Quarterly Technical Report 77 - D

for

Hanford Seismic Network

October 1, 1977 through December 31, 1977

Geophysics Program

University of Washington

January 31, 1978

This report is also being sent to Washington Public Power Supply System as part of the reporting requirements for Contract #C-10976.



PREPARED FOR THE U.S. DEPARTMENT OF ENERGY
UNDER CONTRACT NO. EY-76-S-06-2225
TASK AGREEMENT NO. 39

## Operations

The eastern Washington seismic array has operated in the same configuration as at the end of last quarter. There have been few operational problems and only a few maintenance trips were required. The development and deployment of digital event recorders funded by WPPSS has proceeded with two stations currently operating in the Ellensburg area. Installation of these types of recorders in the more remote high mountain areas must be delayed until better weather.

Under development presently is a data base system on one of the University's general purpose computers to allow anyone in the state with a computer terminal to obtain any part of the latest catalog of located earthquakes. When this is operational all funding agencies will be notified of the procedures to obtain the data.

## Data

The seismic activity in the Hanford region was below normal this quarter with only 15 events being located that are probably not blasts. The Entiat area was very active during this quarter with over twenty events in the immediate Entiat area. Several construction blasts in the area were recorded to help further define the velocity model. There were several earthquakes in the Ellensburg area though they did not occur when the digital event recorders were operating. The largest of these was a magnitude 2.9 on Oct. 9 and located about 5 km. NNE of Ellensburg.

Epicenter maps with this report show located earthquakes in figure 2 for this quarter, and probable and known explosions in figure 3.

## Magnitude Calibration

We have relocated the Wood-Anderson instruments. On October 19th

and 20th, with the help of Mr. George Lest, a new location was found for the W-A instruments at the Battelle Northwest Office just outside Richland, Washington.

On November 30 the instruments were installed in the basement of the Battelle Northwest offices and are presently running at a magnification of 5600. The records are being changed by Mr. Harvey Hooker who is an electronic technician for Battelle. Mr. Tom Bishop has helped coordinate visits and necessary paper work.

We have recorded fifteen (15) local earthquakes at Entiat whose magnitudes can be computed. Several are very close to the Entiat station and the Richter magnitude could be questioned because of the short epicentral distance causing azimuthal dependency on ground motion amplitude.

To overcome this complexity we plan to inspect the Newport Observatory's Wood-Anderson records of selected earthquakes in northeastern Washington for comparison.

The seismicity in the Richland area is somewhat less than in the Entiat area and therefore it would seem that we may need to record longer at Richland to record a dozen or so magnitude determined earthquakes.

Tiltmeters

At the end of November, we thermally insulated the tiltmeter electronics and clamped the heavy cable between tiltmeters and their electronics packages. Clamping prevents any possible loading of the tiltmeters due to its cable. For the following month, all tiltmeters remained relatively quiet with maximum fluctuations of 0.8 $\mu$ radians, which is a substantial improvement over the drift determined in the previous quarter.

Using static loading near each tiltmeter, we determined the coordinate frame for each tiltmeter. However, the long term data is not in agreement

with the frame determined by the short term static loading. Using the frame determined by the short term loading, the long term easterly tilts and the long term northerly tilts track at a $180^{o}$ phase difference between tiltmeters. We are currently trying to investigate the discrepancy between short term and long term data.

TABLE 1. Eastern Washington Velocity Models

| North Model | $V_p$ (km/sec) | Depth |
|---|---|---|
| | 5.1 | 0.0 |
| | 6.05 | 0.5 |
| | 7.2 | 19.0 |
| | 8.0 | 24.5 |
| South Model | | |
| | 3.7 | 0.0 |
| | 4.7 | 0.8 |
| | 5.15 | 1.2 |
| | 6.05 | 7.5 |
| | 7.2 | 19.0 |
| | 8.0 | 28.0 |

S - arrival times are computed by using the P - wave model and dividing the resulting travel time by 1.72.

