06	0.05	0.20	0.35	0.44	0.47	0.42	0.29	0.12	-0.07	-0.23
3	M	-0.32	-0.33	-0.25	-0.10	0.08	0.24	0.35	0.38	0.33	0.21	0.06	-0.08	-0.17	-0.19	-0.12	0.02	0.20	0.37	0.47	0.50	0.44	0.29	0.08	-0.13
4	TU	-0.29	-0.37	-0.36	-0.24	-0.05	0.16	0.34	0.44	0.45	0.37	0.20	0.00	-0.16	-0.25	-0.25	-0.15	0.04	0.25	0.43	0.54	0.55	0.45	0.26	0.02
5	W	-0.21	-0.36	-0.41	-0.35	-0.18	0.05	0.28	0.46	0.55	0.52	0.37	0.15	-0.08	-0.25	-0.32	-0.28	-0.13	0.10	0.34	0.52	0.62	0.59	0.44	0.20
6	TH	-0.07	-0.29	-0.41	-0.42	-0.29	-0.07	0.20	0.44	0.60	0.64	0.55	0.34	0.07	-0.17	-0.33	-0.37	-0.27	-0.06	0.20	0.45	0.62	0.68	0.60	0.39
7	F	0.11	-0.16	-0.35	-0.43	-0.37	-0.18	0.09	0.37	0.59	0.71	0.70	0.53	0.26	-0.03	-0.27	-0.39	-0.37	-0.22	0.04	0.32	0.56	0.70	0.71	0.57
8	SA	0.31	0.01	-0.25	-0.39	-0.41	-0.28	-0.03	0.27	0.54	0.73	0.79	0.70	0.46	0.15	-0.15	-0.35	-0.42	-0.35	-0.14	0.15	0.43	0.64	0.74	0.69
9	SU	0.49	0.20	-0.10	-0.31	-0.40	-0.34	-0.15	0.14	0.44	0.68	0.82	0.82	0.65	0.36	0.03	-0.25	-0.40	-0.42	-0.29	-0.04	0.26	0.52	0.69	0.74
10	M	0.64	0.39	0.08	-0.18	-0.34	-0.37	-0.25	-0.01	0.29	0.57	0.77	0.85	0.78	0.56	0.23	-0.09	-0.32	-0.43	-0.41	-0.23	0.04	0.33	0.57	0.70
11	TU	0.70	0.55	0.28	-0.01	-0.24	-0.34	-0.32	-0.16	0.11	0.41	0.65	0.81	0.83	0.71	0.44	0.12	-0.18	-0.37	-0.44	-0.38	-0.18	0.10	0.37	0.56
12	W	0.67	0.64	0.45	0.18	-0.08	-0.26	-0.32	-0.25	-0.07	0.20	0.47	0.68	0.79	0.77	0.61	0.34	0.02	-0.23	-0.39	-0.44	-0.35	-0.14	0.12	0.37
13	TH	0.55	0.62	0.56	0.36	0.11	-0.11	-0.25	-0.28	-0.20	-0.01	0.24	0.48	0.66	0.74	0.70	0.52	0.25	-0.03	-0.26	-0.40	-0.43	-0.33	-0.13	0.11
14	F	0.34	0.49	0.55	0.48	0.30	0.08	-0.11	-0.22	-0.24	-0.15	0.02	0.24	0.46	0.61	0.67	0.62	0.46	0.21	-0.05	-0.26	-0.39	-0.42	-0.34	-0.15
15	SA	0.07	0.29	0.44	0.49	0.43	0.28	0.09	-0.08	-0.19	-0.21	-0.14	0.01	0.21	0.41	0.56	0.62	0.58	0.43	0.20	-0.04	-0.25	-0.39	-0.43	-0.36
16	SU	-0.19	0.03	0.24	0.40	0.47	0.42	0.29	0.12	-0.05	-0.16	-0.20	-0.15	-0.02	0.16	0.36	0.52	0.60	0.57	0.44	0.23	-0.01	-0.23	-0.39	-0.44
