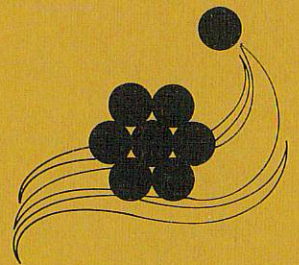


AIR QUALITY DATA SUMMARY

Counties Of King
Kitsap
Pierce
Snohomish

1979



**PUGET SOUND
AIR POLLUTION CONTROL AGENCY**

Puget Sound Air Pollution Control Agency

410 West Harrison Street, P.O. Box 9863 (206) 344-7330
Seattle, Washington 98109

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1979
AIR QUALITY
DATA SUMMARY

measured and compiled by the
Technical Services Division

PUGET SOUND
AIR POLLUTION CONTROL AGENCY
410 West Harrison Street
P.O. Box 9863
Seattle, Washington 98109

1979 AIR QUALITY DATA SUMMARY

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REFERENCE COPIES OF THIS SUMMARY HAVE BEEN PLACED IN PUBLIC AND COLLEGE LIBRARIES WITHIN THE PUGET SOUND REGION. INDIVIDUAL COPIES ARE FOR SALE AT THE PUGET SOUND AIR POLLUTION CONTROL AGENCY SEATTLE HEADQUARTERS OFFICE. PRICE: \$4.00

PUBLISHED NOVEMBER, 1980
TECHNICAL SERVICES DIVISION
(206) 344-7326

INTRODUCTION

Air quality and meteorological data collected in the Central Puget Sound Region during 1979 are presented in this eighth annual data summary. The format is similar to that of past annual summaries with contents updated for calendar year 1979. The description of the air quality and meteorological sampling system has been revised and updated with new pictures and accompanying discussion. Plots of temperature soundings on four days have been included on pages 36 and 37 to document the meteorological conditions associated with specific violations of air quality standards.

The report begins with a list of the Agency's air sampling sites. The related locator map makes clear that air monitoring is concentrated in or near industrial/urban centers. The body of the report contains summaries of pollutant measurements for 1979 together with interpretive comments. The report ends with meteorological data collected in the region. The stability wind roses on the last three pages are pictorial presentations of the actual distributions of meteorological data which are often used in modeling.

All data collected are reported quarterly to the State Department of Ecology; some of it is forwarded from there to the National Aerometric Data Bank maintained by the U. S. Environmental Protection Agency. The State Department of Ecology conducts some air monitoring within the region in addition to that done by the Agency. The Department of Ecology publishes its own annual summary which contains air quality data for the entire state. Requests for specific information on carbon monoxide, ozone and oxides of nitrogen should be directed to the Washington State Department of Ecology, Office of Air Programs, Data Control Section, Olympia, Washington 98504.

PUGET SOUND AIR POLLUTION CONTROL AGENCY

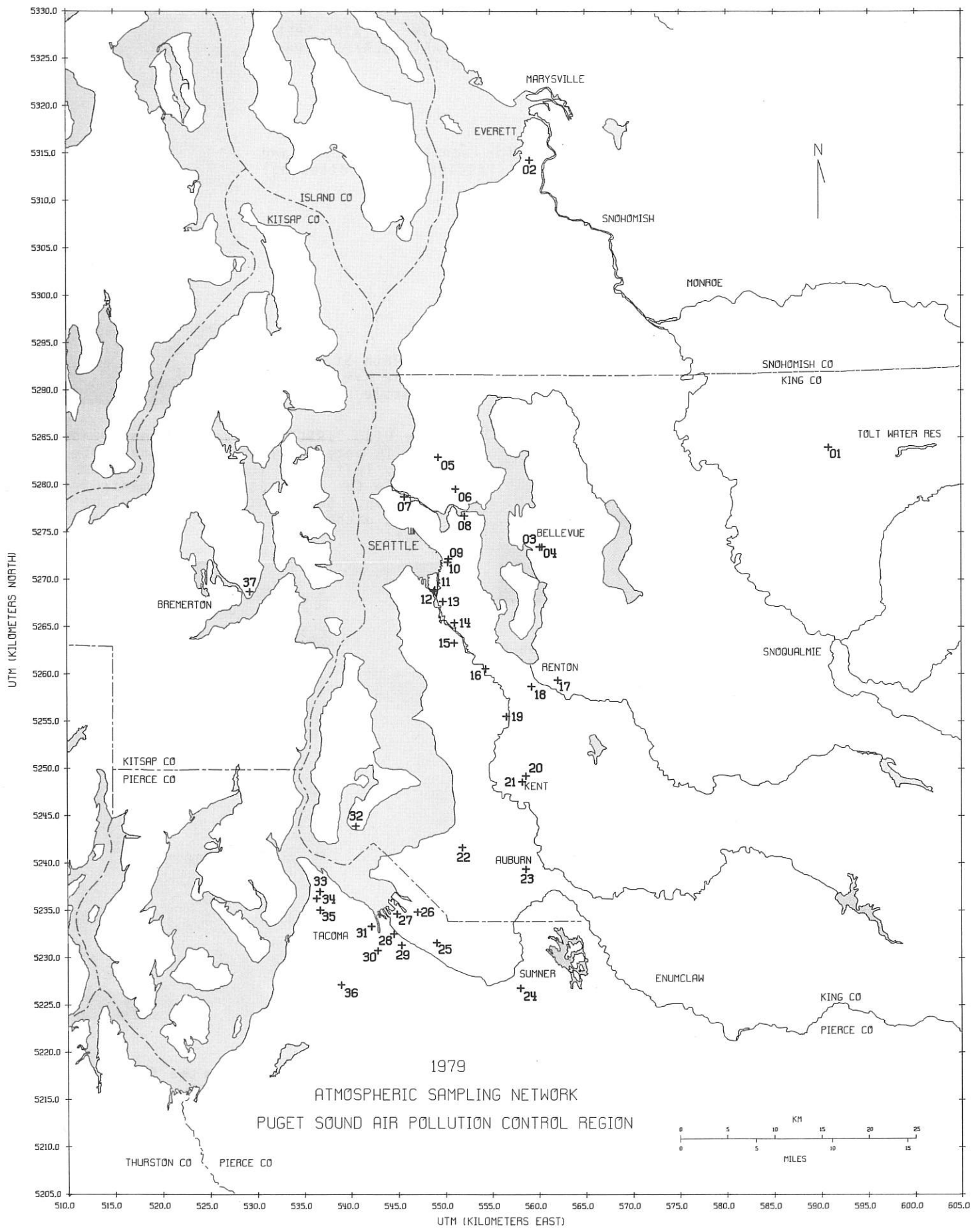
Atmospheric Sampling Network

1979

Sta. Code	Location	a Type of Sampling									
		A	B	C	D	E	F	G	H	I	
01	TOLT RIVER WATERSHED, KING CO, WA	A									
02	MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	A	B	C	D						I
*03	504 BELLEVUE WAY NE, BELLEVUE, WA	A									
*04	PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	A									I
05	NORTH 98TH ST & STONE AVE N, SEATTLE, WA	A	B	C	D						I
*06	5701 - 8TH AVE NE, SEATTLE, WA	A									
07	2700 W COMMODORE WAY, SEATTLE, WA	A									I
*08	PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	A			D						I
09	PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	A									
*10	FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	A									I
11	HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	A									
12	HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA			B		D					
13	DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	A	B	C	D						
*14	GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	A									
15	SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	A									
16	DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	A									
17	SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	A									
18	SOUTH 2ND ST & LAKE AVE S, RENTON, WA	A									
19	SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	A	B	C	D						
20	22916 86TH AVE S, KENT, WA	A	B	C	D	E	F	G	H		
21	MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	A									
22	FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	A	B	C	D						
23	115 E MAIN ST, AUBURN, WA	A									
24	SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	A		C	D				G		
25	FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	A									
26	2340 TAYLOR WAY, TACOMA, WA	A									
27	FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	A		C	D						
28	TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	A									
29	CASCADIA, 2002 E 28TH ST, TACOMA, WA	A									
30	WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	A		C	D						
31	HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	A									
32	SW 283RD & 101ST AVE SW, MAURY ISLAND, WA		B		D						
33	NORTH 43RD & VISSCHER STS, TACOMA, WA	A	B	C	D						I
34	NORTH 37TH & VASSAULT STS, TACOMA, WA		B		D						
35	NORTH 26TH & PEARL STS, TACOMA, WA	A	B	C	D						I
*36	MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	A									
37	EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	A									

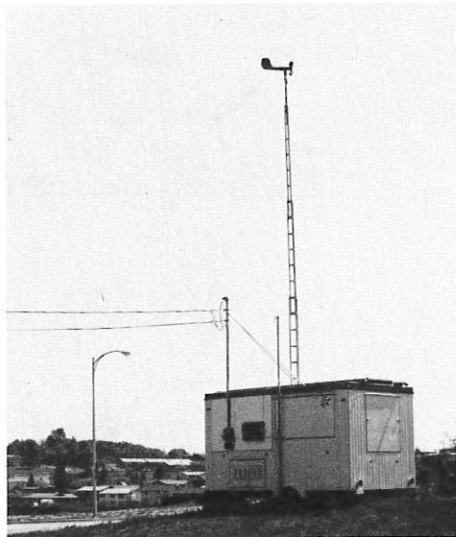
* Station operated by Washington State Department of Ecology
 (Additional Ozone sampling and all Carbon Monoxide sampling is performed by the
 Department of Ecology. Summaries of these data are included in this publication).

a Type of Sampling -----		
A Suspended Particulates-HiVol	E Nitrogen Dioxide (NO2)	H Atmospheric Particles (b - Scattering)
B Sulfur Dioxide (SO2)	F Nitrogen Oxides (NOx)	I Lead
C Suspended Particulates-COH'S	G Ozone (O3)	
D Wind Speed & Direction		



AIR QUALITY AND METEOROLOGICAL SAMPLING SYSTEM

- Remote stations continuously monitor: WIND DIRECTION WIND SPEED
(Addresses and map are presented on pages 2 and 3) SUSPENDED PARTICULATES (COHs)
SULFUR DIOXIDE
- Some stations have additional sensors for monitoring OZONE and
ATMOSPHERIC PARTICLES (b-scattering)



North 37th
and Vassault
Sts., Tacoma

Pictures on this and one on the following page show sites where sampling is conducted. The monitoring objective and therefore the parameters actually sampled are often different. Actual sampling at each station is documented in the table on page 2.

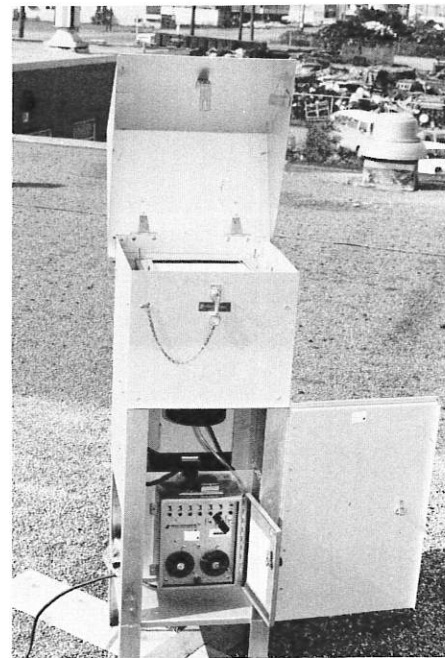


Inside a station are the telemetry electronics which translate all the instrument signals for transmission over phone lines at the command of the central control station computer. A tape sampler analyzes SUSPENDED PARTICULATES measured as COHs. An analyzer operating on the principle of ultraviolet fluorescence measures SULFUR DIOXIDE. This measurement is also recorded at the site on a strip chart recorder.

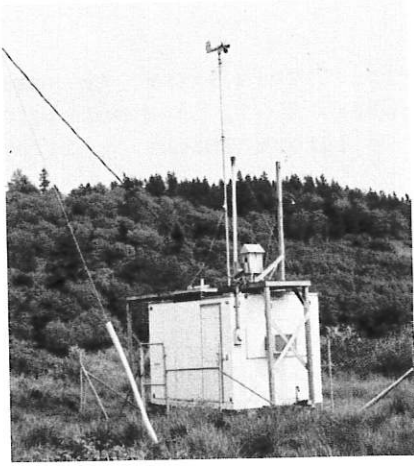


N. 98th St. and
Stone Ave. North,
Seattle

The WIND DIRECTION and SPEED sensor is mounted on a 10 meter tower. A sampling probe immediately left of the tower obtains an ambient air sample for analysis by instruments inside the station. Self-contained high volume samplers and adichotomous sampler are located on the roof.

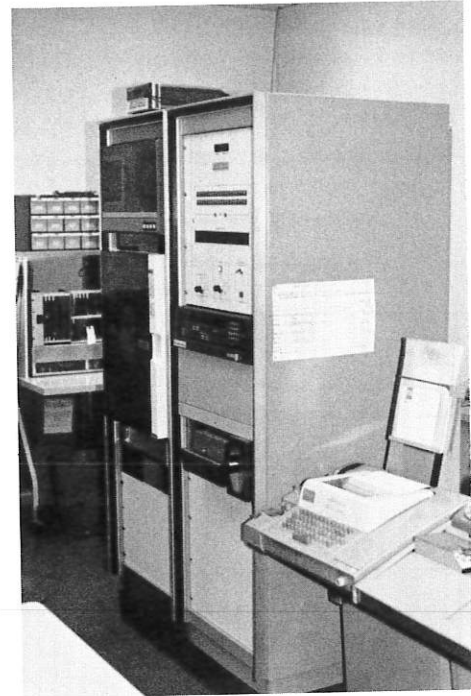


A high volume sampler is the federal reference method for measuring TOTAL SUSPENDED PARTICULATES. The instrument in the picture above is open to show the filter (in frame beneath hinged sampler cover) on which the sample is collected. An electric high flow rate blower pulls air through the filter at about 50 cubic feet per minute. Particulates with diameters from about 0.1 micrometer to 100 micrometers are collected on the filter. The sampler is normally operated continuously for 24 hours every sixth day.



1. Data from all remote stations is immediately telemetered to the central station computer via phone lines.

station at 22916 86th Ave. S., Kent



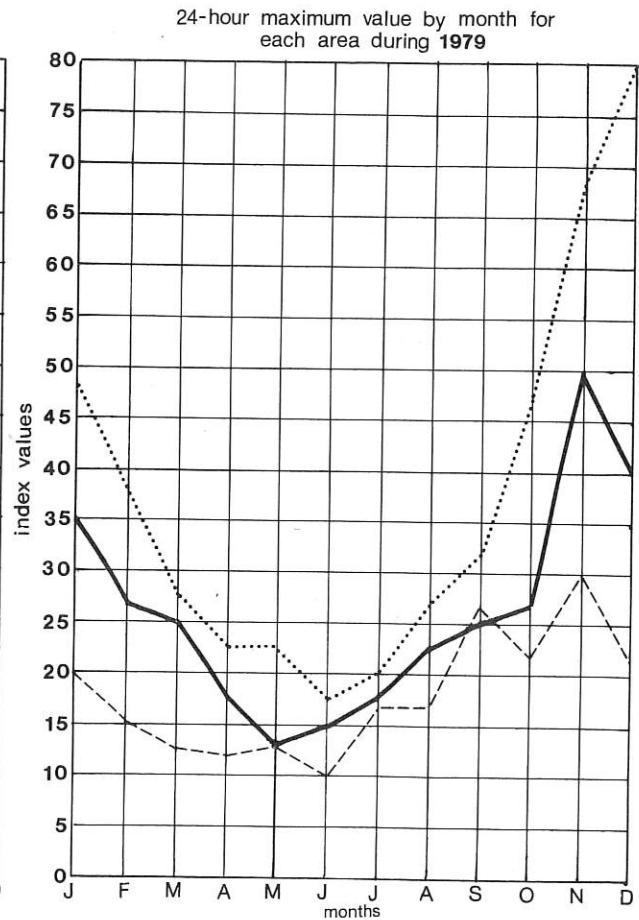
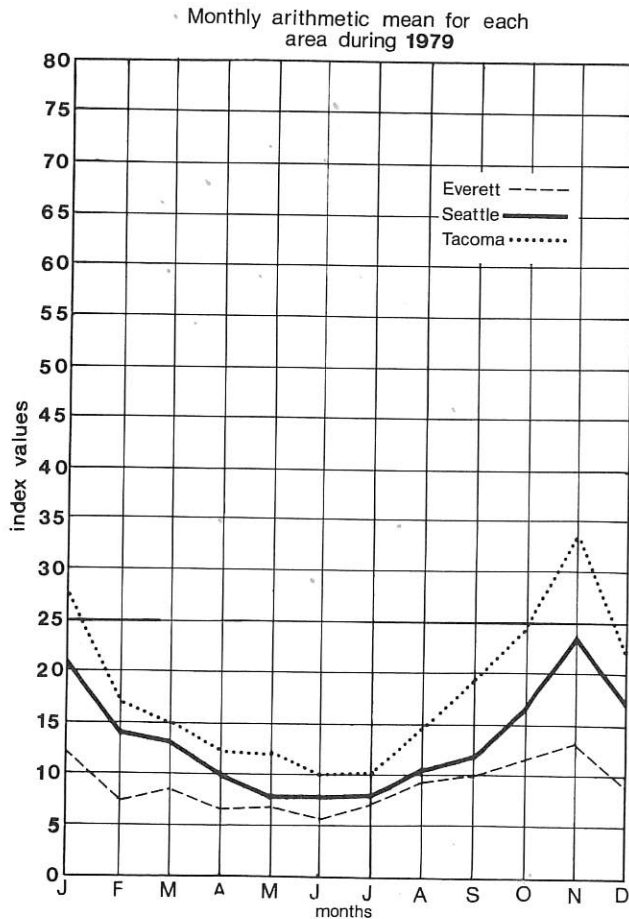
2. Central station computer controls the entire network. It processes all incoming data, and computes 15-minute, 1-hour, and 24-hour averages for immediate printout.
3. Processed averages are printed by teleprinter on a continuous schedule around the clock each day of the year.
4. All data is checked for validity by air quality specialists prior to use.
5. After validation, the data is processed by off-line computer to provide a monthly summary for each station and parameter containing the specific hourly averages, daily maximum and mean, monthly arithmetic and geometric means and selected moving averages.
6. Permanent data files stored on magnetic tape and disk allow rapid retrieval for correlation with other data, for trend analyses, for atmospheric modeling, for land use planning, for control strategy evaluation and for special studies.
7. Nontelemetered data from the high volume samplers measuring total suspended particulates is manually processed and calculated, punched on cards, summarized and stored in permanent computer files for rapid retrieval.
8. Data is used to evaluate the attainment of ambient air quality standards; to maintain real-time surveillance for episode avoidance; and to report an air quality index to the public.

AIR QUALITY INDEX

The air quality index is a scalar value representing the average concentration of suspended particulates and/or sulfur dioxide at a particular location for the most recent 24 hours. An index is calculated three times a day at 8 AM, 12 noon, and 4 PM, for each of the three geographic areas - Everett, Seattle and Tacoma. These index values are immediately tape-recorded Monday through Friday to provide up-to-date information for the news media. An index of 50 is approximately equal to the alert stage of the Washington

Episode Plan. This index, in use locally since October, 1971, is compatible with the national Pollutant Standards Index.

The charts below depict variations from month to month in air quality index values for the Everett, Seattle, and Tacoma areas during 1979. The chart at the left displays monthly arithmetic means of calculated daily index values while the chart at the right presents maximum index values reached during each month of the year.



AIR STAGNATION ADVISORIES

An "Air Stagnation Advisory" is issued by the National Weather Service when poor atmospheric dispersion conditions exist and these conditions are forecast to persist for 24 hours or more. An Air Stagnation Advisory was in effect in the Puget Sound region for the following periods during 1979:

Valid From:
 2 PM, Wednesday, October 10
 5 PM, Thursday, November 8

To:
 5 PM, Saturday, October 13
 8 AM, Friday, November 16

Acquisition of Data

The Agency operates a network of high volume samplers which monitors suspended particulates at various locations within King, Kitsap, Pierce and Snohomish Counties. High volume sampling is the federal reference method for measuring total suspended particulates. These samplers operate on an intermittent schedule sampling continuously for 24 hours every sixth day.

The Annual Standard

In April, 1971, the U.S. Environmental Protection Agency established national primary and secondary ambient air quality standards. Later in that year, the Agency's existing standard for suspended particulates was amended so that it was identical to the national secondary standard. This sets a value of 60 micrograms per cubic meter, annual geometric mean, which shall not be exceeded. The standard is written in terms of a geometric mean rather than an arithmetic mean because the distribution of air quality data is better described by the geometric statistic.

As a result of the averaging period indicated by the standard, a minimum of one year of sampling is required at any location to assess the suspended particulate concentrations with respect to the annual standard. Additional years of data document more completely the concentrations at that location.

Factors Influencing Concentrations

Particulates are released from industrial operations, from auto and truck traffic, and from other smaller sources. Once into the air these particulates are dispersed and transported by the wind. Valleys, hills, and large bodies of water affect the local direction and speed of the wind. Lower atmosphere stability influences how quickly particulates are dispersed. Particulate emissions change from day to day due to intermittent industrial operations, equipment breakdown, and traffic changes. These are some of the factors which influence the ambient particulate concentrations.