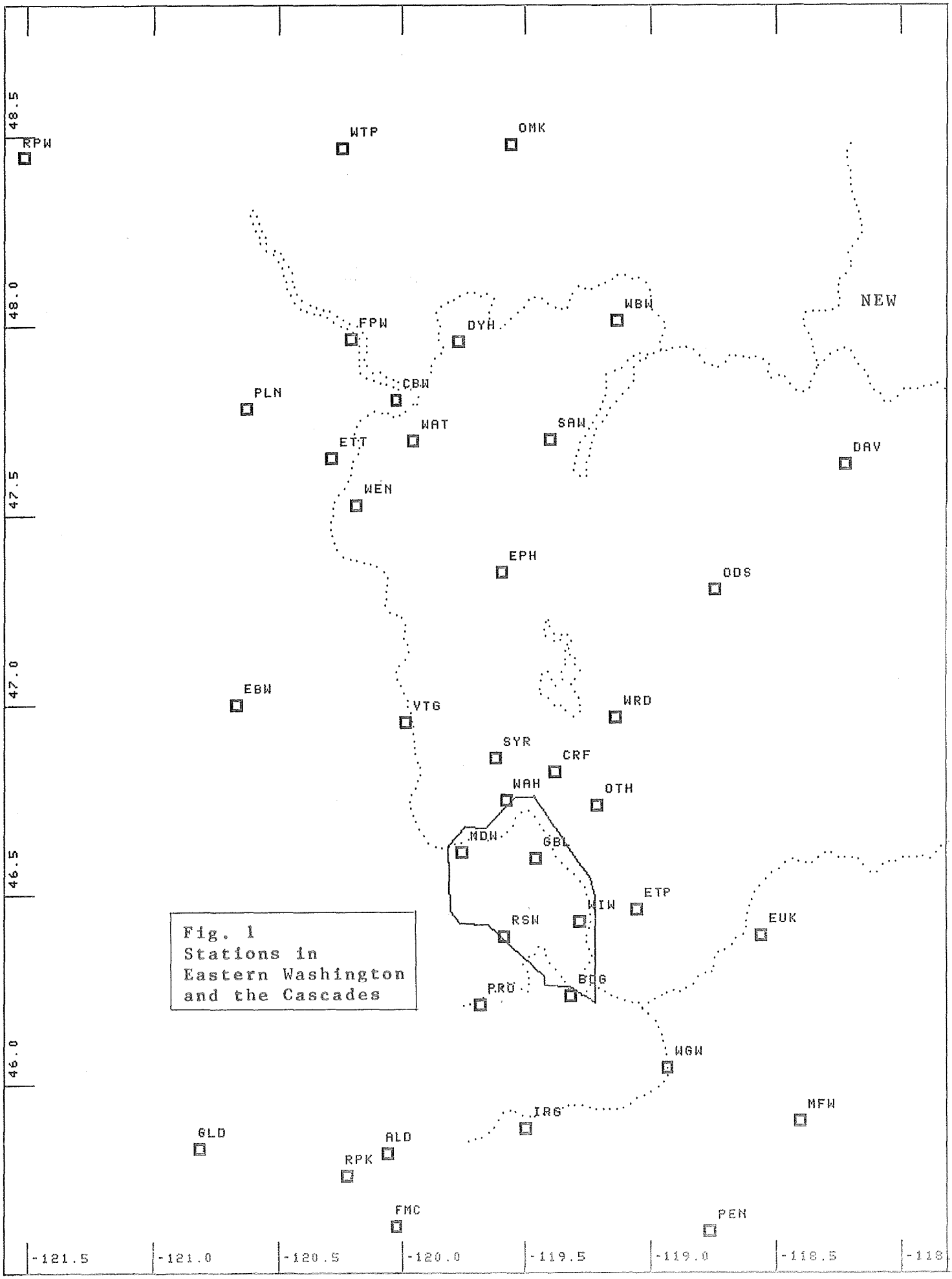


Fig. 1
Stations in
Eastern Washington
and the Cascades

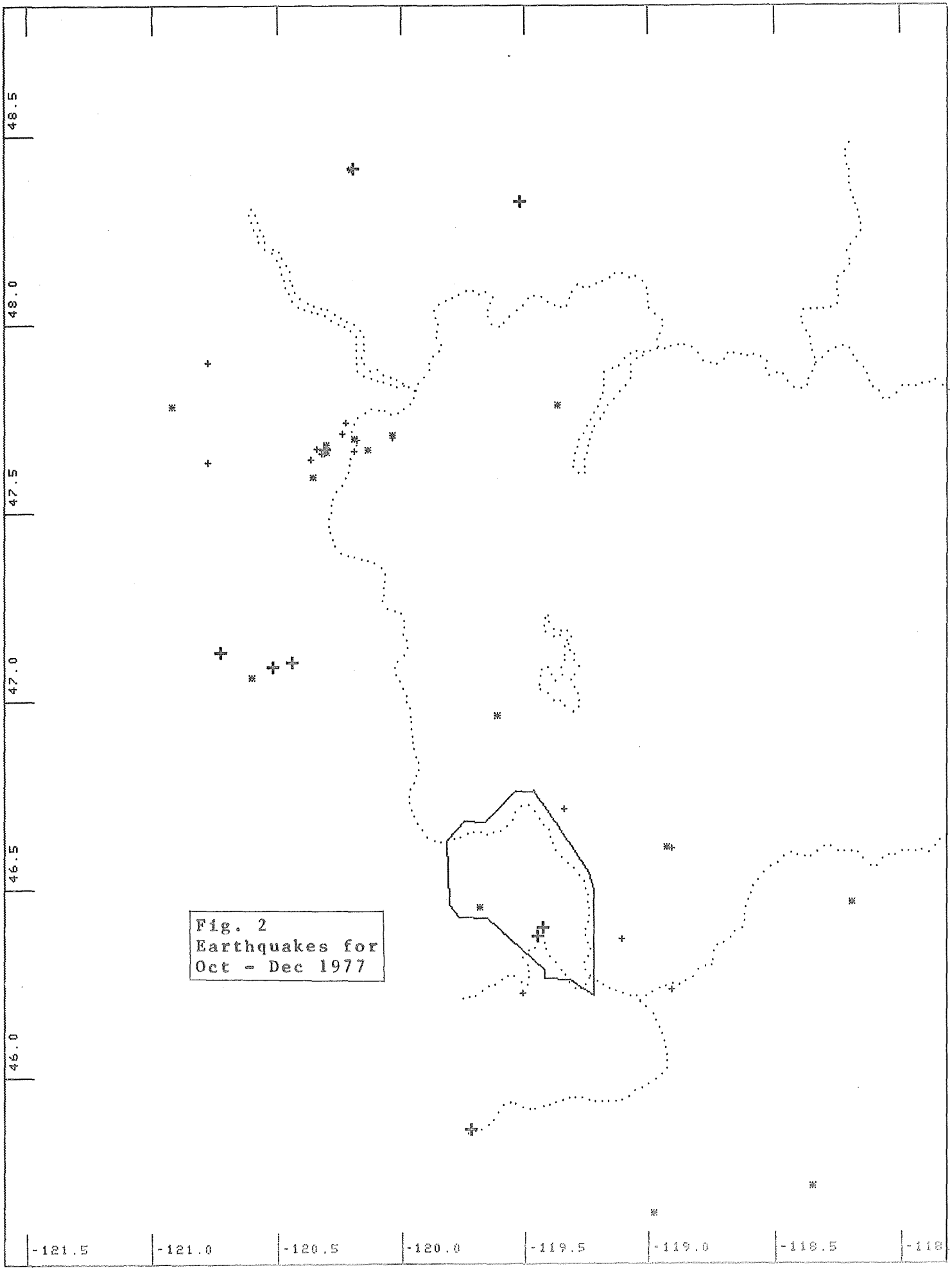


Fig. 2
Earthquakes for
Oct - Dec 1977

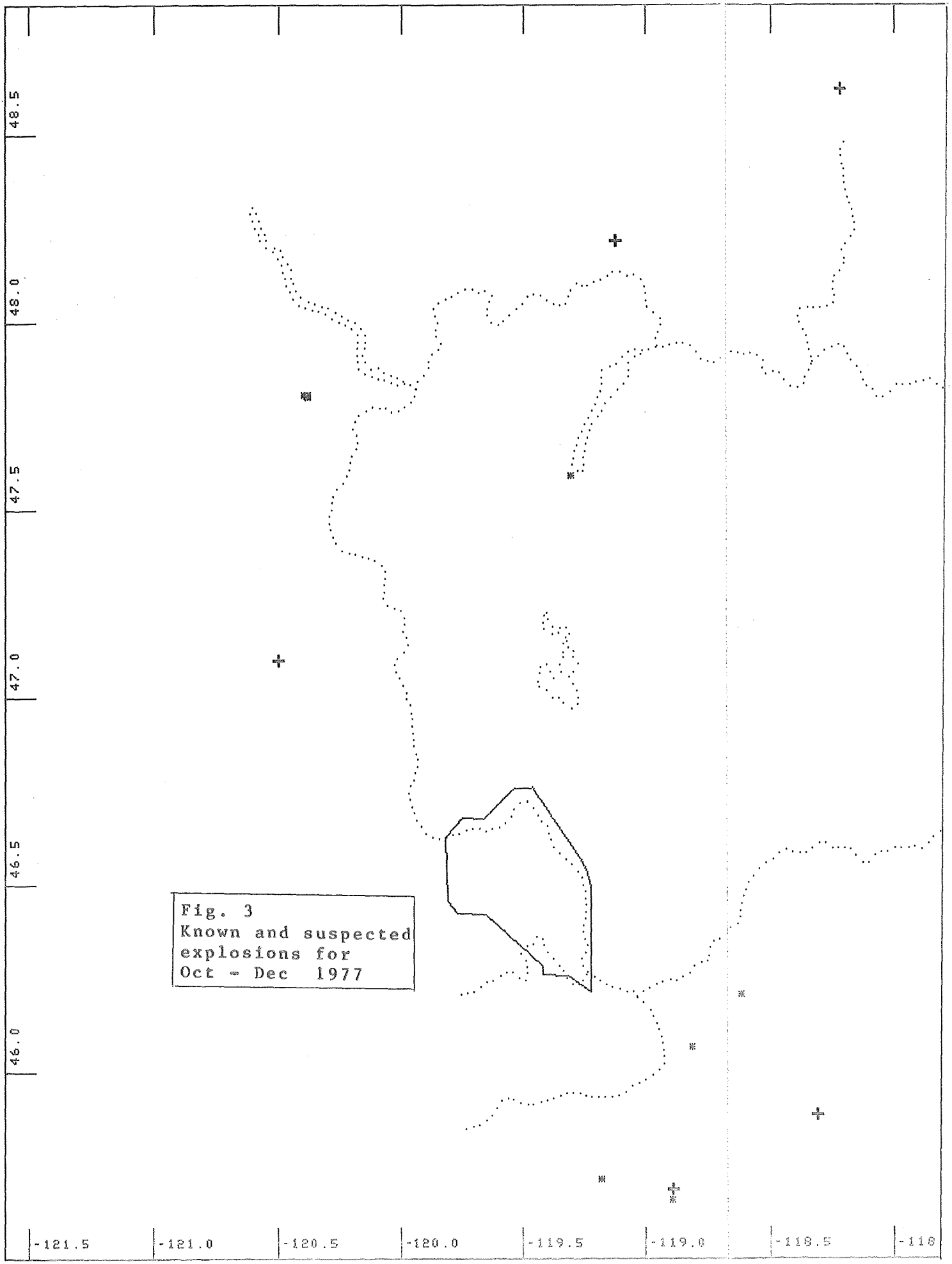


Fig. 3
Known and suspected explosions for Oct - Dec 1977

## Located with South Model

| DATE | YRDAY | HRMN | SEC | N LAT | W LON | DEPTH | MAG | STA | GAP | ERR | ERZ | Q | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/27/77 | 270 | 2043 | 4.0 | 45-53.20 | 118-18.64 | 1.0 | 2.4 | 7 | 271 | 4.0 | 2.8 | D | P |
| 9/30/77 | 273 | 2052 | 49.4 | 45-43.53 | 119- 9.90 | 3.0 | 1.7 | 5 | 224 | 10.7 | 13.3 | D | P |
| 10/ 6/77 | 279 | 2327 | 19.5 | 45-40.11 | 118-52.81 | 3.0 | 1.9 | 5 | 201 | .2 | .3 | C | P |
| 10/ 9/77 | 282 | 2320 | 8.6 | 45-43.05 | 118-20.17 | 1.7 | 2.0 | 6 | 265 | 2.8 | .7 | D | |
