

UK UNLIMITED

ATOMIC WEAPONS ESTABLISHMENT

AWE REPORT NO. O 15/88

Body Wave Magnitudes of Some Underground Nuclear  
Explosions at the Nevada(USA) and  
Shagan River(USSR) Test Sites  
(UK UNCLASSIFIED)

R C Lilwall  
P D Marshall  
D W Rivers\*

Recommended for issue by

A Douglas, Superintendent

Approved by

B L Elphick, Head of Division

\*Teledyne Geotech Alexandria Laboratories  
314 Montgomery Street, Alexandria,  
VA 22314-1581, USA

## CONTENTS

	<u>Page</u>
SUMMARY	3
1. INTRODUCTION	3
2. DETERMINATION OF MAGNITUDE	3
3. RESULTS	5
4. ACKNOWLEDGMENTS	7
APPENDIX A	8
REFERENCES	21
TABLES 1 - 8	22
FIGURES 1 - 2	32

## SUMMARY

Maximum likelihood estimates of the seismic magnitude  $m_b$  are presented for some of the larger explosions at the Nevada (USA) and Shagan River (USSR) test sites. The amplitude data used are read from records from the World Wide Standard Seismograph Network (WWSSN) and augmented with additional data taken from the seismological bulletins of the International Seismological Centre (ISC), Newbury, UK and the US National Earthquake Information Service (NEIS) Earthquake Data Reports (EDR).

### 1. INTRODUCTION

Basic source information (location, origin time, depth, yield, etc) about underground nuclear explosions is important to seismologists interested in studying the structure of the earth, as well as those interested in discrimination between earthquake and explosion generated seismic signals. Numerous scientists have appealed for the release of epicentral details of explosions to aid research programmes (Bullen, Griggs and Press, Teller, (1-3). In response, Springer and Kinnaman (4,5) published the basic epicentre details for all announced underground nuclear explosions detonated in the USA from 1961 to 1973. Numerous yield estimates were also included. The origin times and precise epicentres of French underground nuclear explosions in the Sahara between 1961 and 1966 have been published by Duclaux and Michaud (6).

Several international data centres collect seismic wave arrival times from all over the world and compute estimates of the origin time, epicentre, depth and size for seismic disturbances including underground explosions. Bulletins containing these data are published by the US National Earthquake Information Service (NEIS) in Colorado, USA and the International Seismological Centre (ISC) in Newbury, UK. A similar service is provided by the Institute of Physics of the Earth in Moscow, but the Soviet bulletin does not usually report data on nuclear explosions.

The ISC bulletin includes an estimate of the mean magnitude for most explosions. However, the magnitude reported is determined only to one decimal place and takes no account of station magnitude corrections for the seismic stations used. In effect the network used to determine  $m_b$  is different for almost every explosion. This report provides the seismological community with improved estimates of  $m_b$  for some of the larger explosions in the principal test sites of the USA and USSR, namely the Nevada Test Site (NTS) and the Shagan River Test Site. P wave amplitude and period data read from the records of the WWSSN augmented with similar data provided by stations reporting to the ISC and NEIS have been analysed to obtain  $m_b$  using a maximum-likelihood procedure.

### 2. DETERMINATION OF MAGNITUDE

The size of a seismic source is measured by its magnitude. For short period (SP) seismic P wave data the Gutenberg and Richter definition (7) is used:-

$$m_b = \log_{10} A/T + B(\Delta) \quad \dots(1)$$

where A is the amplitude of the P wave in nm, T its predominant period in seconds, B( $\Delta$ ) a distance normalising term.

Consider n explosions recorded at some or all of q stations. Then if  $m_{ij}$  is the magnitude of the ith explosion recorded at station j, we can write

$$m_{ij} = b_i + s_j + \epsilon_{ij}, \quad \dots(2)$$

where  $b_i$  depends on the seismic size of the explosion,  $s_j$  is a station correction and  $\epsilon_{ij}$  is an error term. Least squares can be used to estimate  $b_i$  and  $s_j$  using the method described by Douglas (8) if it is assumed that

$$\sum_{j=1}^q s_j = 0 \quad \dots(3)$$

Least squares estimates are unbiased if the observed  $m_{ij}$  are sampled randomly from a normal population. The latter cannot be assumed however if station amplitude measurement thresholds result in "censoring" of many lower values of  $m_{ij}$ . To allow for threshold effects the following "maximum likelihood" estimation technique has been used.

Following Christoffersson et al. (9) the probability distribution of the observed station magnitudes  $m_{ij}$  can be written as:

$$P \left[ \begin{matrix} m_{ij} \\ \text{obs} \end{matrix} \middle| b_i, s_j, \sigma \dots \right] = \frac{\phi \left[ \frac{m_{ij} - G_j}{\gamma_j} \right] \theta \left[ \frac{m_{ij} - s_j - b_i}{\sigma} \right]}{\phi \left[ \frac{s_j + b_i - G_j}{\sqrt{\sigma^2 + \gamma_j^2}} \right]} \quad \dots(4)$$

where

$$G_j = g_j + B(\Delta_j) \quad \dots(5)$$

$\theta$  is the normal density function of variance  $\sigma^2$  representing the distribution of "uncensored" values of  $m_{ij}$ ;  $\phi$  the cumulative normal distribution;  $g_j$  the mean (50%) amplitude measurement threshold in terms of Log A/T for station j;  $\gamma_j^2$  the variance of the threshold assumed normally distributed about  $g_j$ . If the sources are close together equation 5 enables the mean Log A/T thresholds  $g_j$  to be expressed in terms of magnitude thresholds  $G_j$ .

Estimates of  $b_i, s_j$  and  $\sigma$  can be determined by maximising the likelihood function resulting from the product over the observed values of  $m_{ij}$  of terms given by equation 4

$$L(b_i, s_j, \sigma) = \prod_{m_{ij}} \text{observed } P(m_{ij} | b_i, s_j, \dots) \dots (6)$$

Maximisation being subject to the constraint equation 3.

When using least squares, the effect of large errors, which deviate from normal law, can be reduced by the application of weighting as in Jeffreys' (10) method of uniform reduction. This method assumes that the random variable  $\epsilon_{ij}$  is essentially normal but modified by the addition of a low amplitude uniform distribution. In the maximum likelihood estimation described above this is introduced by adding a constant term to the probability density function given by equation 4. Examination of observed distributions away from the mode suggested a value 0.01 times the maximum is appropriate for this term. Its introduction progressively reduces the contribution of observations beyond two to three standard deviations from the mode.

As well as the observations  $m_{ij}$  the method requires values for the threshold parameters  $g_j$  and  $\gamma_j$ . These are estimated from the overall distribution of Log A/T submitted to the ISC by each station using the method of Kelly and Lacoss (11). The threshold values used in the analysis are based on those published by Lilwall (12) with some small modifications and additions.

### 3. RESULTS

The basic input data were read from the records of the WWSSN for stations situated in the teleseismic distance range 20 to 95°. The baseline of the magnitude estimates is influenced by the network of stations used via the terms  $s_j$ . A uniform spatial distribution is therefore desirable to average out this effect. Data for additional stations, obtained from the bulletins of the ISC and NEIS, were added to increase the quantity and improve the spatial distribution of stations about each of the test sites. For some WWSSN stations, measurements reported in the ISC bulletin were used to supplement the film records read for this study.

The distribution of stations used for magnitude determination is shown in figures 1 and 2 for the NTS and Shagan River data sets respectively. The number of stations included is a compromise between the need for sufficient data to give stable estimates and an attempt to achieve uniform coverage. Addition of more data tends to increase further the high weight given to data from Europe and North America.

Magnitudes were estimated for 71 NTS events using 98 stations and for 39 Shagan River events using 92 stations. The magnitudes  $m_{ij}$  at each station for every event for which there were A/T data were computed using equation (1) and both the Gutenberg-Richter (7) and Veith-Clawson (13) distance normalising terms  $B(\Delta)$ . The individual station magnitudes for every event, calculated using the Gutenberg-Richter B-factors, are listed in the appendix to this report. It should be emphasized that these are the raw station magnitudes  $m_{ij}$  shown in equation (2).

Table 1 shows the event magnitudes  $b_i$  obtained by maximising the likelihood function given in equation (6) using  $m_{ij}$  calculated using the NTS data set and the Gutenberg-Richter B-factors, and table 2 shows the event magnitudes calculated for the same data using the Veith-Clawson

B-factors. Tables 3 and 4 show the event magnitudes calculated for the Shagan River data set using the Gutenberg-Richter and Veith Clawson B-factors, respectively.

As can be seen from tables 1 to 4, the range of magnitudes is about 5.40 to 6.15 for the NTS events and 5.77 to 6.21 for the Shagan River events. These tables also show the number of stations contributing A/T data to each event. The magnitudes of the events are all large enough that non-detection of the signals at those stations with large detection thresholds would introduce only a small bias into the estimation of the event magnitudes if least squares were used instead of the maximum-likelihood method.

A different source of bias which operates in the opposite direction might be introduced by the absence of A/T data from those records for which the P-wave signals were clipped due to the instruments being overdriven. This cause of magnitude non-reporting is not taken into account in equation (4), and therefore the maximum-likelihood method (unless modified) will not serve to eliminate it.

In order to investigate whether the presence of non-detections and clipped signals exerted a significant influence on the estimation of event magnitudes for the NTS and Shagan data sets, the generalized linear model (GLM) algorithm of Blandford et al. (14) was applied to the WWSSN records for 11 events from the Shagan River data set. The GLM is designed to estimate event magnitudes unbiased by either non-detections or clipping, if the threshold for the applicable type of non-reporting is measured in every instance that A/T cannot be measured. For this limited data set, it was found that 287 signals could be measured, 7 were not detected, and 13 were clipped. The average  $m_b$  of the 11 events estimated using the GLM differed by only 0.01 magnitude units from that estimated using least squares.

The test of the GLM on the small data set shows that least squares is not strongly biased for events of this size, and we therefore expect that the maximum-likelihood method also produces values that are little different from those that would be obtained by least squares. This is verified by calculating least-squares event magnitudes for the entire Shagan and NTS data sets; the differences from the magnitudes estimated by maximum likelihood are less than 0.03. This near agreement is due in part to the small number of non-detections for events of this size and in part to the small variance  $\sigma^2$  of the magnitudes measured at all the stations (for each event). As equation 6 shows, this variance is also estimated by maximising the likelihood function, and its value was found to be only 0.14 for the NTS data set and 0.12 for the Shagan River data set. This is appreciably smaller than the values of about 0.35 that are typically found for earthquakes, and this narrow distribution of individual station magnitudes significantly reduces the size of any potential magnitude bias. A study of the differences in the least squares and maximum-likelihood estimates of magnitudes has been performed by Lilwall (15).

Along with the event magnitudes  $b_i$ , the maximum-likelihood method generates estimates of the station terms  $s_j$ . Tables 5 and 6 show these for the NTS data set as calculated using the Gutenberg-Richter and Veith-Clawson B-factors respectively, and tables 7 and 8 show them for the Shagan River data set calculated using both sets of B-factors.

4.        ACKNOWLEDGEMENTS

The authors would like to thank the staff at the Center for Seismic Studies in Arlington, Virginia, USA as well as Messrs Robert Wagner and Rong-Song Jih of Teledyne Geotech for their considerable assistance in undertaking this work. Thanks are also due to the numerous analysts around the world who measure P wave amplitudes and report them to the ISC.

