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ABSTRACT and NONTECHNICAL SUMMARY

This is the annual technical report for USGS Joint Operating Agreement 01HQAG0011 "*Pacific Northwest Seismograph Network (PNSN) Operations*". The Pacific Northwest Seismograph Network (PNSN) operates seismograph stations in Washington and Oregon, and collects and analyzes earthquake data. Between Jan. 1, 2002 and Dec. 31, 2002 the PNSN analyzed 5,495 events. Of these, 4,544 were earthquakes or blasts within the network (1,751 of which were too small to locate). Within the network area, 2,299 tectonic earthquakes were located west of 120.5 degrees west longitude (including 461 in the general vicinity of Mount St. Helens), and 263 east of 120.5 degrees west longitude. The remaining events were blasts within the network (453), regional earthquakes (319), teleseisms (659), low-frequency events (537 events, 13 locatable, probably icequakes, near the summit of Mt. Rainier), and surficial events (572 events, 4 locatable, mostly rockfalls near the summits of Mt. St. Helens and Mt Rainier).

Between Jan. 1, 2002 and Dec. 31, 2002, 24 earthquakes were reported felt in Washington west of the Cascades, ranging in magnitude from 1.6 to 4.1. Ten earthquakes (magnitudes -0.9 to 3.4) were reported felt east of the Cascades. Some of these were part of a sporadic sequence of very shallow earthquakes (less than 2 km deep) located in downtown Spokane. Due to the shallow depth and the urban environment, many extremely small earthquakes were felt. The Spokane sequence began in May of 2001 and continued to be fairly vigorous through Dec. 2001. The largest event in the sequence, magnitude 4.0, occurred on Nov. 11, 2001. In 2002, only a half-dozen events were located in Spokane. Spokane is usually seismically quiet. No similar Spokane sequence is known.

In Oregon four earthqukes were reported felt, including the largest event during the reporting period, a magnitude 4.5 earthquake near Mt. Hood on June 29. Seismic activity near Mount Hood began to increase in May with several one- or two-day clusters of 10-15 events/day. Early June had a few smaller clusters with 5-7 events/day, and activity increased dramatically on June 29 following the magnitude 4.5 earthquake. Eighty-nine earthquakes were located in the Mt. Hood area on June 29 and 30, and activity continued into July, with the number of events/day diminishing as the month went on (91 located events in July), and continuing to diminish through August (44 located events). By September activity was at a background level (4 located events). The M 4.5 mainshock was located at about 6 km depth. About 76% of the aftershocks were in the 4-8 km depth range, and about 22% were shallower than 4 km.

The Mw7.9 Denali, Alaska earthquake of 3 November, 2002 was well-recorded by the PNSN. Large-amplitude surface waves from the Denali quake produced seiches in lakes and pools in Washington State. In Seattle, a seiche damaged houseboats in Lake Union and were wll recorded on strong-motion seismographs throughout western Washington.

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SUMMARY

This is the 2002 annual technical report for USGS Joint Operating Agreement 01HQAG0011 *"Pacific Northwest Seismograph Network (PNSN) Operations"*. This agreement covered network operations in western Washington and northern Oregon, routine data processing, and preparation of bulletins and reports. PNSN stations in southern and central Oregon are maintained by the University of Oregon under Cooperative Agreement 01HQAG0012 and this report also covers the work undertaken under that agreement. The objective of our work under this operating agreement was to gather seismic data, and to analyze and interpret them for use in evaluation of seismic and volcanic hazards in Washington and Oregon. This report includes an update on recent changes in our data acquisition and processing system, a review of station operations during 2002, an overview of our public information program, and a summary of 2002 seismicity.

Since 1984, we have issued quarterly bulletins for all of Washington and Oregon. These include catalogs of earthquakes and blasts located in Washington and Oregon, providing up-to-date coverage of seismic and volcanic activity. Appendix 1 contains quarterly bulletins covering 2002.

CURRENT INITIATIVES

Introduction

The PNSN is continuing the long process of upgrading operations. Upgrades include enhancement of the emergency information distribution system, installation of seismic sensors that can accurately capture the full range of earthquake amplitudes and frequencies, implementation of a data recording system that fully supports multi-component data, and near-real-time data exchange with neighboring networks.

CREST Stations

The USGS/NOAA CREST (Consolidated Reporting of EarthquakeS and Tsunamis) project is designed to improve NOAA's ability to assess the likelihood of a tsunami and issue timely warnings in the event of a west coast subduction earthquake. CREST calls for upgrades to regional networks to enable them to provide very rapid and reliable information to the Alaska and Pacific Tsunami Warning Centers. Installation of CREST stations began in 1998. In 2002 telemetry links to stations at Megler, Washington, and Mt. Hebo, Oregon were completed and a new station was installed east of Portland.

PNSN Strong Motion Program

Since 1996, the PNSN has installed digital strong-motion instruments. Most of these are in the Puget Sound Area, but stations are also being sited in other urban areas. In 2002, 10 new permanent instruments were installed, bringing the total number of PNSN real-time strong-motion instruments to 80.

Continuous data from these stations are sent to the PNSN via Internet or leased-line modem. Most of the strong-motion instruments (except CREST stations) also have internal memory and are configured to record internally if ground motions exceed a specified threshold. If continuous data transmission fails, the internally recorded data are still available via dial-up retrieval or site visit. Three additional dial-up stations in the Portland area are operated by the USGS.

PNSN RACE (Rapid Alerts for Cascadia Earthquakes) System

RACE is an earthquake notification system for emergency managers and others who need very rapid pager-based notification of earthquake activity. The RACE system is based on the CUBE system developed at Caltech for the Southern California Seismic Network. The RACE system is operating in approximately 10 emergency management and state agencies in Washington and Oregon.

EARTHWORM Progress Report

Data acquisition is divided among three computers, which subsequently exchange and share the acquired data. In 2002, installation of *pigia*, an Intel-based earthworm digitizer running under MS-Windows, was completed. *Pigia* is the digitizer for analog data acquired by *verme*, while our old SUN-based SUNWORM system digitizes the same data for acquisition by the *scossa* and *milli* computers. A remote digitizing computer has been installed in Klamath Falls to eliminate our expensive long-distance leased phone-lines.

OPERATIONS

Seismometer Locations and Network Maintenance

Figure 1 shows seismograph stations operated by the PNSN at the end of 2002, when the PNSN EARTHWORM SYSTEM was digitally recording 460 channels of real-time or near-real-time seismic data. Stations available include a total of 151 short-period stations, 35 broad-band, and 84 strong-motion stations.

The Pacific Northwest Seismograph Network (PNSN) operates 175 short-period, broad-band, or strong-motion seismic stations west of 120 degrees west longitude under this agreement. The supported stations cover much of western Washington and Oregon, including the volcanos of the central Cascades. Some stations include up to 7 components. PNSN stations in southern and central Oregon are maintained by the University of Oregon under Cooperative Agreement 01HQAG0012.

Forty additional stations are operated under other support, and stations funded by other contracts or telemetered in real or near-real time from adjacent networks are also used in event locations. Station Tables 1A-1C list the locations of various types of stations. Quarterly reports provide additional details of station operation. Quarterly reports from January 1, 2002 through December, 2002 are included as Appendix 1.

Aside from station outages, normal maintenance includes a visit to each site at least once every two years to replace batteries and do preventive maintenance. In addition seismometers must be replaced every 4-6 years. More than 30 radio telemetry relay sites are also maintained independently of the seismograph stations.