| 10/20/77 | 293 | 1759 | 54.1 | 46-14.51 | 118-53.81 | 4.0 | 1.0 | 6 | 131 | 1.3 | 2.8 | C | |
| 10/20/77 | 293 | 2234 | .9 | 45-38.83 | 118-57.95 | 1.8 | 1.7 | 6 | 240 | 8.7 | 12.0 | D | |
| 11/ 6/77 | 310 | 1720 | 1.8 | 46-27.52 | 119-40.01 | 20.9 | 1.4 | 12 | 195 | 1.3 | 1.3 | C | |
| 11/ 8/77 | 312 | 2223 | 32.1 | 45-51.65 | 119-43.25 | .8 | 2.1 | 8 | 248 | 3.2 | 2.6 | D | |
| 11/10/77 | 314 | 16 7 | 40.3 | 46- 4.66 | 118-48.25 | 2.0 | 2.0 | 8 | 94 | 1.1 | 1.8 | C | P |
| 11/14/77 | 318 | 20 4 | 52.5 | 46-22.41 | 119-27.08 | 6.7 | 2.0 | 8 | 209 | 1.7 | 1.2 | C | |
| 11/18/77 | 322 | 9 8 | 37.8 | 46-22.59 | 119- 5.57 | 3.8 | .6 | 9 | 147 | .3 | .4 | B | |
| 11/19/77 | 323 | 056 | 23.5 | 45-41.22 | 118-53.75 | 3.0 | 2.3 | 7 | 185 | 11.6 | 19.6 | D | P |