Action to Reduce Concentrations

In urban areas where suspended particulate levels exceed the standards, the Clean Air Act and the 1977 Amendments require a plan to meet the standards. The Agency has adopted emission standards, enforced these standards, encouraged paving of roads and parking lots, reduced outdoor fires, and taken many other individual actions designed to reduce the amount of particulates which escape to the ambient air.

Assessing The Results

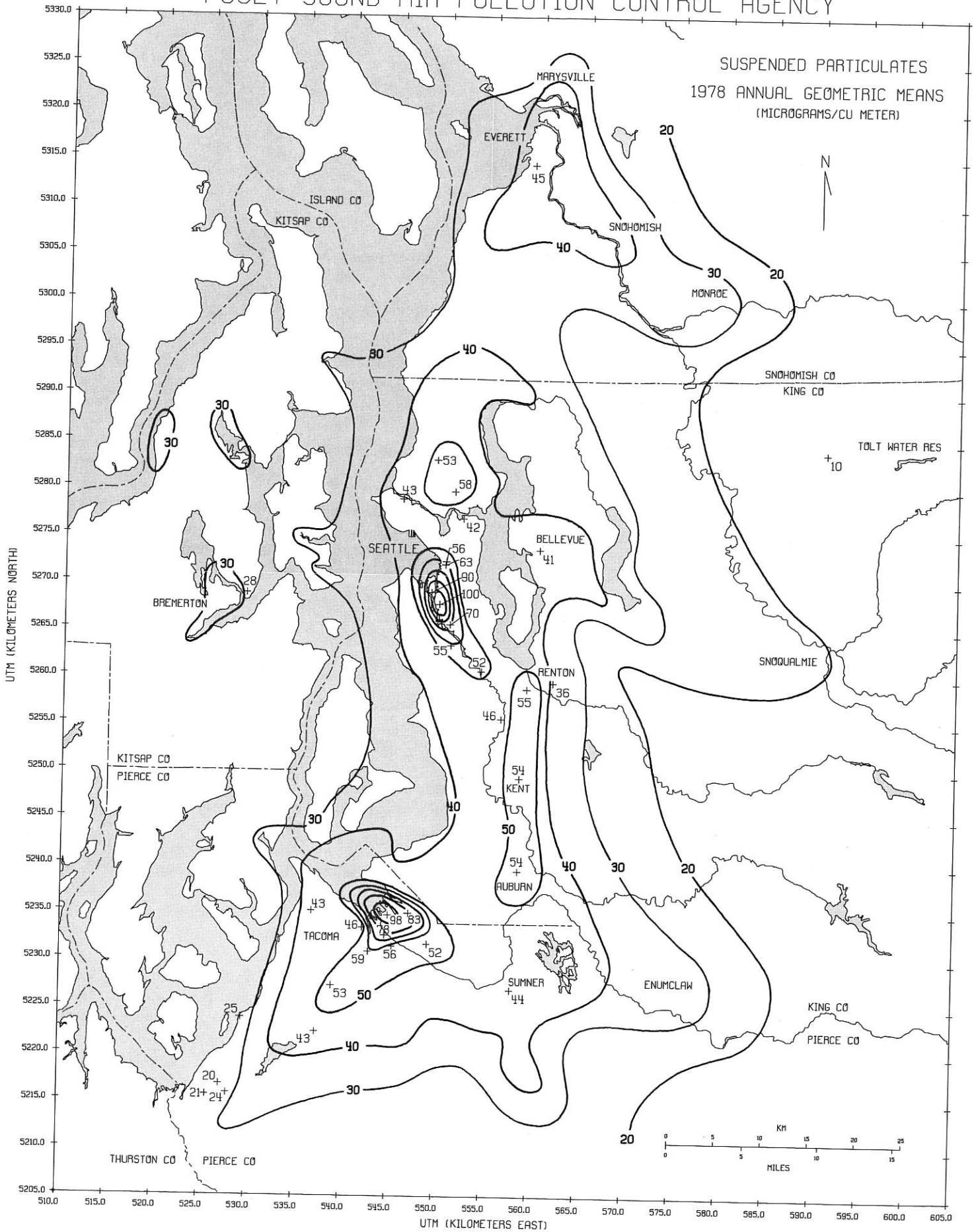
Since several factors influence the suspended particulate values, it is never absolutely evident whether an increase or decrease measured at a station results directly from corresponding changes in source emissions. Stagnant meteorological conditions on a sampling day may contribute to a higher measured reading, but the reverse is also true. Therefore, analysis of trends in air quality must recognize all relevant factors. Assessment of a long-term trend should be based on several years of data.

Suspended Particulate Maps - 1978 & 1979

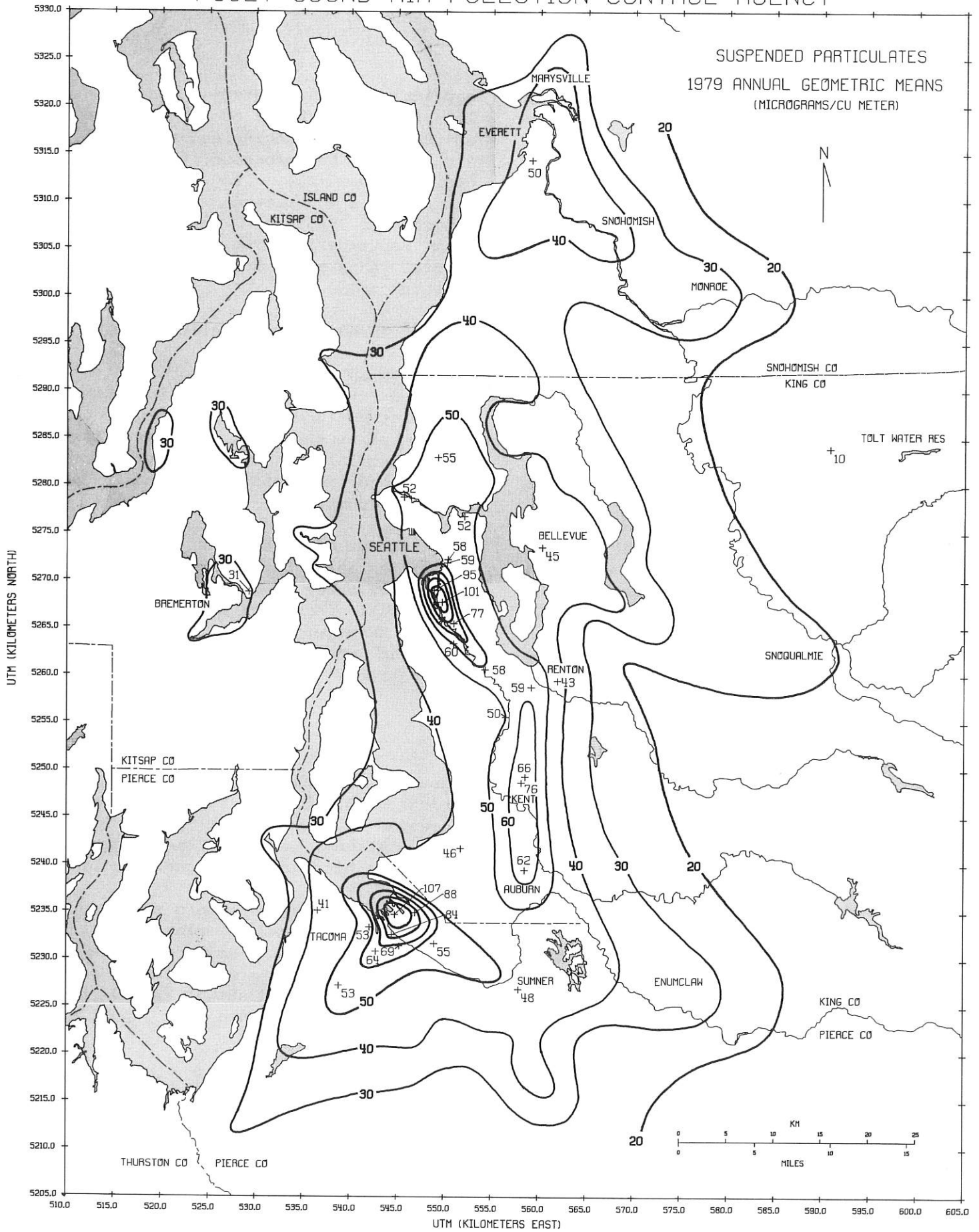
The maps which follow this page summarize suspended particulate values throughout the region for each of calendar years 1978 and 1979. Each map presents annual geometric mean suspended particulate concentrations and depicts the horizontal distribution of this pollutant. The observed concentrations at each sampling station, together with a detailed particulate emission inventory and information about local winds and topography were used in developing each map.

The concentration of suspended particulates at a location may be determined by interpolating between adjacent isopleths (lines connecting points of equal concentration). Areas which exceed the annual standard of 60 micrograms per cubic meter are clearly delineated. The Tideflats-Puyallup Valley area of Tacoma, and the Harbor Island-Duwamish Valley area of Seattle exceeded this standard in 1978 and 1979. The valley from Renton through Kent to Auburn exceeded the standard in 1979.

PUGET SOUND AIR POLLUTION CONTROL AGENCY



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A Technique to Examine Trends

An analysis technique which allows a reasonable determination of trends is the moving mean or average. As applied to suspended particulates, a 12 month moving geometric mean relates directly to the annual standard. This moving mean is calculated simply by computing the 12 month geometric mean for consecutive 12 month periods moving along in one month steps. The moving mean is displayed by plotting each calculated value against the ending month of each period. These moving mean suspended particulate values may be compared directly to the annual standard. As more and more years of data are acquired at a sampling station, the power of the technique to display a trend is enhanced.

A variation of this technique which does even a better job of displaying a trend, but requires more years of data, is calculation of the moving geometric mean in multiples of 12 months. For example, 24 and 36 month moving geometric means smooth out some of the year to year variations in meteorology and short-term changes in source emissions to more clearly depict the trend.

Trend - Background Areas

The Agency has operated a single station near the Tolt Water Reservoir in the foothills of the Cascade Mountains since November, 1966. The 12, 24, and 36 month moving geometric mean graphs all depict a rather low value ranging between 10 and 14 micrograms per cubic meter. This station exhibits a steady, unchanging trend apparently unaffected by the urbanized areas of the Puget Sound region. The value documented at Tolt represents an estimate of the background value for the air of the Puget Sound area.

Trend - Displayed by Long-Term Sampling

Data has been acquired at the Public Safety Building in Seattle since February, 1965. The long-term trend decreases gradually, then appears to slightly increase during 1976 through 1979. This is most clearly depicted by the 24 and 36 month moving

geometric mean graphs. Assessment of a long-term trend based on isolated segments of the 12 month moving geometric mean plot could easily be erroneous; for example, the period from July to December, 1975 indicates a moderate decrease and just the opposite is indicated during the period from September, 1976, to August, 1977. Several years of sampling are needed to show the trend.

Trend - Industrialized Areas

Two areas in the Puget Sound region have exceeded the annual standard most of the time that measurements have been made. As delineated by the preceding maps, these are the industrialized Duwamish Valley in south Seattle and the industrialized Tideflats area in Tacoma.

Examination of the 12 month moving geometric mean graphs for several stations in each of these two areas reveals some substantial increases over the last four years. Twenty-four and 36 month moving geometric mean plots also confirm this upward trend.

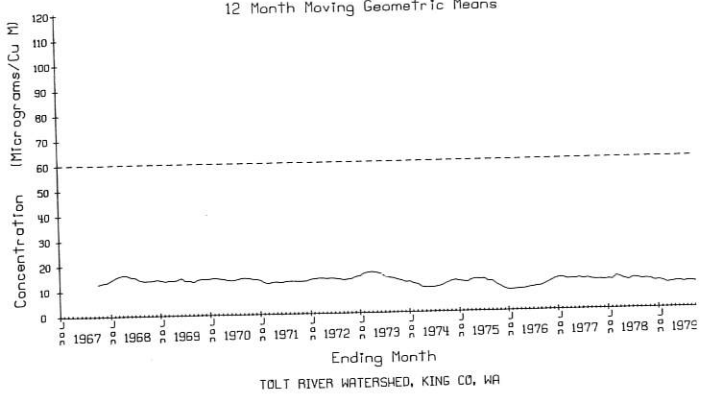
Summary

Of the 29 current stations which also measured suspended particulate levels during 1978, 25 of them recorded an increase in levels for 1979. For 19 of these stations, the increase equaled or exceeded 4 micrograms per cubic meter.

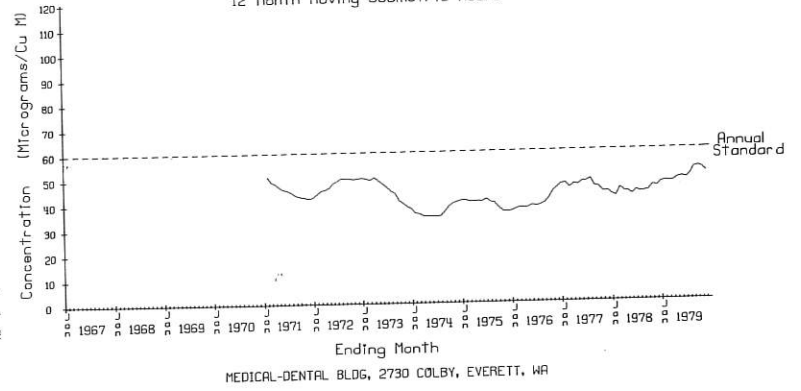
Increased particulate levels were observed both in industrialized areas and suburban, residential areas. However, the Tolt station, which is a considerable distance from the urbanized Puget Sound region, recorded no change in particulate concentrations.

Seven stations exceeded the national primary standard of 75 micrograms per cubic meter. One of these stations is located in Kent; three are located in the industrialized Duwamish Valley of Seattle; and three are located in the industrialized Tideflats of Tacoma.

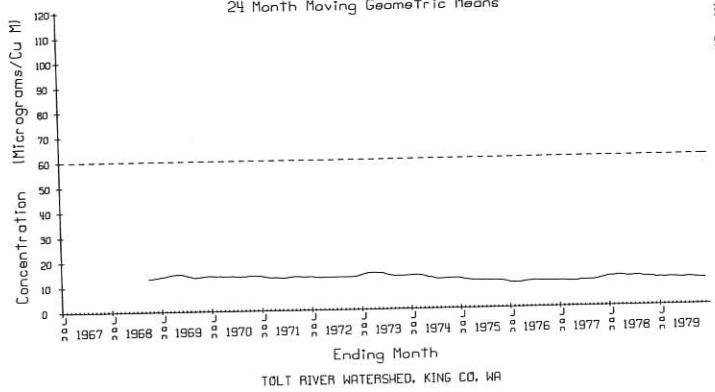
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



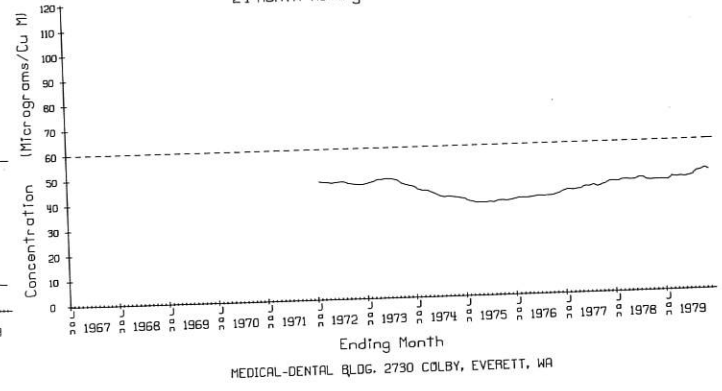
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



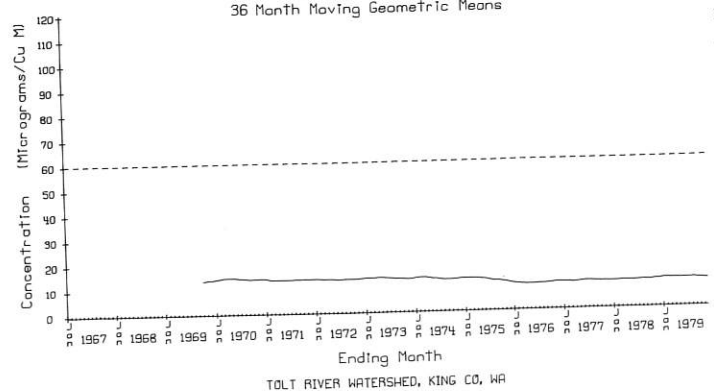
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



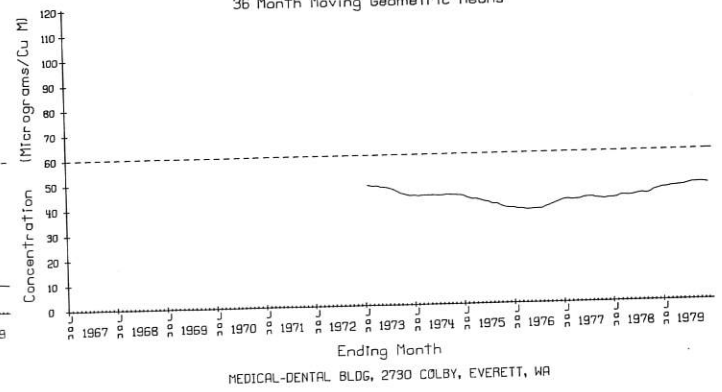
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



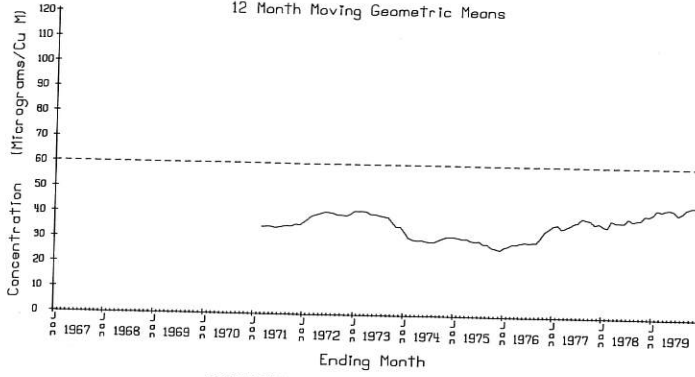
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

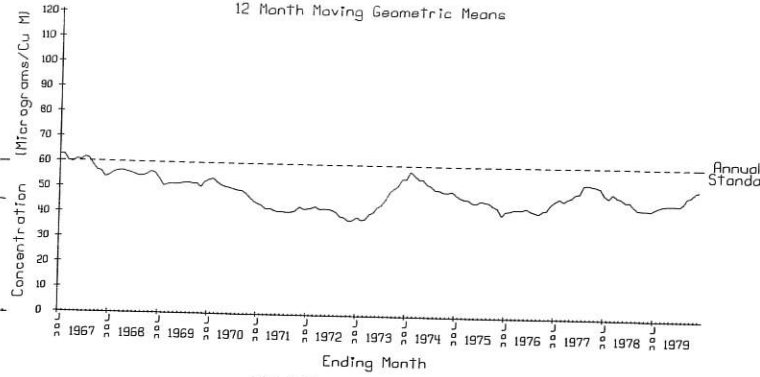


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



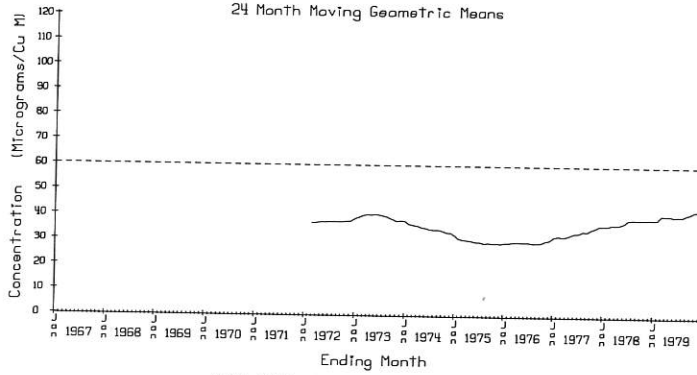
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



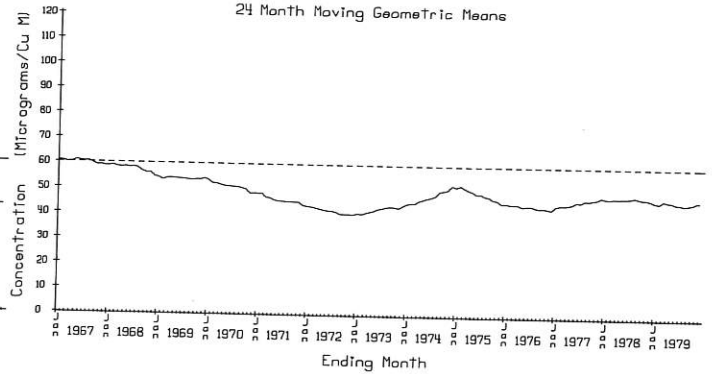
2700 W COMMODORE WAY, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