Table 1A lists short-period, mostly vertical-component stations used in locating seismic events in Washington and Oregon. The first column in the table gives the 3-letter station designator, followed by a symbol designating the funding agency; stations marked by a percent sign (%) were supported by USGS joint operating agreement 01-HQ-AG-0011. A plus (+) indicates support under Pacific Northwest National Laboratory, Battelle contract 259116-A-B3. Stations designated "#" are USGS-maintained stations recorded at the PNSN. Stations designated by letters are operated by other networks, and telemetered to the PNSN. "M" stations are received from the Montana Bureau of Mines and Geology, "C" stations from the Canadian Pacific Geoscience Center, "U" stations from the US Geological Survey (usually USNSN stations), "N" stations from the USGS Northern California Network, and "H" stations from the Hanford Reservation via the Pacific Northwest National Labs. Other designations indicate support from other sources. Additional columns give station north latitude and west longitude (in degrees, minutes and seconds), station elevation in km, and comments indicating landmarks for which stations were named.

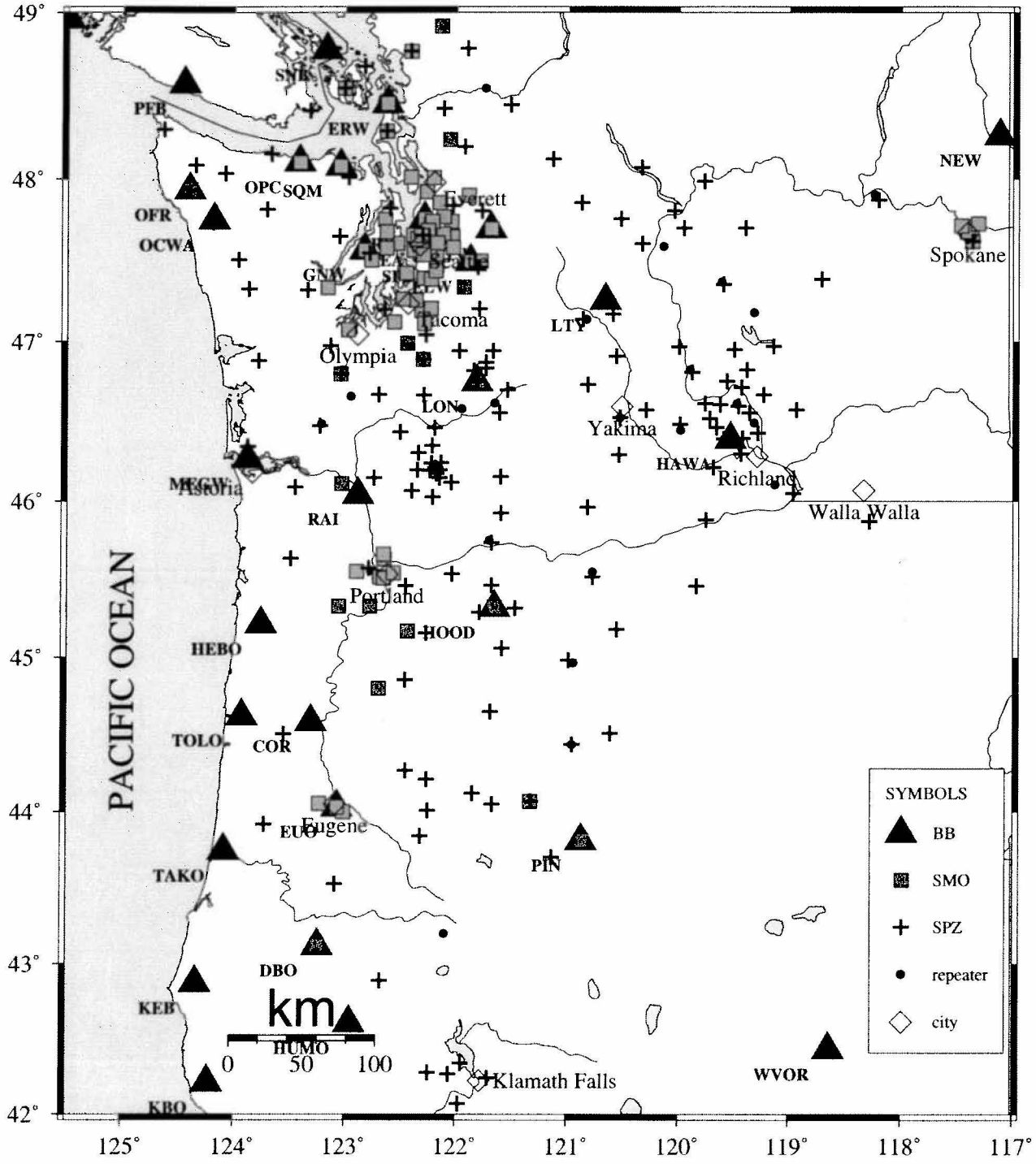

Figure 1A. Stations operating at the end of 4th quarter, 2002. Stations shown are short period vertical (SP), 3-component broadband (BB), or strong motion (SMO).

TABLE 1A - Short-period Stations operated by the PNSN during the fourth quarter 2002