APPENDIX A

INDIVIDUAL STATION MAGNITUDES FOR NTS AND SHAGAN RIVER EXPLOSIONS  
USING GUTENBERG-RICHTER DISTANCE FACTORS



APPENDIX A

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	AAM	ADK	AFI	AFR	AKU	ALE	ANT	AQU	ARE	ATL	BDF	BEC	BHP	BLA	BNS	BOG	BRG	CAR	CLL	CMC	COL	COP	DAG	EKA	ESK	
660630	1	6.20	0.00	0.00	0.00	6.03	0.00	0.00	6.68	0.00	0.00	6.24	5.44	6.30	6.29	0.00	0.00	6.36	6.32	5.46	6.09	0.00	0.00	0.00	6.08	
670223	2	5.80	0.00	0.00	0.00	5.79	0.00	0.00	5.62	0.00	0.00	5.26	5.47	5.90	5.89	5.76	0.00	5.88	0.00	5.33	5.81	0.00	0.00	5.40	0.00	
670520	1	6.04	0.00	0.00	0.00	5.82	5.98	0.00	0.00	0.00	0.00	5.26	5.47	5.90	5.89	5.76	0.00	5.96	0.00	5.59	5.97	0.00	0.00	5.50	5.73	
670523	1	5.61	0.00	0.00	0.00	5.43	0.00	0.00	6.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70	0.00	4.91	5.69	0.00	0.00	0.00	0.00	
670927	1	0.00	0.00	0.00	0.00	5.71	0.00	5.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.89	0.00	5.89	0.00	0.00	5.63	0.00	0.00	5.60	5.50	
671018	1	5.70	0.00	0.00	0.00	5.62	0.00	0.00	6.16	0.00	0.00	0.00	0.00	5.48	0.00	0.00	0.00	5.75	0.00	0.00	5.70	0.00	0.00	5.30	0.00	
680221	2	5.34	0.00	0.00	0.00	5.62	5.50	5.23	6.34	5.54	0.00	5.32	5.32	5.80	5.79	0.00	0.00	5.84	0.00	0.00	5.67	5.53	0.00	5.60	5.30	
680322	1	5.48	0.00	0.00	0.00	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.90	0.00	0.00	5.73	0.00	0.00	0.00	5.75	
680615	1	5.83	0.00	0.00	0.00	5.63	0.00	0.00	6.40	5.51	0.00	5.92	5.60	0.00	5.99	5.80	0.00	6.15	0.00	0.00	6.04	5.70	5.29	5.80	5.76	
680829	1	5.86	0.00	0.00	0.00	5.73	5.80	0.00	6.45	5.60	0.00	6.00	5.58	0.00	5.99	0.00	0.00	6.06	0.00	0.00	5.80	0.00	0.00	6.00	0.00	
680906	2	0.00	0.00	0.00	0.00	5.53	0.00	6.00	6.00	5.51	0.00	5.32	0.00	0.00	5.49	0.00	0.00	5.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
690507	1	5.76	0.00	0.00	0.00	5.80	0.00	0.00	6.37	5.98	0.00	0.00	0.00	0.00	5.78	0.00	0.00	5.98	5.63	5.30	0.00	0.00	0.00	0.00	0.00	
691008	1	5.57	0.00	0.00	0.00	5.12	5.52	0.00	6.15	5.60	0.00	5.80	5.30	5.80	5.48	5.72	0.00	5.80	5.43	0.00	5.67	0.00	0.00	0.00	5.52	
691029	3	0.00	0.00	0.00	0.00	5.70	5.68	0.00	6.26	5.60	0.00	0.00	5.18	5.37	5.79	0.00	0.00	5.80	5.53	0.00	5.89	0.00	0.00	0.00	0.00	
701014	1	0.00	0.00	0.00	0.00	5.31	0.00	0.00	6.00	5.40	0.00	0.00	0.00	0.00	5.78	0.00	0.00	5.70	5.43	0.00	0.00	0.00	0.00	0.00	0.00	
701217	1	5.72	0.00	5.90	0.00	5.82	5.98	0.00	6.44	5.79	0.00	5.68	5.39	5.91	5.89	5.74	0.00	6.39	5.63	0.00	5.93	0.00	0.00	0.00	0.00	
720921	1	5.71	0.00	0.00	0.00	5.82	0.00	0.00	6.00	6.00	0.00	5.33	0.00	0.00	5.78	0.00	5.40	5.74	0.00	0.00	5.74	0.00	5.40	0.00	5.68	
730426	2	5.52	0.00	0.00	6.05	0.00	0.00	0.00	6.68	0.00	0.00	0.00	0.00	5.40	5.45	0.00	5.10	5.21	5.33	0.00	5.48	0.00	0.00	0.00	0.00	
730606	1	0.00	0.00	6.41	0.00	5.88	0.00	0.00	6.68	0.00	0.00	5.91	0.00	0.00	6.29	0.00	6.10	6.04	5.93	0.00	6.05	6.51	6.00	5.87	0.00	
740227	1	5.26	0.00	5.70	6.18	0.00	5.41	5.90	5.37	6.22	0.00	5.76	5.60	0.00	5.71	5.79	0.00	5.35	0.00	5.43	0.00	5.70	0.00	5.52	0.00	
740710	1	6.04	0.00	0.00	6.14	0.00	5.41	5.65	0.00	6.10	0.00	0.00	5.25	5.80	5.78	0.00	5.40	5.79	5.49	0.00	5.88	0.00	5.75	5.30	0.00	
740830	1	0.00	0.00	5.94	0.00	5.57	5.98	0.00	6.25	0.00	0.00	0.00	5.26	0.00	5.69	0.00	5.60	5.86	5.53	0.00	5.85	0.00	5.65	5.20	0.00	
750228	1	6.07	0.00	5.86	6.02	0.00	5.63	0.00	5.43	0.00	0.00	5.60	5.26	5.71	5.67	5.64	5.50	5.87	5.53	0.00	5.66	6.03	5.59	5.30	5.43	
750514	1	0.00	0.00	6.10	5.83	0.00	5.86	6.10	5.91	0.00	0.00	0.00	0.00	0.00	5.96	0.00	5.91	5.81	0.00	0.00	0.00	0.00	5.80	5.60	6.02	
750603	1	0.00	0.00	5.92	5.89	0.00	5.73	5.83	5.48	6.37	0.00	5.63	5.22	0.00	5.62	5.82	5.71	5.94	5.63	0.00	6.09	0.00	5.77	5.30	5.66	
750603	2	0.00	0.00	5.60	6.10	0.00	5.60	0.00	6.10	0.00	0.00	0.00	0.00	0.00	5.66	0.00	5.50	5.74	5.53	0.00	5.85	0.00	5.47	5.10	0.00	
750619	1	6.25	0.00	6.09	6.57	0.00	5.89	0.00	5.60	6.83	0.00	6.10	5.72	5.53	5.91	5.67	5.79	5.56	4.82	0.00	5.80	5.93	5.80	6.00	0.00	
751120	1	6.29	0.00	6.09	6.23	0.00	5.75	5.93	0.00	6.47	0.00	0.00	5.36	0.00	0.00	5.80	0.00	5.80	0.00	5.83	0.00	5.97	0.00	5.87	5.50	0.00
751220	1	6.21	0.00	5.84	6.25	0.00	5.77	0.00	6.00	0.00	0.00	5.29	0.00	5.66	0.00	5.50	5.89	5.43	0.00	5.78	0.00	5.57	5.40	5.53	0.00	
760204	1	5.93	0.00	5.72	6.35	0.00	5.73	0.00	6.38	0.00	0.00	5.22	0.00	5.67	5.93	0.00	5.50	0.00	5.43	0.00	5.81	0.00	5.52	0.00	5.48	
760204	2	6.06	0.00	5.82	6.36	0.00	5.47	0.00	6.00	0.00	0.00	5.49	0.00	0.00	5.98	0.00	5.50	0.00	5.43	0.00	5.59	0.00	5.59	5.50	5.35	
760214	1	6.28	0.00	0.00	6.32	0.00	5.58	5.79	0.00	0.00	0.00	6.01	0.00	0.00	0.00	0.00	5.80	6.16	0.00	0.00	5.89	0.00	5.73	5.70	0.00	
760309	1	0.00	0.00	6.26	0.00	0.00	5.87	0.00	0.00	0.00	0.00	5.72	0.00	0.00	0.00	0.00	5.69	6.11	5.72	0.00	5.99	0.00	5.78	5.90	6.06	
760317	1	6.23	0.00	6.18	6.34	0.00	6.01	0.00	6.00	0.00	0.00	0.00	0.00	0.00	6.36	0.00	5.90	6.08	4.83	0.00	5.70	5.90	5.90	5.83	0.00	
760317	2	6.42	0.00	5.80	6.41	0.00	5.85	0.00	6.00	0.00	0.00	0.00	0.00	0.00	6.16	0.00	5.70	6.00	5.73	0.00	5.80	0.00	5.80	5.60	5.72	

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	AAM	ADK	AFI	AFR	AKU	ALE	ANT	AQU	ARE	ATL	BDF	BEC	BHP	BLA	BNS	BOG	BRG	CAR	CLL	CMC	COL	COP	DAG	EKA	ESK	
761228	1	0.00	0.00	0.00	5.79	0.00	0.00	5.33	0.00	5.92	0.00	0.00	5.53	0.00	5.48	5.76	0.00	5.30	5.58	5.33	0.00	5.51	0.00	5.33	5.00	5.15
770405	1	0.00	0.00	0.00	0.00	0.00	5.70	5.70	0.00	6.35	0.00	0.00	0.00	0.00	5.67	5.94	0.00	5.44	0.00	5.48	0.00	5.70	0.00	5.60	5.36	5.57
770819	1	0.00	0.00	0.00	0.00	0.00	5.65	5.66	0.00	0.00	0.00	0.00	0.00	0.00	5.75	0.00	5.51	5.45	5.83	0.00	0.00	5.64	0.00	5.61	5.36	5.48
771109	1	0.00	0.00	5.75	6.40	0.00	0.00	0.00	0.00	6.23	0.00	0.00	0.00	0.00	5.72	0.00	0.00	5.72	5.91	5.74	0.00	6.14	0.00	5.75	5.56	5.58
771214	1	0.00	0.00	0.00	6.18	0.00	5.92	6.06	0.00	6.47	0.00	0.00	0.00	0.00	6.03	0.00	5.96	5.66	6.06	5.63	0.00	5.98	5.70	5.69	5.17	5.42
780223	1	0.00	0.00	0.00	6.32	5.46	5.72	0.00	0.00	6.39	0.00	0.00	0.00	0.00	0.00	0.00	5.51	5.74	5.56	0.00	5.70	0.00	5.66	5.28	0.00	
780323	1	6.24	0.00	0.00	6.39	5.40	5.66	5.66	0.00	6.22	0.00	0.00	0.00	0.00	0.00	0.00	5.41	5.47	5.75	5.47	0.00	5.63	0.00	5.55	5.42	5.54
780411	1	5.88	0.00	5.70	0.00	5.37	5.24	5.47	0.00	6.02	0.00	5.52	0.00	0.00	5.68	0.00	0.00	5.29	0.00	5.30	0.00	5.48	0.00	5.29	0.00	0.00
780411	2	5.84	0.00	5.82	0.00	4.90	5.44	5.25	0.00	6.10	0.00	5.56	0.00	0.00	5.75	0.00	0.00	5.47	0.00	5.42	0.00	5.55	0.00	5.31	0.00	5.52
780712	1	0.00	0.00	0.00	0.00	0.00	5.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.48	0.00	5.46	0.00	0.00	0.00	5.55	5.14	5.50	
780831	1	0.00	0.00	5.95	5.61	5.29	5.51	0.00	5.18	6.29	0.00	0.00	5.62	0.00	5.74	0.00	0.00	0.00	5.78	5.53	0.00	5.15	0.00	5.41	5.47	0.00
780927	2	0.00	0.00	5.79	6.17	5.38	5.88	5.79	5.16	6.19	0.00	5.74	5.74	0.00	0.00	0.00	0.00	5.70	5.89	5.74	0.00	0.00	0.00	5.72	5.36	5.51
781216	1	0.00	0.00	0.00	0.00	5.32	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.49	0.00	5.36	0.00	0.00	0.00	5.45	0.00	0.00	
790208	1	6.16	0.00	0.00	0.00	5.37	5.48	5.95	0.00	0.00	0.00	0.00	5.81	0.00	5.88	0.00	0.00	5.53	5.95	5.47	0.00	5.85	0.00	5.36	5.36	5.28
790611	1	0.00	0.00	0.00	0.00	5.20	5.33	0.00	0.00	6.23	0.00	5.55	5.75	0.00	6.10	0.00	0.00	5.36	6.03	5.53	0.00	5.71	0.00	5.45	0.00	5.45
790906	1	5.87	0.00	5.61	6.15	0.00	5.92	6.04	5.51	0.00	0.00	5.84	0.00	0.00	5.89	0.00	0.00	5.63	5.81	5.73	0.00	5.96	0.00	5.69	5.50	5.61
790926	1	0.00	0.00	0.00	0.00	5.53	5.57	0.00	0.00	6.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.60	0.00	5.54	0.00	0.00	0.00	0.00	0.00	0.00
800426	1	0.00	5.37	5.93	0.00	0.00	5.32	0.00	5.30	6.09	0.00	5.42	5.59	0.00	0.00	0.00	0.00	5.38	5.73	5.43	0.00	5.58	0.00	5.44	5.18	5.15
800612	1	0.00	5.66	5.85	0.00	5.45	5.48	5.65	0.00	6.25	0.00	5.71	5.61	0.00	0.00	0.00	0.00	5.34	0.00	5.42	0.00	5.74	0.00	5.45	5.43	5.59
800725	1	0.00	5.52	5.61	0.00	5.29	5.42	5.38	5.03	5.98	0.00	0.00	0.00	0.00	0.00	0.00	5.59	5.40	5.75	5.42	0.00	5.95	0.00	5.33	5.23	0.00
810115	1	0.00	0.00	5.75	6.11	5.40	0.00	5.70	0.00	6.20	0.00	0.00	5.53	0.00	5.66	0.00	0.00	5.43	5.85	5.53	0.00	0.00	0.00	5.44	0.00	5.75
810606	1	0.00	5.58	0.00	0.00	5.41	5.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.39	0.00	5.32	0.00	0.00	0.00	5.22	5.55	0.00	
820128	1	5.87	5.83	0.00	6.18	5.75	5.96	5.93	5.74	0.00	0.00	0.00	5.69	0.00	5.92	0.00	0.00	5.70	6.22	5.63	0.00	5.90	0.00	5.64	5.45	0.00
820212	2	5.72	0.00	0.00	5.90	5.60	5.65	5.50	5.33	6.20	0.00	0.00	5.85	0.00	5.72	0.00	5.28	5.39	5.80	5.22	0.00	5.64	0.00	5.30	5.57	5.65
820624	1	0.00	0.00	0.00	0.00	5.38	5.42	5.25	5.32	0.00	0.00	0.00	0.00	0.00	5.87	0.00	0.00	5.60	5.97	5.53	0.00	5.63	0.00	5.30	5.50	5.48
820805	1	5.66	0.00	0.00	6.05	5.38	0.00	5.55	0.00	0.00	0.00	0.00	0.00	0.00	5.72	0.00	0.00	5.60	5.91	5.53	0.00	5.81	6.08	5.68	5.35	5.48
830901	1	5.66	5.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50	0.00	0.00	5.30	0.00	5.23	0.00	0.00	0.00	5.03	5.12	0.00
840301	1	6.01	5.95	0.00	6.06	5.65	5.97	5.66	0.00	0.00	0.00	0.00	5.81	0.00	5.72	0.00	0.00	5.70	5.90	5.73	0.00	6.05	0.00	5.79	5.43	5.75
840531	1	0.00	5.79	0.00	6.16	5.18	5.70	5.83	0.00	0.00	0.00	0.00	5.81	0.00	5.75	0.00	0.00	5.50	5.77	5.43	0.00	6.00	5.45	5.49	5.25	5.28
850402	1	0.00	5.82	0.00	6.10	5.56	5.51	5.69	0.00	0.00	0.00	0.00	5.49	0.00	5.76	0.00	0.00	5.60	5.83	5.53	0.00	0.00	0.00	5.51	5.20	5.79
850502	1	0.00	0.00	0.00	5.80	5.56	5.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.73	0.00	0.00	5.60	5.94	5.53	0.00	5.78	5.49	5.63	5.50	5.66
860717	1	5.79	5.63	0.00	0.00	5.47	4.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.81	0.00	0.00	5.56	6.08	5.49	0.00	5.68	0.00	5.37	5.49	0.00
861114	1	0.00	5.76	0.00	6.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.56	0.00	5.570	0.00	0.00	0.00	5.62	5.35	0.00
861213	1	0.00	5.43	0.00	0.00	0.00	5.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.40	5.73	5.29	0.00	0.00	0.00	5.25	5.13	0.00
870813	1	0.00	5.99	0.00	0.00	0.00	5.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.66	0.00	5.63	0.00	0.00	0.00	0.00	5.44	5.77
870924	1	0.00	5.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.47	5.57	0.00