| 11/21/77 | 325 | 1952 | 55.3 | 46-28.43 | 118-10.72 | 4.9 | 1.9 | 6 | 298 | 4.1 | 1.5 | D | |
| 11/26/77 | 330 | 320 | 36.9 | 46-13.90 | 119-29.63 | 1.8 | 1.0 | 5 | 210 | .7 | 13.5 | D | |
| 11/28/77 | 332 | 23 5 | 38.5 | 46-13.09 | 118-35.94 | 1.7 | 1.8 | 10 | 149 | 1.5 | 2.2 | C | P |
| 11/30/77 | 334 | 2330 | 1.8 | 46-47.93 | 119-45.05 | 3.0 | 2.0 | 8 | 233 | 37.1 | 21.8 | D | |
| 12/ 5/77 | 339 | 041 | 53.1 | 46-37.03 | 118-53.61 | 3.4 | .9 | 8 | 192 | 1.2 | 1.9 | C | |
| 12/ 9/77 | 343 | 1627 | 17.3 | 46-37.14 | 118-54.79 | .9 | 1.3 | 6 | 190 | 1.2 | 4.2 | C | |
| 12/12/77 | 346 | 938 | 14.2 | 46-58.22 | 119-35.79 | 3.0 | 2.0 | 17 | 80 | .9 | 1.4 | C | |
| 12/21/77 | 355 | 218 | 19.1 | 46-23.94 | 119-26.08 | 1.5 | 2.3 | 11 | 88 | .3 | .6 | C | |
| 12/24/77 | 358 | 2 3 | 18.8 | 46-43.23 | 119-19.92 | 5.1 | .3 | 7 | 227 | 1.1 | 2.2 | C | |