17	M	-0.38	-0.22	0.00	0.22	0.39	0.48	0.46	0.34	0.16	-0.02	-0.16	-0.22	-0.20	-0.08	0.11	0.32	0.50	0.60	0.60	0.48	0.27	0.01	-0.23	-0.40
18	TU	-0.47	-0.41	-0.24	0.00	0.24	0.43	0.53	0.52	0.40	0.20	-0.01	-0.18	-0.27	-0.26	-0.13	0.08	0.31	0.52	0.64	0.65	0.53	0.31	0.03	-0.23
19	W	-0.42	-0.49	-0.42	-0.23	0.04	0.31	0.52	0.62	0.60	0.46	0.22	-0.03	-0.23	-0.34	-0.32	-0.18	0.06	0.33	0.56	0.70	0.71	0.58	0.33	0.03
20	TH	-0.25	-0.44	-0.49	-0.40	-0.18	0.12	0.41	0.63	0.73	0.68	0.49	0.21	-0.08	-0.30	-0.41	-0.38	-0.21	0.06	0.36	0.61	0.76	0.76	0.61	0.35
21	F	0.00	-0.28	-0.45	-0.48	-0.35	-0.09	0.24	0.54	0.75	0.83	0.74	0.49	0.16	-0.15	-0.38	-0.48	-0.43	-0.22	0.09	0.41	0.66	0.80	0.78	0.60
22	SA	0.29	-0.04	-0.30	-0.45	-0.44	-0.27	0.03	0.37	0.67	0.85	0.89	0.75	0.45	0.09	-0.23	-0.45	-0.53	-0.45	-0.21	0.12	0.45	0.69	0.81	0.76
23	SU	0.55	0.22	-0.10	-0.33	-0.43	-0.38	-0.17	0.16	0.50	0.77	0.92	0.91	0.71	0.37	0.00	-0.31	-0.50	-0.55	-0.43	-0.17	0.17	0.48	0.70	0.76
24	M	0.70	0.45	0.13	-0.15	-0.34	-0.40	-0.30	-0.05	0.28	0.60	0.83	0.93	0.86	0.62	0.27	-0.09	-0.37	-0.53	-0.54	-0.39	-0.11	0.21	0.49	0.67
25	TU	0.71	0.59	0.33	0.04	-0.21	-0.34	-0.34	-0.20	0.06	0.38	0.66	0.84	0.89	0.77	0.50	0.15	-0.18	-0.41	-0.52	-0.50	-0.33	-0.05	0.24	0.48
26	W	0.61	0.61	0.46	0.21	-0.05	-0.24	-0.32	-0.28	-0.11	0.15	0.44	0.67	0.80	0.79	0.64	0.36	0.04	-0.24	-0.42	-0.49	-0.43	-0.25	0.00	0.25
27	TH	0.44	0.53	0.49	0.32	0.09	-0.12	-0.26	-0.29	-0.21	-0.03	0.22	0.46	0.64	0.72	0.67	0.49	0.23	-0.05	-0.27	-0.41	-0.44	-0.36	-0.18	0.04
28	F	0.24	0.39	0.43	0.36	0.20	0.00	-0.16	-0.25	-0.25	-0.15	0.03	0.24	0.44	0.58	0.62	0.54	0.36	0.13	-0.10	-0.28	-0.38	-0.39	-0.30	-0.14
29	SA	0.05	0.22	0.33	0.35	0.27	0.12	-0.04	-0.17	-0.22	-0.20	-0.10	0.06	0.24	0.40	0.51	0.52	0.43	0.27	0.07	-0.13	-0.27	-0.34	-0.34	-0.25
30	SU	-0.11	0.06	0.20	0.29	0.29	0.21	0.09	-0.05	-0.15	-0.19	-0.16	-0.08	0.06	0.22	0.36	0.44	0.44	0.36	0.22	0.04	-0.13	-0.25	-0.31	-0.30
31	M	-0.23	-0.09	0.06	0.19	0.27	0.27	0.21	0.10	-0.02	-0.11	-0.16	-0.15	-0.08	0.04	0.19	0.32	0.40	0.40	0.33	0.21	0.04	-0.11	-0.23	-0.30