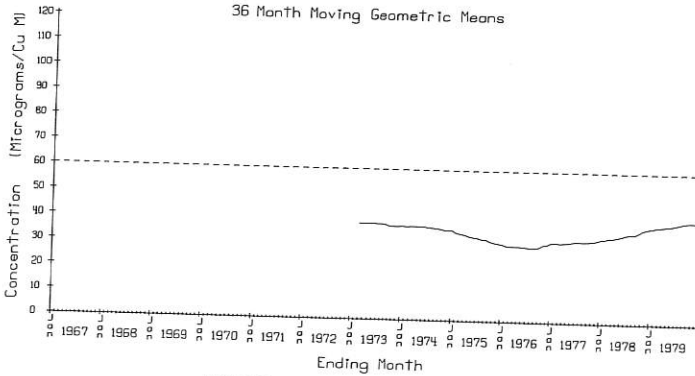
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

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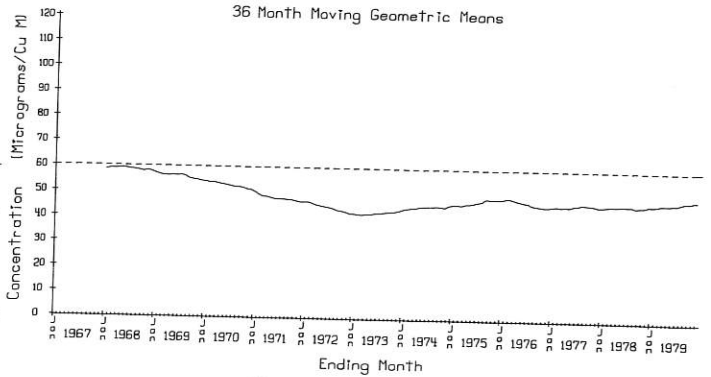
2700 W COMMODORE WAY, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA

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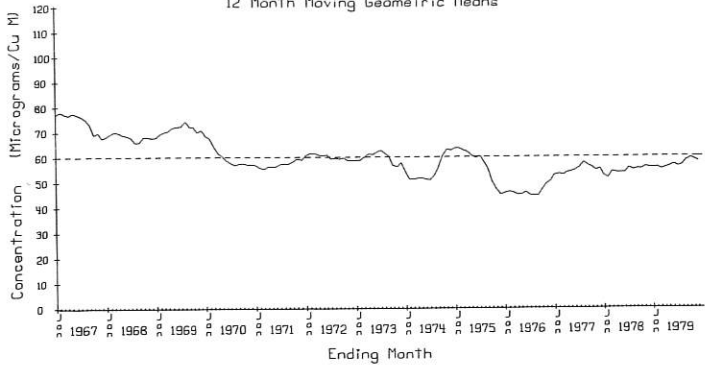


2700 W COMMODORE WAY, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

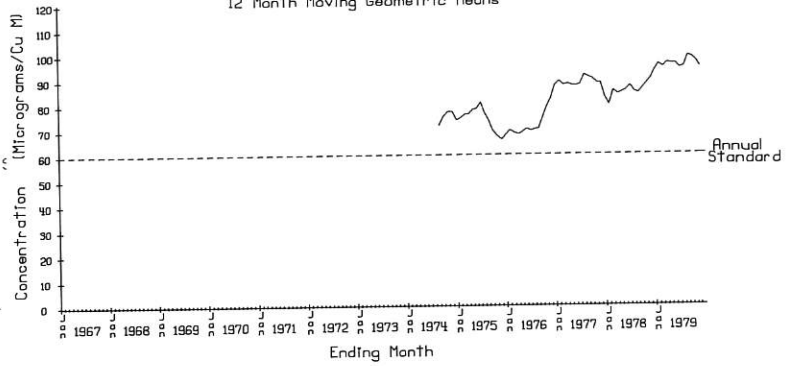


PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

12 Month Moving Geometric Means

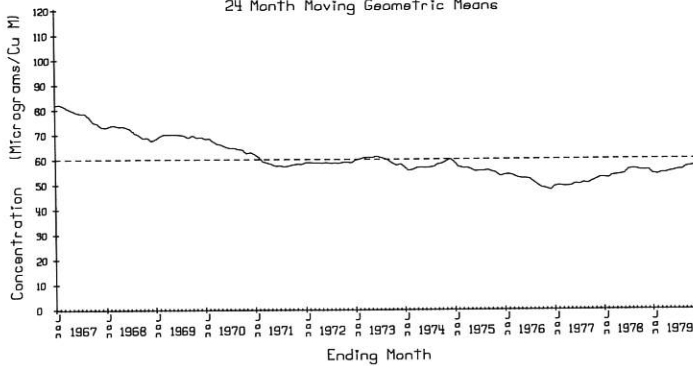


HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

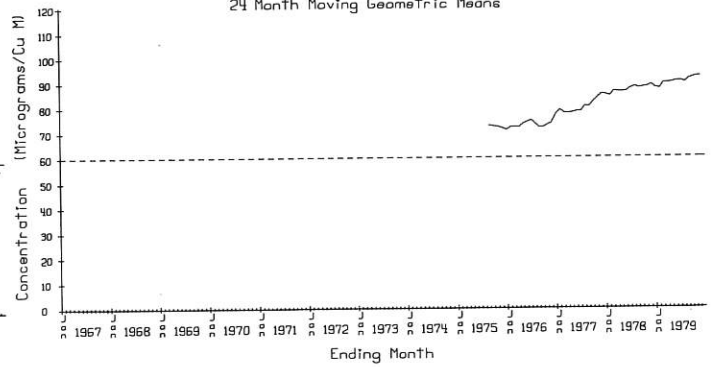


PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

24 Month Moving Geometric Means

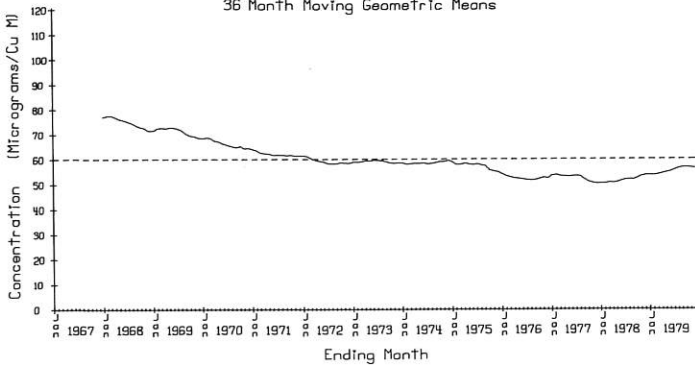


HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

36 Month Moving Geometric Means

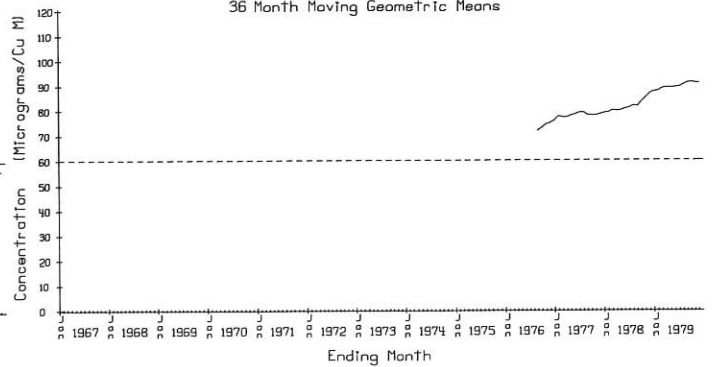


PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA

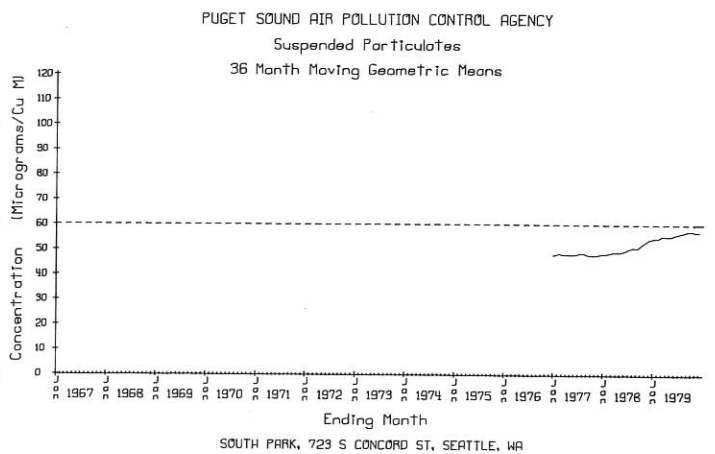
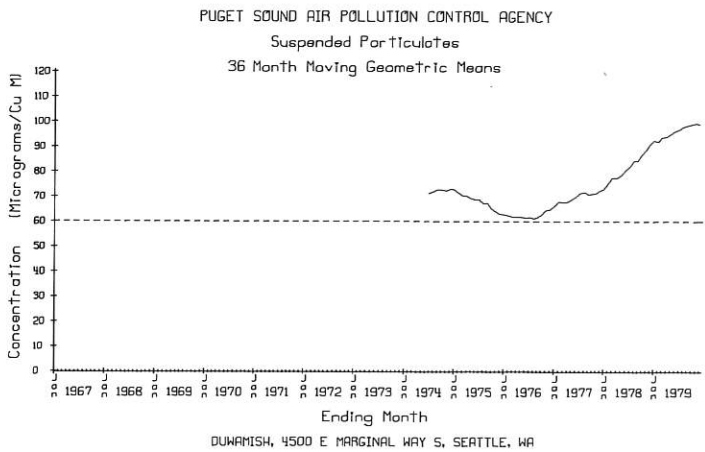
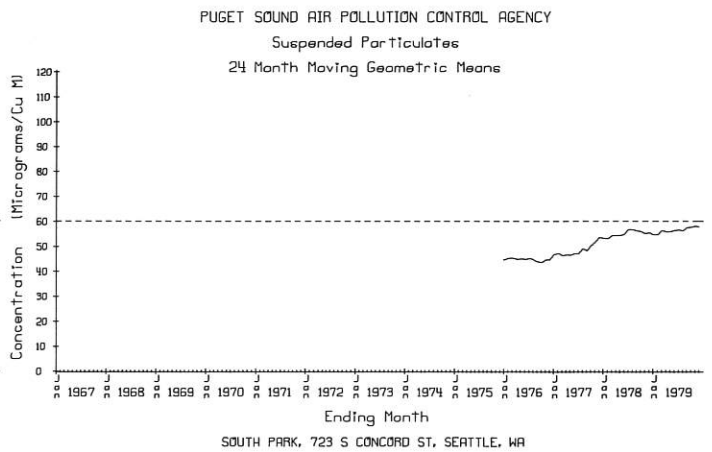
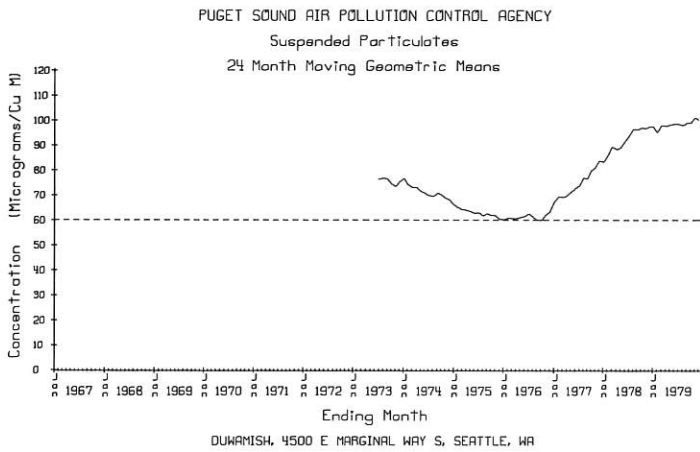
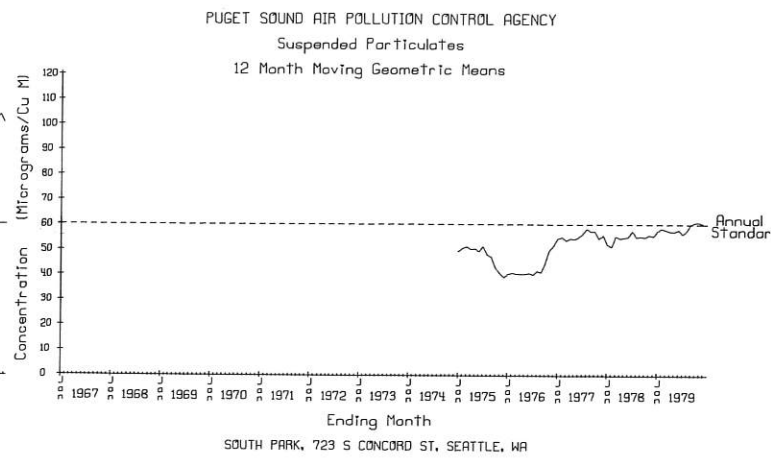
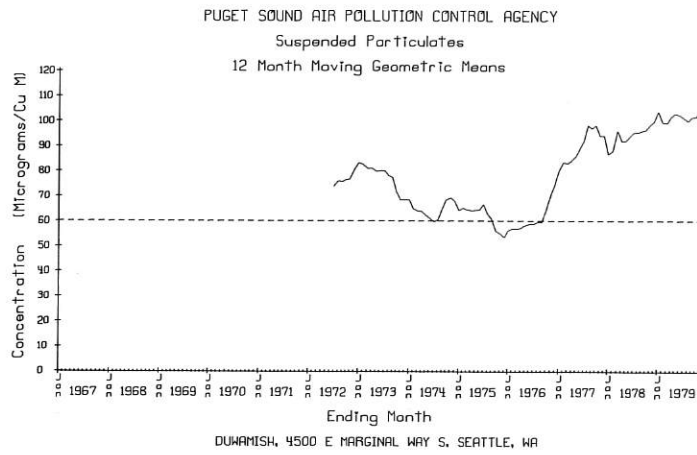
PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

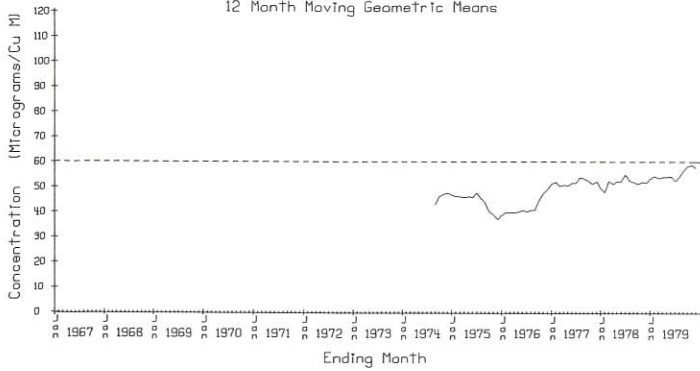
36 Month Moving Geometric Means



HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA

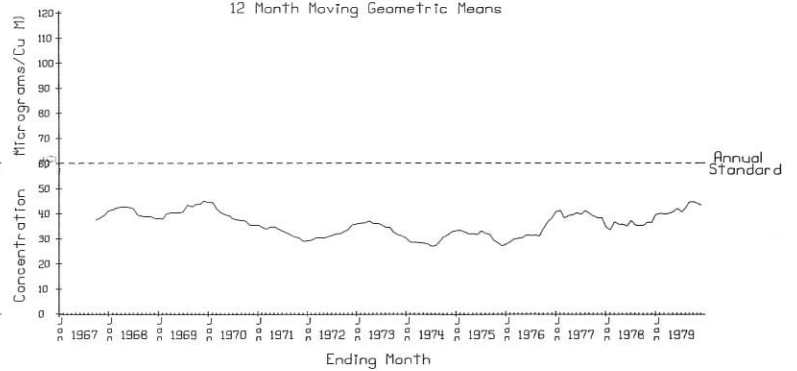


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



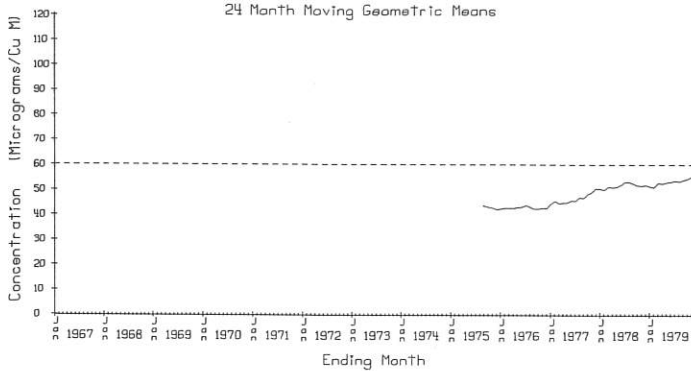
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



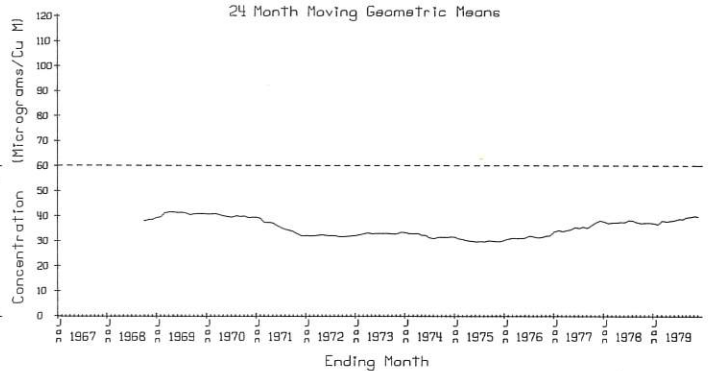
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



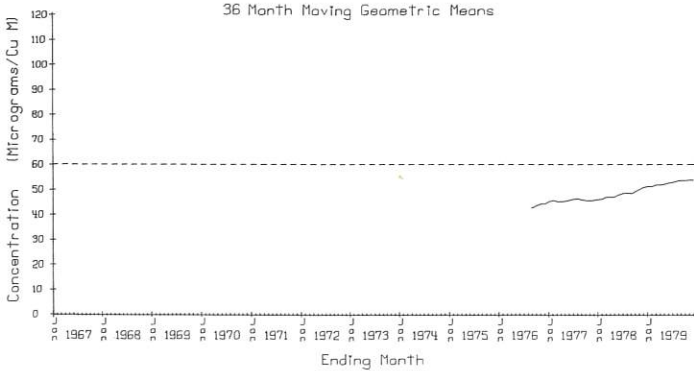
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



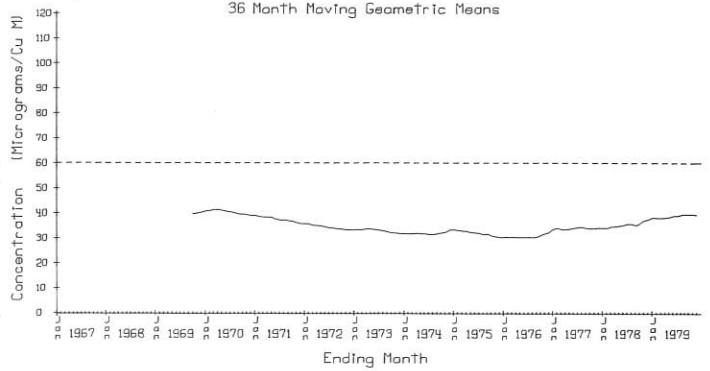
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



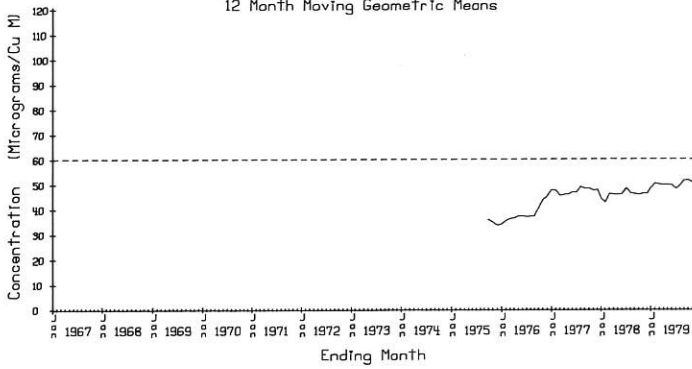
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



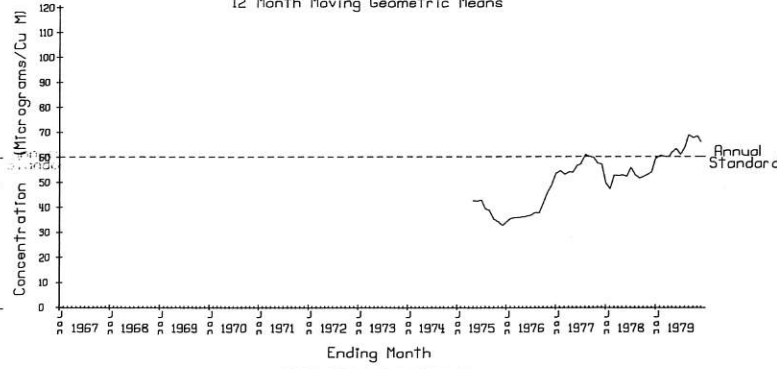
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