STA	F	LAT	LONG	EL	NAME
ASR	%	46 09 09.9	121 36 01.6	1.357	Mt. Adams - Stagman Ridge
AUG	%	45 44 10.0	121 40 50.0	0.865	Augspurger Mtn
BBO	%	42 53 12.6	122 40 46.6	1.671	Butler Butte, Oregon
BEN	H	46 31 12.0	119 43 18.0	0.335	PNNL station
BEND	%	44 04 00.8	121 19 36.0	-	UO Bend Office, DOGAMI SMO
BHW	%	47 50 12.6	122 01 55.8	0.198	Bald Hill
BLN	%	48 00 26.5	122 58 18.6	0.585	Blyn Mt.
BOW	%	46 28 30.0	123 13 41.0	0.870	Boistfort Mt.
BPO	%	44 39 06.9	121 41 19.2	1.957	Bald Peter, Oregon
BRO	%	44 16 02.5	122 27 07.1	0.135	Big Rock Lookout, Oregon
BRV	+	46 29 07.2	119 59 28.2	0.920	Black Rock Valley
BSMT	M	47 51 04.8	114 47 13.2	1.950	Bassoo Peak, MT
BUO	%	42 16 42.5	122 14 43.1	1.797	Burton Butte, Oregon
BVW	+	46 48 39.5	119 52 56.4	0.670	Beverly
CBS	+	47 48 17.4	120 02 30.0	1.067	Chelan Butte, South
CDF	%	46 07 01.4	122 02 42.1	0.756	Cedar Flats
CHMT	M	46 54 51.0	113 15 07.0	-	Chamberlain Mtn, MT
CMM	%	46 26 07.0	122 30 21.0	0.620	Crazy Man Mt.
CMW	%	48 25 25.3	122 07 08.4	1.190	Cultus Mtns.
CPW	%	46 58 25.8	123 08 10.8	0.792	Capitol Peak
CRF	+	46 49 30.0	119 23 13.2	0.189	Corfu
DPW	+	47 52 14.3	118 12 10.2	0.892	Davenport
DY2	+	47 59 06.6	119 46 16.8	0.890	Dyer Hill 2
EDM	%	46 11 50.4	122 09 00.0	1.609	East Dome, Mt. St. Helens
ELK	%	46 18 20.0	122 20 27.0	1.270	Elk Rock
ELL	+	46 54 34.8	120 33 58.8	0.789	Ellensburg
EPH	+	47 21 22.8	119 35 45.6	0.661	Ephrata
ET3	+	46 34 38.4	118 56 15.0	0.286	Eltopia (replaces ET2)
ETW	+	47 36 15.6	120 19 56.4	1.477	Entiat
FHE	+	46 57 06.9	119 29 49.0	0.455	Frenchman Hills East
FL2	%	46 11 47.0	122 21 01.0	1.378	Flat Top 2
FMW	%	46 56 29.6	121 40 11.3	1.859	Mt. Fremont
FRIS	%	44 12 44.0	122 16 01.8	1.642	Frissel Point, OR
GBB	H	46 36 31.8	119 37 40.2	0.185	PNNL Station
GBL	+	46 35 54.0	119 27 35.4	0.330	Gable Mountain
GHW	%	47 02 30.0	122 16 21.0	0.268	Garrison Hill
GL2	+	45 57 35.0	120 49 22.5	1.000	New Goldendale
GLK	%	46 33 27.6	121 36 34.3	1.305	Glacier Lake
GMO	%	44 26 20.8	120 57 22.3	1.689	Grizzly Mountain, Oregon
GMW	%	47 32 52.5	122 47 10.8	0.506	Gold Mt.
GPW	%	48 07 05.0	121 08 12.0	2.354	Glacier Peak
GSM	%	47 12 11.4	121 47 40.2	1.305	Grass Mt.
GUL	%	45 55 27.0	121 35 44.0	1.189	Guler Mt.
H2O	H	46 23 44.5	119 25 22.7	0.175	Water PNNL Station
HAM	%	42 04 08.3	121 58 16.0	1.999	Hamaker Mt., Oregon
HBO	%	43 50 39.5	122 19 11.9	1.615	Huckleberry Mt., Oregon
HDW	%	47 38 54.6	123 03 15.2	1.006	Hoodsport
HOG	%	42 14 32.7	121 42 20.5	1.887	Hogback Mtn., Oregon
HSO	%	43 31 33.0	123 05 24.0	1.020	Harness Mountain, Oregon
HSR	%	46 10 28.0	122 10 46.0	1.720	South Ridge, Mt. St. Helens
HTW	%	47 48 14.2	121 46 03.5	0.833	Haystack Lookout
HUO	%	44 07 10.9	121 50 53.5	2.037	Husband OR (UO)
IRO	%	44 00 19.0	122 15 15.4	1.642	Indian Ridge, OR
JBO	+	45 27 41.7	119 50 13.3	0.645	Jordan Butte, Oregon
JCW	%	48 11 42.7	121 55 31.1	0.792	Jim Creek
JUN	%	46 08 50.0	122 09 04.4	1.049	June Lake
KMO	%	45 38 07.8	123 29 22.2	0.975	Kings Mt., Oregon
KOS	%	46 27 46.7	122 11 41.3	0.610	Kosmos
KTR	N	41 54 31.2	123 22 35.4	1.378	CAL-NET
LAB	%	42 16 03.3	122 03 48.7	1.774	Little Aspen Butte, Oregon
LAM	N	41 36 35.2	122 37 32.1	1.769	CAL-NET
LCCM	M	45 50 16.8	111 52 40.8	1.669	Lewis and Clark Caverns, MT
LCW	%	46 40 14.4	122 42 02.8	0.396	Lucas Creek
LMW	%	46 40 04.8	122 17 28.8	1.195	Ladd Mt.
LNO	+	45 52 18.6	118 17 06.6	0.771	Lincton Mt., Oregon
LO2	%	46 45 00.0	121 48 36.0	0.853	Longmire
LOC	+	46 43 01.2	119 25 51.0	0.210	Locke Island
LVP	%	46 03 59.4	122 24 10.2	1.134	Lakeview Peak
MBW	%	48 47 02.4	121 53 58.8	1.676	Mt. Baker
MCMT	M	44 49 39.6	112 50 55.8	2.323	McKenzie Canyon, MT
MCW	%	48 40 46.8	122 49 56.4	0.693	Mt. Constitution
MDW	+	46 36 47.4	119 45 39.6	0.330	Midway
MEW	%	47 12 07.0	122 38 45.0	0.097	McNeil Island
MJ2	+	46 33 27.0	119 21 32.4	0.146	May Junction 2
MOON	%	44 03 05.5	121 40 05.5	2.270	Moon Mt, OR
MOX	+	46 34 38.4	120 17 53.4	0.501	Moxie City
MPO	%	44 30 17.4	123 33 00.6	1.249	Mary's Peak, Oregon
MTM	%	46 01 31.8	122 12 42.0	1.121	Mt. Mitchell
NAC	+	46 43 59.4	120 49 25.2	0.728	Naches
NCO	%	43 42 14.4	121 08 18.0	1.908	Newberry Crater, Oregon
NEL	+	48 04 12.6	120 20 24.6	1.500	Nelson Butte
NLO	%	46 05 21.9	123 27 01.8	0.826	Nicolai Mt., Oregon