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-R

E FACTORS

EVENT	FCC	FFC	FRB	FUR	GDH	GEO	GIE	GIL	GRF	GUA	HFS	HNR	HON	INK	JOS	KBS	KEV	KHC	KIP	KJF	KON	KRA	KRK	KTG	LHC
660630 1	0.00	0.00	0.00	0.00	6.31	0.00	0.00	0.00	0.00	0.00	0.00	6.80	0.00	0.00	0.00	0.00	5.67	6.10	5.84	0.00	6.14	0.00	0.00	6.42	0.00
670223 2	0.00	0.00	0.00	0.00	5.71	0.00	0.00	0.00	0.00	0.00	0.00	6.19	0.00	0.00	0.00	0.00	5.30	5.60	5.96	0.00	0.00	0.00	0.00	5.88	0.00
670520 1	0.00	0.00	0.00	0.00	5.87	5.66	5.62	0.00	0.00	0.00	0.00	6.61	0.00	0.00	0.00	0.00	5.90	6.02	0.00	0.00	5.94	0.00	5.94	5.99	0.00
670523 1	0.00	0.00	0.00	0.00	5.61	5.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70	0.00	0.00	0.00	5.70	0.00	0.00	5.62	0.00
670927 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.40	5.70	5.87	0.00	5.99	0.00	0.00	5.93	0.00
671018 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.75	5.53	0.00	5.76	0.00	5.77	0.00	0.00	5.77	0.00
680221 2	0.00	0.00	0.00	6.30	5.63	5.47	0.00	0.00	0.00	6.30	0.00	6.21	0.00	0.00	0.00	5.66	5.38	5.80	0.00	0.00	5.73	0.00	5.38	5.63	0.00
680322 1	5.52	0.00	0.00	0.00	5.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.62	5.36	5.60	0.00	0.00	0.00	0.00	5.42	5.95	0.00
680615 1	5.51	0.00	0.00	0.00	6.03	0.00	0.00	0.00	0.00	6.42	0.00	6.50	5.92	0.00	0.00	5.85	5.52	5.90	5.90	0.00	5.84	0.00	5.70	6.02	0.00
680829 1	0.00	0.00	0.00	0.00	5.84	6.15	0.00	6.00	0.00	6.51	0.00	6.62	0.00	0.00	0.00	5.53	5.50	5.90	5.77	0.00	5.94	6.50	0.00	5.92	0.00
680906 2	0.00	0.00	0.00	5.70	0.00	0.00	0.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.68	5.10	5.60	5.65	0.00	5.69	6.00	5.77	5.70	0.00
690507 1	5.10	0.00	0.00	5.40	5.61	5.86	0.00	6.30	5.48	0.00	0.00	6.27	0.00	0.00	0.00	5.72	5.40	5.70	5.74	0.00	5.63	6.10	0.00	5.55	0.00
691008 1	0.00	0.00	0.00	5.30	0.00	0.00	0.00	5.70	5.78	5.83	0.00	5.86	5.50	0.00	0.00	0.00	5.50	0.00	0.00	0.00	5.59	6.00	0.00	5.31	0.00
691029 3	0.00	0.00	0.00	5.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.41	0.00	0.00	0.00	0.00	5.70	0.00	0.00	0.00	6.00	0.00	0.00	5.76	0.00
701014 1	0.00	5.31	0.00	5.50	5.32	0.00	0.00	6.00	5.88	0.00	0.00	0.00	0.00	0.00	5.24	0.00	5.50	5.60	0.00	0.00	5.59	5.90	0.00	5.73	0.00
701217 1	5.48	0.00	0.00	5.80	5.74	0.00	0.00	5.80	5.88	0.00	0.00	6.14	0.00	0.00	0.00	5.90	5.30	5.90	0.00	0.00	6.02	6.20	0.00	6.00	0.00
720921 1	0.00	5.66	0.00	6.40	5.85	0.00	0.00	4.76	5.68	0.00	0.00	0.00	0.00	0.00	0.00	5.98	5.64	5.70	0.00	5.41	5.87	0.00	0.00	5.95	0.00
730426 2	5.15	5.50	0.00	5.69	5.36	0.00	5.40	5.74	0.00	0.00	5.70	0.00	0.00	0.00	5.34	5.73	5.18	5.30	0.00	5.50	5.51	0.00	0.00	5.60	0.00
730606 1	6.28	0.00	0.00	6.45	6.08	0.00	0.00	6.32	0.00	6.56	6.30	0.00	0.00	6.12	6.04	6.01	5.70	6.20	0.00	6.10	6.19	6.50	0.00	6.27	0.00
740227 1	0.00	5.46	0.00	5.80	5.54	0.00	0.00	5.79	5.58	6.03	5.70	6.25	0.00	0.00	5.54	0.00	5.10	5.40	0.00	5.61	0.00	6.10	0.00	5.82	5.63
740710 1	0.00	5.46	5.86	5.90	5.52	0.00	0.00	5.75	0.00	6.19	5.90	0.00	0.00	5.40	5.64	0.00	5.70	5.60	0.00	5.51	5.89	0.00	0.00	5.88	5.62
740830 1	0.00	0.00	0.00	5.90	5.64	0.00	0.00	6.08	5.68	5.92	4.20	0.00	0.00	0.00	5.64	5.72	5.39	5.50	0.00	5.60	5.78	6.10	0.00	5.98	5.79
750228 1	5.29	5.08	0.00	5.88	5.64	0.00	5.83	5.79	5.67	6.23	5.90	6.15	0.00	0.00	0.00	5.73	5.30	5.70	0.00	5.70	5.77	0.00	0.00	5.74	5.68
750514 1	5.72	0.00	0.00	0.00	6.01	0.00	6.16	6.54	6.00	6.24	0.00	6.63	0.00	6.19	5.95	6.05	5.51	5.90	0.00	5.90	0.00	6.40	0.00	5.85	6.01
750603 1	5.52	0.00	0.00	6.43	5.56	0.00	0.00	0.00	5.93	6.43	6.00	0.00	0.00	5.90	5.64	5.94	5.54	5.60	0.00	5.70	5.79	6.10	0.00	5.75	5.78
750603 2	0.00	0.00	0.00	5.81	5.57	0.00	0.00	5.74	5.58	0.00	5.80	0.00	0.00	0.00	5.54	5.77	5.30	5.60	0.00	0.00	5.83	6.10	0.00	5.86	5.67
750619 1	6.21	0.00	0.00	6.07	6.11	0.00	0.00	0.00	0.00	6.82	6.20	6.28	0.00	j.88	5.93	6.05	5.54	5.70	0.00	6.00	5.84	6.30	0.00	6.18	6.13
751120 1	5.74	0.00	6.00	0.00	5.78	0.00	0.00	0.00	0.00	0.00	6.30	6.41	0.00	5.72	0.00	6.02	5.67	5.80	0.00	5.80	5.99	6.30	0.00	6.04	6.03
751220 1	0.00	5.45	0.00	5.33	0.00	0.00	5.38	6.05	0.00	0.00	5.80	6.27	0.00	0.00	5.44	5.79	5.45	5.70	0.00	5.60	0.00	0.00	0.00	5.90	5.73
760204 1	5.29	5.64	0.00	5.70	5.57	0.00	5.58	0.00	0.00	0.00	5.90	0.00	0.00	0.00	5.45	5.80	5.49	5.55	0.00	5.71	0.00	6.00	0.00	5.85	5.55
760204 2	5.33	5.29	5.76	6.20	5.69	0.00	0.00	5.84	0.00	0.00	5.80	0.00	0.00	0.00	5.34	5.73	5.27	5.60	0.00	5.60	0.00	0.00	0.00	5.78	5.56
760214 1	5.76	5.63	6.31	0.00	5.54	0.00	0.00	0.00	0.00	6.10	0.00	0.00	0.00	5.75	0.00	5.82	5.50	0.00	0.00	5.70	0.00	6.30	0.00	5.80	6.07
760309 1	5.21	0.00	0.00	5.80	5.96	0.00	0.00	6.15	5.93	0.00	5.90	0.00	0.00	6.11	0.00	5.81	5.31	5.90	0.00	5.60	5.94	5.30	0.00	6.03	5.97
760317 1	0.00	0.00	0.00	5.80	6.00	0.00	0.00	0.00	0.00	6.44	6.20	6.87	0.00	0.00	0.00	5.98	5.52	6.00	0.00	5.80	6.07	0.00	0.00	6.32	0.00
760317 2	0.00	0.00	0.00	5.80	5.92	0.00	0.00	0.00	0.00	6.32	6.10	0.00	0.00	5.16	0.00	5.81	5.42	5.80	0.00	5.80	5.93	6.30	0.00	5.93	0.00

APPENDIX A (continued)

STATION MAGNITUDES FOR NT USING BERG-R DISTANCE FACTORS

EVENT	FCC	FFC	FRB	FUR	GDH	GEO	GIE	GIL	GRF	GUA	HFS	HNR	HON	INK	JOS	KBS	KEV	KHC	KIP	KJF	KON	KRA	KRK	KTG	LBC			
761228	1	0.00	5.15	0.00	5.60	5.34	0.00	0.00	5.67	5.47	0.00	5.80	6.13	0.00	0.00	0.00	5.58	5.12	5.40	0.00	5.41	0.00	0.00	5.50	0.00			
770405	1	0.00	0.00	0.00	5.54	5.81	0.00	0.00	5.73	5.68	0.00	5.90	6.12	0.00	0.00	0.00	5.75	5.45	5.90	0.00	5.62	5.82	0.00	0.00	5.81	5.77		
770819	1	5.11	5.56	5.50	6.10	5.58	0.00	0.00	5.80	5.64	0.00	5.80	0.00	0.00	0.00	0.00	5.59	5.45	0.00	0.00	5.62	5.70	6.10	0.00	0.00	0.00		
771109	1	0.00	0.00	0.00	0.00	6.04	0.00	5.66	6.13	0.00	0.00	6.10	6.35	0.00	0.00	0.00	0.00	5.50	0.00	0.00	5.91	6.03	6.40	0.00	6.13	0.00		
771214	1	5.41	0.00	5.67	0.00	5.82	0.00	0.00	5.97	0.00	0.00	5.90	0.00	0.00	0.00	0.00	5.82	5.51	0.00	0.00	5.70	6.07	6.30	0.00	6.10	5.88		
780223	1	5.11	0.00	5.64	5.79	5.66	0.00	0.00	0.00	5.86	0.00	5.86	0.00	5.78	0.00	0.00	5.79	5.48	5.80	0.00	5.60	0.00	6.10	0.00	5.73	5.75		
780323	1	5.54	0.00	5.48	5.81	5.74	0.00	0.00	5.78	0.00	0.00	5.84	6.01	0.00	0.00	0.00	5.65	5.39	0.00	0.00	5.61	0.00	6.10	0.00	5.83	5.71		
780411	1	0.00	0.00	0.00	5.44	5.63	0.00	0.00	5.60	5.34	0.00	5.53	0.00	5.32	0.00	0.00	5.54	5.08	5.30	0.00	5.28	5.40	5.90	0.00	5.15	5.70		
780411	2	5.25	0.00	5.54	5.64	5.64	0.00	0.00	5.65	5.70	0.00	5.87	0.00	5.50	0.00	0.00	5.63	5.39	5.70	0.00	5.30	5.59	6.00	0.00	5.27	5.62		
780712	1	0.00	5.62	0.00	5.37	5.70	0.00	0.00	0.00	5.75	6.18	5.96	0.00	0.00	0.00	5.84	0.00	5.40	5.70	0.00	5.64	5.83	6.10	0.00	5.85	5.58		
780831	1	0.00	0.00	5.52	0.00	5.41	0.00	0.00	0.00	5.77	5.73	5.73	0.00	0.00	5.59	5.74	5.63	5.18	5.60	0.00	5.01	5.48	6.10	0.00	5.52	0.00		
780927	2	0.00	5.60	5.80	6.62	5.89	0.00	0.00	0.00	0.00	0.00	6.17	0.00	0.00	0.00	5.74	6.04	5.61	5.90	0.00	5.91	0.00	6.40	0.00	6.07	5.86		
781216	1	0.00	0.00	5.64	6.07	0.00	0.00	0.00	0.00	5.60	0.00	5.86	0.00	0.00	5.35	0.00	0.00	0.00	5.50	0.00	5.45	5.73	5.90	0.00	5.54	5.60		
790208	1	0.00	0.00	5.51	0.00	5.55	0.00	0.00	0.00	5.75	0.00	5.73	6.34	0.00	0.00	5.92	5.57	5.36	5.67	0.00	5.51	5.84	6.10	0.00	5.99	0.00		
790611	1	0.00	0.00	0.00	5.59	0.00	0.00	0.00	0.00	5.52	6.35	5.63	0.00	0.00	0.00	5.24	5.72	5.20	5.47	0.00	5.36	5.62	5.90	0.00	5.69	5.57		
790906	1	5.75	5.61	0.00	0.00	0.00	0.00	0.00	0.00	5.92	6.37	6.15	0.00	0.00	0.00	5.84	6.34	5.01	5.97	0.00	5.81	6.13	6.40	0.00	0.00	5.86		
790926	1	5.24	0.00	5.63	0.00	0.00	0.00	0.00	0.00	5.71	0.00	6.00	0.00	0.00	0.00	5.64	0.00	5.33	5.61	0.00	5.18	0.00	6.00	0.00	0.00	5.73		
800426	1	5.39	5.52	0.00	0.00	5.38	0.00	0.00	0.00	5.50	0.00	5.68	0.00	0.00	0.00	5.46	5.46	5.45	5.36	0.00	0.00	0.00	5.90	0.00	5.35	5.63		
800612	1	5.46	5.63	5.68	0.00	5.52	0.00	0.00	0.00	5.52	6.29	5.57	6.37	0.00	5.60	5.64	0.00	5.15	5.43	0.00	5.38	5.78	6.02	0.00	5.45	5.66		
800725	1	0.00	0.00	0.00	0.00	5.51	0.00	0.00	0.00	5.64	5.75	5.52	0.00	0.00	0.00	5.57	5.59	0.00	5.43	0.00	5.37	5.41	5.99	0.00	5.39	5.56		
810115	1	6.00	0.00	0.00	6.14	5.35	0.00	0.00	0.00	5.71	0.00	5.87	0.00	0.00	0.00	5.56	5.83	5.45	0.00	0.00	5.81	0.00	6.27	0.00	0.00	5.63		
810606	1	0.00	5.55	5.35	0.00	0.00	0.00	0.00	0.00	5.52	0.00	5.56	0.00	0.00	5.34	5.44	5.52	5.51	5.40	0.00	5.40	0.00	6.03	0.00	0.00	5.78		
820128	1	0.00	5.70	5.83	6.36	5.81	0.00	5.21	0.00	5.81	6.49	6.03	0.00	0.00	0.00	6.04	5.96	5.70	5.90	0.00	5.71	0.00	6.41	0.00	0.00	5.79		
820212	2	0.00	0.00	5.51	5.89	5.55	0.00	0.00	0.00	0.00	0.00	5.73	0.00	0.00	0.00	5.43	0.00	5.19	5.30	0.00	5.50	5.54	5.75	0.00	0.00	5.65		
820624	1	5.34	0.00	0.00	0.00	5.73	0.00	0.00	0.00	5.68	0.00	5.82	0.00	0.00	0.00	5.70	0.00	5.20	5.50	0.00	5.50	5.80	5.99	0.00	0.00	5.67		
820805	1	5.42	5.47	0.00	6.11	0.00	0.00	0.00	0.00	5.83	5.70	6.07	0.00	0.00	0.00	5.53	0.00	5.48	5.50	0.00	5.81	6.03	6.07	0.00	0.00	0.00		
830901	1	0.00	5.48	0.00	0.00	0.00	0.00	0.00	0.00	5.46	0.00	5.94	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.00	5.40	0.00	5.92	0.00	0.00	5.48		
840301	1	0.00	4.78	0.00	6.17	6.13	0.00	0.00	0.00	5.82	6.33	0.00	0.00	0.00	5.18	5.65	5.69	5.75	5.90	0.00	5.91	0.00	6.30	0.00	0.00	5.91		
840531	1	0.00	5.45	0.00	6.06	5.93	0.00	0.00	0.00	5.77	0.00	5.90	0.00	5.95	0.00	0.00	5.39	5.45	5.90	0.00	5.61	0.00	0.00	0.00	0.00	5.52		
850402	1	0.00	5.71	0.00	6.00	5.81	0.00	5.49	0.00	5.82	0.00	5.87	0.00	0.00	0.00	5.54	6.06	5.49	5.90	0.00	5.71	0.00	6.10	0.00	0.00	5.66		
850502	1	0.00	0.00	0.00	6.10	5.80	0.00	0.00	0.00	5.68	6.10	5.80	0.00	5.92	5.30	0.00	5.82	5.19	5.70	0.00	5.50	0.00	6.10	0.00	0.00	0.00		
860717	1	0.00	5.63	0.00	0.00	0.00	0.00	0.00	0.00	5.64	0.00	0.00	0.00	0.00	5.56	0.00	0.00	0.00	6.14	0.00	5.42	0.00	0.00	0.00	0.00	5.79		
861114	1	0.00	5.70	0.00	6.14	0.00	0.00	0.00	0.00	5.90	0.00	5.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.89	0.00	5.59	0.00	6.31	0.00	0.00	0.00
861213	1	0.00	5.73	0.00	5.82	0.00	0.00	0.00	0.00	5.57	0.00	5.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	0.00	5.50	0.00	5.92	0.00	0.00	0.00
870813	1	0.00	5.82	0.00	6.06	0.00	0.00	0.00	0.00	5.71	0.00	6.09	0.00	0.00	0.00	0.00	0.00	5.58	5.42	0.00	5.92	0.00	6.32	0.00	0.00	0.00		
870924	1	0.00	5.85	0.00	5.82	0.00	0.00	0.00	0.00	5.64	0.00	5.91	0.00	0.00	0.00	0.00	0.00	0.00	5.19	0.00	0.00	0.00	6.00	0.00	0.00	0.00		