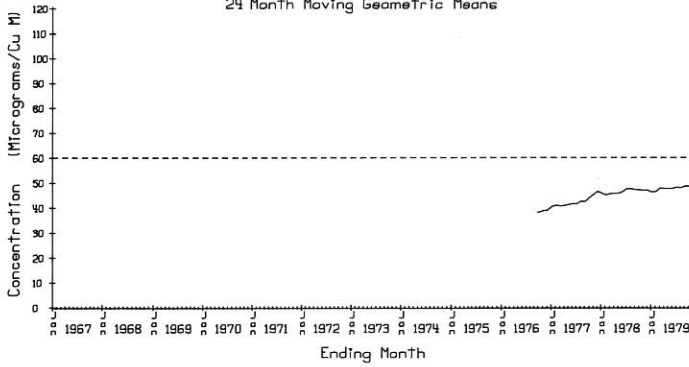
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



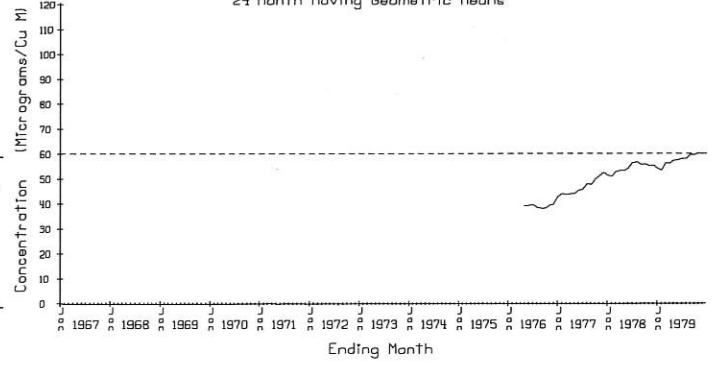
22916 86TH AVE S. KENT, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



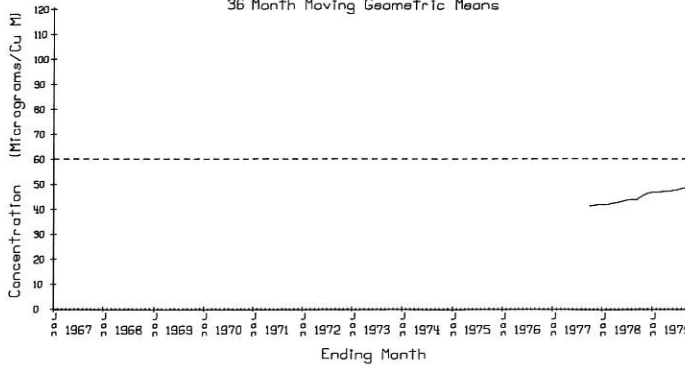
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



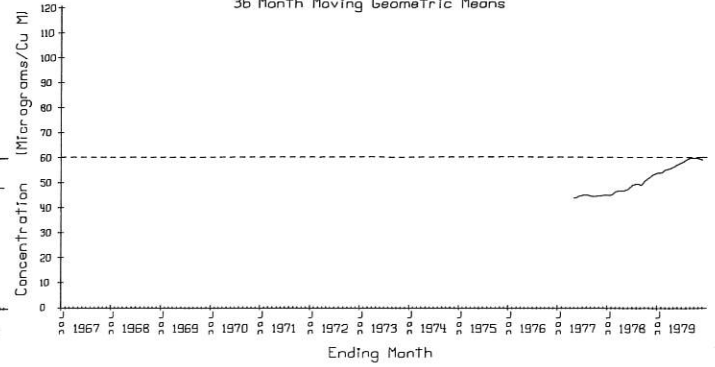
22916 86TH AVE S, KENT, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

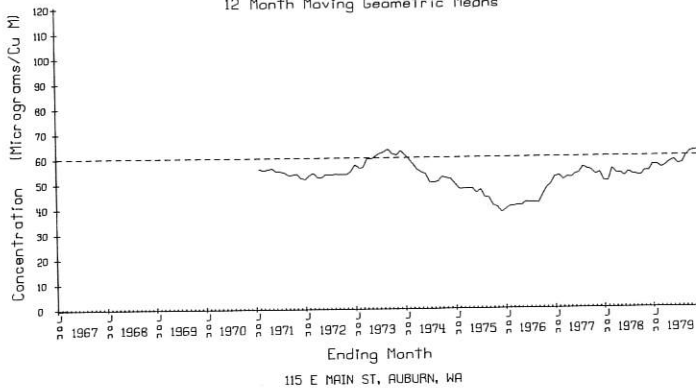


22916 86TH AVE S, KENT, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

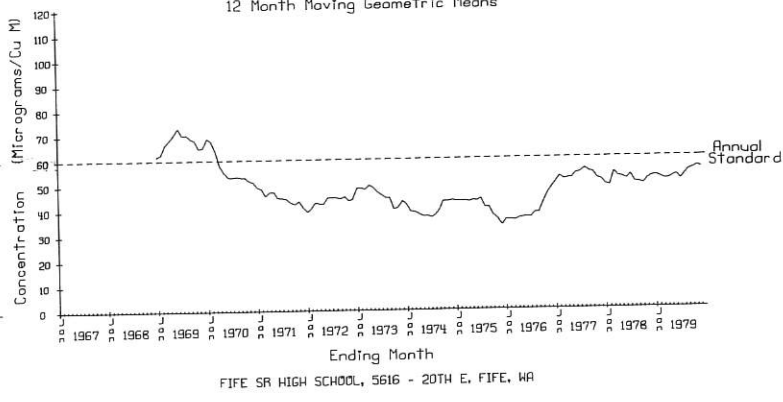
12 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

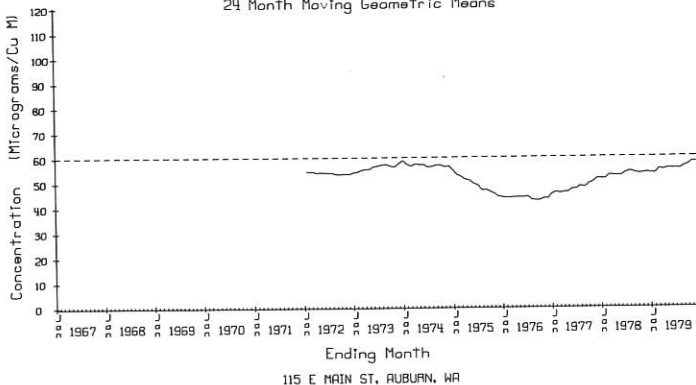
12 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

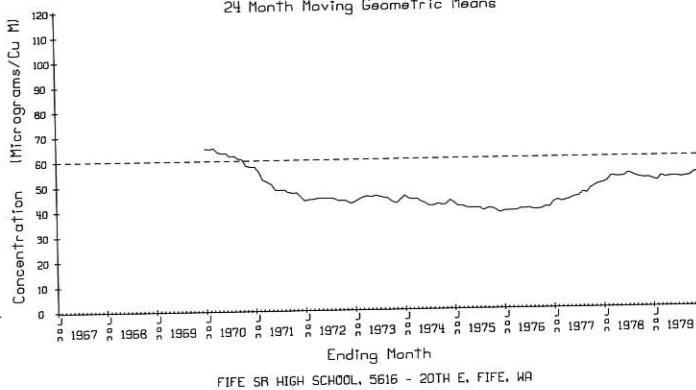
24 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

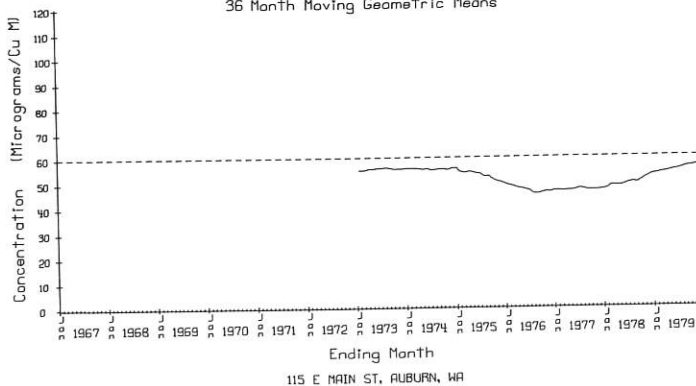
24 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY

Suspended Particulates

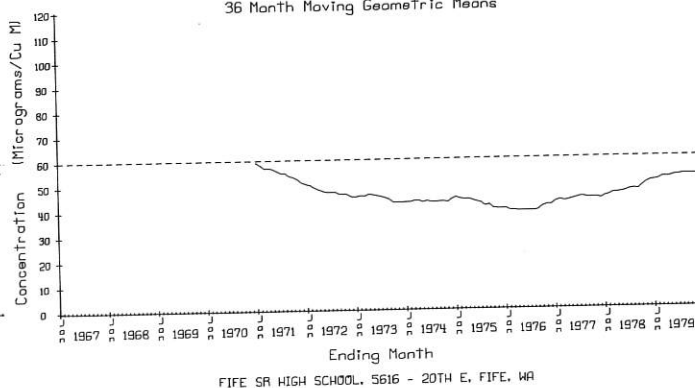
36 Month Moving Geometric Means

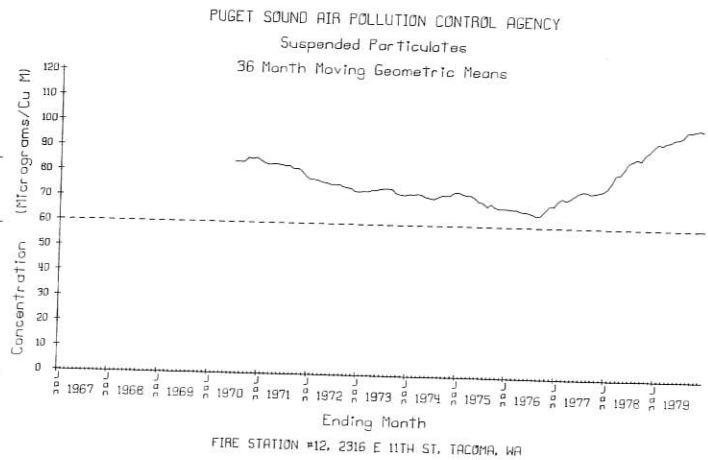
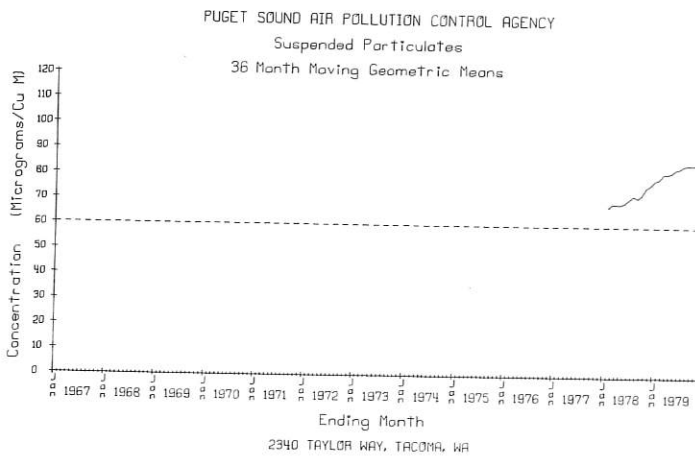
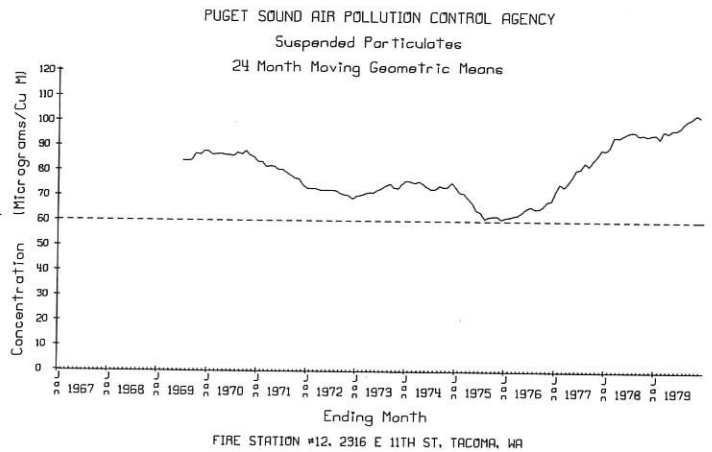
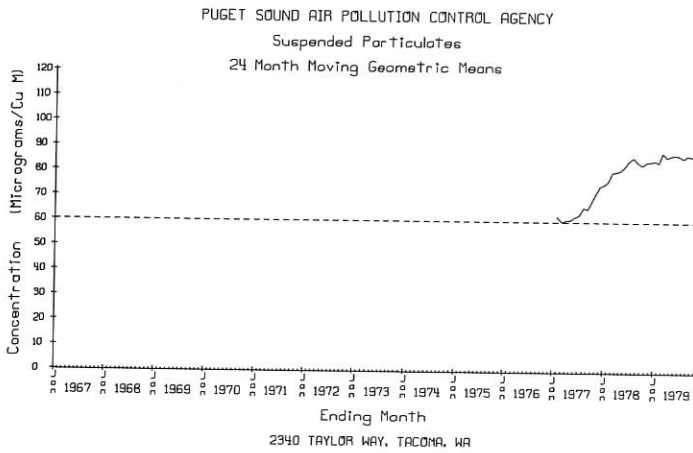
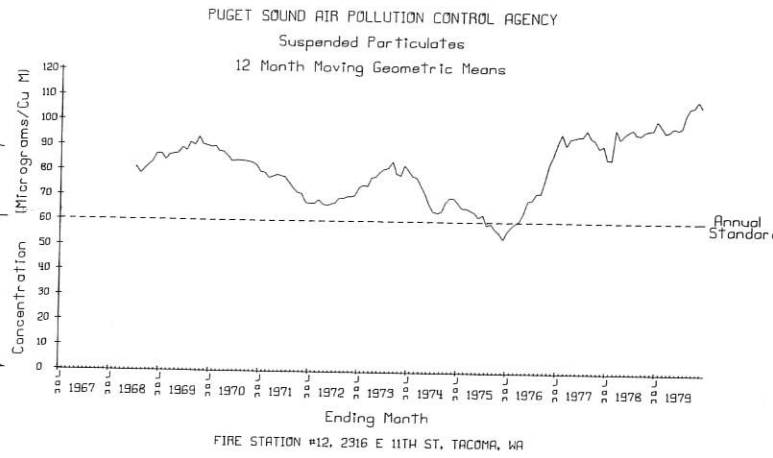
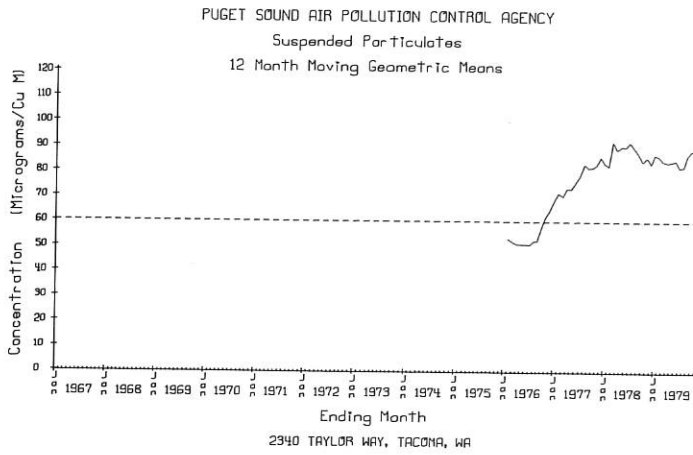


PUGET SOUND AIR POLLUTION CONTROL AGENCY

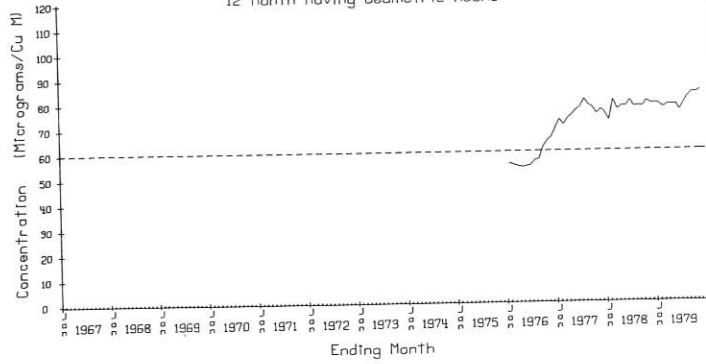
Suspended Particulates

36 Month Moving Geometric Means



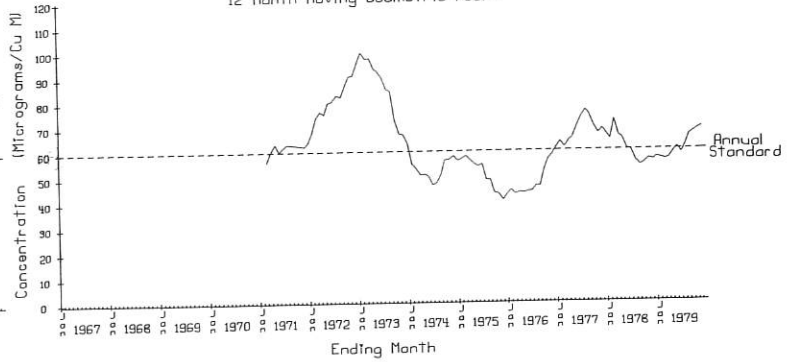


PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



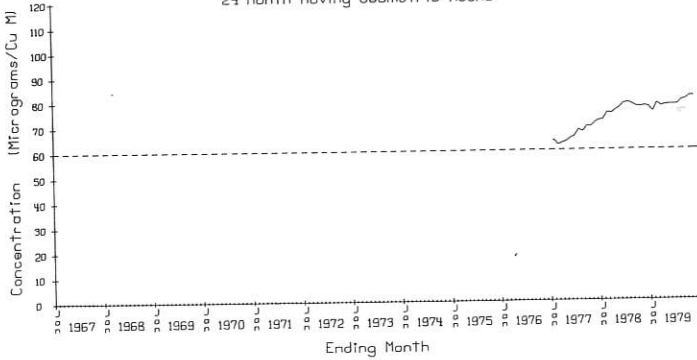
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



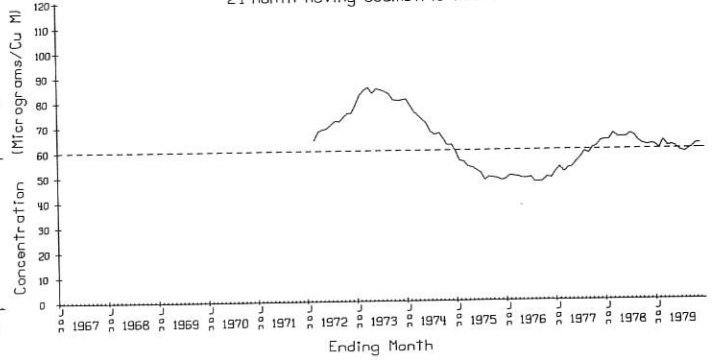
CASCADIA, 2002 E 28TH ST, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



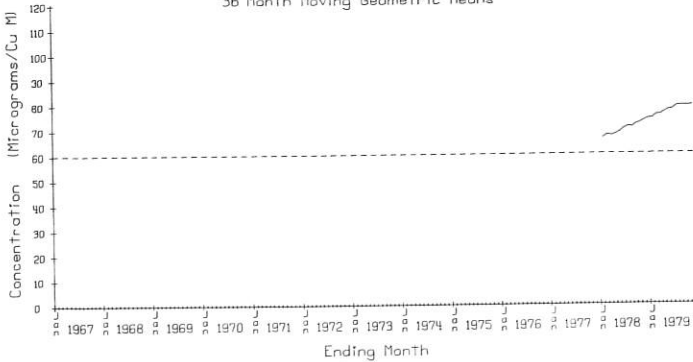
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