DATUM OF PREDICTIONS = MEAN SEA LEVEL

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

15. APPENDIX 2 - Predicted High and Low Waters

NORTH SEA - HUTTON FIELD

LAT 61 00 N   LONG 1 24 E

TIME ZONE GMT

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

YEAR 1984

MAY

TIME	M	TIME	M

JUNE

TIME	M	TIME	M

JULY	TIME	M		TIME	M	AUGUST	TIME	M		TIME	M
	0530	-0.78		0612	-0.73		0029	0.75		0028	0.55
1	1144	0.55	16	1219	0.38	1	0653	-0.93	16	0642	-0.71
SU	1736	-0.63	M	1801	-0.59	W	1306	0.53	TH	1256	0.35
	2354	0.68					1853	-0.72		1834	-0.63
	0619	-0.81		0021	0.55		0117	0.70		0102	0.50
2	1234	0.52	17	0648	-0.71	2	0741	-0.86	17	0713	-0.64
M	1822	-0.62	TU	1256	0.32	TH	1354	0.47	F	1330	0.32
				1834	-0.58		1940	-0.65		1909	-0.55
	0042	0.66		0057	0.49		0206	0.63		0138	0.45
3	0710	-0.81	18	0723	-0.67	3	0832	-0.75	18	0748	-0.55
TU	1324	0.47	W	1333	0.26	F	1443	0.40	SA	1408	0.29
	1912	-0.60		1909	-0.56		2033	-0.56		1948	-0.45
	0133	0.61		0135	0.43		0300	0.53		0218	0.38
4	0805	-0.79	19	0801	-0.62	4	0928	-0.62	19	0829	-0.45
W	1418	0.40	TH	1412	0.21	SA	1536	0.35	SU	1453	0.26
	2005	-0.56		1948	-0.51		2138	-0.47		2039	-0.35
	0227	0.55		0216	0.37		0402	0.43		0305	0.32
5	0901	-0.74	20	0843	-0.56	5	1031	-0.50	20	0921	-0.35
TH	1514	0.34	F	1457	0.18	SU	1640	0.32	M	1548	0.24
	2104	-0.51		2036	-0.45		2258	-0.41		2155	-0.27
	0327	0.49		0304	0.31		0515	0.36		0409	0.27
6	1002	-0.69	21	0934	-0.50	6	1143	-0.42	21	1037	-0.29
F	1614	0.31	SA	1549	0.16	M	1753	0.34	TU	1702	0.25
	2210	-0.48		2136	-0.38					2329	-0.27
	0430	0.44		0357	0.27		0022	-0.41		0533	0.25
7	1106	-0.63	22	1033	-0.45	7	0638	0.34	22	1200	-0.29
SA	1719	0.30	SU	1651	0.17	TU	1252	-0.39	W	1822	0.31
	2323	-0.46		2251	-0.34		1906	0.40			
	0539	0.41		0502	0.25		0135	-0.46		0049	-0.35
8	1210	-0.59	23	1137	-0.42	8	0751	0.36	23	0657	0.30
SU	1824	0.35	M	1758	0.22	W	1352	-0.41	TH	1310	-0.36
							2006	0.48		1928	0.41