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	ICR	LPB	LPS	MAL	MT	MBC	MOX	NAO	NAT	NEZ	NIE	NNA	NOR	NUR	OGD	PAE	PDA	PEL	PMO	PMR	PNS	HN	PPT	PRU	PIO	
660630	1	0.00	6.40	6.04	6.18	0.00	5.50	5.92	0.00	0.00	0.00	7.05	0.00	5.41	5.92	0.00	0.00	6.23	6.16	0.00	0.00	5.92	0.00	0.00	6.08	0.00
670223	2	0.00	6.05	0.00	5.83	0.00	5.40	0.00	0.00	5.94	0.00	0.00	0.00	4.95	5.40	0.00	0.00	0.00	0.00	0.00	0.00	5.35	0.00	0.00	5.69	0.00
670520	1	0.00	0.00	5.63	5.64	5.86	5.44	5.52	0.00	0.00	0.00	0.00	0.00	5.25	5.75	5.84	0.00	0.00	5.81	0.00	0.00	5.45	0.00	0.00	5.99	5.93
670523	1	0.00	5.90	0.00	0.00	5.57	4.70	0.00	0.00	0.00	0.00	0.00	0.00	5.50	5.99	0.00	0.00	0.00	0.00	0.00	0.00	5.52	0.00	0.00	5.69	0.00
670927	1	0.00	4.91	5.54	5.88	5.88	5.40	5.52	0.00	0.00	0.00	5.94	0.00	5.30	5.64	0.00	0.00	0.00	0.00	0.00	0.00	5.25	0.00	0.00	5.89	0.00
671018	1	5.60	5.99	0.00	5.74	0.00	5.40	5.32	0.00	5.79	0.00	0.00	0.00	5.03	5.40	5.19	0.00	0.00	5.51	0.00	6.00	0.00	0.00	0.00	5.79	5.68
680221	2	0.00	7.21	0.00	5.69	0.00	5.40	5.22	0.00	5.74	0.00	0.00	0.00	4.90	5.52	5.62	0.00	0.00	5.61	0.00	6.00	5.55	0.00	0.00	5.79	0.00
680322	1	0.00	0.00	5.60	0.00	0.00	5.30	5.42	0.00	5.81	0.00	0.00	0.00	4.93	5.58	5.77	0.00	0.00	5.77	0.00	5.60	5.32	0.00	0.00	0.00	0.00
680615	1	6.10	6.12	5.17	0.00	0.00	5.70	5.72	0.00	6.05	0.00	0.00	0.00	0.00	5.70	0.00	0.00	0.00	5.75	0.00	5.80	5.43	0.00	0.00	5.79	6.06
680829	1	0.00	6.06	0.00	6.08	0.00	0.00	5.72	0.00	0.00	0.00	5.94	0.00	0.00	5.62	6.04	0.00	0.00	5.81	0.00	5.90	5.33	0.00	0.00	5.89	6.22
680906	2	5.72	5.76	0.00	0.00	0.00	5.20	5.32	0.00	5.59	0.00	5.55	0.00	5.20	5.64	0.00	0.00	0.00	5.73	0.00	5.80	0.00	0.00	0.00	5.69	0.00
690507	1	0.00	5.97	5.70	0.00	0.00	5.60	5.43	0.00	6.04	0.00	5.54	0.00	5.20	5.50	0.00	0.00	0.00	0.00	6.00	5.22	0.00	0.00	5.50	5.90	
691008	1	5.87	5.73	5.40	5.76	5.58	5.10	5.33	0.00	5.79	0.00	5.64	0.00	0.00	5.41	0.00	0.00	0.00	5.39	0.00	5.60	0.00	0.00	0.00	5.50	5.52
691029	3	5.48	5.72	5.56	5.54	0.00	5.40	5.42	0.00	5.78	0.00	5.45	0.00	5.13	5.65	5.51	0.00	0.00	5.78	0.00	5.70	0.00	0.00	0.00	0.00	5.66
701014	1	0.00	0.00	5.20	0.00	5.57	4.80	5.33	0.00	0.00	0.00	0.00	0.00	5.20	5.74	5.29	0.00	0.00	5.71	0.00	5.70	5.06	0.00	0.00	5.59	0.00
701217	1	0.00	0.00	5.60	0.00	0.00	5.50	5.62	0.00	6.16	0.00	5.54	5.75	5.25	5.77	0.00	0.00	0.00	5.88	0.00	5.80	0.00	0.00	0.00	5.89	5.75
720921	1	5.92	0.00	0.00	5.60	5.69	5.43	5.43	0.00	5.62	0.00	0.00	5.76	5.47	5.67	0.00	0.00	0.00	5.30	0.00	5.14	0.00	0.00	0.00	5.69	5.77
730426	2	5.53	0.00	5.01	5.79	5.52	5.51	5.22	5.30	0.00	0.00	5.74	5.56	0.00	5.45	0.00	6.10	0.00	0.00	5.76	5.63	0.00	5.88	6.26	5.49	0.00
730606	1	6.43	0.00	0.00	0.00	0.00	5.85	6.02	5.89	6.17	0.00	6.04	6.18	0.00	6.07	6.29	0.00	6.26	5.93	0.00	6.26	0.00	0.00	0.00	6.29	0.00
740227	1	5.80	5.79	5.37	5.62	5.71	5.51	5.32	5.39	5.72	0.00	5.44	5.59	0.00	5.62	0.00	6.05	0.00	5.60	5.70	5.63	0.00	5.82	6.15	5.69	5.62
740710	1	5.89	5.61	5.57	0.00	5.88	5.38	5.43	5.68	0.00	0.00	0.00	5.47	0.00	5.60	5.46	6.32	0.00	0.00	5.82	5.68	0.00	6.12	6.19	5.80	0.00
740830	1	5.97	5.91	0.00	0.00	5.68	5.52	5.52	5.64	0.00	0.00	0.00	5.91	0.00	5.60	0.00	5.95	0.00	0.00	5.70	5.97	0.00	5.77	6.07	5.69	0.00
750228	1	5.59	0.00	0.00	0.00	5.78	5.06	5.42	5.74	0.00	0.00	0.00	5.50	0.00	5.63	5.49	5.92	0.00	0.00	5.74	5.65	0.00	5.78	6.18	0.00	0.00
750514	1	6.17	0.00	0.00	0.00	5.93	5.86	5.83	0.00	0.00	0.00	6.08	0.00	5.86	6.16	5.83	0.00	0.00	5.59	6.22	0.00	5.52	5.97	0.00	0.00	
750603	1	0.00	0.00	0.00	0.00	5.82	5.89	5.62	5.70	0.00	0.00	5.85	0.00	0.00	5.70	5.77	5.79	0.00	0.00	5.54	0.00	0.00	5.57	6.01	5.69	0.00
750603	2	0.00	0.00	0.00	0.00	5.71	5.53	5.42	5.65	0.00	0.00	5.64	0.00	0.00	5.70	5.41	6.08	0.00	0.00	5.65	4.80	0.00	6.06	6.26	5.79	0.00
750619	1	0.00	0.00	0.00	0.00	5.44	6.04	5.71	5.79	0.00	0.00	5.75	0.00	0.00	5.87	5.98	6.34	7.27	0.00	6.16	5.05	0.00	6.21	6.57	5.98	6.11
751120	1	6.44	6.00	0.00	0.00	6.13	5.68	5.83	0.00	6.10	0.00	6.14	6.02	0.00	5.77	5.92	6.15	0.00	0.00	5.74	0.00	0.00	5.78	6.16	0.00	0.00
751220	1	0.00	0.00	0.00	0.00	0.00	5.60	5.52	5.73	0.00	0.00	0.00	5.57	0.00	5.72	5.11	5.98	0.00	0.00	5.73	4.80	0.00	5.92	6.19	5.79	5.86
760204	1	0.00	5.69	0.00	0.00	j.84	5.52	5.53	0.00	0.00	0.00	5.34	5.46	0.00	5.80	5.30	6.23	0.00	0.00	5.78	5.68	0.00	6.02	6.27	5.70	0.00
760204	2	0.00	5.88	0.00	0.00	5.77	5.57	5.42	0.00	0.00	0.00	0.00	5.69	0.00	5.55	5.45	6.25	0.00	0.00	5.82	5.81	0.00	6.06	6.34	5.79	0.00
760214	1	6.24	6.00	0.00	0.00	0.00	5.66	0.00	5.66	0.00	0.00	0.00	5.88	0.00	5.75	0.00	6.02	0.00	0.00	5.82	0.00	0.00	5.83	6.18	0.00	0.00
760309	1	6.05	0.00	0.00	0.00	5.84	0.00	5.72	5.56	0.00	0.00	0.00	6.03	0.00	5.52	6.05	0.00	0.00	5.86	6.00	5.88	0.00	0.00	0.00	5.99	0.00
760317	1	6.34	6.00	0.00	0.00	0.00	5.93	5.82	0.00	0.00	0.00	0.00	6.05	0.00	5.85	5.93	6.37	0.00	0.00	6.03	5.75	0.00	6.08	6.36	6.09	0.00
760317	2	6.00	0.00	0.00	0.00	0.00	5.77	5.72	0.00	0.00	0.00	0.00	5.73	0.00	5.78	5.24	6.19	0.00	0.00	5.95	6.05	0.00	6.07	6.32	5.99	0.00