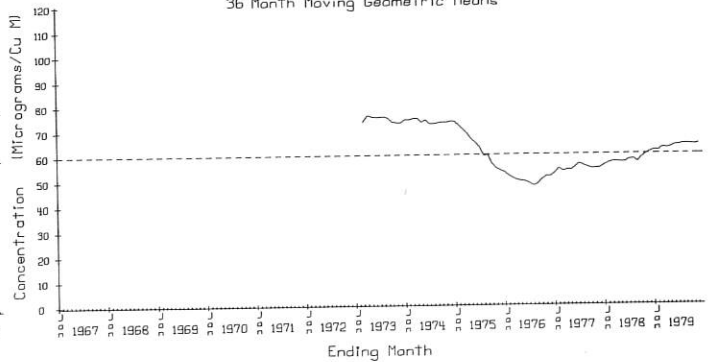
CASCADIA, 2002 E 28TH ST, TACOMA, WA

PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means

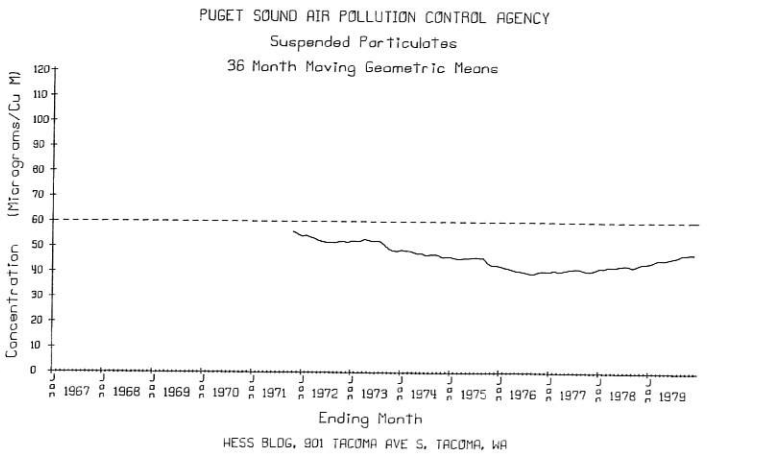
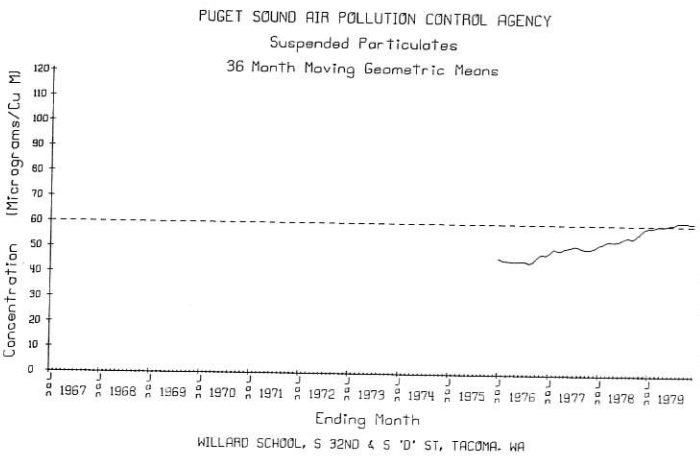
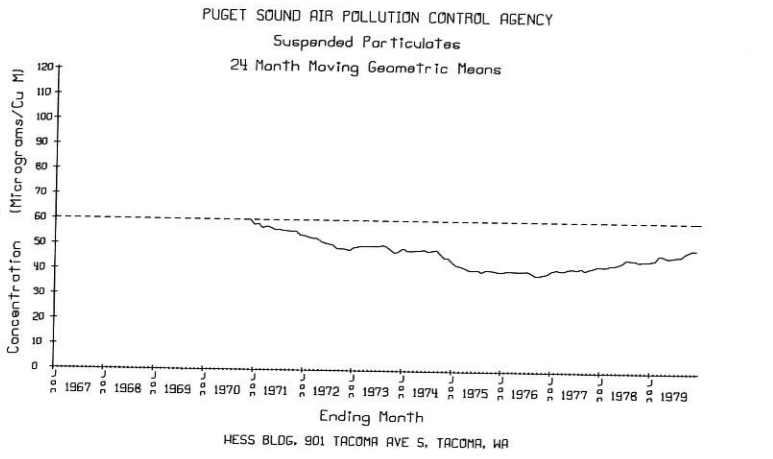
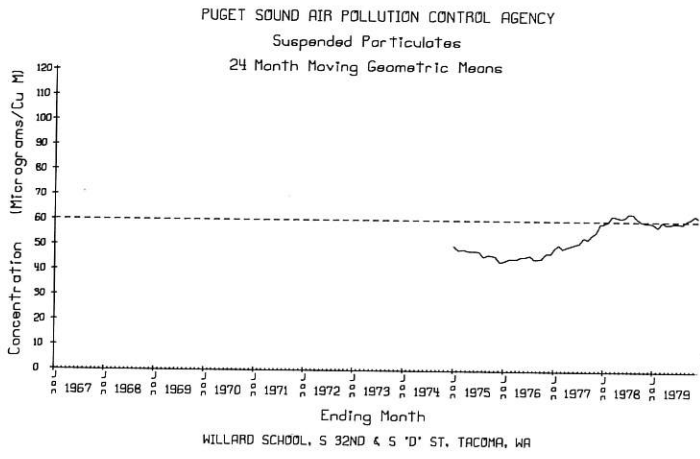
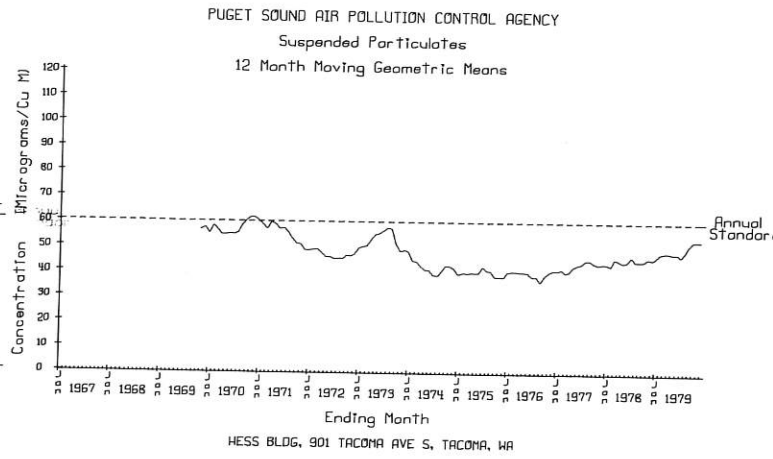
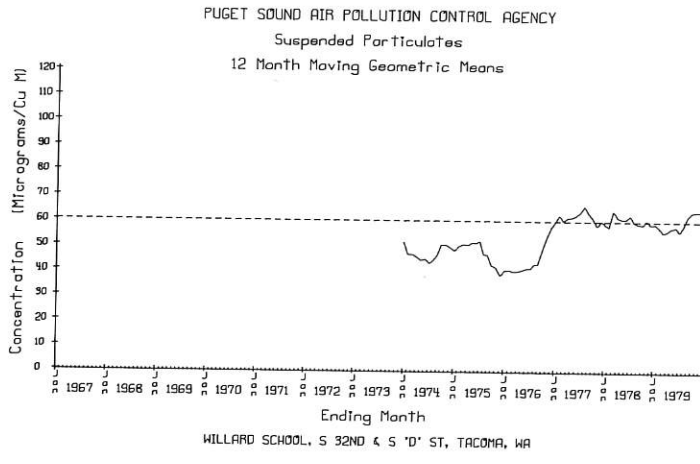


TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA

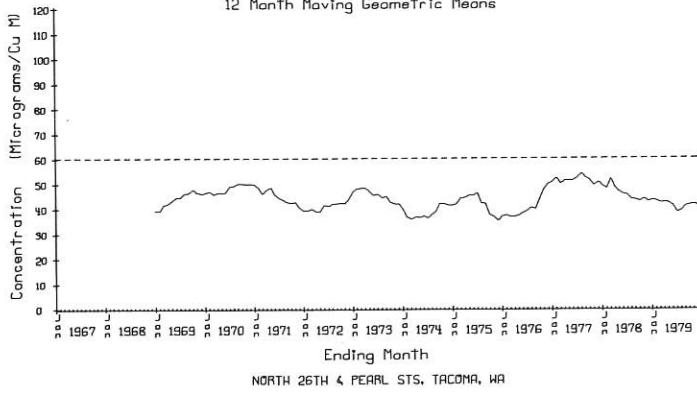
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



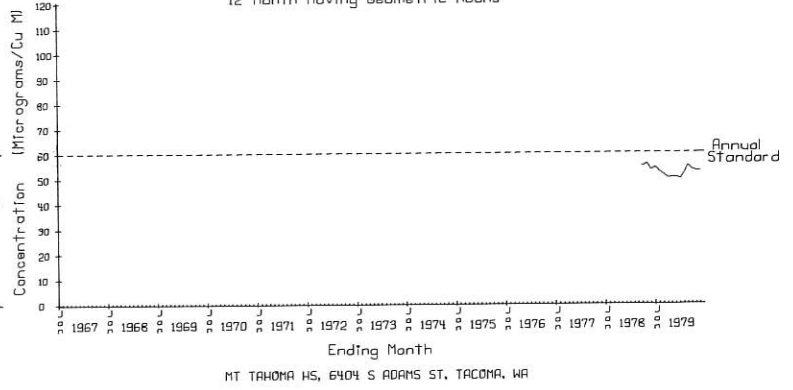
CASCADIA, 2002 E 28TH ST, TACOMA, WA



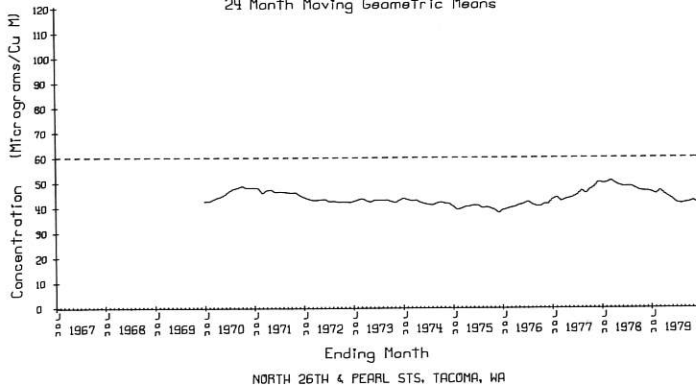
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



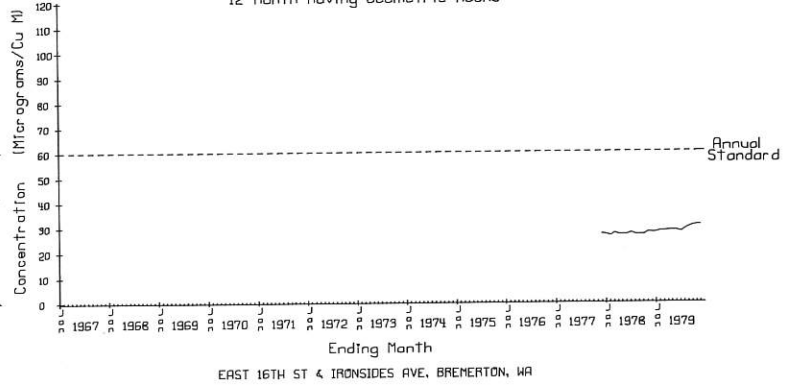
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



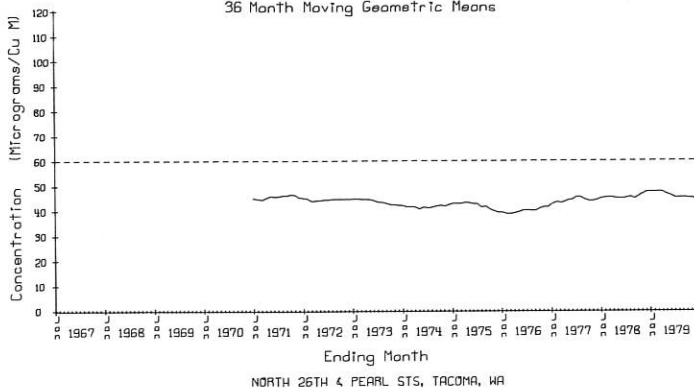
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



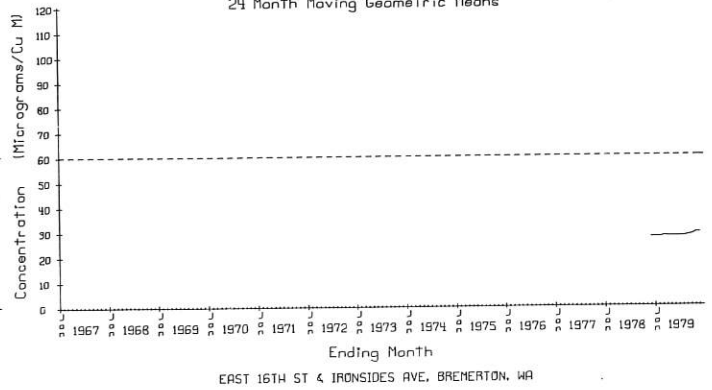
PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
12 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
36 Month Moving Geometric Means



PUGET SOUND AIR POLLUTION CONTROL AGENCY
Suspended Particulates
24 Month Moving Geometric Means



SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1979

Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. Of Obs.	Year Arith Mean	Year Geom Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
TOLT RIVER WATERSHED, KING CO, WA	9	4	11	15	15	23	33	28	21	13	7	7	56	15	10
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	60	38	68	47	55	54	59	63	75	68	45	29	59	56	50
504 BELLEVUE WAY NE, BELLEVUE, WA ^a									75	76	52	58	18	65	57
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	62	60	53	39	36	35	40	43	58	72	50	44	58	50	45
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	64	56	71	54	64	59	55	75	69	71	48	34	61	60	55
5701 - 8TH AVE NE, SEATTLE, WA	79	60	92	56	52	49	71	54	66	83	68	58	61	66	61
2700 W COMMODORE WAY, SEATTLE, WA	77	75	75	44	41	43	38	49	59	65	64	57	61	57	52
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	66	59	68	43	42	39	45	50	58	79	63	57	61	56	52
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	57	58	71	61	61	64	57	60	75	84	52	52	59	63	58
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	61	61	76	53	53	61	57	73	79	77	55	62	58	64	59
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	125	131	125	92	83	99	81	93	127	122	83	84	61	104	95
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	146	87	133	97	118	104	102	99	116	135	140	79	114	113	101
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA ^b			166	67	73	89	78	70	129	113	46	65	41	87	77
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	88	70	76	44	49	76	56	60	88	95	62	58	61	68	60
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	83	59	74	46	53	66	58	58	81	85	64	38	59	64	58
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	61	35	55	39	46	65	50	54	61	62	42	29	61	50	43
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	81	61	80	57	46	64	59	62	71	99	57	49	60	65	59
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	63	56	60	41	45	55	53	55	70	69	48	43	61	55	50
22916 86TH AVE S, KENT, WA	84	51	99	66	78	102	90	81	116	80	60	39	61	79	66
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA ^c		72	109	77	81	134	93	78	104	83	81	51	53	86	76
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA ^d				74	56	52	44	49	57	51	43	32	42	49	46
115 E MAIN ST, AUBURN, WA	83	65	74	54	59	63	57	58	80	86	70	66	61	68	62
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	70	43	48	35	47	64	54	49	76	77	46	46	59	55	48
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	80	53	71	43	57	74	58	68	79	82	66	51	55	64	55
2340 TAYLOR WAY, TACOMA, WA	175	72	108	69	98	101	87	90	119	123	104	82	61	102	88
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	135	91	121	101	131	103	135	162	120	150	133	80	116	122	107
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	114	72	110	67	92	96	80	106	108	121	79	84	61	94	84
CASCADIA, 2002 E 28TH ST, TACOMA, WA	97	56	123	51	75	94	63	81	115	138	69	66	60	86	69
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	96	62	73	46	63	74	54	66	101	119	76	58	61	74	64
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	73	71	76	33	37	55	44	56	74	103	61	50	60	61	53
NORTH 43RD & VISSCHER STS, TACOMA, WA ^e	62	49	73	37	50								22	55	47
NORTH 26TH & PEARL STS, TACOMA, WA	62	43	48	31	38	43	33	48	64	61	51	34	60	47	41
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	107	52	76	33	49	63	55	58	77	82	57	45	54	63	53
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	36	32	33	25	26	30	28	34	37	47	38	31	61	33	31

^a Sampling Started 9/12/79

^b Sampling Started 3/10/79

^c Sampling Started 2/2/79

^d Sampling Started 4/21/79

^e Sampling Ended 5/9/79

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1979

Statistical Summary

Location	No. Of Obs.	Frequency Distribution - Percent										Arith Mean	Geom Mean	Geom Std Dev	Arith Std Dev
		10	20	30	40	50	60	70	80	90	95				
TOLT RIVER WATERSHED, KING CO, WA	56	3	5	6	7	11	15	19	23	31	42	15	10	2.61	12.70
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	59	26	35	41	50	54	60	63	73	87	97	56	50	1.60	24.26
504 BELLEVUE WAY NE, BELLEVUE, WA	18	29	35	35	46	52	62	82	95	108	118	65	57	1.69	33.97
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA	58	24	30	34	38	42	50	54	66	86	95	50	45	1.58	24.10
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	61	30	37	41	46	56	63	73	85	98	108	60	55	1.57	26.14
5701 - 8TH AVE NE, SEATTLE, WA	61	37	44	49	52	58	64	69	79	103	126	66	61	1.47	29.12
2700 W COMMODORE WAY, SEATTLE, WA	61	32	36	39	43	49	54	63	69	86	113	57	52	1.52	28.46
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA	61	30	35	40	47	51	54	63	70	87	105	56	52	1.47	22.89
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	59	34	43	47	52	59	62	67	82	94	106	63	58	1.49	26.80
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	58	33	46	51	59	62	65	74	85	94	104	64	59	1.52	22.78
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	61	48	64	75	83	97	109	121	132	163	174	104	95	1.55	44.60
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	114	51	66	76	91	100	117	134	159	180	216	113	101	1.63	54.65
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	41	43	50	57	63	76	85	95	115	154	174	87	77	1.60	45.75
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	61	27	38	47	54	61	72	80	86	121	127	68	60	1.68	34.50
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	59	29	38	48	53	59	61	74	84	98	118	64	58	1.58	28.87
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	61	20	23	32	41	48	54	61	73	83	88	50	43	1.78	25.54
SOUTH 2ND ST & LAKE AVE S, RENTON, WA	60	30	40	47	55	62	68	73	78	101	124	65	59	1.55	28.21
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	61	27	30	38	48	53	61	65	72	86	93	55	50	1.56	22.79
22916 86TH AVE S, KENT, WA	61	24	35	45	59	71	82	101	125	141	147	79	66	1.89	45.07
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	53	35	46	57	70	85	95	108	111	134	138	86	76	1.69	43.70
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	42	25	31	37	41	48	49	53	64	77	86	49	46	1.47	18.91
115 E MAIN ST, AUBURN, WA	61	34	44	50	53	61	66	72	90	112	129	68	62	1.50	29.00
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	59	21	29	38	42	49	56	62	77	94	102	55	48	1.73	28.75
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA	55	22	28	42	50	64	73	78	86	118	121	64	55	1.80	33.42
2340 TAYLOR WAY, TACOMA, WA	61	41	53	64	73	92	106	123	135	174	192	102	88	1.73	63.22
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	116	47	65	82	95	108	127	145	168	202	222	122	107	1.70	64.16
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	61	39	49	66	73	86	95	112	126	169	175	94	84	1.65	45.99
CASCADIA, 2002 E 28TH ST, TACOMA, WA	60	27	36	54	62	72	77	97	111	161	216	86	69	1.96	59.89
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	61	27	39	47	56	68	78	85	101	133	138	74	64	1.72	39.64
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	60	28	35	38	44	49	57	65	86	107	131	61	53	1.69	36.13
NORTH 43RD & VISSCHER STS, TACOMA, WA	22	20	22	32	46	53	56	57	82	98	101	55	47	1.80	31.10
NORTH 26TH & PEARL STS, TACOMA, WA	60	18	24	31	37	42	48	59	66	77	91	47	41	1.68	23.09
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	54	20	34	47	51	53	61	70	85	107	128	63	53	1.89	37.24
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA	61	19	21	23	28	33	35	38	43	51	56	33	31	1.47	12.72

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)