	0034	-0.48		0007	-0.35		0236	-0.55		0152	-0.49
9	0649	0.42	24	0612	0.27	9	0849	0.40	24	0804	0.39
M	1309	-0.57	TU	1239	-0.42	TH	1443	-0.46	F	1406	-0.46
	1926	0.42		1902	0.30		2056	0.56		2022	0.53
	0138	-0.53		0113	-0.40		0324	-0.63		0244	-0.65
10	0754	0.44	25	0720	0.32	10	0935	0.43	25	0857	0.49
TU	1402	-0.56	W	1334	-0.46	F	1525	-0.52	SA	1456	-0.58
	2019	0.50		1955	0.40		2138	0.61		2108	0.65
	0236	-0.59		0209	-0.49		0406	-0.70		0332	-0.81
11	0850	0.48	26	0818	0.39	11	1014	0.45	26	0945	0.58
W	1451	-0.56	TH	1423	-0.51	SA	1602	-0.59	SU	1541	-0.70
	2107	0.58		2042	0.51		2216	0.63		2155	0.75
	0328	-0.64		0258	-0.61		0441	-0.75		0417	-0.94
12	0941	0.50	27	0910	0.47	12	1048	0.45	27	1030	0.64
TH	1536	-0.56	F	1510	-0.58	SU	1634	-0.64	M	1623	-0.78
	2149	0.64		2127	0.60		2249	0.63		2240	0.83
	0414	-0.69		0346	-0.73		0513	-0.78		0501	-1.01
13	1026	0.50	28	0959	0.53	13	1120	0.43	28	1115	0.67
F	1616	-0.57	SA	1555	-0.65	M	1705	-0.68	TU	1705	-0.83
	2230	0.66		2212	0.68		2323	0.61		2325	0.87
	0457	-0.72		0433	-0.84		0543	-0.78		0544	-1.01
14	1106	0.47	29	1047	0.58	14	1151	0.41	29	1158	0.67
SA	1654	-0.59	SU	1640	-0.72	TU	1733	-0.69	W	1746	-0.82
	2308	0.65		2257	0.74		2356	0.58			
	0536	-0.73		0519	-0.92		0612	-0.76		0010	0.85
15	1144	0.43	30	1133	0.59	15	1224	0.38	30	0628	-0.94
SU	1727	-0.59	M	1723	-0.75	W	1803	-0.68	TH	1241	0.63
	2344	0.61		2343	0.76					1828	-0.76
				0605	-0.95					0055	0.80
			31	1219	0.57				31	0712	-0.80
			TU	1808	-0.76				F	1324	0.58
										1913	-0.65

DATUM OF PREDICTIONS = MEAN SEA LEVEL HEIGHTS IN METRES

TIDAL PREDICTIONS PREPARED BY TIDAL COMPUTATION AND STATISTICS SECTION,
INSTITUTE OF OCEANOGRAPHIC SCIENCES, BIDSTON OBSERVATORY, BIRKENHEAD, MERSEYSIDE, UK.