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	LOR	LPB	LPS	MAL	MAT	MBC	MOX	NAO	NAT	NB2	NIE	NNA	NOR	NUR	OGD	PAE	PDA	PEL	PMO	PMR	PNS	PPN	PPT	PRU	PTO	
761228	1	5.79	5.61	5.39	5.62	5.60	0.00	5.32	0.00	0.00	0.00	5.34	0.00	5.42	0.00	5.55	0.00	0.00	5.45	5.45	0.00	5.44	5.70	5.59	0.00	
770405	1	0.00	0.00	6.06	5.73	5.75	5.60	5.50	0.00	0.00	0.00	6.14	5.68	0.00	5.65	5.22	0.00	0.00	0.00	0.00	5.74	0.00	0.00	0.00	5.76	0.00
770819	1	0.00	0.00	5.95	5.61	5.79	5.55	5.42	0.00	0.00	0.00	5.84	5.65	0.00	5.53	5.25	5.92	0.00	0.00	0.00	4.72	0.00	5.80	6.07	5.71	0.00
771109	1	0.00	6.04	0.00	5.86	5.94	0.00	5.66	0.00	0.00	0.00	5.72	0.00	5.88	5.43	6.04	0.00	5.40	0.00	5.84	0.00	5.87	6.00	5.91	0.00	
771214	1	0.00	6.06	6.11	0.00	5.97	0.00	5.62	0.00	0.00	0.00	5.90	0.00	5.69	5.62	6.00	0.00	5.61	5.50	5.93	0.00	5.90	5.98	5.79	0.00	
780223	1	0.00	6.03	0.00	0.00	5.63	5.67	5.50	0.00	0.00	5.52	5.84	5.72	0.00	5.72	0.00	6.43	0.00	0.00	5.73	5.70	0.00	5.98	6.23	5.79	0.00
780323	1	0.00	5.79	5.34	5.69	5.75	5.47	5.53	0.00	0.00	5.59	5.84	5.70	0.00	5.72	0.00	6.12	0.00	5.44	5.59	5.98	0.00	5.94	6.23	5.74	0.00
780411	1	0.00	5.58	0.00	5.62	5.49	5.15	5.23	0.00	0.00	4.88	5.65	5.75	0.00	5.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
780411	2	0.00	5.38	0.00	5.72	5.74	5.18	5.36	0.00	0.00	5.15	5.74	5.70	0.00	5.39	0.00	0.00	0.00	0.00	0.00	5.44	0.00	0.00	0.00	0.00	0.00
780712	1	0.00	5.71	0.00	0.00	0.00	5.56	5.44	0.00	0.00	5.69	5.74	5.48	0.00	0.00	0.00	0.00	0.00	0.00	5.68	5.58	0.00	6.00	6.24	5.71	0.00
780831	1	5.99	0.00	5.20	0.00	5.65	5.35	5.49	0.00	0.00	5.18	5.95	5.65	0.00	0.00	0.00	5.60	0.00	0.00	5.26	5.40	0.00	5.69	5.53	5.64	5.60
780927	2	6.16	5.70	0.00	0.00	0.00	5.83	5.73	0.00	0.00	5.72	5.94	5.75	0.00	5.49	5.53	6.18	6.19	0.00	5.50	5.99	0.00	5.95	6.19	5.94	0.00
781216	1	0.00	5.80	0.00	0.00	5.71	0.00	5.30	0.00	0.00	5.39	5.94	5.79	0.00	0.00	0.00	5.93	0.00	0.00	0.00	5.51	0.00	0.00	5.87	5.56	0.00
790208	1	0.00	5.51	5.35	0.00	5.64	5.47	5.46	0.00	0.00	5.61	5.84	5.81	0.00	0.00	0.00	0.00	0.00	5.76	0.00	5.60	0.00	0.00	0.00	0.00	0.00
790611	1	6.01	5.99	5.28	5.89	5.51	5.29	5.43	0.00	0.00	5.01	5.64	5.90	0.00	5.32	0.00	0.00	5.85	5.63	0.00	5.74	0.00	5.41	0.00	5.50	5.91
790906	1	0.00	5.72	5.73	0.00	5.50	5.73	5.79	0.00	0.00	5.54	0.00	0.00	0.00	0.00	0.00	6.05	6.07	0.00	5.85	5.99	0.00	6.06	6.29	5.96	0.00
790926	1	0.00	5.70	0.00	0.00	5.78	5.35	5.53	0.00	0.00	5.31	0.00	5.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	5.56	0.00
800426	1	5.64	5.46	5.35	5.42	5.57	5.26	5.40	0.00	0.00	5.18	0.00	5.60	0.00	5.16	0.00	0.00	0.00	0.00	5.16	0.00	0.00	0.00	0.00	5.43	5.63
800612	1	5.97	5.70	5.55	0.00	5.63	5.38	5.37	0.00	0.00	0.00	0.00	5.74	0.00	5.45	0.00	0.00	0.00	0.00	0.00	5.87	0.00	0.00	0.00	5.49	5.91
800725	1	0.00	5.79	5.47	0.00	5.54	0.00	5.33	0.00	0.00	0.00	0.00	5.84	0.00	5.36	0.00	5.71	0.00	0.00	0.00	5.78	0.00	5.59	0.00	0.00	0.00
810115	1	5.79	5.94	5.59	5.55	5.81	5.53	5.55	0.00	0.00	5.47	6.01	0.00	0.00	5.85	0.00	0.00	0.00	5.60	5.60	5.70	0.00	0.00	6.23	5.79	5.93
8106061	0.00	5.70	0.00	0.00	0.00	0.00	5.32	0.00	0.00	5.12	5.79	0.00	0.00	5.30	0.00	0.00	0.00	0.00	0.00	0.00	5.47	0.00	0.00	0.00	5.49	0.00
820128	1	6.04	6.06	0.00	0.00	5.93	5.64	5.73	0.00	0.00	5.92	6.02	0.00	0.00	5.97	0.00	6.20	0.00	0.00	5.66	5.88	0.00	6.15	6.31	5.99	5.97
820212	2	5.85	5.70	5.52	0.00	5.66	5.63	5.31	0.00	0.00	5.12	5.68	5.96	0.00	5.18	0.00	5.70	0.00	0.00	5.36	5.59	0.00	5.57	5.81	5.28	5.65
820624	1	5.92	5.84	0.00	4.77	5.89	0.00	5.53	0.00	0.00	5.08	0.00	5.88	0.00	5.48	0.00	5.93	0.00	0.00	0.00	0.00	0.00	5.78	5.94	5.59	5.87
820805	1	5.81	6.04	0.00	0.00	0.00	5.28	5.52	0.00	0.00	5.63	5.91	5.41	0.00	5.95	0.00	5.92	5.88	5.62	5.60	0.00	0.00	5.80	5.93	5.69	5.87
830901	1	0.00	0.00	0.00	0.00	0.00	5.17	5.22	0.00	0.00	4.96	5.51	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29	0.00
840301	1	0.00	0.00	0.00	0.00	6.05	0.00	5.63	0.00	0.00	5.78	5.96	0.00	0.00	5.63	0.00	6.03	0.00	5.58	5.62	0.00	0.00	5.94	5.96	5.90	0.00
840531	1	5.96	5.69	0.00	0.00	5.75	5.58	5.52	0.00	0.00	5.75	5.88	0.00	0.00	5.46	0.00	6.02	0.00	5.29	5.74	0.00	0.00	0.00	6.03	5.79	5.63
850402	1	0.00	5.98	0.00	0.00	5.90	5.50	5.52	0.00	0.00	5.78	6.04	0.00	0.00	5.66	0.00	6.10	0.00	0.00	6.80	5.90	0.00	6.02	6.21	5.79	5.66
850502	1	5.93	0.00	0.00	0.00	5.93	0.00	5.52	0.00	0.00	5.29	5.84	0.00	0.00	5.49	0.00	0.00	0.00	5.48	0.00	5.50	0.00	5.72	5.81	5.49	5.66
860717	1	5.85	5.75	0.00	0.00	5.84	5.08	5.45	0.00	0.00	5.24	0.00	0.00	0.00	5.35	0.00	0.00	0.00	0.00	5.54	0.00	0.00	0.00	0.00	5.62	0.00
861114	1	0.00	5.88	0.00	0.00	5.84	5.48	5.51	0.00	0.00	5.74	0.00	0.00	0.00	5.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.10	6.06	5.76	0.00
861213	1	0.00	5.68	0.00	0.00	5.59	5.10	5.28	0.00	0.00	5.16	0.00	0.00	0.00	5.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.39	0.00
870813	1	6.02	0.00	0.00	0.00	0.00	0.00	5.61	0.00	0.00	5.89	0.00	0.00	0.00	5.87	0.00	5.86	0.00	0.00	5.50	5.79	0.00	5.70	6.04	5.79	0.00
870924	1	5.88	5.80	0.00	0.00	5.79	5.23	5.49	0.00	0.00	5.43	0.00	0.00	0.00	5.36	0.00	0.00	0.00	0.00	0.00	5.57	0.00	5.49	5.83	5.52	0.00

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	RAR	RES	RUV	SCH	SCP	SEO	SHA	SHK	SJG	SSF	STJ	STU	TOL	TPT	TRI	TRN	TVO	UME	VAH	VAL	WES	YKC	ZUL
761228 1	0.00	5.21	5.69	0.00	4.88	0.00	0.00	5.52	5.98	5.52	0.00	5.19	5.88	5.32	0.00	5.32	5.65	5.42	5.45	0.00	0.00	0.00	5.73
770405 1	0.00	0.00	0.00	5.59	0.00	0.00	0.00	5.78	6.18	0.00	0.00	5.39	0.00	0.00	0.00	5.55	0.00	5.77	0.00	0.00	0.00	5.24	6.12
770819 1	0.00	0.00	5.91	5.60	5.31	0.00	0.00	5.61	5.68	5.63	0.00	5.36	5.88	5.50	0.00	5.63	5.89	5.61	5.82	0.00	0.00	5.53	6.23
771109 1	0.00	0.00	6.10	5.99	5.58	0.00	0.00	5.82	6.28	0.00	6.62	5.54	6.14	5.62	0.00	5.40	6.10	0.00	0.00	0.00	4.97	0.00	5.63
771214 1	0.00	0.00	5.98	5.87	5.41	5.81	6.26	5.52	6.54	5.69	0.00	0.00	5.88	5.74	0.00	5.76	5.91	5.83	5.99	0.00	0.00	0.00	5.93
780223 1	0.00	0.00	6.01	5.54	0.00	0.00	0.00	0.00	6.26	5.65	0.00	5.38	5.84	5.69	0.00	5.65	0.00	0.00	5.94	0.00	0.00	5.63	5.92
780323 1	0.00	5.49	5.93	5.87	5.19	0.00	0.00	5.68	6.39	5.60	6.31	5.24	5.92	5.53	0.00	0.00	6.06	0.00	5.90	0.00	0.00	5.79	6.33
780411 1	0.00	5.17	5.78	0.00	5.42	5.14	0.00	5.68	6.09	5.59	0.00	5.35	6.00	5.32	0.00	5.52	0.00	0.00	0.00	0.00	5.19	5.02	6.02
780411 2	0.00	5.15	5.71	0.00	5.56	5.62	0.00	6.05	6.21	5.66	0.00	5.49	6.05	5.20	0.00	5.66	0.00	0.00	0.00	0.00	5.32	5.32	5.83
780712 1	0.00	5.59	0.00	5.78	0.00	0.00	0.00	0.00	6.16	5.68	6.26	0.00	6.02	5.62	0.00	5.48	6.26	0.00	5.68	5.60	0.00	5.64	6.03
780831 1	0.00	5.31	5.85	5.64	5.57	0.00	0.00	6.21	6.24	5.80	0.00	5.26	5.66	5.46	0.00	5.60	5.61	5.43	5.65	0.00	5.45	5.52	6.33
780927 2	0.00	5.84	5.96	5.80	5.59	0.00	0.00	6.29	5.75	5.92	0.00	5.63	0.00	5.54	0.00	5.80	6.22	5.87	5.89	0.00	0.00	5.38	6.33
781216 1	0.00	5.22	5.74	0.00	0.00	0.00	0.00	0.00	6.26	5.60	0.00	0.00	0.00	0.00	0.00	5.76	0.00	0.00	5.65	0.00	0.00	5.68	5.83
790208 1	0.00	5.40	0.00	0.00	5.08	0.00	0.00	0.00	6.42	5.59	0.00	5.58	6.07	0.00	5.15	5.75	0.00	5.90	0.00	0.00	0.00	5.28	5.93
790611 1	0.00	0.00	5.70	0.00	5.55	6.16	0.00	6.19	6.44	5.67	0.00	0.00	5.94	0.00	0.00	5.65	5.95	5.49	0.00	5.61	0.00	5.69	5.83
790906 1	0.00	5.67	6.10	6.06	5.47	0.00	0.00	6.11	6.14	5.87	6.60	5.68	6.25	0.00	0.00	5.69	6.23	6.03	6.10	0.00	4.96	5.31	6.13
790926 1	0.00	5.29	5.85	5.55	0.00	0.00	0.00	6.22	0.00	0.00	5.92	0.00	5.83	0.00	0.00	5.59	0.00	0.00	5.76	0.00	0.00	0.00	6.03
800426 1	0.00	4.99	5.54	0.00	5.38	0.00	0.00	0.00	0.00	5.61	0.00	0.00	5.68	5.24	0.00	5.65	0.00	0.00	5.46	0.00	5.25	5.32	5.83
800612 1	0.00	0.00	5.78	5.56	5.55	6.12	0.00	0.00	0.00	5.68	0.00	5.29	6.02	0.00	4.85	5.83	0.00	5.49	5.72	0.00	0.00	5.81	5.93
800725 1	0.00	0.00	5.68	0.00	5.49	5.73	0.00	6.29	0.00	5.68	0.00	5.15	0.00	5.42	0.00	5.79	0.00	5.53	5.53	0.00	5.59	0.00	5.83
810115 1	0.00	0.00	0.00	0.00	0.00	5.97	5.63	6.15	6.32	5.66	0.00	5.42	0.00	0.00	0.00	5.75	0.00	0.00	5.95	0.00	0.00	5.45	6.03
810606 1	0.00	0.00	5.85	5.70	0.00	0.00	0.00	0.00	0.00	5.67	0.00	0.00	0.00	5.69	0.00	0.00	5.79	0.00	5.75	0.00	0.00	5.38	6.32
820128 1	0.00	0.00	6.16	6.02	5.36	0.00	0.00	6.37	0.00	5.82	0.00	5.63	6.22	5.93	0.00	0.00	6.21	0.00	6.11	0.00	5.08	5.81	6.23
820212 2	0.00	0.00	5.82	5.38	0.00	5.85	0.00	6.05	5.78	5.50	0.00	0.00	5.79	5.36	4.88	0.00	5.76	5.48	5.69	0.00	5.28	5.31	5.72
820624 1	0.00	0.00	5.76	0.00	j.27	0.00	0.00	0.00	6.17	5.63	0.00	5.62	5.93	0.00	5.00	0.00	0.00	5.51	5.68	0.00	5.10	5.59	5.73
820805 1	0.00	0.00	5.98	0.00	5.26	0.00	0.00	6.05	5.96	5.67	0.00	0.00	6.22	5.68	0.00	0.00	5.96	5.93	5.85	0.00	4.99	0.00	5.93
830901 1	0.00	0.00	0.00	5.29	5.24	0.00	0.00	0.00	0.00	5.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	5.93
840301 1	0.00	0.00	6.05	5.83	5.45	6.09	5.85	6.03	0.00	0.00	0.00	5.42	6.02	5.62	0.00	0.00	6.06	0.00	5.95	0.00	0.00	5.68	5.93
840531 1	0.00	0.00	6.01	5.66	5.33	5.95	0.00	6.03	0.00	5.73	0.00	5.58	5.85	5.62	0.00	0.00	5.87	0.00	5.98	0.00	0.00	5.52	6.03
850402 1	0.00	0.00	6.10	0.00	j.44	0.00	0.00	6.07	0.00	5.73	0.00	0.00	0.00	5.70	5.06	0.00	5.91	0.00	6.00	0.00	0.00	5.76	0.00
850502 1	0.00	0.00	5.80	0.00	0.00	6.15	0.00	6.06	0.00	5.73	0.00	5.46	0.00	0.00	0.00	0.00	0.00	0.00	5.70	5.73	5.46	5.47	6.03
860717 1	0.00	0.00	5.86	5.68	5.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.70	0.00	0.00	0.00	0.00	5.73	0.00	5.38	5.50	0.00
861114 1	0.00	0.00	6.04	0.00	0.00	0.00	0.00	0.00	0.00	5.79	0.00	0.00	0.00	5.72	0.00	0.00	0.00	0.00	5.96	0.00	0.00	5.75	0.00
861213 1	0.00	0.00	0.00	5.56	0.00	0.00	0.00	0.00	0.00	5.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.52	0.00
870813 1	0.00	0.00	5.90	5.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	0.00	0.00	5.78	0.00	5.73	0.00	0.00	0.00	0.00
870924 1	0.00	0.00	5.57	0.00	0.00	0.00	0.00	0.00	0.00	5.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.17	0.00