## Located with North Model

| DATE | YRDAY | HRMN | SEC | N LAT | W LON | DEPTH | MAG | STA | GAP | ERR | ERZ | Q | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/ 7/77 | 188 | 2221 | 37.9 | 48-20.91 | 117-50.97 | .3 | 1.8 | 6 | 183 | 1.5 | 3.7 | C | P |
| 7/10/77 | 191 | 719 | 31.3 | 48-30.41 | 122-31.66 | 4.0 | 3.9 | 10 | 329 | 17.6 | 25.4 | D | W |
| 7/13/77 | 194 | 715 | 6.2 | 47- 3.60 | 120-57.15 | .1 | 3.8 | 28 | 67 | 1.1 | 2.7 | D | F |
| 7/13/77 | 194 | 720 | 1.5 | 47- 4.26 | 120-58.44 | 2.9 | 2.0 | 10 | 128 | 3.0 | 3.8 | D | |
| 7/13/77 | 194 | 8 0 | 25.9 | 47-35.51 | 121-42.22 | .1 | 2.4 | 9 | 82 | 2.2 | 11.2 | C | W |
| 7/13/77 | 194 | 1249 | 36.6 | 47- 4.19 | 120-59.20 | .3 | 2.2 | 17 | 95 | 1.2 | 2.6 | D | |
| 7/13/77 | 194 | 1433 | 38.1 | 47- 3.85 | 120-59.11 | 1.0 | 2.4 | 17 | 96 | 1.2 | 1.9 | D | |
| 7/15/77 | 196 | 349 | 9.7 | 47-36.78 | 120-14.19 | 4.2 | .5 | 9 | 142 | .8 | 1.7 | C | |
| 7/15/77 | 196 | 630 | .5 | 47-42.34 | 120- 7.43 | 4.3 | .4 | 7 | 215 | 1.2 | 3.0 | C | |
| 7/15/77 | 196 | 1543 | 54.3 | 47-45.29 | 121-56.27 | 10.6 | 3.4 | 15 | 135 | 5.0 | 3.5 | C | W |
| 7/16/77 | 197 | 126 | 19.2 | 47-39.81 | 120-10.01 | 4.9 | .5 | 6 | 156 | 1.6 | 6.6 | C | |
| 7/16/77 | 197 | 2 8 | 45.0 | 46-33.11 | 120-44.68 | 3.5 | 1.7 | 13 | 199 | 3.3 | 2.6 | D | |
| 7/17/77 | 198 | 1738 | 8.9 | 47- 6.33 | 120-59.06 | 5.5 | 1.5 | 6 | 277 | 14.6 | 3.4 | D | |
| 7/18/77 | 199 | 658 | 37.0 | 47-40.15 | 120-10.18 | 1.7 | .9 | 7 | 153 | .7 | 7.0 | C | |
| 7/22/77 | 203 | 622 | 42.9 | 47-42.25 | 120-15.60 | 6.8 | .1 | 6 | 128 | .3 | .6 | B | |
| 7/23/77 | 204 | 1917 | 52.5 | 46-37.46 | 120-54.53 | 3.0 | 2.0 | 25 | 209 | 2.9 | 2.1 | D | |
| 7/25/77 | 206 | 522 | 19.5 | 47-40.61 | 120-18.88 | 1.6 | -.3 | 7 | 150 | .8 | 2.9 | C | |
| 7/27/77 | 208 | 1037 | 22.3 | 47-36.12 | 120-19.50 | 2.8 | -.1 | 6 | 267 | 1.7 | 2.6 | C | |
| 7/29/77 | 210 | 5 0 | 27.1 | 47-37.79 | 120- 8.71 | 8.3 | .5 | 9 | 136 | .3 | .6 | B | |
| 7/29/77 | 210 | 948 | 18.5 | 47-40.03 | 120-18.74 | 4.4 | .1 | 8 | 149 | .7 | .9 | B | |
| 8/ 3/77 | 215 | 1437 | 9.4 | 47-11.89 | 119-52.30 | 3.0 | 1.0 | 5 | 130 | 1.6 | 48.7 | D | |
| 8/ 5/77 | 217 | 1447 | 55.1 | 48-20.44 | 120-49.87 | 3.0 | 1.3 | 7 | 265 | 3.9 | 90.3 | D | |
| 8/ 6/77 | 218 | 849 | 36.7 | 47-24.95 | 120-33.81 | 3.5 | .5 | 7 | 287 | 5.3 | 41.7 | D | |
| 8/ 7/77 | 219 | 1532 | 11.2 | 47-37.20 | 120- 5.73 | 9.4 | -.8 | 6 | 166 | 1.4 | 3.1 | C | |