STA	F	LAT	LONG	EL	NAME
OBC	%	48 02 07.1	124 04 39.0	0.938	Olympics - Bonidu Creek
OBH	%	47 19 34.5	123 51 57.0	0.383	Olympics - Burnt Hill
OCP	%	48 17 53.5	124 37 30.0	0.487	Olympics - Cheeka Peak
OD2	+	47 23 15.6	118 42 34.8	0.553	Odessa site 2
ON2	%	46 52 50.8	123 46 51.8	0.257	Olympics - North River
OOW	%	47 44 03.6	124 11 10.2	0.561	Octopus West
OSD	%	47 48 59.2	123 42 13.7	2.008	Olympics - Snow Dome
OSR	%	47 30 20.3	123 57 42.0	0.815	Olympics Salmon Ridge
OT3	+	46 40 08.4	119 13 58.8	0.322	New Othello (replaces OT2 8/26)
OTR	%	48 05 00.0	124 20 39.0	0.712	Olympics - Tyee Ridge
PAT	+	45 52 55.2	119 45 08.4	0.262	Paterson
PCMD	%	46 53 20.9	122 18 00.9	0.239	PC Mountain Detachment ANSS-SM
PGO	%	45 27 42.6	122 27 11.5	0.253	Gresham, Oregon
PGW	%	47 49 18.8	122 35 57.7	0.122	Port Gamble
PRO	+	46 12 45.6	119 41 08.4	0.553	Prosser
RCM	%	46 50 08.9	121 43 54.4	3.085	Mt. Rainier, Camp Muir
RCS	%	46 52 15.6	121 43 52.0	2.877	Mt. Rainier, Camp Schurman
RED	H	46 17 51.0	119 26 15.6	0.330	Red Mountain PNNL Station
RER	%	46 49 09.2	121 50 27.3	1.756	Mt. Rainier, Emerald Ridge
RMW	%	47 27 35.0	121 48 19.2	1.024	Rattlesnake Mt. (West)
RNO	%	43 54 58.9	123 43 25.5	0.850	Roman Nose, Oregon
RPW	%	48 26 54.0	121 30 49.0	0.850	Rockport
RRHS	%	46 47 58.6	123 02 25.4	0.047	Rochester HS ANSS-SMO
RSW	+	46 23 40.2	119 35 28.8	1.045	Rattlesnake Mt. (East)
RVC	%	46 56 34.5	121 58 17.3	1.000	Mt. Rainier - Voight Creek
RVW	%	46 08 53.2	122 44 32.1	0.460	Rose Valley
SAW	+	47 42 06.0	119 24 01.8	0.701	St. Andrews
SBES	%	48 46 05.9	122 24 54.2	0.119	Silver Beach ES SMO
SEA	%	47 39 15.8	122 18 29.3	0.030	UW, Seattle (Wood Anderson BB
SEP	#	46 12 00.7	122 11 28.1	2.116	September lobe, Mt. St. Helens
SFER	%	47 37 10.4	117 21 55.7	0.715	Spokane, Ferris High School
SHW	%	46 11 37.1	122 14 06.5	1.425	Mt. St. Helens
SLF	%	47 45 32.0	120 31 40.0	1.750	Sugar Loaf
SMW	%	47 19 10.7	123 20 35.4	0.877	South Mtn.
SNI	H	46 27 50.4	119 39 35.1	0.323	Snively PNNL station
SOS	%	46 14 38.5	122 08 12.0	1.270	Source of Smith Creek
SSO	%	44 51 21.6	122 27 37.8	1.242	Sweet Springs, Oregon
STD	%	46 14 16.0	122 13 21.9	1.268	Studebaker Ridge
STW	%	48 09 03.1	123 40 11.1	0.308	Striped Peak
SVOH	%	48 17 21.8	122 37 54.8	0.022	Skagit Valley CC ANSS-SMO
TBM	+	47 10 12.0	120 35 52.8	1.006	Table Mt.
TDH	%	45 17 23.4	121 47 25.2	1.541	Tom,Dick,Harry Mt., Oregon
TDL	%	46 21 03.0	122 12 57.0	1.400	Tradedollar Lake
TRW	+	46 17 32.0	120 32 31.0	0.723	Toppenish Ridge
TWW	+	47 08 17.4	120 52 06.0	1.027	Teanaway
UWFH	%	48 32 46.0	123 00 43.0	0.010	UW Friday Harbor ANSS-SMO
VBE	%	45 03 37.2	121 35 12.6	1.544	Beaver Butte, Oregon
VCR	%	44 58 58.2	120 59 17.4	1.015	Criterion Ridge, Oregon
VDB	C	49 01 34.0	122 06 10.1	0.404	Canada
VFP	%	45 19 05.0	121 27 54.3	1.716	Flag Point, Oregon
VG2	%	45 09 20.0	122 16 15.0	0.823	Goat Mt., Oregon
VGB	+	45 30 56.4	120 46 39.0	0.729	Gordon Butte, Oregon
VGZ	C	48 24 50.0	123 19 27.8	0.067	Canada
VIP	%	44 30 29.4	120 37 07.8	1.731	Ingram Pt., Oregon
VLL	%	45 27 48.0	121 40 45.0	1.195	Laurance Lk., Oregon
VLM	%	45 32 18.6	122 02 21.0	1.150	Little Larch, Oregon
VSP	%	42 20 30.0	121 57 00.0	1.539	Spence Mtn, Oregon
VT2	+	46 58 02.4	119 59 57.0	1.270	Vantage2
VTH	%	45 10 52.2	120 33 40.8	0.773	The Trough, Oregon
WA2	+	46 45 19.2	119 33 56.4	0.244	Wahluke Slope
WAT	+	47 41 55.2	119 57 14.4	0.821	Waterville
WIB	%	46 20 34.8	123 52 30.6	0.503	Willapa Bay
WIW	+	46 25 45.6	119 17 15.6	0.128	Wooded Island
WPO	%	45 34 24.0	122 47 22.4	0.334	West Portland, Oregon
WPW	%	46 41 55.7	121 32 10.1	1.280	White Pass
WRD	+	46 58 12.0	119 08 41.4	0.375	Warden
WRW	%	47 51 26.0	120 52 52.0	1.189	Wenatchee Ridge
YA2	+	46 31 36.0	120 31 48.0	0.652	Yakima
YEL	#	46 12 35.0	122 11 16.0	1.750	Yellow Rock, Mt. St. Helens
YPT	+	46 02 55.8	118 57 44.0	0.325	Yellepit

Table 1B lists broad-band stations used in locating seismic events in Washington and Oregon, and Table 1C lists strong-motion stations.

TABLE 1B

Broad-band three-component stations operating at the end of the fourth quarter 2002. Symbols are as in Table 1A.

STA	F	LAT	LONG	EL	NAME
BRKS	%	47 45 19.1	122 17 17.9	0.020	Brookside ANSS-SMO
COR	U	44 35 08.5	123 18 11.5	0.121	Corvallis, Oregon (OSU BB)
DBO	%	43 07 09.0	123 14 34.0	0.984	Dodson Butte, Oregon (UO CREST)
ELW	%	47 29 39.4	121 52 17.2	0.267	EchoLakeBPA BB-SMO-IDS20
ERW	%	48 27 14.4	122 37 30.2	0.389	Mt. Erie SMO-IDS24 BB
EUO	%	44 01 45.7	123 04 08.2	0.160	Eugene,OR U0 CREST BB SMO
GNW	%	47 33 51.8	122 49 31.0	0.165	Green Mt CREST BB SMO
HAWA	U	46 23 32.3	119 31 57.2	0.367	Hanford Nike USNSN BB
HEBO	%	45 12 49.2	123 45 15.0	0.875	Mt. Hebo, OR CREST BB SMO
HLID	U	43 33 45.0	114 24 49.3	1.772	Hailey, ID USNSN BB
HOOD	%	45 19 17.8	121 39 07.8	1.520	Mt Hood Mdws, OR CREST BB SMO
HUMO		42 36 25.6	122 57 24.1	0.555	Hull Mountain,OR BB from UCB
KBO	N	42 12 45.0	124 13 33.3	1.008	Bosley Butte, OR CREST BB
KEB	N	42 52 20.0	124 20 03.0	0.818	Edson Butte, OR CREST BB
KRMB	N	41 31 23.0	123 54 29.0	1.265	Red Mtn, OR CREST BB
KSXB	N	41 49 51.0	123 52 33.0	-	Camp Six, OR CREST BB
LON	%	46 45 00.0	121 48 36.0	0.853	Longmire CREST BB LONLZ SMO
LTY	%	47 15 21.2	120 39 53.3	0.970	Liberty (BB)
MEGW	%	46 15 57.4	123 52 38.2	0.332	Megler, WA CREST BB SMO
MOD		41 54 08.9	120 18 10.6	1.555	Modoc Plateau, CA from UCB
NEW	U	48 15 50.0	117 07 13.0	0.760	Newport Observatory USNSN BB
OCWA	U	47 44 56.0	124 10 41.2	0.671	Octopus Mtn. USNSN BB
OFR	%	47 56 00.0	124 23 41.0	0.152	Olympics, Forest Resource Center
OPC	%	48 06 01.0	123 24 41.8	0.090	Olympic Penn College CREST BB
OZB	C	48 57 37.1	125 29 34.1	0.671	Canada
PFB	C	48 34 30.0	124 26 39.8	0.465	P.Renfrew, Canada
PIN	%	43 48 40.0	120 52 19.0	1.865	Pine Mt., Oregon (U0 CREST, BB)
PNT	C	49 18 57.6	119 36 57.6	0.550	Canada, BB
SEA	%	47 39 15.8	122 18 29.3	0.030	UW, Seattle (Wood Anderson BB)
SNB	C	48 46 33.6	123 10 16.3	0.408	Canada BB
SP2	%	47 33 23.3	122 14 52.8	0.030	Seward Park, Seattle SMO-IDS24
SQM	%	48 04 39.0	123 02 44.0	0.030	Sequim, WA (CREST BB SMO)
TAKO	%	43 44 36.6	124 04 52.5	0.046	Tahkenitch, OR CREST BB SMO
TOLO	%	44 37 19.3	123 55 16.6	0.021	Toledo BPA, OR CREST BB SMO
TTW	%	47 41 40.7	121 41 20.0	0.542	Tolt Res, WA CREST BB SMO
WVOR	U	42 26 02.0	118 38 13.0	1.344	Wildhorse Valley, Oregon (USNS)
YBH		41 43 55.3	122 42 37.4	1.060	Yreka, CA from UCB