1979

Summary of Observations Greater Than 150

Location	Jan 3	Jan 6	Jan 9	Jan 18	Jan 30	Feb 2	Feb 14	Feb 20	Mar 10	Mar 13	Mar 19	Mar 22	Apr 21	Apr 27	Apr 30	May 3	May 18	May 21
	Wed	Sat	Tue	Thu	Tue	Fri	Wed	Tue	Sat	Tue	Mon	Thu	Sat	Fri	Mon	Thu	Fri	Mon
5701 - 8TH AVE NE, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2700 W COMMODORE WAY, SEATTLE, WA	--	--	155	--	--	--	--	--	153	--	--	--	--	--	--	--	--	--
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	209	--	159	--	--	246	174	--	213	--	--	157	--	168	--	--	--	--
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	242	171	196	173	216	198	164	--	305	222	174	175	167	174	--	--	--	214
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	--	--	--	--	--	--	--	174	--	--	245	--	--	--	--	--	--
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22916 86TH AVE S, KENT, WA	176	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	--	--	--	--	--	--	--	--	--	--	215	--	--	--	--	--	--
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--	--	--	--	--	--	--	--	163	--	--	178	--	--	--	--	--	--
2340 TAYLOR WAY, TACOMA, WA	430	--	192	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	226	177	174	--	209	160	--	153	--	200	--	214	--	--	--	--	--	--
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	222	--	169	--	--	--	--	--	165	--	--	174	--	185	162	202	182	163
CASCADIA, 2002 E 28TH ST, TACOMA, WA	191	--	--	--	--	--	--	--	280	--	--	216	--	--	--	--	--	--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	206	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Location	May 30	Jun 20	Jun 29	Jul 17	Jul 18	Jul 20	Jul 26	Aug 10	Aug 13	Aug 19	Aug 22	Aug 28	Aug 31	Sep 18	Sep 24	Sep 25	Sep 30	Oct 3
	Wed	Wed	Fri	Tue	Wed	Fri	Thu	Fri	Mon	Sun	Wed	Tue	Fri	Tue	Mon	Tue	Sun	Wed
5701 - 8TH AVE NE, SEATTLE, WA	--	--	--	--	--	--	173	--	--	--	--	--	--	--	--	--	--	--
2700 W COMMODORE WAY, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	153	--	--	159	--	--	171	180	--	--	--	--	--	--	--	--	--	--
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	154	--	157	164	238
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22916 86TH AVE S, KENT, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	259	--	--	--	--	--	--	--	--	--	--	--	156	--	--	--	--
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2340 TAYLOR WAY, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	--	--	166	288	196	357	--	164	--	207	214	355	183	174	--	--	--	--
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--	--	--	--	--	--	--	--	175	--	--	--	161	--	175	--	306	--
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	164	--	--	--	--
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Location	Oct 4	Oct 6	Oct 9	Oct 10	Oct 11	Oct 12	Nov 2	Nov 8	Nov 9	Nov 13	Nov 14	Nov 15	Nov 20	Nov 28	Nov 29	Dec 28	Dec 29
	Thu	Sat	Tue	Wed	Thu	Fri	Fri	Thu	Fri	Tue	Wed	Thu	Tue	Wed	Thu	Fri	Sat
5701 - 8TH AVE NE, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2700 W COMMODORE WAY, SEATTLE, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA	--	176	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA	--	--	--	--	--	--	--	--	--	165	259	--	--	--	--	--	--
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA	--	165	--	--	--	163	--	--	--	--	--	--	--	--	--	--	--
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	--	--	152	252	189	160	159	181	156	222	269	250	241	171	--	249	--
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	166	212	177	183	--	--	--	160	185	230	--	--	--	--	--	--
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	--	--	--	--	--	170	--	--	--	--	--	--	--	--	--	--	--
22916 86TH AVE S, KENT, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	--	--	--	--	--	159	--	--	--	--	--	--	--	--	--	--	--
2340 TAYLOR WAY, TACOMA, WA	--	174	--	--	--	192	--	--	--	--	--	--	--	--	152	--	210
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	184	182	168	267	181	207	163	222	224	164	182	240	228	214	180	191	215
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	--	196	--	--	--	188	--	--	--	--	--	--	--	--	--	--	--
CASCADIA, 2002 E 28TH ST, TACOMA, WA	--	277	--	--	--	236	--	--	--	--	--	--	--	--	--	--	174
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	--	182	--	--	--	206	--	--	--	--	--	--	--	--	--	--	161
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA	--	--	--	--	--	206	--	--	--	--	--	--	--	--	--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	--	157	--	212	--	--	--	--	--	--	154	--	--	--	--	--	--

-- Indicates no sample on specified day

SUSPENDED PARTICULATES
(Micrograms per Cubic Meter)
1979

Summary of Maximum and 2nd High Observed Concentrations

Location	Jan	Jan	Feb	Mar	Mar	Apr	Jun	Jul	Jul	Aug	Aug	Sep	Oct	Oct	Oct	Nov	Nov	Dec
	3	9	2	10	22	27	20	20	26	13	28	18	6	10	12	13	14	29
	Wed	Tue	Fri	Sat	Thu	Fri	Wed	Fri	Thu	Mon	Tue	Tue	Sat	Wed	Fri	Tue	Wed	Sat
TOLT RIVER WATERSHED, KING CO, WA								49		51	--	--			--	--	--	
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA				102	102								133	--	--	--	--	
504 BELLEVUE WAY NE, BELLEVUE, WA	--	--	--	--	--	--	--	--	--	--	--	--	118	--	136	--	--	
PUGET POWER BLDG, 10604 NE 4TH, BELLEVUE, WA													100	--	137	--	--	
NORTH 98TH ST & STONE AVE N, SEATTLE, WA													128	--	113	--	--	
5701 - 8TH AVE NE, SEATTLE, WA					153				173									
2700 W COMMODORE WAY, SEATTLE, WA		155	142															
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA													123	--	113	--	--	
PUBLIC SAFETY BLDG, 604 - 3RD AVE, SEATTLE, WA		--		119									176	--			165	259
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA																		
HARBOR ISLAND, 3400 13TH AVE SW, SEATTLE, WA				246	213													269
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA					305													230
GEORGETOWN, 6431 CORSON AVE S, SEATTLE, WA	--	--	--		245													--
SOUTH PARK, 723 S CONCORD ST, SEATTLE, WA	158															170	--	--
DUWAMISH VALLEY, 12026 42ND AVE S, KING CO, WA	135															140	--	--
SE DIST HEALTH CTR, 12015 SE 128TH, RENTON, WA	120															114	--	--
SOUTH 2ND ST & LAKE AVE S, RENTON, WA					130											149	--	--
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA						106										111	--	--
22916 86TH AVE S, KENT, WA	176					215												
MEMORIAL PARK, 850 N CENTRAL AVE, KENT, WA	--	--				178		259										
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	--	--	--	--	--		95									87	--	--
115 E MAIN ST, AUBURN, WA				135												149	--	135
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	113															159	--	--
FIFE SR HIGH SCHOOL, 5616 - 20TH E, FIFE, WA								--								144	--	145
2340 TAYLOR WAY, TACOMA, WA	430					214												
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA				--				357			355							
TREATMENT PLANT, 1241 CLEVELAND WY, TACOMA, WA	222														196	--	--	--
CASCADIA, 2002 E 28TH ST, TACOMA, WA					280							--	--		277	--	--	--
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA															182	--	206	--
HESS BLDG, 901 TACOMA AVE S, TACOMA, WA															147	--	206	--
NORTH 43RD & VISSCHER STS, TACOMA, WA					101	133		--	--	--	--	--	--	--	--	--	--	--
NORTH 26TH & PEARL STS, TACOMA, WA													103	104	--	--	--	--
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA	206														212			
EAST 16TH ST & IRONSIDES AVE, BREMERTON, WA														73	--	--	--	--

-- Indicates no sample on specified day

SUSPENDED PARTICULATES
(COH's/1000 Lin Ft)
1979

Statistical Summary

Location	No. of 1 Hour Samples	Frequency Distribution - Percent													Arith Mean	Geom Mean	Std Dev	Arith Std Dev
		5	10	20	30	40	50	60	70	80	90	95	99					
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	8486	.2	.2	.3	.3	.4	.4	.5	.6	.8	1.0	1.3	1.8	.54	.45	1.85	.36	
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	8493	.2	.2	.3	.3	.4	.5	.6	.7	.9	1.3	1.7	2.4	.63	.50	1.94	.48	
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	8108	.2	.2	.3	.4	.5	.6	.8	.9	1.2	1.7	2.0	2.8	.80	.61	2.11	.60	
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	8611	.1	.2	.2	.3	.4	.4	.5	.7	.9	1.2	1.5	2.1	.59	.45	2.09	.45	
22916 86TH AVE S, KENT, WA	7524	.1	.1	.2	.3	.3	.4	.5	.6	.9	1.4	1.7	2.4	.58	.41	2.33	.53	
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	4985	.1	.2	.2	.3	.3	.4	.5	.6	.8	1.2	1.4	2.1	.54	.41	2.12	.44	
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	8244	.1	.2	.2	.3	.3	.4	.5	.6	.7	1.0	1.2	1.8	.51	.39	2.12	.37	
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	8380	.2	.3	.4	.6	.7	.9	1.0	1.3	1.7	2.3	2.9	4.0	1.10	.83	2.18	.84	
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	8470	.1	.1	.2	.2	.3	.4	.4	.6	.7	1.0	1.2	1.9	.48	.37	2.10	.38	
NORTH 43RD & VISSCHER STS, TACOMA, WA	3023	.1	.1	.2	.2	.3	.4	.4	.5	.7	1.0	1.3	1.9	.48	.36	2.18	.39	
NORTH 26TH & PEARL STS, TACOMA, WA	8304	.1	.1	.2	.2	.3	.4	.5	.6	.7	1.1	1.4	2.3	.51	.37	2.22	.45	

Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean	Year Geom Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	.75	.45	.51	.40	.41	.34	.42	.55	.59	.70	.80	.55	8486	.54	.45
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	.97	.58	.55	.44	.33	.32	.39	.54	.59	.85	1.19	.87	8493	.63	.50
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	1.21	.79	.79	.59	.49	.48	.48	.66	.71	1.01	1.54	1.07	8108	.80	.61
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	.90	.65	.60	.42	.35	.35	.40	.50	.52	.74	.83	.77	8611	.59	.45
22916 86TH AVE S, KENT, WA	.76	.48	.51	.40	.35	.31	.33	.28	.30	.41	.53	.72	7524	.58	.41
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA													4985	.54	.41
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA	.82	.45	.45	.36	.33	.30	.33	.43	.50	.66	.88	.55	8244	.51	.39
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA	1.67	1.03	.93	.72	.73	.59	.62	.88	1.16	1.60	2.07	1.34	8380	1.10	.83
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA	.81	.43	.44	.32	.35	.33	.33	.42	.42	.54	.70	.67	8470	.48	.37
NORTH 43RD & VISSCHER STS, TACOMA, WA	.74	.51	.47	.30	.28								3023	.48	.36
NORTH 26TH & PEARL STS, TACOMA, WA	.88	.53	.51	.35	.32	.22	.23	.33	.45	.67	.95	.66	8304	.51	.37

ATMOSPHERIC PARTICLES
(b-sp (x 10000/m))
1979 Statistical Summary

Location	No. of 1 Hour Samples	Frequency Distribution - Percent													Arith Mean	Geom Mean	Std Dev	Arith Std Dev
		5	10	20	30	40	50	60	70	80	90	95	99					
22916 86TH AVE S, KENT, WA	8514	.1	.2	.3	.3	.4	.5	.6	.8	1.2	1.8	2.5	3.9	.79	.54	2.37	.79	

Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean	Year Geom Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
22916 86TH AVE S, KENT, WA	.87	.48	.62	.55	.47	.44	.55	.83	.98	1.45	1.53	.75	8514	.79	.54

58%
Reduct

SUSPENDED PARTICULATES
Comparison of Methods

COH: SUSPENDED PARTICULATES (COH/1000 LIN FT)
B-SP: ATMOSPHERIC PARTICLES (B-SP (X 10000/M))
TSP: SUSPENDED PARTICULATES (MICROGRAMS PER CUBIC METER)

1979 Correlation Coefficients

Location: 22916 86TH AVE S, KENT, WA

	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ALL AVAILABLE SAMPLES													
1 HR COH VS 1 HR B-SP Sample Correlation Coefficient	.85	.91	.88	.83	.86	.76	.65	.63	.69	.67	.74	.89	.92
Number of 1 Hour Samples	7416	731	659	719	708	693	709	729	213	231	608	690	726
24 HR COH VS 24 HR B-SP Sample Correlation Coefficient	.87	.95	.94	.88	.94	.81	.77	.67	.64	.73	.76	.91	.97
Number of 24 Hour Samples	301	31	27	28	29	27	30	31	9	9	23	27	30
TSP SAMPLING DAYS ONLY													
24 HR COH VS 24 HR B-SP Sample Correlation Coefficient	.86	Coefficient of Haze (COH) represents a measure of suspended particulates derived from the decrease in light transmission through a filter tape as particulates accumulate on the tape. Ambient air is drawn through the filter tape continuously for 28 minutes; the final reading is taken; the tape then advances to a new position and the cycle repeats again and again to provide continuous sampling. The calculated concentrations measured by this method are reported in COH - units per thousand linear feet of sampled air.											
24 HR COH VS 24 HR TSP Sample Correlation Coefficient	.32	The light scattering extinction coefficient (B-SP) represents a measure of atmospheric particles. The light scattering extinction coefficient is inversely related to visibility and has been shown highly correlated to fine particle mass concentration. B-SP values summarized here were continuously measured using a model 1561 integrating nephelometer. The sample air stream was heated 5 to 15 degrees C above ambient air temperature to dry the particles.											
24 HR B-SP VS 24 HR TSP Sample Correlation Coefficient	.44												
Number of 24 Hr Samples Common to all Three Parameters	48												

Note: 24 Hour Averages Taken From
Midnight to Midnight

Total suspended particulates (TSP) are measured by the federal reference method of high volume sampling.

SULFUR DIOXIDE
(Parts per Million)
1979

Monthly Arithmetic Averages

Location	Monthly Arithmetic Averages												No. of 1 Hour Samples	Year Arith Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	.003	.001	.016	.011	.014	.014	.014	.013	.014	.014	.006	.003	7963	.010
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	.016	.007	.007	.006	.005	.006	.006	.007	.006	.007	.005	.005	6884	.007
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA		.003	.014	.004	.005	.005		.005	.005	.005	.005	.004	6193	.006
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	.013	.009	.010	.007	.009	.013	.012	.015	.014	.010	.009	.009	7845	.011
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	.002	.005	.012	.009	.013	.014	.014	.009	.008	.007			7243	.009
22916 86TH AVE S, KENT, WA	.001			.009	.010	.009	.021	.009	.005	.003	.003	.002	5914	.007
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA						.007	.013	.009	.003	.005	.005	.003	5001	.006
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	.004	.009	.007	.008	.006		.006	.008	.004	.005	.010	.011	7200	.007
NORTH 43RD & VISSCHER STS, TACOMA, WA	.009	.007	.010	.006	.006								3090	.008
NORTH 37TH & VASSAULT STS, TACOMA, WA						.007	.011	.006	.008	.010	.010	.008	4616	.008
NORTH 26TH & PEARL STS, TACOMA, WA	.008	.005	.006	.006	.008	.010	.009	.009	.006	.010	.011	.006	8257	.008

Number of Concentrations Exceeding Selected Values
for Various Averaging Periods

Location	5 Minute Average	1 Hour Average		3 Hour Average	24 Hour Average	
	1.00 ppm	0.40 ppm	0.25 ppm	0.50 ppm	0.10 ppm	0.14 ppm
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	6	2	5	0	0	0
NORTH 98TH ST & STONE AVE N, SEATTLE, WA	0	0	0	0	0	0
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	5	0	13	0	0	0
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA	0	0	2	0	0	0
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA	0	0	1	0	0	0
22916 86TH AVE S, KENT, WA	0	0	2	0	0	0
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	1	2	5	0	0	0
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA	0	0	7	0	0	0
NORTH 43RD & VISSCHER STS, TACOMA, WA	0	0	1	0	0	0
NORTH 37TH & VASSAULT STS, TACOMA, WA	0	0	4	0	0	0
NORTH 26TH & PEARL STS, TACOMA, WA	5	0	10	0	0	0

Sulfur Dioxide is continuously measured using one of the following three methods:
ultraviolet fluorescence, flame photometric detection, or conductimetry.

SULFUR DIOXIDE
(Parts per Million)
1979

Summary of Maximum and Second Highest Concentrations
for Various Averaging Periods

Location	5 Minute Average			1 Hour Average			3 Hour Average			24 Hour Average		
	Value	Date	End Time	Value	Date	End Time	Value	Date	End Time	Value	Date	End Time
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA	1.30	24 May	0314	.57	10 Mar	1940	.29	10 Mar	2000	.06	10 Mar	2000
	1.28	10 Mar	1937	.41	27 Mar	1100	.20	27 Mar	1300	.06	27 Mar	2200
NORTH 98TH ST & STONE AVE N, SEATTLE, WA				.15	4 Jan	0800	.08	18 Jan	2100	.05	19 Jan	0700
				.09	18 Jan	1900	.07	4 Jan	0900	.03	5 Jan	2400
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA	1.43	31 May	0654	.39	8 Mar	2042	.23	9 Mar	0100	.10	27 Mar	2300
	1.43	31 May	0659	.36	20 Apr	2200	.22	27 Mar	0500	.09	9 Mar	0900
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA				.34	28 Jun	0655	.18	14 Sep	1600	.05	10 Mar	1800
				.28	13 Mar	1700	.17	28 Jun	0900	.05	28 Jun	1100
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA				.32	28 Jun	1014	.17	29 Oct	1900	.05	26 Sep	2100
				.25	29 Oct	1700	.16	10 Aug	1100	.04	15 Mar	0100
22916 86TH AVE S, KENT, WA				.32	18 Jun	0145	.19	20 Jul	1100	.05	6 Jul	2400
				.29	20 Jul	0926	.16	6 Jul	1200	.05	20 Jul	1800
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA	1.42	23 Aug	1232	.46	26 Aug	2324	.27	10 Aug	1300	.06	11 Aug	0600
				.44	10 Aug	1144	.17	26 Aug	2400	.04	23 Jul	1600
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA				.30	25 Nov	1350	.27	11 Aug	0800	.04	5 Feb	0700
				.28	23 Jul	0740	.22	25 Jul	1200	.04	4 Apr	0600
NORTH 43RD & VISSCHER STS, TACOMA, WA				.31	1 Feb	1415	.17	1 Feb	1500	.05	21 Apr	2000
				.24	20 Feb	2000	.11	2 Mar	1600	.04	2 Feb	0300
NORTH 37TH & VASSAULT STS, TACOMA, WA				.33	27 Nov	0332	.19	27 Nov	0500	.05	14 Jul	0800
				.27	7 Sep	0111	.16	11 Oct	1400	.05	11 Oct	1500
NORTH 26TH & PEARL STS, TACOMA, WA	1.63	16 Sep	2048	.37	11 Oct	1249	.24	11 Oct	1400	.06	9 Jun	1100
	1.62	13 May	2012	.36	8 Jun	1231	.18	9 Jun	1000	.05	14 May	1300

5 Minute Average Recorded Only for Concentrations Exceeding 1.00 ppm
Ending Times are Reported in Pacific Standard Time

Photochemical Oxidants

The oxidant found in largest amounts in photochemical smog is ozone, a very reactive form of oxygen. Most oxidants are not emitted directly into the atmosphere but instead result from a series of chemical reactions between nitrogen oxides and reactive hydrocarbons in the presence of sunlight. This series of "photochemical" reactions proceeds for several hours generally producing maximum ozone levels between noon and early evening.

In the Puget Sound region the highest ozone concentrations occur during summer months when there are more hours of sunlight and the sun reaches higher elevation angles. Light northerly winds frequently accompany these warm, dry days. As a result, the highest ozone concentrations normally occur 5 to 15 miles south to southeast of the major urban centers.

Photochemical Oxidant/Ozone Standards

In April, 1971, the U.S. Environmental Protection Agency established national ambient air quality standards. The photochemical oxidant standard was set at a 1 hour average of 0.08 parts per million (ppm) not to be exceeded more than once per year. Later in 1971 the Agency adopted an identical local standard.

New national standards for ozone were established in February, 1979. The level of the primary and secondary standards is 0.12 ppm. The standard is attained "when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than one".

If an "exceedence" is defined to be a day with the maximum 1 hour average greater than 0.12 ppm, the standard is attained when the expected number of exceedences is equal to or less than one. In the case of a complete data set, the expected number of exceedences is simply the average number of observed exceedences during the most recent 3 years.

An incomplete data set for a given year requires an estimate of the number of exceedences in that year. This estimate is based upon the observed number of exceedences, the number of required monitoring days, the number of days upon which a valid maximum was recorded, and the number of days assumed to be less than the standard level.

The estimated number of exceedences is always greater than or equal to the observed number of exceedences, and, for stations where no exceedences are observed, the estimate is always zero.

The expected number of exceedences is then calculated as the three year average of the estimated number of exceedences. A shorter sampling period may shorten the averaging period to a minimum of one year.

Using the Ozone Table to Assess Attainment

The 1979 ozone table shows whether national and local standards were attained in 1979. In some instances, the table allows projection of nonattainment of the national standard into a succeeding year.

Examination of the column entitled "No. of Days 1 Hour Average Exceeded .08 ppm" shows that 7 of 9 stations had at least two days on which 1 hour averages exceeded .08 ppm, and thus exceeded the local standard in 1979.

The column at the extreme right of the table shows that 5 of 9 stations had a value for expected number of exceedences greater than 1.0, and thus exceeded the national standard in 1979.

The estimated number of exceedences shown for 1978 and 1979 may be used to project nonattainment of the national standard for two stations, Lake Sammamish and Sumner, at least through 1980.