| 8/ 9/77 | 221 | 124 | 15.2 | 47-39.37 | 120- 9.72 | 3.8 | 1.1 | 11 | 117 | .3 | 1.4 | B | |
| 8/12/77 | 224 | 1731 | 46.6 | 47-36.72 | 120-22.56 | 6.0 | -.4 | 6 | 191 | .9 | 1.7 | C | |
| 8/14/77 | 226 | 0 0 | 56.9 | 47-44.26 | 120- 3.05 | 3.9 | -.4 | 8 | 122 | .5 | 2.0 | B | |
| 8/18/77 | 230 | 3 3 | 14.4 | 47-39.91 | 120-18.93 | 1.7 | -.6 | 5 | 175 | 1.5 | 4.7 | C | |
| 8/20/77 | 232 | 1110 | 43.1 | 47-41.21 | 120- 4.10 | 8.8 | 1.3 | 14 | 120 | .4 | .8 | B | |
| 8/23/77 | 235 | 452 | 16.5 | 47- 3.64 | 120-58.70 | .6 | 1.7 | 12 | 156 | .8 | 15.5 | D | |
| 8/28/77 | 240 | 737 | 17.6 | 48-44.31 | 119-51.33 | 5.4 | 1.6 | 11 | 279 | 2.5 | 2.0 | C | |
| 8/29/77 | 241 | 1240 | 38.8 | 47-43.11 | 120-17.10 | 8.1 | 2.8 | 18 | 101 | 1.0 | .9 | B | |
| 8/30/77 | 242 | 2116 | 54.7 | 47-39.36 | 120-11.06 | 7.1 | .3 | 7 | 108 | .2 | .6 | B | |
| 9/ 1/77 | 244 | 2 1 | 3.0 | 47-17.12 | 119-50.59 | 9.1 | 1.3 | 11 | 247 | .8 | .7 | C | |
| 9/ 1/77 | 244 | 2311 | 7.7 | 48-40.38 | 120-16.18 | 2.1 | 1.4 | 10 | 277 | 3.3 | 30.5 | D | |
| 9/ 2/77 | 245 | 043 | 46.0 | 48-40.65 | 120-16.07 | 3.2 | 1.1 | 10 | 278 | 2.6 | 1.9 | D | |
| 9/ 4/77 | 247 | 1810 | 30.4 | 47-43.35 | 120- 2.48 | 7.2 | -.0 | 7 | 136 | .5 | 1.1 | B | |
| 9/ 5/77 | 248 | 043 | 22.8 | 47- 5.91 | 121- 1.65 | 3.0 | 1.6 | 18 | 154 | 2.2 | 1.7 | D | |
| 9/ 5/77 | 248 | 524 | 46.6 | 47- 6.01 | 121- .73 | 2.0 | 1.6 | 15 | 154 | 2.2 | 2.0 | D | |
| 9/11/77 | 254 | 1244 | 8.9 | 48- 8.12 | 119-10.32 | .9 | 1.7 | 8 | 206 | 1.8 | 3.7 | C | |
| 9/14/77 | 257 | 854 | 45.0 | 47-41.80 | 120-22.63 | 3.0 | -.4 | 8 | 171 | 1.0 | 4.7 | C | |
| 9/16/77 | 259 | 622 | 17.0 | 47-37.21 | 120-17.29 | 2.9 | .2 | 6 | 160 | 1.7 | 5.5 | C | |
| 9/17/77 | 260 | 125 | 5.4 | 47-37.86 | 120-14.73 | 4.6 | .8 | 11 | 139 | 1.0 | 3.0 | C | |
| 9/17/77 | 260 | 945 | 32.7 | 48-53.71 | 119-17.12 | .1 | 2.1 | 11 | 297 | 2.2 | 2.2 | D | |
| 9/20/77 | 263 | 527 | 11.4 | 47-39.73 | 120-16.19 | .1 | .8 | 8 | 87 | .9 | 1.5 | B | |
| 9/22/77 | 265 | 1459 | 11.9 | 47-38.28 | 120-19.12 | .0 | 1.2 | 13 | 162 | .5 | .9 | C | |
| 9/23/77 | 266 | 2110 | 51.3 | 47-42.96 | 120-47.98 | 6.2 | .7 | 5 | 318 | 5.3 | 5.5 | D | |
| 9/27/77 | 270 | 124 | 17.1 | 47-40.40 | 120- 8.92 | 6.1 | -.9 | 7 | 131 | .2 | .9 | B | |
| 9/28/77 | 271 | 240 | 41.3 | 47-40.09 | 120- 4.30 | 7.7 | -.5 | 6 | 196 | .7 | 1.5 | C | |
| 9/28/77 | 271 | 20 3 | 47.9 | 47-48.91 | 120-21.38 | 3.0 | -.1 | 6 | 132 | 1.1 | 15.4 | C | |