Table 1C lists strong-motion, three-component stations operating in Washington and Oregon that provide data in real or near-real time to the PNSN. Several of these stations also have broad-band instruments, as noted. The "SENSOR" field designates what type of seismic sensor is used;

- A = Terra-Tech SSA-320 SLN triaxial accelerometer/Terra-Tech IDS24
- A20 = Terra-Tech SSA-320 triaxial accelerometer/Terra-Tech IDS20 recording system,
- FBA23 = Kinemetrics FBA23 accelerometers and Reftek recording system,
- EPI = Kinemetrics Episensor accelerometers and Reftek recording system.
- BB = Guralp CMG-40T 3-D broadband velocity sensor.
- BB3 = Guralp CMG3T 3-D broadband velocity sensor.
- BBZ = Broad Band sensor, PMD 2024, vertical component only.
- K2 = Kinemetrics Episensor accelerometers and K2 Recording System

The "TELEMETRY" field indicates the type of telemetry used to recover the data.

- D = dial-up,
- E = continuously telemetered via Internet from a remote EARTHWORM system
- I = continuously telemetered via Internet,
- L = continuously telemetered via dedicated lease-line telephone lines,
- L-PPP = continuously telemetered via dedicated lease-line telephone lines using PPP protocol
- M = continuously telemetered via BPA microwave
- R = continuously telemetered via spread-spectrum radio

TABLE 1C

Strong-motion three-component stations operating at the end of the fourth quarter 2002. Symbols are as in Table 1A.

STA	F	LAT	LONG	EL	NAME	SENSORS	TELEMETRY
ALCT	%	47 38 48.8	122 2 15.7	0.055	Alcott Elementary	K2	I
ALST	%	46 6 32.3	123 1 58.5	0.198	Alston	A20	E,M
ALVY	%	43 59 53.2	123 0 57.0	0.155	Alvey	K2	E,M
ATES	%	48 14 10.9	122 3 33.0	0.062	Trafton Elementary	K2	I
BABE	%	47 36 21.0	122 32 7.0	0.083	Blakely Elementary	K2	I
BEND	%	44 4 0.8	121 19 36.0	0.000	U of O Bend Field Office	K2	I
BEVT	%	47 55 12.0	122 16 12.0	0.170	Boeing Plant Everett	K2	I
BRKS	%	47 45 19.1	122 17 17.9	0.020	Brookside Elementary	K2,BBZ	I
COLT	%	45 10 13.1	122 26 12.8	0.213	Colton High School	CMG5T	I
CSO	#	45 31 1.0	122 41 22.5	0.036	Canyon	FBA23	D
DBO	%	43 7 9.0	123 14 34.0	0.984	Dodson Butte (CREST)	EPI,BB3	E,L-PPP
EARN	%	47 44 27.2	122 2 37.7	0.159	East Ridge Elementary	K2	I
EGRN	%	47 4 24.0	122 58 41.0	0.057	Evergreen State College	K2	I
ELW	%	47 29 39.4	121 52 17.2	0.267	Echo Lake	A,BB	D,M,L
ERW	%	48 27 14.4	122 37 30.2	0.389	Mount Erie	A,BB	D,L,M
EUO	%	44 1 45.7	123 4 8.2	0.160	Eugene Golf Course (CREST)	EPI,BB	E,L-PPP
EVCC	%	48 0 27.0	122 12 15.3	0.030	Everett Community College	K2	I
EVGW	%	47 51 15.8	122 9 12.2	0.122	Gateway Middle School	K2	I
EYES	%	45 19 46.5	123 3 23.5	0.061	Ewing Young Elementary	CMG5T	I
FINN	%	47 43 10.2	122 13 55.9	0.121	Finn Hill Junior High	K2	I
GNW	%	47 33 51.8	122 49 31.0	0.165	Green Mountain (CREST)	EPI,BB3	L-PPP
HAO	#	45 30 33.1	122 39 24.0	0.018	Harrison	FBA23	D
HEBO	%	45 12 49.2	123 45 15.0	0.875	Mt. Hebo (CREST)	EPI,BB	M,E
HICC	%	47 23 24.4	122 17 52.4	0.115	Highline Community College	K2	I
HOLY	%	47 33 55.4	122 23 1.0	0.106	Holy Rosary School	K2	I
HOOD	%	45 19 17.8	121 39 7.8	1.520	Hood Meadows (CREST)	EPI,BB	L-PPP,I
HUBA	%	45 37 51.0	122 39 4.9	0.023	Hudson's Bay High School	CMG5T	I
KDK	%	47 35 42.7	122 19 56.0	0.004	King Dome	K2	I
KEEL	%	45 33 0.8	122 53 42.4	0.067	Keeler	A20	D,E,M
KICC	%	47 34 37.9	122 37 52.4	0.017	Kitsap County Central Communications	K2	I
KIMB	%	47 34 29.3	122 18 10.1	0.069	Kimball Elementary	K2	I
KIMR	%	47 30 11.0	122 46 2.0	0.123	Mod. Risk Waste Collection Facility	K2	I
KINR	%	47 45 6.0	122 38 35.0	0.008	North Road Shed	K2	I
KITP	%	47 40 30.0	122 37 47.0	0.076	Wastewater Treatment Plant	K2	I
KNJH	%	47 23 5.0	122 13 42.0	0.014	Kent Junior High	K2	I
LANE	%	44 3 6.5	123 13 54.8	0.120	Lane	K2	E,M
LAWT	%	47 39 23.4	122 23 21.9	0.050	Lawton Elementary	A20	I
LEOT	%	47 46 4.4	122 6 56.2	0.115	Leota Junior High	K2	I
LON	%	46 45 0.0	121 48 36.0	0.853	Longmire Sprgs (CREST)	EPI,BB3	L-PPP
LTY	%	47 15 21.2	120 39 53.4	0.970	Liberty Hghts Mine (CREST)	BB3	I
MARY	%	47 39 45.7	122 7 11.6	0.011	Marymoor Park	K2	I
MBKE	%	48 55 2.0	122 8 29.0	1.010	Kendall Elementary	K2	I
MBPA	%	47 53 54.7	121 53 20.2	0.186	Monroe	A20	D,M,L
MEAN	%	47 37 21.7	122 18 18.7	0.037	Meany Middle School	K2	I
MEGW	%	46 15 57.4	123 52 38.2	0.332	Megler (CREST)	EPI,BB	M,E
MPL	%	47 28 7.0	122 11 4.5	0.122	Maple Valley	A	D,M,L
MRIN	%	44 48 1.4	122 41 53.8	0.187	Marion	K2	M,E
NIHS	%	47 44 29.2	122 13 17.1	0.137	Inglemoore High School	K2	I
NOWS	%	47 41 12.0	122 15 21.2	0.002	NOAA Sand Point	A20	I
OFR	%	47 56 0.0	124 23 41.0	0.152	Olympic Nat. Res. Cntr (CREST)	EPI,BB	I,E
OHC	%	47 20 2.0	123 9 29.0	0.006	Hood Canal Junior High	K2	I
OPC	%	48 6 1.0	123 24 41.8	0.090	Peninsula College (CREST)	EPI,BB	I
PAYL	%	47 11 34.0	122 18 46.0	0.009	Aylen Junior High	K2	I
PCEP	%	47 6 41.8	122 17 24.0	0.160	Puyallup East Sheriff Precinct	K2	I
PCFR	%	46 59 23.3	122 26 27.4	0.137	Roy Training Center	K2	I
PCMD	%	46 53 20.9	122 18 0.9	0.239	Mountain Detachment	K2	I
PERL	%	45 19 42.0	122 46 40.2	0.068	Pearl	K2	M,E
PIN	%	43 48 40.0	120 52 19.0	1.865	Pine Mtn. (CREST)	EPI,BB3	E,L-PPP
PNLK	%	47 34 54.5	122 2 1.0	0.128	Pine Lake Middle School	K2	I
QAW	%	47 37 54.3	122 21 15.5	0.140	Queen Anne	A20	L
RAW	%	47 20 14.0	121 55 53.2	0.208	Raver	A20	M,L
RBEN	%	47 26 6.7	122 11 10.0	0.152	Benson Hill Elementary	K2	I
RBO	#	45 32 27.0	122 33 51.5	0.158	Rocky Butte	FBA23	D
RHAZ	%	47 32 24.7	122 11 1.3	0.108	Hazelwood Elementary	A20	I
ROSS	%	45 39 43.0	122 39 25.0	0.061	Ross	A20	E
RRHS	%	46 47 58.6	123 2 25.4	0.047	Rochester High School	K2	I
RWW	%	46 57 53.7	123 32 31.7	0.015	Ranney Well (CREST)	EPI,BB3	L-PPP
SBES	%	48 46 5.9	122 24 54.2	0.119	Silver Beach Elem. School	K2	I
SEA	%	47 39 15.8	122 18 29.3	0.030	Univ. of Washington	A20,PMD2023	L
SFER	%	47 37 10.4	117 21 55.7	0.715	Ferris High School	K2	I
SGAR	%	47 40 37.8	117 24 50.3	0.579	Garfield Elementary	K2	I
SHIP	%	47 39 19.0	122 19 14.4	0.005	WashDOT Lake Union Shop	CMG5T	I,R
SHLY	$	47 42 30.4	117 24 57.7	0.626	Spokane Temp	K2	None
SMNR	%	47 12 16.6	122 13 53.4	0.022	Sumner High School	K2	I
SNIO	$	47 40 46.0	117 24 18.0	0.584	Spokane NIOSH	K2	None
SOPS	$	47 43 40.8	117 18 46.5	0.707	Orchard Prairie Elementary	K2	I
SP2	%	47 33 23.3	122 14 52.8	0.030	Seward Park	A,BB	L
SQM	%	48 4 39.0	123 2 44.0	0.030	Sequim Battelle Prop. (CREST)	EPI,BB	I,R
SVOH	%	48 17 21.8	122 37 54.8	0.022	Skagit Valley College Oak Harbor	K2	I
SVTR	%	47 29 45.4	121 46 49.3	0.146	Two Rivers School	CMG5T	I
SWES	%	47 42 51.0	117 27 53.2	0.623	Westview Elementary	K2	I
SWID	%	48 0 31.0	122 24 42.0	0.062	South Whidbey Primary School	K2	I
TAKO	%	43 44 36.6	124 4 52.5	0.046	Tahkenitch (CREST)	EPI,BB	M,E
TBPA	%	47 15 29.0	122 22 1.0	0.002	Tacoma	A20	M,L,D
TKCO	%	47 32 12.7	122 18 1.5	0.005	King County Airport	A20	I
TOLO	%	44 37 19.3	123 55 16.6	0.021	Toledo (CREST)	EPI,BB	M,E
TTW	%	47 41 40.7	121 41 20.0	0.542	Tolt Reservoir (CREST)	EPI,BB	I
UPS	%	47 15 50.2	122 29 1.1	0.113	University of Puget Sound	K2	I
UWFH	%	48 32 46.0	123 0 43.0	0.010	Friday Harbor Laboratories	K2	I
VVHS	%	47 25 25.1	122 27 13.1	0.095	Vashon High School	K2	I
WISC	%	47 36 32.0	122 10 27.8	0.056	Wilburton Instruct. Svcs. Cntr.	K2	I