APPENDIX A (continued)

STATION MAGNITUDES FOR NTS USING GUTENBERG-RICHTER DISTANCE FACTORS

EVENT	RAR	RES	RUV	SCH	SCP	SEO	SHA	SHK	SJG	SSF	STJ	SIU	TCL	TPT	TRI	TRR	TVO	UME	VAH	VAL	WES	YKC	ZLL	
660630	1	6.29	5.62	0.00	0.00	6.15	0.00	6.20	6.20	6.30	0.00	0.00	5.91	6.43	0.00	0.00	6.08	0.00	5.89	0.00	6.05	5.88	0.00	0.00
670223	2	0.00	5.30	0.00	0.00	0.00	5.82	0.00	5.60	6.32	0.00	0.00	5.76	0.00	0.00	0.00	5.68	0.00	5.77	0.00	0.00	0.00	0.00	0.00
670520	1	0.00	5.40	0.00	0.00	5.35	6.06	6.01	6.11	6.31	0.00	0.00	5.53	6.10	0.00	0.00	5.65	0.00	5.81	0.00	0.00	0.00	0.00	0.00
670523	1	0.00	5.11	0.00	0.00	5.56	5.96	0.00	6.06	6.23	0.00	0.00	0.00	0.00	0.00	5.59	0.00	5.57	0.00	0.00	5.28	0.00	0.00	
670927	1	0.00	5.40	0.00	0.00	5.29	6.13	0.00	6.00	6.45	0.00	0.00	5.63	0.00	0.00	5.55	0.00	6.01	0.00	0.00	0.00	0.00	0.00	
671018	1	0.00	0.00	0.00	0.00	5.32	0.00	0.00	5.86	6.30	0.00	0.00	0.00	0.00	0.00	5.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
680221	2	5.75	5.30	0.00	0.00	5.05	0.00	0.00	0.00	6.33	0.00	0.00	5.52	5.89	0.00	0.00	5.63	0.00	5.57	0.00	0.00	0.00	0.00	0.00
680322	1	0.00	5.26	0.00	0.00	5.49	6.10	0.00	5.93	6.37	0.00	0.00	6.05	0.00	0.00	5.70	0.00	0.00	0.00	0.00	5.44	0.00	0.00	
680615	1	0.00	5.51	0.00	0.00	5.62	6.32	0.00	6.43	6.71	0.00	0.00	5.96	0.00	0.00	5.22	6.00	0.00	5.90	0.00	6.00	5.59	0.00	0.00
680829	1	0.00	5.61	0.00	0.00	5.45	6.30	0.00	6.39	6.40	0.00	0.00	5.79	0.00	0.00	0.00	5.89	0.00	5.81	0.00	5.88	5.77	0.00	0.00
680906	2	0.00	0.00	0.00	0.00	5.05	0.00	0.00	5.87	6.22	0.00	0.00	0.00	0.00	0.00	5.40	0.00	5.76	0.00	0.00	0.00	0.00	0.00	
690507	1	0.00	5.11	0.00	0.00	5.56	0.00	0.00	6.36	6.44	0.00	0.00	0.00	5.85	0.00	0.00	5.98	0.00	5.64	0.00	0.00	0.00	0.00	0.00
691008	1	0.00	0.00	0.00	0.00	5.21	0.00	0.00	6.02	6.32	0.00	0.00	5.25	5.75	0.00	0.00	5.77	0.00	5.51	0.00	0.00	5.42	0.00	0.00
691029	3	5.75	5.63	0.00	0.00	5.19	0.00	0.00	5.88	6.26	0.00	0.00	5.31	6.03	0.00	0.00	5.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
701014	1	0.00	5.50	0.00	5.64	5.41	0.00	0.00	0.00	6.13	0.00	0.00	5.72	0.00	0.00	5.35	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00
701217	1	0.00	5.70	0.00	5.90	5.31	0.00	5.91	6.40	6.50	0.00	6.29	5.76	5.95	0.00	0.00	5.85	0.00	0.00	0.00	0.00	0.00	5.46	0.00
720921	1	0.00	0.00	0.00	5.81	0.00	0.00	0.00	5.92	0.00	0.00	6.22	5.47	6.12	0.00	0.00	5.41	0.00	5.85	5.82	0.00	0.00	0.00	0.00
730426	2	0.00	5.38	0.00	5.48	5.16	0.00	0.00	5.66	6.08	0.00	0.00	0.00	5.79	5.83	0.00	5.73	5.94	0.00	5.76	0.00	0.00	0.00	0.00
730606	1	0.00	0.00	0.00	6.16	0.00	0.00	0.00	6.72	0.00	0.00	0.00	5.92	0.00	0.00	5.43	6.20	0.00	0.00	0.00	5.98	6.18	6.04	0.00
740227	1	5.37	5.40	5.90	0.00	0.00	0.00	0.00	6.28	6.23	0.00	6.25	5.36	5.79	5.53	0.00	5.29	5.94	5.52	5.98	5.70	0.00	0.00	0.00
740710	1	0.00	5.65	6.27	5.87	0.00	0.00	0.00	5.93	6.16	0.00	6.31	0.00	5.99	6.00	0.00	5.62	6.19	0.00	6.16	0.00	0.00	5.79	6.03
740830	1	0.00	5.66	6.10	5.87	0.00	0.00	0.00	5.93	0.00	0.00	0.00	5.42	0.00	5.70	0.00	5.66	6.07	0.00	6.00	0.00	5.40	5.59	6.32
750228	1	0.00	5.61	6.06	5.94	0.00	0.00	0.00	6.13	0.00	0.00	6.37	5.30	0.00	5.69	0.00	6.33	5.95	5.94	6.06	0.00	5.29	0.00	6.33
750514	1	0.00	5.77	5.78	6.02	0.00	0.00	0.00	6.60	6.79	0.00	6.60	6.01	0.00	5.45	0.00	5.91	5.71	5.92	5.85	6.07	0.00	5.79	7.03
750603	1	0.00	5.57	5.91	5.87	0.00	0.00	0.00	6.08	6.37	0.00	6.26	5.39	5.99	5.45	0.00	5.74	5.93	5.90	5.73	5.60	5.72	0.00	5.83
750603	2	0.00	5.49	6.10	5.86	5.65	0.00	0.00	6.00	6.38	0.00	6.24	5.52	6.01	5.74	0.00	5.55	6.09	5.78	6.00	5.60	4.85	5.47	0.00
750619	1	0.00	5.73	0.00	0.00	6.20	0.00	0.00	6.34	6.68	0.00	6.51	5.64	6.31	6.18	0.00	6.09	6.34	5.94	6.39	5.81	5.73	6.08	6.22
751120	1	0.00	5.66	6.17	5.80	0.00	0.00	0.00	6.70	6.40	6.03	0.00	0.00	6.23	5.65	5.18	5.88	6.19	5.82	6.02	5.77	0.00	6.01	5.93
751220	1	5.76	5.42	5.96	5.65	0.00	0.00	0.00	6.15	0.00	5.67	6.36	5.35	6.10	5.68	0.00	5.59	6.28	0.00	5.90	0.00	0.00	5.78	6.02
760204	1	0.00	5.68	6.29	5.54	0.00	0.00	0.00	6.17	6.17	5.61	6.21	5.35	5.97	5.86	0.00	5.57	6.07	5.89	6.16	0.00	0.00	5.74	5.83
760204	2	0.00	0.00	0.00	5.70	0.00	0.00	5.95	0.00	6.47	5.60	0.00	5.34	6.03	5.82	0.00	0.00	6.09	5.76	6.15	0.00	0.00	5.54	6.02
760214	1	0.00	5.27	6.11	5.78	5.64	0.00	6.16	6.51	0.00	0.00	6.44	0.00	6.08	5.70	0.00	5.89	6.24	5.74	5.96	6.20	0.00	5.52	0.00
760309	1	0.00	5.71	6.27	5.93	5.57	0.00	0.00	6.58	0.00	6.00	0.00	5.52	0.00	5.78	0.00	5.77	0.00	5.61	6.25	0.00	0.00	5.50	6.42
760317	1	6.03	0.00	6.35	6.21	5.48	0.00	0.00	6.69	0.00	6.13	6.26	5.72	6.51	5.94	0.00	5.80	6.24	0.00	6.22	6.10	0.00	0.00	6.32
760317	2	5.78	0.00	6.24	0.00	5.13	6.05	0.00	6.23	0.00	5.79	6.55	5.45	6.22	5.80	0.00	5.69	6.15	0.00	6.18	0.00	0.00	0.00	6.23











## REFERENCES

1. K E Bullen: "Seismology in our Atomic Age". Compt Rend XIC Assembly Gen UGGI, 29-34 (1958)
2. D T Griggs, F Press: "Probing the Earth with Nuclear Explosions". J Geophys Res, 66, 237 (1961)
3. E Teller: "Plowshare". Nucl News, 6, 1-13 (1963)
4. D L Springer, R L Kinnaman: "Seismic Source Summary for US Underground Nuclear Explosions 1961-1970". Bull Seism Soc Am, 61, 1073-1098 (1971)
5. D L Springer, R L Kinnaman: "Seismic Source Summary for US Underground Nuclear Explosions 1971-1973". Bull Seism Soc Am, 65, 343-349 (1975)
6. F Duclaux, L Michaud: "Conditions Experimentales des Tirs Nucleaires Souterrains Francais au Sahara, 1961-1966". C R Acad Sc Paris, t270, Serie B, 189-192 (1970)
7. B Gutenberg, C F Richter: "Magnitude and Energy of Earthquakes". Annali Geofis., 9, 1-15 (1956)
8. A Douglas: "A Special Purpose Least Squares Programme. AWRE Report O54/66, HMSO, London (1966)
9. L A Christoffersson, R T Lacoss, M A Chinnery: "Statistical Models for Magnitude Estimation". Lincoln Lab SATS, TR-75-335, 2-5 (1975)
10. H Jeffreys: "The Theory of Probability". (3rd Ed) Oxford University Press (1961)
11. E J Kelly, R T Lacoss: "Estimation of Seismicity and Network Detection Capability". MIT Lincoln Lab, Tech Note 41, (1969)
12. R C Lilwall: "Redetermination of Body-wave Magnitudes ( $m_b$ ) for the Period 1964-81 Using ISC Bulletin Data". AWRE Report O21/85, HMSO, London (1985)
13. K F Veith, G E Clawson: "Magnitude from Short-period P-wave Data". Bull Seism Soc Am, 62, 435-452 (1972)
14. R R Blandford, R H Shumway, K L McLaughlin, and R Wagner: "Magnitude Yield for Nuclear Explosions at Several Test Sites With Allowance for Effects of Truncated Data, Amplitude Correlation Between Events Within Test Sites, Absorption, and pP". Report No. TGAL-TR-83-6, Teledyne Geotech, Alexandria, Virginia, USA (1984)
15. R C Lilwall: "Some Simulation Studies of Seismic Magnitude Estimators". AWRE Report No. O22/86, HMSO, London (1986)