OZONE
(Parts per Million)
1979

Location / Period of Sampling	Four Highest Daily Maximum 1 Hour Averages			No. of Days 1 Hour Average Exceeded	Estimated No. of Days 1 Hour Average Exceeded .12 ppm			No. of Days 1 Hour Average Expected To Exceed .12 ppm
	Value	Date	End Time		1977	1978	1979	
					.08 ppm			
29000 - 68TH AVE NE, STANWOOD, WA* 20 Jun - 30 Sep	.11	17 Jul	1500	1	-	-	0.0	0.0
	.07	25 Jun	1300					
	.07	15 Jul	1400					
	.07	16 Jul	1400					
SNOHOMISH CO, FIRE DISTRICT #22, ARLINGTON, WA* 24 Apr - 30 Sep	.12	17 Jul	1400	2	-	0.0	0.0	0.0
	.09	14 Sep	1700					
	.08	27 Apr	1500					
	.08	1 Jun	1700					
LAKE SAMMAMISH STATE PARK, KING CO, WA* 1 Jan - 31 Dec	.16	17 Jul	1400	3	5.5	4.1	2.1	3.9
	.13	18 Jul	1400					
	.09	16 Jul	1500					
	.08	27 Apr	1500					
22916 86TH AVE S, KENT, WA 1 Jan - 31 Dec	.10	17 Jul	1400	2	1.1	3.1	0.0	1.4
	.09	25 May	1500					
	.08	16 Jul	1900					
	.08	18 Jul	1500					
KING CO, FIRE DISTRICT #28, ENUMCLAW, WA* 27 Jun - 30 Sep	.13	17 Jul	1700	6	-	0.0	2.2	1.1
	.11	16 Jul	1400					
	.11	18 Jul	1400					
	.11	14 Sep	1700					
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA 1 Jan - 31 Dec	.16	17 Jul	1500	5	3.2	3.1	1.1	2.5
	.12	25 May	1700					
	.11	16 Jul	1400					
	.10	14 Sep	1300					
MT TAHOMA HS, 6404 S ADAMS ST, TACOMA, WA* 20 Apr - 31 Dec	.09	16 Jul	1300	2	0.0	0.0	0.0	0.0
	.09	17 Jul	1500					
	.08	25 May	1700					
	.06	2 Jun	1200					
GIG HARBOR HS, GIG HARBOR, WA* 5 Jun - 24 Oct	.09	17 Jul	1800	1	-	-	0.0	0.0
	.07	16 Jul	1600					
	.06	15 Jul	1500					
	.06	18 Jul	1400					
PIERCE CO, FIRE DISTRICT #21, GRAHAM, WA* 17 May - 30 Sep	.16	17 Jul	1500	5	-	1.5	1.6	1.6
	.12	14 Sep	1800					
	.11	16 Jul	1400					
	.10	25 May	1500					

* Washington State Department of Ecology Station

- Indicates no Ozone Sampling for Given Year

Ending Times are Reported in Pacific Standard Time

Ozone is continuously measured using gas phase chemiluminescence or ultraviolet photometric detection.

CARBON MONOXIDE

Introduction

The Washington State Department of Ecology has statewide jurisdiction over motor vehicular sources. Motor vehicles are the source of most carbon monoxide emissions and are primarily responsible for the carbon monoxide emissions which result in ambient readings exceeding standards in the cities of the Puget Sound area.

During 1979, carbon monoxide analyzers were operated at 13 locations in the Puget Sound region. Sampling ended at three stations and started at one new station during the year.

Factors Influencing Concentrations

In general, high ambient levels of carbon monoxide occur near congested, slow-moving motor vehicle traffic when low level winds are light and stable meteorological conditions exist. Peak concentrations normally coincide with the weekday morning and evening traffic peaks. Minimum values generally occur late at night and on some weekends.

Episode Levels

Episode criteria are specified in the Washington State Emergency Episode Plan. The Alert stage is reached when the ambient carbon monoxide concentration reaches 15 parts per million (ppm) for an 8 hour average, and meteorological conditions are such that the carbon monoxide concentration can be expected to remain at that level for 12 or more hours or increase unless control actions are taken.

Correspondingly, the carbon monoxide concentration for the Warning stage is 30 ppm for an 8 hour average, and for the Emergency stage is 40 ppm for an 8 hour average. A similar statement on the forecast of meteorological conditions and persistence of the carbon monoxide concentration is also part of the declaration of each of these stages.

Data Summary

The carbon monoxide data presented on the following page were obtained from the Department of Ecology monthly data summaries and from the Department publication, "Washington State Air Monitoring Data for 1979". Detailed information regarding site locations; hourly, daily and seasonal averages; and trends may be obtained by contacting the Department of Ecology.

A review of the table of data shows that 9 of the 13 stations exceeded an 8 hour average of 9 ppm at least twice. Therefore all of these 9 stations exceeded the 8 hour average standard.

One station in Tacoma recorded a maximum 1 hour average of 45 ppm. However, the second highest 1 hour average at this station was less than the 35 ppm standard. No other monitoring station recorded a 1 hour average exceeding 35 ppm. Therefore none of the monitoring sites violated the 1 hour standard.

CARBON MONOXIDE
(Parts Per Million)
1979

Location / Period of Sampling	Maximum and Second Highest Concentrations						Number of Averages Exceeding 9 ppm	Number of Days 8 Hour Average Exceeded 9 ppm
	1 Hour Average			8 Hour Average				
	Value	Date	End Time	Value	Date	End Time		
622 BELLEVUE WAY NE, BELLEVUE, WA 1 Jan - 31 Dec	17	8 Jan	1800	12	8 Jan	2200	4	4
	16	8 Jan	1900	10	20 Nov	2300		
4511 UNIVERSITY WAY NE, SEATTLE, WA 1 Jan - 31 Dec	24	10 Oct	2100	16	20 Nov	2200	31	26
	23	10 Nov	1800	15	10 Oct	2200		
3921 LINDEN AVE N, SEATTLE, WA 1 Jan - 31 Dec	11	27 Dec	1900	7	22 Feb	200	0	0
	10	14 Nov	1800	7	1 Nov	2400		
1300 MADISON ST, SEATTLE, WA 1 Jan - 30 Sep	12	9 Jan	1700	10	14 Sep	1400	1	1
	12	14 Sep	800	8	9 Jan	1700		
417 PIKE ST, SEATTLE, WA 1 Jan - 31 Dec	25	13 Mar	1800	15	27 Dec	2300	29	28
	23	6 Dec	1700	14	13 Mar	2300		
1424 4TH AVE, SEATTLE, WA 1 Jan - 31 Dec	35	14 Sep	1700	16	27 Dec	2200	42	39
	24	14 Sep	1600	14	10 Jan	1900		
2ND AVE & UNIVERSITY ST, SEATTLE, WA 1 Jan - 31 Dec	27	14 Sep	1700	13	14 Sep	1700	13	12
	24	14 Sep	1600	12	13 Mar	2300		
5TH AVE & JAMES ST, SEATTLE, WA 1 Jan - 31 Dec	34	14 Sep	1700	19	14 Sep	1700	32	29
	29	14 Sep	1600	13	8 Jan	1900		
FIRE STATION #10, 301 2ND AVE S, SEATTLE, WA 1 Jan - 31 Dec	17	10 Jan	1800	13	14 Nov	2400	4	4
	17	14 Nov	2200	12	27 Dec	2200		
1000 4TH AVE S, SEATTLE, WA 1 Jan - 30 Sep	18	10 Jan	1700	10	10 Jan	1800	1	1
	15	8 Jan	1800	8	25 Jan	2200		
2809 26TH AVE S, SEATTLE, WA 1 Jan - 31 Dec	21	21 Nov	900	12	13 Nov	2400	3	3
	19	4 Jan	1000	11	27 Dec	2200		
715 S 11TH ST, TACOMA, WA 1 Jan - 31 Jul	12	30 Jan	900	7	17 Jan	1300	0	0
	11	17 Jan	1000	6	2 Jan	1800		
942 PACIFIC AVE, TACOMA, WA 1 Jul - 31 Dec	45	14 Nov	1800	16	14 Nov	1900	14	11
	27	15 Nov	1800	15	21 Nov	2200		

Ending Times are Reported in Pacific Standard Time
Carbon Monoxide is Measured on a Continuous Basis Using the Nondispersive Infrared Method

LEAD

In October, 1978, the U.S. Environmental Protection Agency (EPA) established a national ambient air quality standard for lead. This standard is a primary (health related) standard and is set at 1.5 micrograms per cubic meter averaged over one calendar quarter. EPA based the new standard on preventing exposure of children, ages one to five, to ambient air lead which might cause their blood lead level to exceed 30 micrograms of lead per deciliter of blood.

According to EPA, about 90 percent of the lead emitted into the nation's air comes from automobile exhaust. The remainder comes from stationary sources such as primary and secondary nonferrous smelters.

In 1978, the State Department of Ecology, together with the Agency, established a network for monitoring lead in the ambient air. Data acquired during 1978 and 1979 identify two areas in the Puget Sound region which exceed the lead standard. These are both in Seattle. One area is a strip of Interstate 5 from Spokane Street to Northgate. The other area is the Harbor Island industrial region. The table below presents the results of sampling during 1979. Two stations, one in each of these areas, show lead concentrations in excess of the standard.

LEAD
(Micrograms per cubic meter)
1979 Quarterly Arithmetic Averages

Location	1st	2nd	3rd	4th
504 Bellevue Way NE, Bellevue, Wa				0.90
North 98th St & Stone Ave N, Seattle, Wa	0.85	0.44	0.59	0.77
5701 - 8th Ave NE, Seattle, Wa	1.68	1.23	1.74	1.56
Portage Bay, 2725 Montlake Blvd E, Seattle, Wa	1.10	0.56	0.81	1.15
Harbor Island, 3400 13th Ave SW, Seattle, Wa	2.02	2.26	2.11	1.51
North 43rd & Visscher Sts, Tacoma, Wa	0.79			
North 26th & Pearl Sts, Tacoma, Wa	0.79	0.36	0.50	0.63

A lower atmosphere sounding unit began operating on the east shore of Portage Bay in Seattle during 1971. The Department of Ecology operates the station. Normal operation provides one slow ascent sounding to 700 millibars about 0700 local time each Monday through Friday except on holidays. This sounding is the primary source of lower atmosphere data in the Puget Sound Basin and is an essential basis for many forecasts including air stagnation forecasts. Each sounding is reasonably representative of the lower atmosphere in the entire Puget Sound area. The Agency makes regular use of the sounding in evaluating and interpreting air quality data and also enters the sounding in a computerized data base.

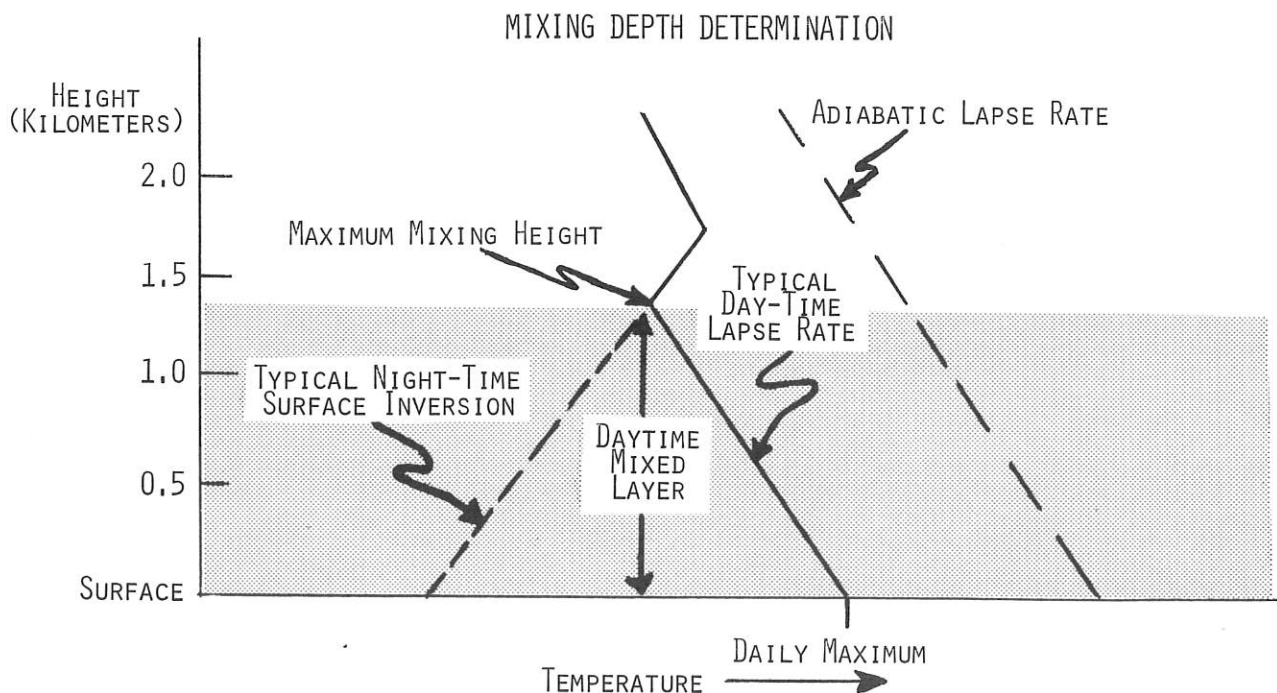
The figure below illustrates some key concepts. Temperature increasing with height is termed a TEMPERATURE INVERSION. A temperature inversion limits the height to which pollutants are mixed or dispersed vertically. The MIXING DEPTH is simply the height from the surface to the temperature inversion base. The mixing depth continuously changes responding to the daytime increase or nighttime decrease of surface temperature, and to other processes which modify the temperature at the ground or aloft.

On days with no temperature inversion, the mixing depth is unlimited and this

contributes to rapid pollutant dispersion and good air quality. In contrast, a temperature inversion near the surface thick enough so that the daytime mixing depth will not exceed the depth of the inversion significantly restricts vertical dispersion. This stable condition is associated with higher concentrations of air pollutants.

Four soundings during 1979 are plotted and presented on the following pages. The temperature is represented by a solid line connecting actual data values enclosed by circles. The dewpoint temperature is represented by a dashed line connecting actual data values enclosed by triangles. The measured winds at several heights are plotted to the right of the sounding and also reported as numerical values in degrees/knots.

These soundings represent days on which pollutant levels were high and exceeded standards at many stations. Maximum OZONE levels for all stations were recorded on JUL 17. Maximum or second high 1 hour and 8 hour average CARBON MONOXIDE values were recorded for several stations on SEP 14 and NOV 14. Many stations recorded TSP values exceeding the 24 hour standard on JUL 17, OCT 12, and NOV 14. No TSP sampling was conducted on SEP 14. An Air Stagnation Advisory was in effect on OCT 12 and NOV 14.