Data Processing

The PNSN seismic recording system uses real-time telemetry, and records earthquake using an 'event trigger'. Analog and strong-motion digital data are recorded at 100 samples per sec., while broad-band digital data are usually digitized at 50 samples per sec. Arrival times, first motion polarities, signal durations, signal amplitudes, locations and focal mechanisms (when possible) are determined in post-processing. Digital data are processed for all locatable teleseisms, regional events, and local events. Each trace data file has an associated 'pickfile' which includes arrival times, polarities, coda lengths, and other data.

EARTHWORM is our main PNSN data-acquisition system. Analog stations, and most digital stations, are continuously telemetered in real time. Only one broadband station (LTY) and three USGS strong-motion stations in Portland record only on-site. Their data are retrieved via dial-up modem, if needed. All of the real-time data are continuously recorded into temporary disk storage areas called "wave tanks" which can accommodate about 24 hours of continuous data for the entire network. Triggering algorithms create individual event files.

Continuous seismic data are archived for about 40 stations, many on volcanoes. We continue to use the UW2 pickfile and data formats, and analysis tools which have been in place for the past decade.

Unedited network-trigger trace data are stored on ongoing "network-archive" backup tapes. Edited "Master Event" trace data files are kept for all seismic events. These "Master Event" files are also translated to IRIS-SEED format and submitted to the IRIS Data Management Center for archive and distribution.

Through EARTHWORM, we exchange real-time data with the University of Oregon, The Battelle Pacific Northwest National Labs, the Pacific Geoscience Centre, the Montana Bureau of Mines, and CALNET. In addition, we send real-time data to the Alaska Tsunami Warning Center, the Pacific Tsunami Warning Center, the Cascade Volcano Observatory, and the National Earthquake Information Center,

The entire PNSN catalog has been contributed to the CNSS composite catalog located at the Northern California Earthquake Data Center. The PNSN section of the CNSS catalog is updated daily.

Starting in the fall of 2001, we started shipping a large portion of our waveform data to the IRIS DMC in near real time. This was done by running the *ew2seed* program at IRIS which connects to our EARTHWORM waveservers and extracts 1/2 hour of data at a time. Sevral months of testing proved successful. In the spring of 2002, we started sending all PNSN traces from all wave servers so that IRIS has a complete copy of all our continuous data in the BUD (Buffer of Uniform Data) system.

Publications

Publications wholly or partly supported under this operating agreement are listed in Appendix 2.