TABLE 1 (cont.)  
NTS magnitudes based on the Gutenberg-Richter distance factors

name	date	$m_b$	std. error	no. stn.
ICEBERG	780323	5.69	0.02	59
FONDUTTA	780411	5.44	0.02	49
BACKBEACH	780411	5.54	0.02	53
LOWBALL	780712	5.70	0.02	44
PANIR	780831	5.57	0.02	59
RUMMY	780927	5.83	0.02	59
FARM	781216	5.59	0.03	34
QUINELLA	790208	5.68	0.02	47
PEPATO	790611	5.60	0.02	55
HEARTS	790906	5.86	0.02	58
SHEEPSHEAD	790926	5.61	0.03	32
COLWICK	800426	5.46	0.02	50
KASH	800612	5.63	0.02	55
TAFI	800725	5.52	0.02	47
BASEBALL	810115	5.70	0.02	49
HARZER	810606	5.54	0.03	34
JORNADA	820128	5.90	0.02	58
HOSTA	820212	5.52	0.02	60
NEBBIOLO	820624	5.62	0.02	48
ATRISCO	820805	5.69	0.02	53
CHANCELLOR	830901	5.40	0.03	25
TORTUGAS	840301	5.82	0.02	52
CAPROCK	840531	5.69	0.02	53
HERMOSA	850402	5.76	0.02	49
TOWANDA	850502	5.65	0.02	46
CYBAR	860717	5.64	0.03	33
GASCON	861114	5.78	0.03	27
BODIE	861213	5.48	0.03	24
TAHOKA	870813	5.78	0.03	29
LOCKNEY	870924	5.56	0.03	23

TABLE 2  
NTS magnitudes based on the Veith-Clawson distance factors

name	date	$m_b$	std. error	no. stn.
HALFBEAK	660630	6.08	0.03	43
AGILE	670223	5.68	0.03	29
COMMODORE	670520	5.80	0.02	44
SCOTCH	670523	5.56	0.03	26
ZAZA	670927	5.72	0.03	31
LANPHER	671018	5.58	0.03	29
KNOX	680221	5.60	0.02	46
STINGER	680322	5.65	0.03	30
RICKEY	680615	5.87	0.02	49
SLED	680829	5.87	0.02	44
NOGGIN	680906	5.52	0.03	32
PURSE	690507	5.69	0.03	41
PIPKIN	691008	5.50	0.02	46
CALABASH	691029	5.59	0.03	37
TIJERAS	701014	5.52	0.03	35
CARPETBAG	701217	5.77	0.02	49
OSCURO	720921	5.65	0.03	42
STARWORT	730426	5.48	0.02	48
ALMENDRO	730606	6.12	0.02	48
LATIR	740227	5.58	0.02	65
ESCABOSA	740710	5.69	0.02	58
PORTMANTEAU	740830	5.70	0.02	53
TOPGALLANT	750228	5.66	0.02	61
TYBO	750514	5.97	0.03	54
STILTON	750603	5.71	0.02	61
MIZZEN	750603	5.65	0.02	54
MAST	750619	6.00	0.02	65
INLET	751120	5.89	0.02	56
CHIBERTA	751220	5.69	0.02	54
KEELSON	760204	5.67	0.02	57
ESROM	760204	5.68	0.02	51
CHESHIRE	760214	5.83	0.02	47
ESTUARY	760309	5.87	0.02	49
POOL	760317	6.00	0.02	51
STRAIT	760317	5.85	0.02	49
RUDDER	761228	5.38	0.02	53
MARSILLY	770405	5.64	0.02	43
SCANTLING	770819	5.60	0.02	52
SANDREEF	771109	5.79	0.02	47
FARALLONES	771214	5.77	0.02	55
REBLOCHON	780223	5.69	0.02	49



TABLE 2 (cont.)  
NTS magnitudes based on the Veith-Clawson distance factors

name	date	$m_b$	std. error	no. stn.
ICEBERG	780323	5.66	0.02	59
FONDUTTA	780411	5.41	0.02	49
BACKBEACH	780411	5.51	0.02	53
LOWBALL	780712	5.67	0.02	44
PANIR	780831	5.54	0.02	59
RUMMY	780927	5.80	0.02	59
FARM	781216	5.56	0.03	34
QUINELLA	790208	5.65	0.02	47
PEPATO	790611	5.57	0.02	55
HEARTS	790906	5.83	0.02	58
SHEEPSHEAD	790926	5.58	0.03	32
COLWICK	800426	5.43	0.02	50
KASH	800612	5.60	0.02	55
TAFI	800725	5.49	0.02	47
BASEBALL	810115	5.67	0.02	49
HARZER	810606	5.51	0.03	34
JORNADA	820128	5.87	0.02	58
HOSTA	820212	5.49	0.02	60
NEBBIOLO	820624	5.59	0.02	48
ATRISCO	820805	5.66	0.02	53
CHANCELLOR	830901	5.35	0.03	25
TORTUGAS	840301	5.79	0.02	52
CAPROCK	840531	5.66	0.02	53
HERMOSA	850402	5.73	0.02	49
TOWANDA	850502	5.62	0.02	46
CYBAR	860717	5.61	0.03	33
GASCON	861114	5.75	0.03	27
BODIE	861213	5.44	0.03	24
TAHOKA	870813	5.75	0.03	29
LOCKNEY	870924	5.53	0.03	23

**TABLE 3**  
**Shagan River magnitudes based on the Gutenberg-Richter distance factors**

date	origin time	$m_b$	std. error	no. stn.
691130	03:32:57.2	6.02	0.03	46
721102	01:26:57.6	6.16	0.02	58
721210	04:27:08.4	5.96	0.02	42
730723	01:22:57.8	6.17	0.02	55
731214	07:46:57.0	5.79	0.02	54
760704	02:56:57.7	5.85	0.02	57
761123	05:02:57.4	5.79	0.02	45
780829	02:37:06.5	5.90	0.02	41
780915	02:36:57.3	5.89	0.02	50
781129	04:33:02.9	5.96	0.02	53
790623	02:56:57.6	6.16	0.02	56
790707	03:46:57.4	5.84	0.02	63
790804	03:56:57.2	6.13	0.02	67
790818	02:51:57.3	6.13	0.02	70
791028	03:16:56.9	5.98	0.02	60
791202	04:36:57.5	5.99	0.02	59
791223	04:56:57.6	6.13	0.02	60
800914	02:42:39.3	6.21	0.02	53
801012	03:34:14.1	5.88	0.02	51
801214	03:47:06.6	5.93	0.02	57
801227	04:09:08.2	5.87	0.02	56
810422	01:17:11.4	5.94	0.02	64
810913	02:17:18.2	6.06	0.02	57
811018	03:57:02.6	6.00	0.02	57
811227	03:43:14.1	6.16	0.02	56
820425	03:23:05.4	6.03	0.02	55
820704	01:17:14.4	6.08	0.02	48
821205	03:37:12.6	6.08	0.02	64
830612	02:36:43.5	6.02	0.02	52
831006	01:47:06.5	5.95	0.02	55
831026	01:55:04.8	6.04	0.02	57
840425	01:09:03.5	5.90	0.02	58
840526	03:13:12.4	6.01	0.02	64
840714	01:09:10.5	6.10	0.02	58
841027	01:50:10.6	6.19	0.02	60
841202	03:19:06.3	5.77	0.02	52
841216	03:55:02.7	6.12	0.02	58
841228	03:50:10.7	6.00	0.02	59
850615	00:57:00.7	6.05	0.02	55

**TABLE 4**  
**Shagan River magnitudes based on the Veith-Clawson distance factors**

date	origin time	$m_b$	std. error	no. stn.
691130	03:32:57.2	5.99	0.03	46
721102	01:26:57.6	6.14	0.02	58
721210	04:27:08.4	5.94	0.02	42
730723	01:22:57.8	6.15	0.02	55
731214	07:46:57.0	5.76	0.02	54
760704	02:56:57.7	5.82	0.02	57
761123	05:02:57.4	5.77	0.02	45
780829	02:37:06.5	5.87	0.02	41
780915	02:36:57.3	5.87	0.02	50
781129	04:33:02.9	5.94	0.02	53
790623	02:56:57.6	6.14	0.02	56
790707	03:46:57.4	5.82	0.02	63
790804	03:56:57.2	6.10	0.02	67
790818	02:51:57.3	6.11	0.02	70
791028	03:16:56.9	5.95	0.02	60
791202	04:36:57.5	5.97	0.02	59
791223	04:56:57.6	6.10	0.02	60
800914	02:42:39.3	6.18	0.02	53
801012	03:34:14.1	5.85	0.02	51
801214	03:47:06.6	5.90	0.02	57
801227	04:09:08.2	5.85	0.02	56
810422	01:17:11.4	5.91	0.02	64
810913	02:17:18.2	6.03	0.02	57
811018	03:57:02.6	5.97	0.02	57
811227	03:43:14.1	6.14	0.02	56
820425	03:23:05.4	6.00	0.02	55
820704	01:17:14.4	6.06	0.02	48
821205	03:37:12.6	6.05	0.02	64
830612	02:36:43.5	5.99	0.02	52
831006	01:47:06.5	5.92	0.02	55
831026	01:55:04.8	6.02	0.02	57
840425	01:09:03.5	5.88	0.02	58
840526	03:13:12.4	5.98	0.02	64
840714	01:09:10.5	6.07	0.02	58
841027	01:50:10.6	6.16	0.02	60
841202	03:19:06.3	5.74	0.02	52
841216	03:55:02.7	6.10	0.02	58
841228	03:50:10.7	5.97	0.02	59
850615	00:57:00.7	6.03	0.02	55

**TABLE 5**  
**Station terms for NTS using Gutenberg-Richter distance factors**

stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.
AAM	0.18	0.03	36	GRF	0.03	0.02	43	PDA	0.20	0.06	7
ADK	0.00	0.04	14	GUA	0.44	0.04	24	PEL	-0.14	0.04	26
AFI	0.09	0.03	26	HFS	0.19	0.02	51	PMO	-0.11	0.03	35
AFR	0.39	0.03	32	HNR	0.54	0.03	23	PMR	0.05	0.02	53
AKU	-0.28	0.04	23	HON	0.06	0.05	7	PNS	-0.38	0.05	11
ALE	-0.09	0.02	57	INK	-0.09	0.04	16	PPN	0.12	0.03	38
ANT	0.02	0.02	39	JOS	-0.10	0.03	31	PPT	0.36	0.03	39
AQU	-0.34	0.04	15	KBS	0.03	0.02	47	PRU	0.01	0.02	61
ARE	0.56	0.02	39	KEV	-0.33	0.02	60	PTO	0.11	0.03	24
ATL	-0.11	0.05	10	KHC	-0.05	0.02	64	RAR	0.02	0.05	7
BDF	0.02	0.05	8	KIP	0.03	0.05	9	RES	-0.26	0.02	39
BEC	-0.05	0.03	32	KJF	-0.09	0.02	52	RUV	0.24	0.02	44
BHP	-0.53	0.04	14	KON	0.08	0.02	43	SCH	0.03	0.02	39
BLA	0.08	0.03	36	KRA	0.43	0.02	51	SCP	-0.29	0.02	45
BNS	0.10	0.03	30	KRK	-0.08	0.07	5	SEO	0.30	0.03	19
BOG	-0.06	0.04	12	KTG	0.09	0.02	52	SHA	0.17	0.05	8
BRG	-0.16	0.02	53	LHC	0.03	0.02	39	SHK	0.39	0.02	54
CAR	0.17	0.02	55	LOR	0.23	0.03	34	SJG	0.61	0.02	46
CLL	-0.16	0.02	56	LPB	0.14	0.02	49	SSF	0.03	0.02	37
CMC	-0.47	0.07	5	LPS	-0.20	0.04	27	STJ	0.53	0.04	19
COL	0.10	0.02	50	MAL	0.07	0.03	23	STU	-0.30	0.02	45
COP	-0.33	0.06	11	MAT	0.08	0.02	49	TOL	0.27	0.02	45
DAG	-0.15	0.02	53	MBC	-0.22	0.02	59	TPT	-0.11	0.03	40
EKA	-0.30	0.02	52	MOX	-0.20	0.02	68	TRI	-0.72	0.05	8
ESK	-0.19	0.02	43	NAO	-0.14	0.04	12	TRN	-0.06	0.02	54
FCC	-0.34	0.04	27	NAT	0.16	0.04	14	TVO	0.27	0.03	34
FFC	-0.11	0.03	29	NB2	-0.23	0.03	29	UME	0.01	0.02	38
FRB	-0.04	0.04	18	NIE	0.12	0.03	38	VAH	0.17	0.02	45
FUR	0.17	0.03	46	NNA	0.00	0.03	39	VAL	-0.12	0.04	15
GDH	-0.03	0.02	53	NOR	-0.56	0.04	13	WES	-0.22	0.03	25
GEO	-0.03	0.07	5	NUR	-0.12	0.02	65	YKC	-0.13	0.02	42
GIE	-0.12	0.05	9	OGD	-0.15	0.04	27	ZUL	0.33	0.03	43
GIL	0.20	0.03	26	PAE	0.27	0.03	35				