LAT 61 00 N LONG 1 24 E

TIME ZONE GMT

TIMES AND HEIGHTS OF HIGH AND LOW WATERS

YEAR 1984

SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER					
	TIME	M		TIME	M		TIME	M		TIME	M		TIME	M		TIME	M		TIME	M		TIME	M
	0142	0.69		0103	0.55		0211	0.59		0116	0.55		0420	0.35		0314	0.45		0448	0.31		0407	0.47
1	0758	-0.63	16	0700	-0.46	1	0813	-0.27	16	0700	-0.24	1	1013	0.00	16	0905	-0.09	1	1031	-0.07	16	0959	-0.20
SA	1409	0.51	SU	1327	0.45	M	1426	0.57	TU	1334	0.56	TH	1620	0.50	F	1528	0.55	SA	1642	0.47	SU	1617	0.60
	2005	-0.52		1912	-0.39		2100	-0.30		1947	-0.22		2337	-0.25		2223	-0.30		2343	-0.29		2259	-0.44
	0233	0.56		0140	0.47		0314	0.43		0206	0.46		0600	0.33		0437	0.43		0558	0.33		0518	0.48
2	0850	-0.46	17	0734	-0.35	2	0922	-0.13	17	0751	-0.14	2	1142	-0.05	17	1035	-0.12	2	1144	-0.12	17	1113	-0.23
SU	1500	0.44	M	1406	0.41	TU	1529	0.49	W	1429	0.49	F	1750	0.49	SA	1651	0.55	SU	1753	0.47	M	1729	0.62
	2114	-0.39		2001	-0.28		2235	-0.24		2107	-0.18					2336	-0.39						
	0335	0.42		0227	0.39		0445	0.32		0319	0.38		0042	-0.32		0557	0.48		0036	-0.34		0004	-0.47
3	0957	-0.31	18	0823	-0.24	3	1055	-0.07	18	0919	-0.08	3	0704	0.37	18	1153	-0.20	3	0655	0.38	18	0624	0.54
M	1603	0.39	TU	1500	0.36	W	1701	0.44	TH	1548	0.44	SA	1245	-0.15	SU	1804	0.62	M	1242	-0.19	TU	1222	-0.28
	2245	-0.32		2118	-0.20					2245	-0.22		1855	0.52					1850	0.50		1835	0.66
	0458	0.32		0334	0.31		0010	-0.28		0455	0.36		0130	-0.40		0039	-0.50		0120	-0.38		0102	-0.49
4	1119	-0.23	19	0945	-0.17	4	0636	0.32	19	1105	-0.11	4	0748	0.42	19	0659	0.57	4	0738	0.46	19	0721	0.63
TU	1727	0.38	W	1617	0.34	TH	1221	-0.12	F	1720	0.46	SU	1333	-0.26	M	1255	-0.31	TU	1330	-0.26	W	1324	-0.35
				2304	-0.21		1834	0.47					1942	0.57		1904	0.72		1937	0.56		1937	0.72
	0019	-0.33		0508	0.28		0119	-0.37		0007	-0.35		0208	-0.47		0131	-0.59		0158	-0.41		0155	-0.49
5	0639	0.30	20	1130	-0.18	5	0742	0.37	20	0625	0.42	5	0822	0.49	20	0751	0.68	5	0816	0.55	20	0812	0.73
W	1239	-0.23	TH	1750	0.37	F	1324	-0.22	SA	1227	-0.22	M	1409	-0.36	TU	1347	-0.41	W	1411	-0.32	TH	1419	-0.42
	1853	0.43					1935	0.53		1836	0.56		2020	0.63		1958	0.82		2019	0.62		2033	0.78
	0134	-0.42		0031	-0.33		0208	-0.47		0109	-0.51		0240	-0.53		0219	-0.65		0233	-0.43		0243	-0.49
6	0754	0.34	21	0643	0.34	6	0823	0.42	21	0728	0.53	6	0853	0.56	21	0837	0.78	6	0851	0.64	21	0900	0.83
TH	1342	-0.30	F	1250	-0.27	SA	1408	-0.34	SU	1324	-0.36	TU	1443	-0.43	W	1434	-0.50	TH	1449	-0.37	F	1511	-0.48
	1957	0.50		1904	0.47		2019	0.58		1934	0.69		2054	0.68		2049	0.91		2058	0.68		2127	0.81
	0229	-0.52		0134	-0.50		0246	-0.56		0201	-0.66		0310	-0.56		0304	-0.66		0305	-0.43		0329	-0.46
7	0844	0.39	22	0749	0.45	7	0857	0.47	22	0819	0.65	7	0924	0.63	22	0919	0.87	7	0924	0.73	22	0943	0.90
F	1432	-0.40	SA	1348	-0.42	SU	1443	-0.45	M	1412	-0.50	W	1514	-0.48	TH	1519	-0.56	F	1525	-0.40	SA	1600	-0.53
	2043	0.57		1959	0.60		2056	0.63		2023	0.82		2128	0.73		2136	0.96		2135	0.72		2216	0.82
	0311	-0.62		0225	-0.68		0317	-0.63		0246	-0.78		0338	-0.56		0346	-0.62		0336	-0.42		0412	-0.43
8	0922	0.43	23	0840	0.57	8	0927	0.51	23	0903	0.75	8	0953	0.70	23	1002	0.94	8	0957	0.79	23	1026	0.94
SA	1510	-0.50	SU	1436	-0.56	M	1514	-0.54	TU	1456	-0.61	TH	1545	-0.50	F	1606	-0.58	SA	1602	-0.42	SU	1648	-0.55
	2121	0.61		2049	0.74		2128	0.67		2110	0.93		2200	0.77		2224	0.96		2213	0.74		2302	0.78