SEISMICITY, EMERGENCY NOTIFICATION, AND OUTREACH

Seismicity

Figure 2 shows earthquakes of magnitude 2.0 or larger located in Washington and Oregon during this reporting period. Table 2 lists earthquakes recorded by the PNSN during 2002 which were reported felt. Table 3 gives information on seismic activity recorded at the PNSN annually since 1980. During this reporting period there were 24 earthquakes reported felt west of the Cascades in Washington, ranging in magnitude from 1.7 to 4.1. Four Oregon earthquakes were reported felt this year; ranging in magnitude from 3.2 to 4.5

East of the Cascades in Washington, 12 earthquakes were felt during 2002. These ranged from magnitude -0.9 to 3.4 and included 6 extremely tiny (M -0.9 to 0.6)events in the Spokane urban area, where a vigorous sequence of earthquakes occurred in 2001.

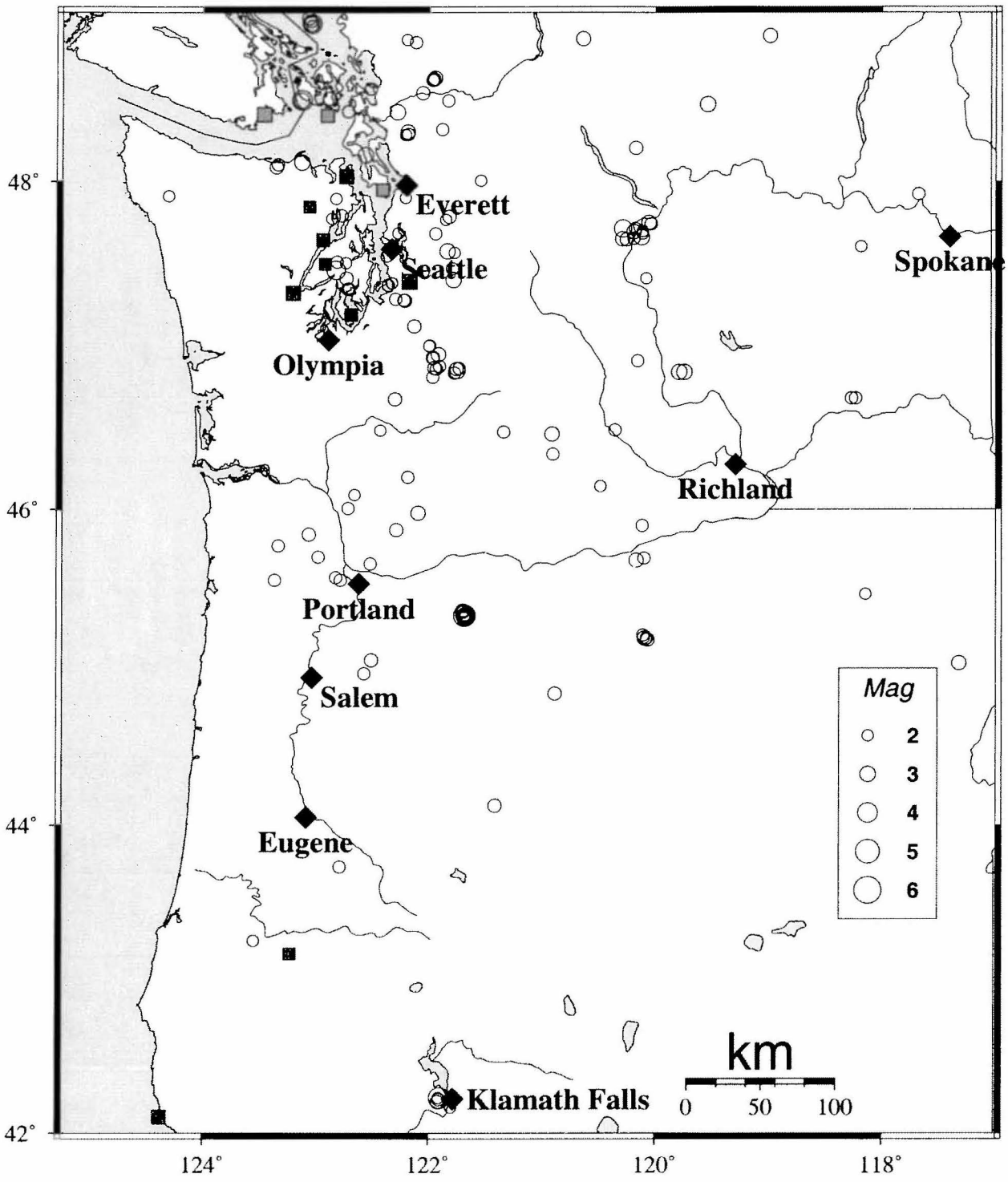

Figure 2. Year 2002 located earthquakes, magnitude >= 2.0. Grey squares indicate earthquakes with depth greater than 30km. Unfilled circles indicate earthquakes with depth <= 30km. Black diamonds indicate cities. Area covered is 117W-125.25W, 42N-49N

TABLE 2 - Felt Earthquakes during 2002

DATE-(UTC)-TIME yy/mm/dd hh:mm:ss	LAT(N) deg.	LON(W) deg.	DEPTH km	MAG	COMMENTS
02/01/04 07:16:12	47.67	117.41	0.6	-0.7	0.7 km WNW of Spokane, WA (Mission & N Division)
02/01/09 03:26:54	48.11	123.12	21.8	2.9	23.4 km E of Port Angeles, WA
02/01/26 14:01:46	47.13	122.13	8.5	2.4	13.7 km SW of Enumclaw, WA
02/02/12 19:16:41	48.41	122.28	18.6	3.0	4.0 km E of Mount Vernon, WA
02/03/11 00:43:51	47.50	122.73	22.7	1.7	10.6 km SW of Bremerton, WA
02/04/13 07:18:55	47.67	117.43	1.3	-0.2	1.6 km WNW of Spokane, WA (Mission & N Division)
02/04/14 15:20:46	47.69	117.39	2.5	-0.9	3.1 km NNE of Spokane, WA (Mission & N Division)
02/04/21 06:21:18	47.68	117.42	0.3	-0.4	1.8 km NW of Spokane, WA (Mission & N Division)
02/04/22 10:38:51	47.29	122.29	20.6	2.2	12.1 km ENE of Tacoma, WA
02/05/01 09:09:45	48.45	119.54	3.7	2.9	10.6 km NNE of Okanogan, WA
02/05/15 17:54:48	42.23	121.90	8.1	4.3	10.0 km W of Klamath Falls, OR
02/05/30 01:40:16	48.87	122.20	13.8	1.6	5.9 km NNE of Deming, WA
02/06/06 14:42:46	47.72	120.28	7.2	3.4	8.1 km NW of Entiat, WA
02/06/16 17:11:10	47.47	122.82	16.1	3.7	18.2 km SW of Bremerton, WA
02/06/29 14:36:04	45.33	121.68	6.2	4.5	4.5 km S of Mt Hood, OR
02/06/29 14:41:21	45.32	121.68	2.7	3.2	5.4 km SSE of Mt Hood, OR
02/06/29 18:49:58	45.34	121.67	6.1	3.8	3.9 km SSE of Mt Hood, OR
02/07/03 12:22:45	48.93	123.04	14.5	3.0	21.9 km S of Vancouver,BC
02/07/22 07:27:34	47.40	121.78	28.0	3.1	9.8 km S of North Bend, WA
02/07/30 21:20:47	48.03	122.73	58.6	2.6	33.6 km NNW of Poulsbo, WA
02/07/31 09:01:58	47.40	122.17	49.3	2.9	10.3 km W of Maple Valley, WA
02/08/10 20:23:04	47.68	117.41	0.0	-0.2	1.6 km NNW of Spokane, WA (Mission & N Division)
02/08/24 03:36:16	47.65	120.29	4.3	2.7	5.1 km W of Entiat, WA
02/09/18 04:37:28	47.57	121.77	11.2	2.0	8.5 km E of Fall City, WA
02/09/21 00:55:20	48.48	123.12	23.4	4.1	10.6 km WSW of Friday Harbor, WA
02/09/21 08:07:14	48.52	122.05	0.0	2.5	13.4 km ENE of Sedro Woolley, WA
02/09/25 05:30:54	48.60	121.96	0.0	2.4	17.7 km WNW of Concrete, WA
02/09/25 05:35:49	48.61	121.95	0.0	2.6	17.2 km WNW of Concrete, WA
02/09/25 07:30:55	47.79	121.82	7.2	2.4	13.3 km ENE of Duvall, WA
02/09/26 07:00:04	48.48	123.13	23.1	2.9	11.2 km WSW of Friday Harbor, WA
02/10/04 17:31:32	47.65	120.25	3.0	2.5	2.3 km WSW of Entiat, WA
02/10/08 10:40:23	47.58	121.84	17.5	2.9	4.2 km ENE of Fall City, WA
02/10/18 10:13:57	47.00	121.99	15.7	2.0	21.7 km S of Enumclaw, WA
02/10/31 10:50:46	48.49	122.88	0.1	2.4	10.1 km ESE of Friday Harbor, WA
02/11/04 05:02:03	48.16	122.56	26.7	3.1	33.3 km SSW of Mount Vernon, WA
02/11/23 09:41:17	47.69	117.40	0.0	0.6	2.3 km N of Spokane, WA (Mission & N Division)
02/11/29 11:52:35	48.93	123.04	13.3	3.8	22.0 km S of Vancouver,BC
02/12/07 04:26:40	48.10	123.34	8.8	2.2	7.8 km E of Port Angeles, WA
02/12/27 06:38:06	48.08	123.35	8.9	2.4	7.5 km ESE of Port Angeles, WA