## Located with North Model

| DATE | YRDAY | HRMN | SEC | N LAT | W LON | DEPTH | MAG | STA | GAP | ERR | ERZ | Q | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/ 6/77 | 279 | 951 | 6.2 | 47-43.18 | 120-13.54 | 3.0 | .6 | 9 | 119 | .5 | 2.7 | B | |
| 10/ 9/77 | 282 | 116 | 47.0 | 47-40.15 | 120-17.32 | 1.8 | 1.6 | 13 | 104 | .4 | 1.5 | B | |
| 10/ 9/77 | 282 | 255 | 16.0 | 47- 5.51 | 120-31.18 | .3 | 2.9 | 20 | 216 | 1.5 | 2.1 | D | |
| 10/10/77 | 283 | 1155 | 13.8 | 47-47.72 | 119-21.25 | .1 | 1.5 | 6 | 165 | 1.0 | 3.6 | C | |
| 10/10/77 | 283 | 1528 | 17.5 | 47-40.78 | 120-19.39 | 7.9 | .6 | 10 | 147 | .4 | .5 | B | |
| 10/12/77 | 285 | 0 3 | 16.9 | 47-48.84 | 120-22.36 | 9.8 | 1.4 | 14 | 135 | .4 | .7 | B | X |
| 10/16/77 | 289 | 2359 | 26.8 | 47-41.37 | 120-17.34 | 2.3 | 1.8 | 12 | 107 | .4 | 1.8 | B | |
| 10/18/77 | 291 | 1938 | 3.2 | 47-47.48 | 120-54.63 | .5 | 1.2 | 7 | 313 | 1.8 | 77.7 | D | |
| 10/19/77 | 292 | 116 | 38.9 | 47-45.09 | 120- .94 | 3.9 | -.1 | 9 | 153 | .5 | 1.0 | B | |
| 10/19/77 | 292 | 23 6 | 34.8 | 47-49.12 | 120-22.60 | .5 | 1.7 | 14 | 138 | .8 | 28.0 | C | X |
| 10/21/77 | 294 | 2331 | 8.3 | 47-36.07 | 119-17.71 | 4.7 | 1.6 | 7 | 156 | .6 | 2.9 | C | P |
| 10/22/77 | 295 | 831 | 57.2 | 47-39.11 | 120-21.12 | 5.9 | .1 | 8 | 166 | .3 | .3 | B | |
| 10/22/77 | 295 | 1418 | 42.9 | 47-42.32 | 120-10.64 | 6.7 | 1.7 | 12 | 70 | .6 | 2.1 | B | |
| 10/23/77 | 296 | 8 0 | 15.0 | 48-25.38 | 120-10.93 | 3.0 | 1.3 | 11 | 124 | 1.0 | 4.5 | B | |
| 10/23/77 | 296 | 922 | 18.3 | 48-25.04 | 120-11.64 | .1 | 2.1 | 12 | 121 | .2 | 2.6 | B | |
| 10/23/77 | 296 | 1518 | 53.5 | 47- 6.08 | 120-30.00 | 1.8 | 2.2 | 13 | 214 | 1.6 | 2.9 | C | P |
| 10/26/77 | 299 | 034 | 33.6 | 47-48.74 | 120-21.99 | .5 | 1.7 | 10 | 133 | .7 | 54.8 | C | X |
| 10/26/77 | 299 | 122 | 22.3 | 47-40.03 | 120-17.88 | 1.5 | .0 | 6 | 132 | 1.8 | 4.9 | B | |
| 10/26/77 | 299 | 1334 | 2.9 | 47-42.59 | 120- 1.43 | 7.2 | .6 | 9 | 150 | .3 | .6 | B | |
| 10/26/77 | 299 | 15 8 | 37.4 | 47-40.03 | 120-18.19 | .8 | .1 | 6 | 147 | 1.7 | 9.9 | C | |
| 10/28/77 | 301 | 425 | 40.2 | 47-41.76 | 121-39.91 | 1.0 | 2.0 | 6 | 331 | 6.8 | 3.8 | D | W |
| 10/28/77 | 301 | 1016 | 4.1 | 47-42.87 | 120- 1.44 | 7.6 | 1.3 | 15 | 71 | .3 | .4 | A | |
| 11/ 1/77 | 305 | 537 | 12.3 | 47-45.42 | 120- 6.78 | 8.2 | -.4 | 8 | 111 | .4 | .8 | B | |
| 11/ 1/77 | 305 | 1210 | 45.1 | 47-36.32 | 120-20.10 | 4.8 | 1.1 | 9 | 183 | .5 | 1.7 | C | |
| 11/ 2/77 | 306 | 1958 | 31.4 | 47-48.97 | 120-22.07 | .5 | 1.4 | 9 | 135 | .7 | 66.4 | C | X |
| 11/ 3/77 | 307 | 424 | 22.8 | 47-40.42 | 120-10.54 | 6.9 | .3 | 9 | 104 | .3 | .7 | B | |
| 11/ 3/77 | 307 | 17 8 | 44.5 | 47- 4.40 | 120-35.33 | 5.8 | 2.0 | 8 | 273 | 2.4 | 2.8 | C | |
| 11/ 4/77 | 308 | 441 | 57.7 | 47-43.52 | 120-18.61 | 1.8 | -.4 | 5 | 114 | .4 | 4.1 | C | |
| 11/ 4/77 | 308 | 2344 | 58.0 | 47-41.15 | 120-15.61 | 7.3 | -.4 | 7 | 150 | .5 | .7 | B | |
| 11/ 5/77 | 309 | 2150 | 54.9 | 47-48.78 | 120-21.90 | 3.0 | 1.1 | 7 | 133 | .6 | 9.2 | C | X |
| 11/ 8/77 | 312 | 1211 | 10.5 | 47- 7.75 | 120-43.96 | 8.6 | 2.2 | 13 | 233 | 1.7 | 1.4 | C | |
| 11/13/77 | 317 | 1926 | 17.9 | 47-38.64 | 120-46.02 | 16.3 | .6 | 7 | 305 | 1.4 | 1.4 | C | |
| 11/15/77 | 319 | 051 | 15.4 | 47-48.83 | 120-21.94 | .5 | 1.4 | 7 | 133 | .8 | 58.0 | C | X |
| 11/17/77 | 321 | 2314 | 56.7 | 47-48.78 | 120-21.83 | .5 | 1.1 | 7 | 132 | .5 | 2.3 | C | X |
| 11/18/77 | 322 | 1231 | 23.8 | 48-19.57 | 119-31.12 | 6.5 | 2.7 | 11 | 151 | .5 | 1.1 | B | |
| 11/23/77 | 327 | 555 | 3.1 | 47-42.24 | 120- 7.34 | 7.9 | -.1 | 8 | 103 | .5 | 1.4 | B | |
| 11/23/77 | 327 | 21 7 | 56.0 | 47-48.96 | 120-22.04 | .5 | 1.5 | 8 | 134 | .4 | 81.5 | C | X |
| 11/24/77 | 328 | 1136 | 34.8 | 47-54.47 | 120-46.00 | 3.0 | .8 | 7 | 297 | 2.5 | 20.0 | D | |
| 12/ 7/77 | 341 | 045 | 45.2 | 47-48.86 | 120-22.29 | .5 | 1.6 | 8 | 135 | .6 | 19.9 | C | X |
| 12/ 7/77 | 341 | 2018 | 34.6 | 47-44.85 | 120-12.58 | 3.0 | 0.0 | 7 | 148 | .4 | 3.1 | C | |
| 12/ 9/77 | 343 | 858 | 16.1 | 47-40.65 | 120- 7.08 | 5.5 | 1.1 | 11 | 120 | .5 | 1.7 | B | |
| 12/ 9/77 | 343 | 1946 | 22.6 | 48-13.28 | 119- 7.43 | .2 | 2.5 | 10 | 243 | 1.1 | 3.4 | C | P |
| 12/10/77 | 344 | 1326 | 16.5 | 47-42.27 | 120- 9.63 | 8.2 | .1 | 8 | 149 | .7 | 1.7 | B | |
| 12/21/77 | 355 | 027 | 11.9 | 48-37.60 | 118-13.28 | 1.5 | 2.0 | 8 | 297 | 3.6 | 2.1 | D | P |
| 12/22/77 | 356 | 647 | 57.5 | 47-40.22 | 120-18.61 | 6.6 | 2.3 | 13 | 147 | .6 | 1.2 | B | |
| 12/27/77 | 361 | 1850 | 36.0 | 47-42.42 | 121-46.37 | 6.1 | 1.9 | 8 | 337 | 12.0 | 3.0 | D | W |
| 12/28/77 | 362 | 1340 | 50.1 | 47- 6.18 | 120-26.47 | 3.0 | 2.1 | 12 | 209 | 1.9 | 29.9 | D | |
| 12/30/77 | 364 | 149 | 46.6 | 47-44.45 | 120- 4.74 | 7.3 | -.5 | 8 | 123 | .3 | .6 | B | |