0346 -0.69 9 0955 0.46 SU 1541 -0.59 2155 0.64	0311 -0.84 24 0927 0.67 M 1519 -0.69 2134 0.86	0345 -0.67 9 0955 0.56 TU 1542 -0.60 2157 0.71	0329 -0.83 24 0943 0.83 W 1538 -0.68 2155 1.00	0404 -0.53 9 1023 0.75 F 1617 -0.48 2233 0.78	0427 -0.54 24 1042 0.97 SA 1652 -0.56 2311 0.92	0409 -0.40 9 1030 0.84 SU 1640 -0.43 2251 0.74	0454 -0.40 24 1108 0.93 M 1734 -0.55 2347 0.72
0417 -0.74 10 1024 0.48 M 1610 -0.66 2227 0.66	0355 -0.94 25 1009 0.74 TU 1600 -0.77 2217 0.94	0412 -0.69 10 1023 0.60 W 1610 -0.62 2228 0.74	0410 -0.82 25 1024 0.89 TH 1620 -0.69 2240 1.02	0433 -0.48 10 1054 0.79 SA 1649 -0.45 2306 0.77	0508 -0.44 25 1123 0.97 SU 1740 -0.51 2357 0.83	0442 -0.37 10 1105 0.85 M 1719 -0.44 2332 0.72	0533 -0.36 25 1149 0.89 TU 1819 -0.53
0444 -0.77 11 1054 0.49 TU 1637 -0.69 2257 0.66	0437 -0.97 26 1051 0.78 W 1641 -0.80 2302 0.97	0437 -0.66 11 1052 0.63 TH 1638 -0.61 2258 0.74	0451 -0.74 26 1105 0.91 F 1702 -0.66 2326 0.98	0501 -0.41 11 1125 0.80 SU 1725 -0.41 2342 0.74	0549 -0.33 26 1204 0.92 M 1831 -0.45	0519 -0.35 11 1143 0.84 TU 1803 -0.44	0029 0.63 26 0611 -0.32 W 1228 0.81 1904 -0.49
0511 -0.76 12 1122 0.50 W 1705 -0.70 2327 0.66	0518 -0.93 27 1132 0.79 TH 1722 -0.77 2346 0.95	0502 -0.61 12 1120 0.66 F 1708 -0.56 2329 0.73	0530 -0.60 27 1144 0.90 SA 1749 -0.58	0530 -0.34 12 1157 0.79 M 1804 -0.35	0045 0.71 27 0629 -0.23 TU 1246 0.84 1924 -0.37	0015 0.68 12 0601 -0.32 W 1225 0.80 1850 -0.44	0112 0.53 27 0649 -0.29 TH 1309 0.72 1948 -0.44
0537 -0.72 13 1151 0.50 TH 1733 -0.66 2358 0.64	0558 -0.81 28 1212 0.77 F 1804 -0.69	0529 -0.54 13 1150 0.67 SA 1739 -0.49	0011 0.88 28 0611 -0.44 SU 1225 0.86 1838 -0.47	0021 0.68 13 0605 -0.27 TU 1234 0.74 1850 -0.30	0134 0.58 28 0714 -0.14 W 1333 0.74 2023 -0.31	0104 0.62 13 0648 -0.28 TH 1312 0.74 1945 -0.43	0154 0.43 28 0728 -0.26 F 1351 0.62 2034 -0.40
0604 -0.66 14 1221 0.50 F 1803 -0.59	0031 0.87 29 0639 -0.64 SA 1253 0.72 1850 -0.57	0001 0.70 14 0556 -0.44 SU 1221 0.65 1812 -0.40	0059 0.75 29 0652 -0.28 M 1309 0.79 1935 -0.35	0107 0.60 14 0648 -0.19 W 1319 0.68 1948 -0.26	0229 0.45 29 0806 -0.08 TH 1425 0.62 2129 -0.27	0158 0.55 14 0742 -0.24 F 1406 0.68 2046 -0.43	0240 0.35 29 0813 -0.22 SA 1439 0.53 2125 -0.35
0029 0.60 15 0631 -0.57 SA 1253 0.48 1835 -0.50	0119 0.74 30 0723 -0.45 SU 1337 0.65 1947 -0.42	0036 0.63 15 0624 -0.34 M 1255 0.62 1852 -0.31	0151 0.59 30 0741 -0.14 TU 1357 0.68 2046 -0.25	0202 0.52 15 0745 -0.13 TH 1416 0.60 2101 -0.26	0332 0.36 30 0912 -0.05 F 1528 0.53 2238 -0.26	0300 0.49 15 0846 -0.21 SA 1508 0.62 2152 -0.43	0332 0.30 30 0910 -0.19 SU 1532 0.45 2223 -0.32
			0254 0.45 31 0844 -0.03 W 1457 0.58 2213 -0.21				0433 0.28 31 1020 -0.16 M 1635 0.41 2325 -0.30

DATUM OF PREDICTIONS = MEAN SEA LEVEL

HEIGHTS IN METRES

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