TABLE 3

Annual counts of events recorded by the PNSN, 1980-2002

Year	Total #	Out of Net	Inside Net			
			Unlocated	Located Total	Located EQs(#felt)	Located Blasts
80	4576	253	1075	3246	2874(18)	372
81	5155	291	1474	3385	2672(29)	713
82	4452	329	1824	2297	1948(20)	349
83	4489	405	2338	1745	1356(15)	389
84	3144	267	1095	1780	1409(16)	371
85	3560	266	1168	2122	1890(16)	232
86	2554	318	452	1776	1594(21)	182
87	1981	537	127	1304	966(22)	338
88	2249	507	114	1624	1263(19)	361
89	2781	501	137	2136	1835(38)	301
90	3433	717	204	2505	2096(26)	409
91	3083	675	315	2085	1687(26)	398
92	3522	891	235	2381	1993(22)	388
93	5594	731	626	4224	3877(35)	347
94	6243	900	1518	3816	3424(28)	392
95	5354	959	1462	2915	2539(16)	376
96	4741	911	1192	2628	2214(39)	414
97	3881	728	904	2239	1992(35)	247
98	7463	831	2174	4430	4176(11)	254
99	4505	803	1483	2187	1965(30)	222
00	5625	1121	1686	2818	2482(18)	341
01	5945	1090	2106	2730	2258(95)	472
02	5495	951	1751	2752	2299(39)	453

Emergency Notification

The RACE system, discussed earlier, is a pager-based alarm system that updates earthquake locations on a map displayed on a PC screen. When a "significant" event (magnitude 2.9 or larger) is located by the PNSN automatic systems, a preliminary location and magnitude is sent within minutes to seismologists and the RACE system via pager. The same information is forwarded via fax and e-mail to others with critical need. A set of web-pages on earthquakes magnitude 3.3 and larger are automatically generated and linked to the PNSN web-site. These preliminary messages are rapidly followed by final processing and update of the RACE systems, faxes, e-mail, and web-site, within 20 minutes to an hour.

Public Information and Outreach

Summary lists for all earthquakes located by the PNSN since 1969 are available via anonymous ftp on **ftp.geophys.washington.edu** in the *pub/seis_net* subdirectory. This information is also available via the PNSN **World-Wide-Web(WWW)** site.

http://www.geophys.washington.edu/SEIS/PNSN/

Our web-server contains text about earthquakes in the Pacific Northwest, maps of stations, catalogs and maps of recent earthquake activity, and maps and text about recent interesting sequences. It also contains links into other sources of earthquake information around the country and world.

The PNSN has an educational outreach program to better inform the public, policy makers, and emergency managers about seismicity and natural hazards. We provide information sheets, lab tours, workshops, and media interviews, and have an audio library with several tapes. We organize and participate in special events in addition to our normal background of informational work; including several thousand calls per quarter to our audio library; tours of the PNSN lab by hundreds of students, teachers, and parents; and outreach talks to numerous groups of all types.

Interest from the press and public continued at a very high level during 2002. Highlights of the PNSN's outreach activities include the first anniversary of the magnitude 6.8 Nisqually Earthquake which attracted major newspaper and television coverage. The Seattle Post Intelligencer produced a weeklong series of in-depth articles about the earthquake, its impacts, and preparedness and mitigation efforts underway. Also on the Nisqually anniversary, the University of Washington's Burke Museum opened a major earthquake exhibit entitled "The Big One" on February 28th 2002. A related traveling exhibit traveled to 6 communities in Washington and Oregon and is still on the road.

The PNSN also organized a "Seattle Fault Trench" press conference for the USGS. On August 25th Brian Sherrod reviewed preliminary findings at a trench in Bellevue to large groups of print and TV media, Bellevue City Officials, and Puget Sound Area engineers.

Other outreach activities included:

- PNSN staff met with numerous state and county officials, representatives of utility and private companies, and engineering and emergency management groups regarding rapid earthquake notification and long-term network and strong-motion development plans.
- The PNSN provided over 70 Seismology Lab tours and lectures for visiting class groups serving ~1,500 students primarily from grades 3-12. The PNSN also has developed new educational resources Web pages and responded to over 1,200 e-mail questions.
- Presentations were given to multiple professional and policy groups including the Oregon Seismic Safety Policy Advisory Committee, the Washington Seismic Safety Committee, and Tribal leaders from Washington and Oregon. Numerous presentations were also made to general audiences.
- The PNSN hosted several ANSS and CREW committee or subcommittee meetings
- PNSN representatives participated in national level ANSS committees and activities throughout the year, and attended a wide variety of other meetings related to earthquake hazards, preparedness, and related information and outreach.

ACKNOWLEDGMENTS

Seismic stations, telemetry links, and data acquisition equipment were maintained by Jim Ramey and Allen Strelow at the UW, Patrick McChesney (stationed at CVO in Vancouver, Washington), Pat Ryan (of the University of Oregon in Eugene, Oregon), and Don Hartshorn (of Pacific Northwest National Labs in Richland, WA). Bill Steele provided information to the public, while Amy Wright handled routine data analysis and archiving of digital trace data in UW2 format. George Thomas, Amy Lindemuth, and Lynn Hultgrien worked on strong motion instrumentation and software. Ruth Ludwin wrote reports and maintained the PNSN web-pages. The University of Oregon (UO) installed and maintained stations and telemetry links in central Oregon, and operated an earthworm node to transmit data to the University of Washington.

APPENDIX 1

PNSN Quarterly Reports
02-A, 02-B, 02-C, and 02-D