Located with South Model

| DATE | YRDAY | HRMN | SEC | N LAT | W LON | DEPTH | MAG | STA | GAP | ERR | ERZ | Q | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/ 3/77 | 184 | 11 4 | 51.7 | 46-42.71 | 119-31.53 | .0 | .7 | 7 | 118 | .3 | .6 | B | |
| 7/ 4/77 | 185 | 056 | 39.7 | 46-50.69 | 119-28.21 | 6.9 | -.1 | 5 | 250 | .2 | .1 | C | |
| 7/ 5/77 | 186 | 1128 | 49.0 | 46-48.21 | 119-32.27 | 3.0 | 1.6 | 9 | 137 | 1.1 | 1.8 | C | |
| 7/ 5/77 | 186 | 14 7 | 35.2 | 46-48.87 | 119-33.27 | 1.5 | 1.2 | 11 | 142 | 1.0 | 2.7 | C | |
| 7/ 5/77 | 186 | 15 6 | 15.5 | 46-48.59 | 119-32.56 | 4.5 | .4 | 6 | 225 | 1.0 | .7 | C | |
| 7/ 6/77 | 187 | 2137 | 46.0 | 46-12.28 | 119-16.50 | 1.5 | 1.4 | 7 | 313 | 1.0 | 1.1 | C | P |
| 7/ 7/77 | 188 | 1432 | 21.3 | 46-27.43 | 119-33.67 | 18.4 | .4 | 5 | 122 | 2.7 | 2.1 | D | |
| 7/13/77 | 194 | 1429 | 22.1 | 46-29.75 | 120- 2.81 | 14.2 | .6 | 6 | 311 | .8 | 1.8 | C | |
| 7/14/77 | 195 | 516 | 56.7 | 46-42.46 | 119-31.09 | 7.1 | .3 | 6 | 122 | .8 | .8 | B | |
| 7/15/77 | 196 | 1554 | 9.2 | 46-53.88 | 119-38.62 | 7.6 | 1.7 | 17 | 89 | 1.2 | 2.6 | C | |
| 7/17/77 | 198 | 2356 | 6.3 | 46- 7.80 | 119-27.65 | 1.5 | 2.2 | 10 | 129 | .6 | .9 | C | P |
| 7/19/77 | 200 | 2110 | 40.9 | 46-43.93 | 119-15.36 | .6 | .8 | 11 | 77 | .6 | 1.3 | B | |
| 7/19/77 | 200 | 2252 | 55.3 | 45-25.83 | 118-38.25 | 3.0 | 2.1 | 7 | 306 | 8.2 | 2.7 | D | P |
| 7/20/77 | 201 | 1651 | 59.3 | 46- 8.06 | 119-27.81 | .3 | 1.9 | 10 | 160 | .5 | 1.1 | B | P |
| 7/20/77 | 201 | 2113 | 59.5 | 46-38.98 | 119-37.74 | 7.9 | 1.0 | 7 | 131 | 1.5 | 7.3 | C | |
| 7/21/77 | 202 | 1518 | 23.3 | 46- 7.63 | 119-27.49 | .8 | 2.2 | 8 | 196 | .7 | 3.6 | C | P |
| 7/21/77 | 202 | 1929 | 52.9 | 46- 4.98 | 119-26.59 | 3.4 | 1.6 | 7 | 278 | 4.0 | 2.8 | D | P |
| 7/24/77 | 205 | 1520 | 46.5 | 46-38.88 | 119-18.55 | 11.9 | -.1 | 6 | 182 | .8 | 2.1 | C | |
| 7/29/77 | 210 | 18 5 | 59.9 | 46-52.94 | 119-22.10 | .8 | .5 | 7 | 276 | 7.0 | 5.1 | D | |
| 8/ 1/77 | 213 | 2030 | 8.6 | 46- 8.24 | 119-27.08 | 15.9 | .9 | 5 | 292 | 1.3 | .7 | D | |
| 8/ 3/77 | 215 | 1716 | 7.1 | 45-44.29 | 118- 5.70 | 5.5 | 2.1 | 7 | 298 | 2.5 | 4.3 | C | P |
| 8/ 6/77 | 218 | 2018 | 6.5 | 46-50.99 | 119-23.48 | 1.3 | .5 | 4 | 260 | 0.0 | 0.0 | C | |
| 8/ 7/77 | 219 | 857 | 42.9 | 46-42.64 | 119-31.41 | 3.9 | .4 | 6 | 119 | .2 | .8 | B | |
| 8/10/77 | 222 | 3 4 | 59.3 | 45-12.73 | 118-13.72 | 1.5 | 2.0 | 6 | 327 | 6.7 | 7.1 | D | R |
| 8/12/77 | 224 | 1816 | 54.6 | 46-50.89 | 119-10.68 | 3.5 | 1.3 | 11 | 157 | .7 | .8 | B | P |
| 8/16/77 | 228 | 1652 | 38.7 | 46-22.44 | 119-33.36 | 18.7 | .6 | 7 | 232 | 2.0 | 1.2 | C | |
| 8/18/77 | 230 | 443 | 52.2 | 46-39.06 | 119-37.60 | .8 | 1.2 | 11 | 74 | 1.0 | 2.0 | C | |
| 8/19/77 | 231 | 2017 | 31.9 | 46-42.41 | 119-30.89 | 3.0 | .9 | 7 | 124 | .3 | 2.6 | B | |
| 8/23/77 | 235 | 133 | 25.5 | 46-42.33 | 119-31.50 | 4.8 | .2 | 7 | 119 | .2 | .7 | B | |
| 8/23/77 | 235 | 2347 | 55.1 | 45-54.11 | 119-19.15 | .3 | 1.9 | 11 | 124 | .5 | 1.0 | B | |
| 8/24/77 | 236 | 1220 | 38.5 | 46-42.18 | 119-31.28 | .2 | 1.0 | 8 | 121 | .3 | .7 | B | |
| 8/25/77 | 237 | 1740 | 43.1 | 46-50.98 | 119-10.58 | 3.0 | 1.8 | 12 | 161 | 1.1 | 1.4 | C | P |
| 9/ 2/77 | 245 | 425 | 20.7 | 46-38.31 | 119-21.28 | 16.6 | .4 | 8 | 89 | .7 | 1.3 | A | |
| 9/ 9/77 | 252 | 1440 | 15.4 | 46-42.15 | 119-32.27 | 3.0 | 0.0 | 5 | 112 | .9 | 6.3 | D | |
| 9/11/77 | 254 | 413 | 15.9 | 46-38.48 | 119-37.73 | 1.5 | 2.7 | 15 | 69 | 1.0 | 2.0 | C | |
| 9/11/77 | 254 | 450 | 26.2 | 46-38.85 | 119-37.78 | 3.0 | -.1 | 7 | 130 | .5 | 4.6 | C | |
| 9/11/77 | 254 | 511 | 6.2 | 46-38.95 | 119-38.08 | .8 | -.3 | 8 | 133 | .5 | 1.0 | B | |
| 9/14/77 | 257 | 1345 | 9.5 | 46-49.04 | 119-32.90 | 4.0 | .6 | 7 | 132 | .5 | 1.7 | B | |
| 9/14/77 | 257 | 14 5 | 56.9 | 46-51.61 | 119-33.64 | 10.2 | .5 | 8 | 192 | 1.7 | 1.7 | C | |
| 9/14/77 | 257 | 1925 | 52.4 | 46-49.09 | 119-33.10 | 3.0 | .9 | 9 | 132 | .7 | 2.8 | B | |
| 9/16/77 | 259 | 019 | 31.7 | 46-42.54 | 119-31.82 | 6.9 | .3 | 7 | 116 | .7 | .7 | B | |