**TABLE 7**  
**Station terms for Shagan River using Gutenberg-Richter distance factors**

stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.
AAE	-0.60	0.04	17	GOL	-0.15	0.02	31	OTT	0.16	0.02	31
AAM	0.45	0.03	20	GUA	-0.07	0.06	8	PCT	-0.23	0.03	19
ADK	-0.09	0.05	12	HKC	-0.28	0.03	28	PDA	0.06	0.05	6
AKU	0.32	0.02	32	HYB	0.20	0.02	37	PMG	0.31	0.02	29
ALE	-0.31	0.02	31	INK	0.36	0.04	23	PMR	0.38	0.03	29
ANP	-0.56	0.05	11	IPM	0.44	0.03	21	PNT	-0.11	0.02	28
AQU	-0.28	0.04	13	IST	0.25	0.04	9	POO	-0.04	0.04	17
ATU	0.11	0.03	19	JER	-0.25	0.04	12	PPI	0.22	0.03	23
BAG	0.24	0.02	32	KBS	-0.69	0.03	22	PRA	-0.41	0.02	34
BDT	0.13	0.03	27	KEV	0.20	0.02	39	PRE	-0.01	0.03	19
BEC	-0.07	0.04	11	KGM	0.33	0.02	27	PTO	-0.23	0.03	21
BKS	0.06	0.02	38	KHC	-0.17	0.02	35	RAB	-0.12	0.03	19
BLA	-0.25	0.02	31	KKM	0.04	0.03	22	RES	-0.45	0.03	18
BNG	0.61	0.05	27	KOD	0.09	0.03	22	SCH	0.19	0.03	24
BRG	-0.41	0.02	36	KRA	0.31	0.02	34	SCP	-0.04	0.03	24
BUL	0.05	0.02	38	KRI	-0.36	0.02	27	SDB	0.20	0.06	4
CHG	-0.06	0.03	25	KTG	0.04	0.03	16	SEO	-0.22	0.03	17
CIR	-0.35	0.03	21	LEM	-0.35	0.04	21	SHI	-0.17	0.05	6
CLK	-0.21	0.03	19	LHC	0.27	0.02	28	SHK	-0.47	0.03	29
COL	0.33	0.03	16	LON	-0.12	0.03	23	SNG	0.16	0.03	26
COP	0.01	0.02	35	LOR	0.09	0.03	32	STU	-0.09	0.02	38
COR	0.29	0.03	19	MAL	-0.13	0.12	15	TAB	0.30	0.05	6
CTA	-0.08	0.02	28	MAT	-0.81	0.03	32	TOL	0.11	0.02	29
DAG	-0.12	0.03	34	MBC	0.51	0.04	21	TRI	-0.24	0.03	13
DAV	-0.46	0.06	4	MNT	-0.13	0.03	28	TRT	0.53	0.03	24
DUG	0.15	0.05	10	MSO	-0.06	0.03	22	VAL	0.09	0.02	33
ESK	0.27	0.02	33	MTD	-0.35	0.02	28	WES	-0.25	0.03	26
FFC	0.37	0.03	26	MUN	0.36	0.02	34	WIN	-0.08	0.03	19
FVM	-0.08	0.02	28	NAI	0.03	0.02	28	WRA	0.28	0.03	21
GBA	0.03	0.03	29	NUR	0.72	0.02	33	YKC	0.57	0.03	29
GDH	0.07	0.03	31	OGD	-0.28	0.04	10				

**TABLE 8**  
**Station terms for Shagan River using Veith-Clawson distance factors**

stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.	stn.	$s_j$	std. error	no. evt.
AAE	-0.59	0.04	17	GOL	-0.10	0.02	31	OTT	0.10	0.02	31
AAM	0.44	0.03	20	GUA	-0.29	0.06	8	PCT	0.02	0.03	19
ADK	-0.14	0.05	12	HKC	-0.02	0.03	28	PDA	-0.02	0.05	6
AKU	0.17	0.02	32	HYB	0.18	0.02	37	PMG	0.22	0.02	29
ALE	-0.48	0.02	31	INK	0.32	0.04	23	PMR	0.19	0.03	29
ANP	-0.41	0.05	11	IPM	0.31	0.03	21	PNT	0.05	0.02	28
AQU	-0.26	0.04	13	IST	0.27	0.04	9	POO	-0.05	0.04	17
ATU	0.30	0.03	19	JER	-0.09	0.04	12	PPI	0.19	0.03	23
BAG	0.02	0.02	32	KBS	-0.53	0.03	22	PRA	-0.19	0.02	34
BDT	0.23	0.03	27	KEV	0.19	0.02	39	PRE	-0.09	0.03	19
BEC	0.00	0.04	11	KGM	0.34	0.02	27	PTO	-0.28	0.03	21
BKS	0.11	0.02	38	KHC	-0.03	0.02	35	RAB	-0.17	0.04	19
BLA	-0.21	0.02	31	KKM	-0.02	0.03	22	RES	-0.52	0.03	18
BNG	0.42	0.05	27	KOD	0.34	0.03	22	SCH	0.12	0.03	24
BRG	-0.18	0.02	36	KRA	0.48	0.02	34	SCP	-0.08	0.03	24
BUL	-0.02	0.02	38	KRI	-0.25	0.02	27	SDB	0.24	0.06	4
CHG	-0.09	0.03	25	KTG	-0.18	0.03	16	SEO	-0.13	0.03	17
CIR	-0.37	0.03	21	LEM	-0.56	0.04	21	SHI	-0.02	0.05	6
CLK	-0.25	0.03	19	LHC	0.31	0.02	28	SHK	-0.33	0.03	29
COL	0.29	0.03	16	LON	-0.13	0.03	23	SNG	-0.01	0.03	26
COP	0.26	0.02	35	LOR	-0.13	0.03	32	STU	0.07	0.02	38
COR	0.21	0.03	19	MAL	-0.18	0.12	15	TAB	0.47	0.05	6
CTA	-0.03	0.02	28	MAT	-0.67	0.03	32	TOL	0.04	0.02	29
DAG	0.03	0.03	34	MBC	0.47	0.04	21	TRI	-0.09	0.03	13
DAV	-0.51	0.06	4	MNT	-0.13	0.03	28	TRT	0.31	0.03	24
DUG	0.22	0.05	10	MSO	-0.15	0.03	22	VAL	0.10	0.02	33
ESK	0.05	0.02	33	MTD	-0.35	0.02	28	WES	-0.33	0.03	26
FFC	0.35	0.03	26	MUN	0.27	0.02	34	WIN	-0.02	0.03	19
FVM	0.00	0.02	28	NAI	-0.15	0.02	28	WRA	0.22	0.03	21
GBA	0.12	0.03	29	NUR	0.71	0.02	33	YKC	0.36	0.03	29
GDH	-0.01	0.03	31	OGD	-0.25	0.04	10				

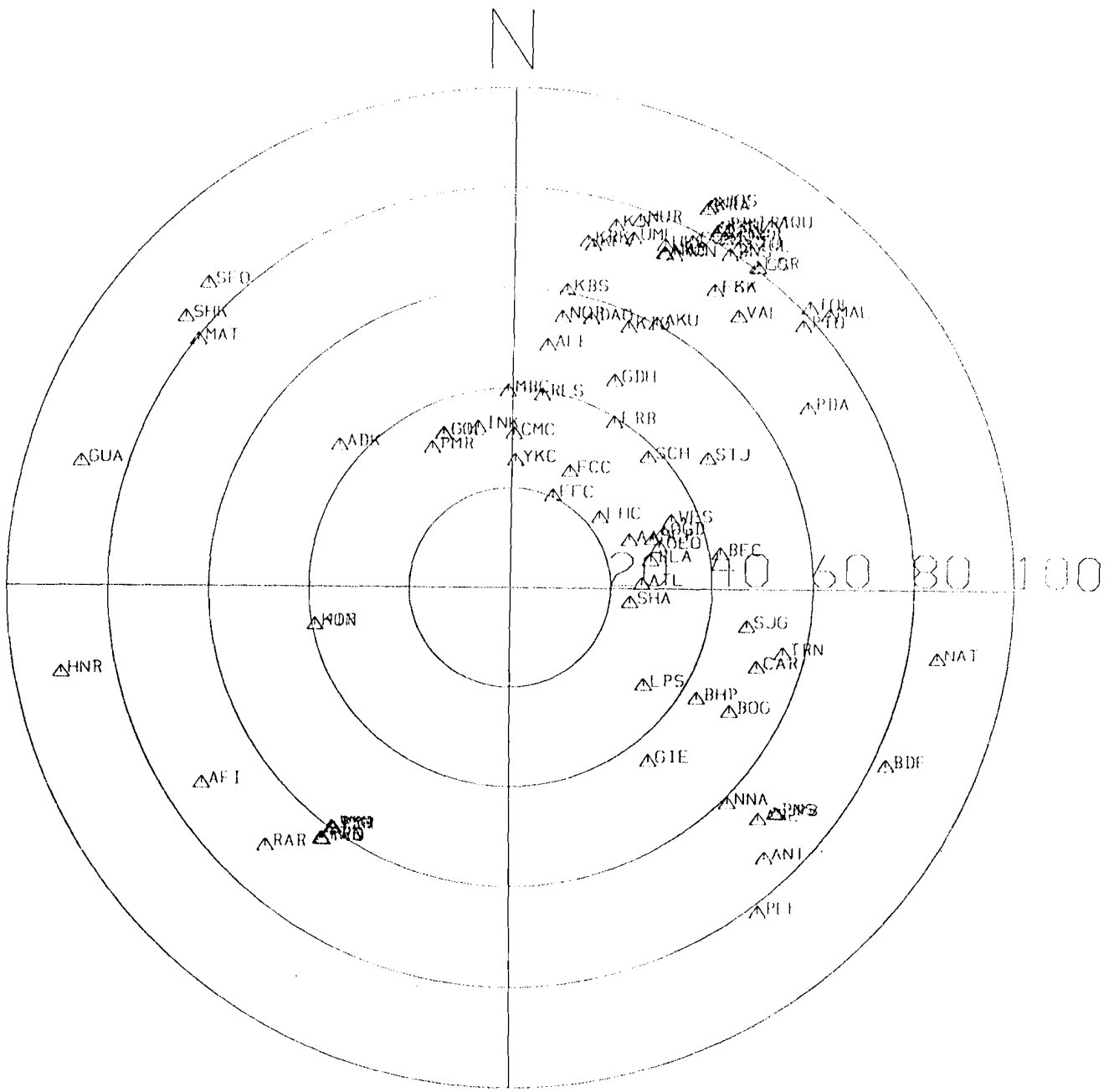


Fig. 1 Distribution of stations used in the estimation of magnitudes for the Nevada Test Site.



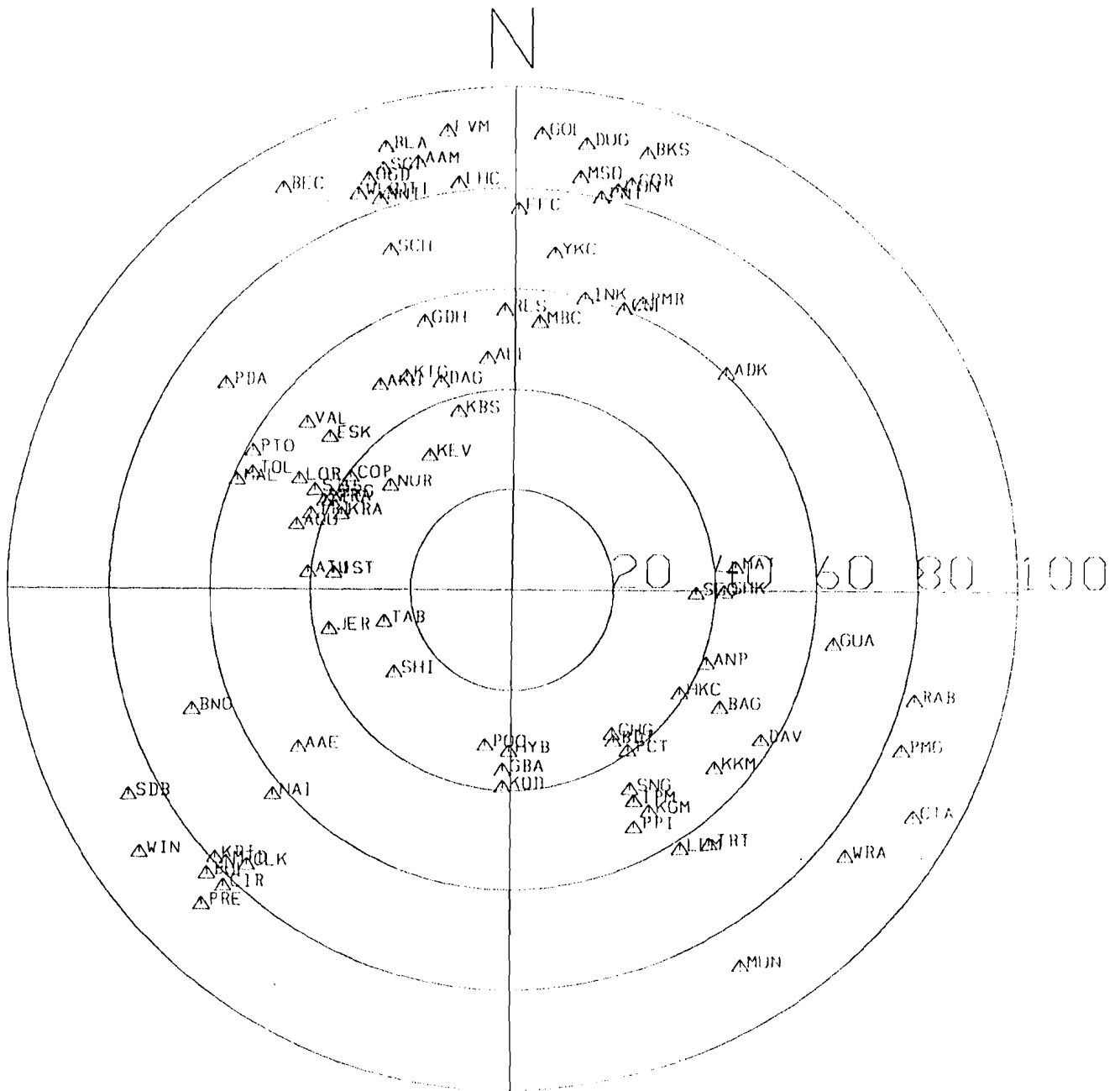


Fig. 2 Distribution of stations used in the estimation of magnitudes for the Shagan River Test Site.

# UK UNLIMITED

Available from  
HER MAJESTY'S STATIONERY OFFICE  
49 High Holborn, London W.C.1  
71 Lothian Road, Edinburgh EH3 9AZ  
9-12 Princess Street, Manchester M60 8AS  
Southey House, Wine Street, Bristol BS1 2BQ  
258 Broad Street, Birmingham B1 2HE  
80 Chichester Street, Belfast BT1 4JY  
or through any bookseller.

**Printed in England**

ISBN 0 85518187 7

# UK UNLIMITED