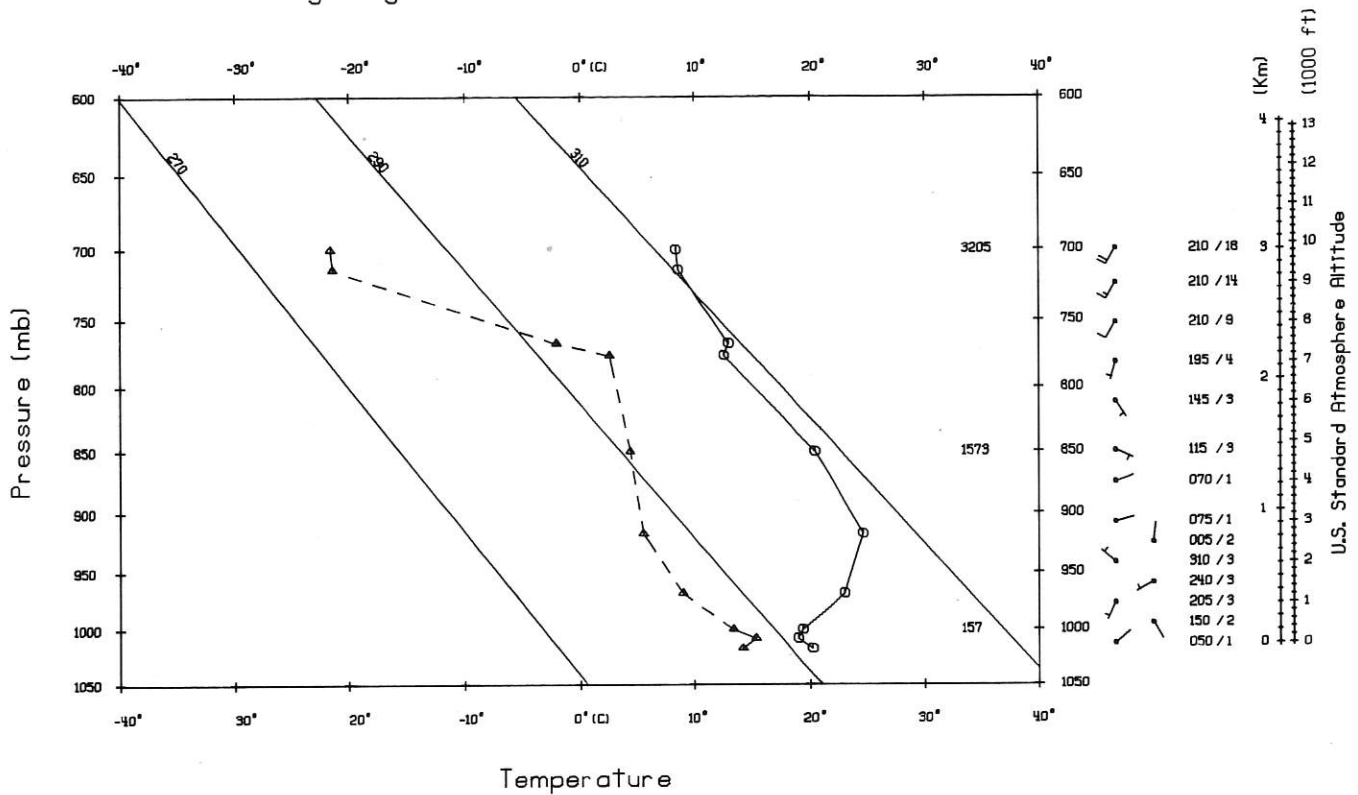


PUGET SOUND AIR POLLUTION CONTROL AGENCY

PSEUDO-ADIABATIC CHART

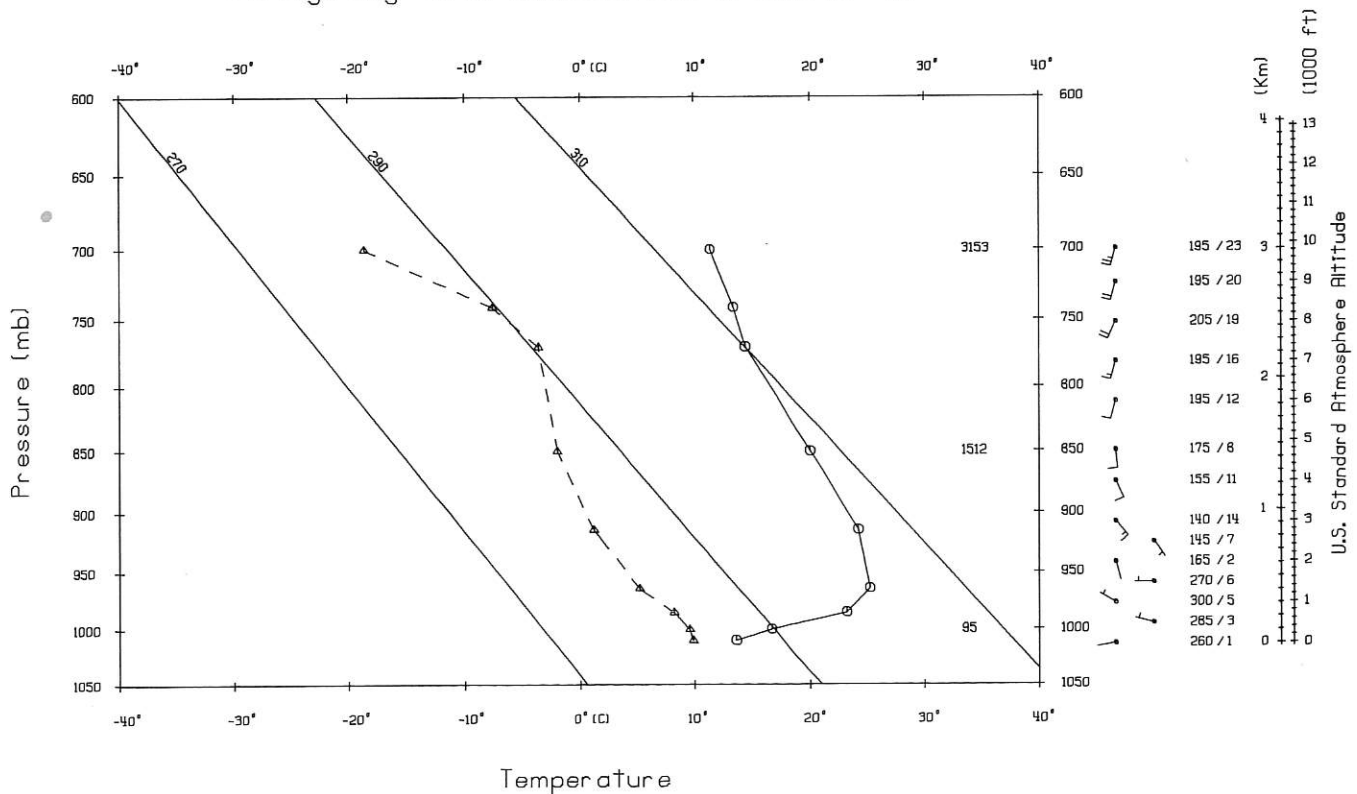
0600 PST 17 Jul 1979

Portage Bay 2725 Mountlake Blvd E, Seattle WA



0600 PST 14 Sep 1979

Portage Bay 2725 Mountlake Blvd E, Seattle WA

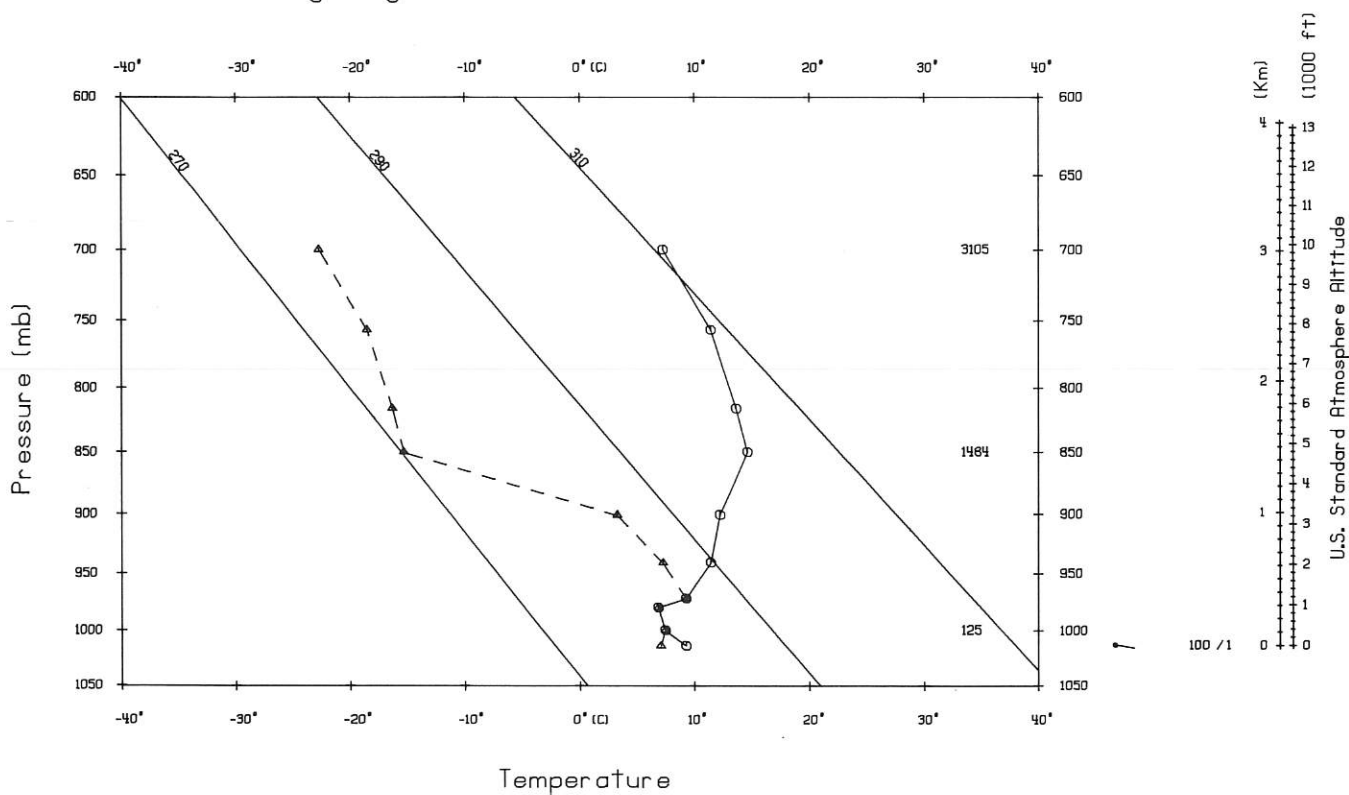


PUGET SOUND AIR POLLUTION CONTROL AGENCY

PSEUDO-ADIABATIC CHART

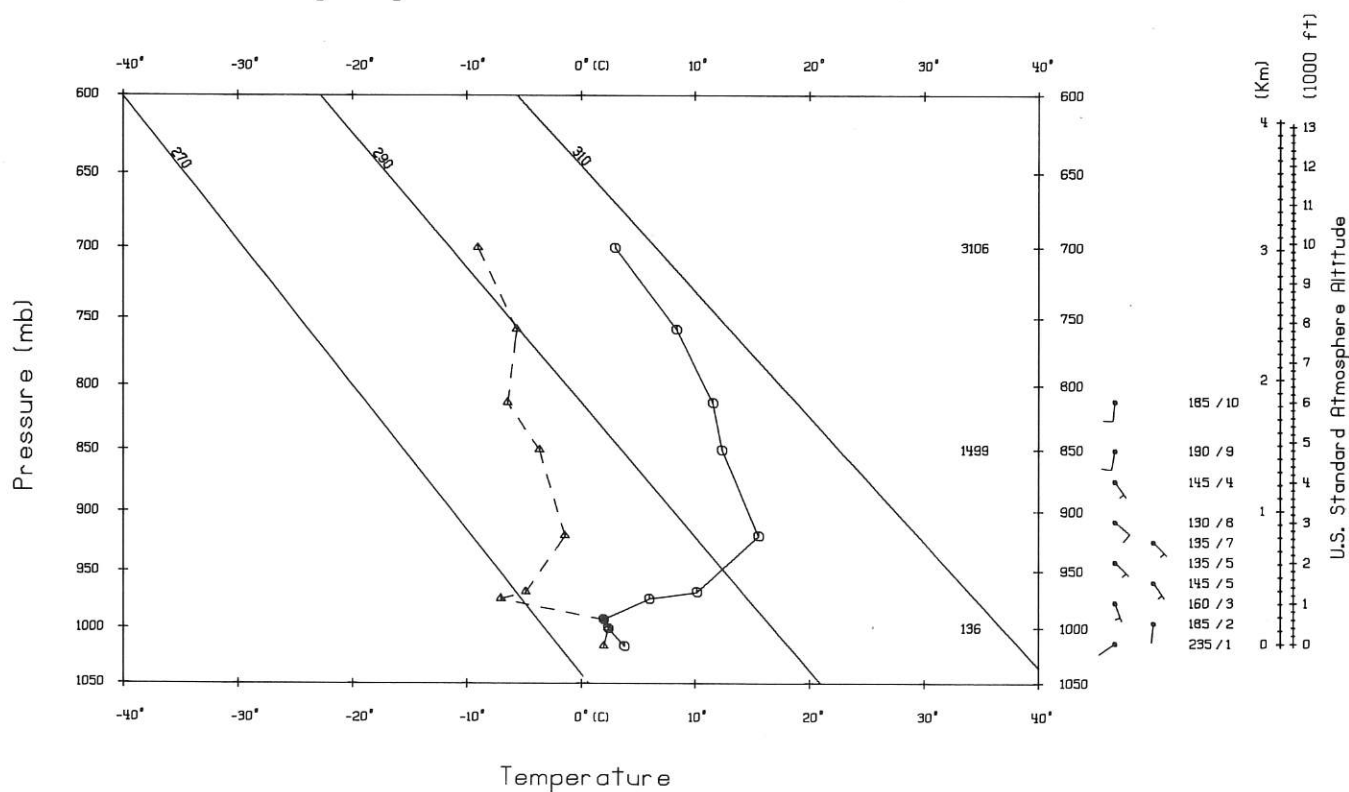
0600 PST 12 Oct 1979

Portage Bay 2725 Mountlake Blvd E. Seattle WA



0700 PST 14 Nov 1979

Portage Bay 2725 Mountlake Blvd E. Seattle WA



The Agency has developed a lower atmosphere climatology from the sounding data base. Each individual temperature sounding is analyzed to determine the vertical lapse rate of temperature, $(-DT/DZ)$, between significant levels. These "significant level" layers are then grouped into sounding layers by the following four stability categories:

- 1) Temperature inversion (a stable condition)
- 2) Stable (no inversion)
- 3) Conditionally stable
- 4) Unstable

Two types of summary tables of these sounding layers are presented below. On

the right the tables present a distribution of TEMPERATURE INVERSION LAYERS showing, for grouped inversion base heights, the number of inversions of a given thickness or depth. Tables on the left present the distribution of the four mutually exclusive SOUNDING LAYERS by height of the base of each layer.

This analysis includes eight years of data (1972 through 1979). There are separate tables for all eight years combined and for calendar year 1979 alone. Seasonal variations may be developed from monthly tables presented in the Air Quality Data Summary for 1977.

FREQUENCY DISTRIBUTION OF SOUNDING LAYERS
(Within Given Lapse Rate Interval Based At or Below Given Height)

PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA

ALL MONTHS 1979
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	LAPSE RATE CATEGORIES (DEGREES C/KM)				Total No. Sounding Layers
	Stable	Cond Stable		Unstable	
		< 0.0 to 5.0	5.1 to 10.0		
SFC	30	46	64	110	250
150	52	69	117	112	350
300	97	88	166	115	466
500	130	133	193	115	571
1000	167	222	276	120	785
1500	210	294	363	125	992
2000	244	360	446	135	1185
2500	275	423	526	141	1365
3000	311	472	586	147	1516
700 MB	312	473	586	147	1518

Number of Soundings: 250

ALL MONTHS 1972-79
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	LAPSE RATE CATEGORIES (DEGREES C/KM)				Total No. Sounding Layers
	Stable	Cond Stable		Unstable	
		< 0.0 to 5.0	5.1 to 10.0		
SFC	281	323	593	799	1996
150	474	509	1046	832	2861
300	739	687	1392	869	3687
500	961	985	1658	881	4485
1000	1266	1636	2316	928	6146
1500	1615	2286	2996	1008	7905
2000	1968	2832	3629	1074	9503
2500	2303	3349	4214	1140	11006
3000	2551	3741	4621	1193	12106
700 MB	2560	3744	4623	1195	12122

Number of Soundings: 1996

NOTES:

- (1) All Heights are measured in Geopotential Meters above Mean Sea Level.
- (2) Sounding terminates at 700 MB (3010 GPM - U.S. Standard Atmosphere).
- (3) Because the Numbers in each Column are cumulative, Totals may be read Directly from the last Row (Height of Base at or Below 700 MB).
- (4) The Lapse Rate is defined as $-DT/DZ$ where DT is Temperature Difference and DZ is Height Difference (or Thickness) between consecutive Sounding Layers. Thus an Inversion is defined by a negative Lapse Rate.

FREQUENCY DISTRIBUTION OF TEMPERATURE INVERSION LAYERS
(Within Given Thickness Interval Based At or Below Given Height)

PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA (Elevation 8 M Above MSL)

ALL MONTHS 1979
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	Thickness (GPM)							Total No. Temperature Inversions	Total No. Sounding Layers
	0 to 150	151 to 300	301 to 450	451 to 600	601 to 750	751 to 900	> 900		
	SFC	4	5	6	3	5	3		
150	7	13	6	5	8	7	6	52	350
300	20	20	17	7	14	9	10	97	466
500	32	30	22	10	15	10	11	130	571
1000	43	44	27	11	17	11	14	167	785
1500	62	61	32	12	17	12	14	210	992
2000	67	82	36	13	20	12	14	244	1185
2500	77	92	43	16	21	12	14	275	1365
3000	93	110	45	16	21	12	14	311	1516
700 MB	94	110	45	16	21	12	14	312	1518

Number of Soundings: 250

ALL MONTHS 1972-79
Morning Soundings (0600 to 0800 PST)

Height of Base (GPM) At or Below	Thickness (GPM)							Total No. Temperature Inversions	Total No. Sounding Layers
	0 to 150	151 to 300	301 to 450	451 to 600	601 to 750	751 to 900	> 900		
	SFC	69	73	52	31	20	16		
150	101	120	80	68	40	28	37	474	2861
300	179	179	124	94	58	46	59	739	3687
500	257	243	152	116	69	55	69	961	4485
1000	389	334	187	139	80	58	79	1266	6146
1500	552	449	220	162	86	62	84	1615	7905
2000	702	569	277	176	97	62	85	1968	9503
2500	848	681	325	195	105	63	86	2303	11006
3000	969	770	358	200	105	63	86	2551	12106
700 MB	978	770	358	200	105	63	86	2560	12122

Number of Soundings: 1996

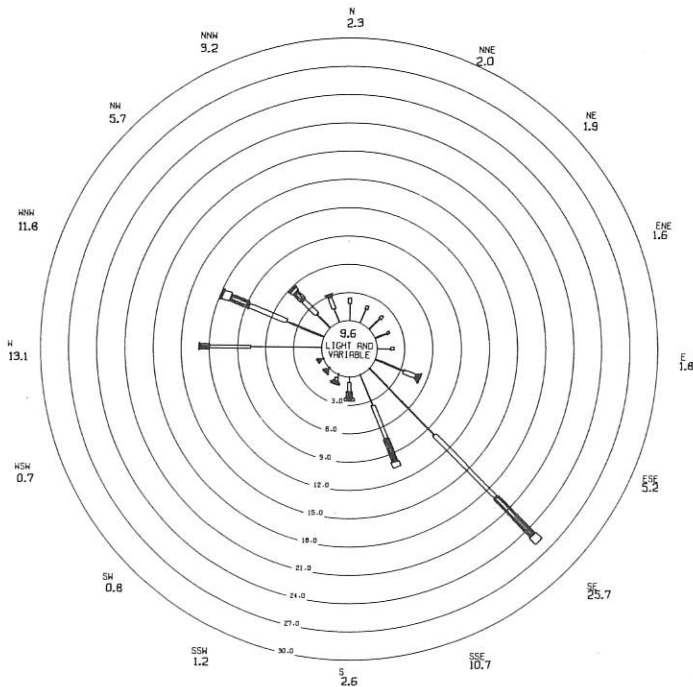
WIND ROSES

The measurement of local area wind speed and direction is essential to the evaluation and control of air pollution. Low wind speeds contribute to higher air pollutant concentrations, particularly near major urban or industrialized areas. Wind direction data aids in determining which sources or source areas affect a specific location.

A wind rose is a graphical means of summarizing the winds for a given time period. It is essentially a count, expressed in these graphs as a percentage frequency, of the number of observations or hours which had a particular direction and speed during the summary period.

The wind rose spokes or arms represent 16 points of the compass, each pointing to a wind direction compass point. The percentage frequency of winds FROM a given direction (without regard to speed) is expressed numerically beneath that direction on the perimeter of each rose.

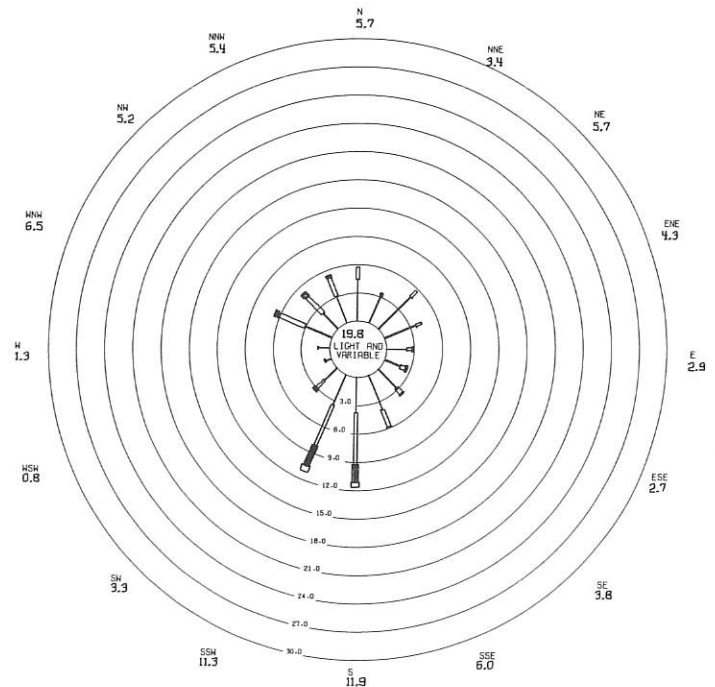
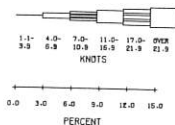
The length of each segment of a spoke indicates the relative frequency of winds within the different speed categories. Using the percent scale located to the lower right of each rose, these lengths may be converted to number of observations or hours during which each speed category occurred. The percentage frequency of light and variable winds (winds less than 1.5 knots) is shown in the center of the rose.



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

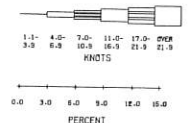
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
MEDICAL-DENTAL BLDG, 2730 COLBY, EVERETT, WA
INCLUSIVE DATES- ALL MONTHS 1979
TOTAL OBSERVATIONS- 6,613

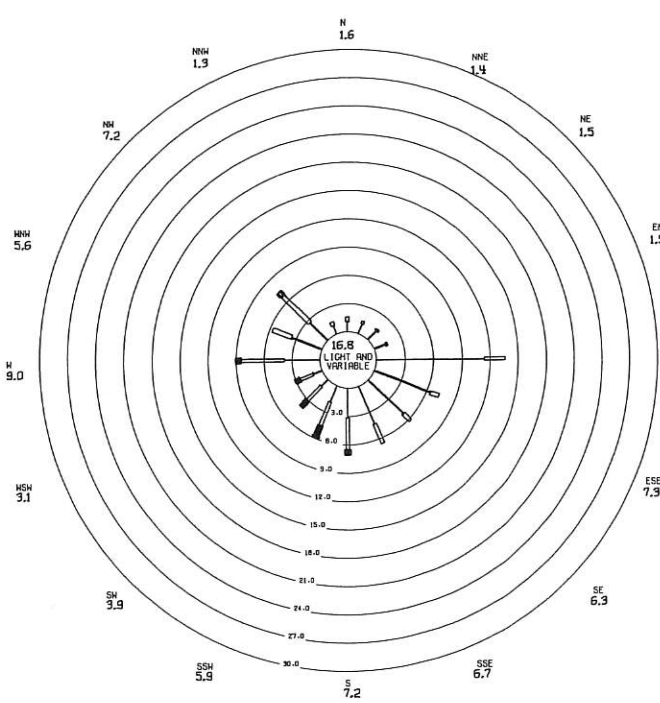


HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 98TH ST & STONE AVE N, SEATTLE, WA
INCLUSIVE DATES- ALL MONTHS 1979
TOTAL OBSERVATIONS- 6,561





HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

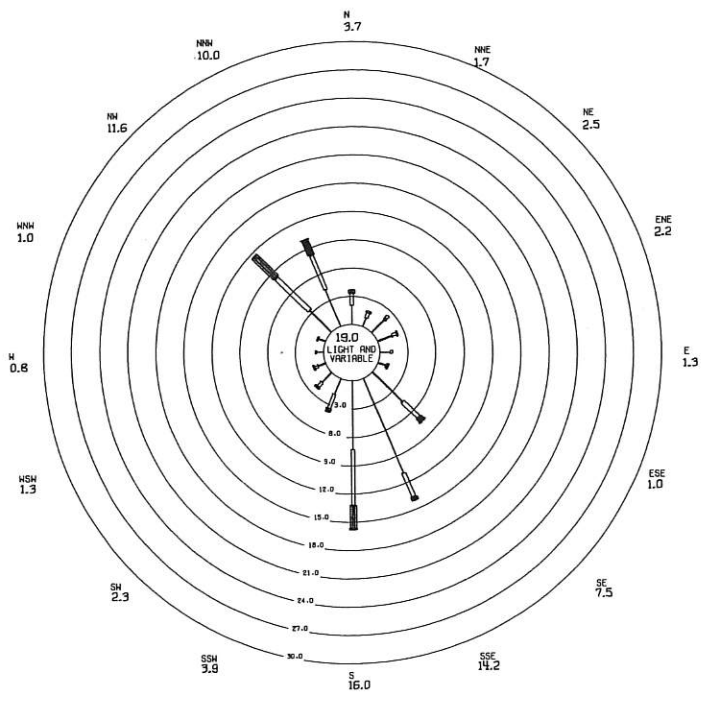
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
PORTAGE BAY, 2725 MONTLAKE BLVD E, SEATTLE, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 8,456

1.1- 4.0- 7.0- 11.0- 17.0- OVER
3.9 6.9 10.9 16.9 21.9 21.9
KNOTS

0.0 3.0 6.0 9.0 12.0 15.0
PERCENT



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

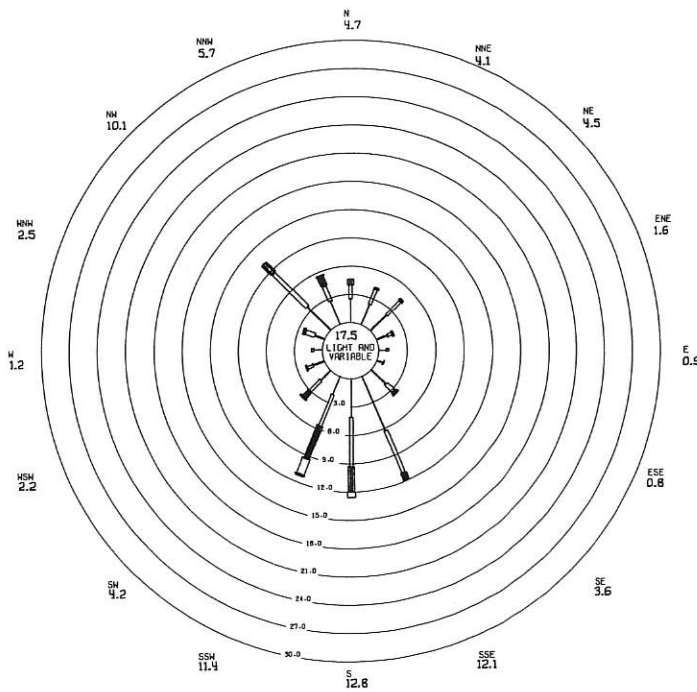
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
HARBOR ISLAND, 3419 13TH AVE SW, SEATTLE, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 7,963

1.1- 4.0- 7.0- 11.0- 17.0- OVER
3.9 6.9 10.9 16.9 21.9 21.9
KNOTS

0.0 3.0 6.0 9.0 12.0 15.0
PERCENT



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

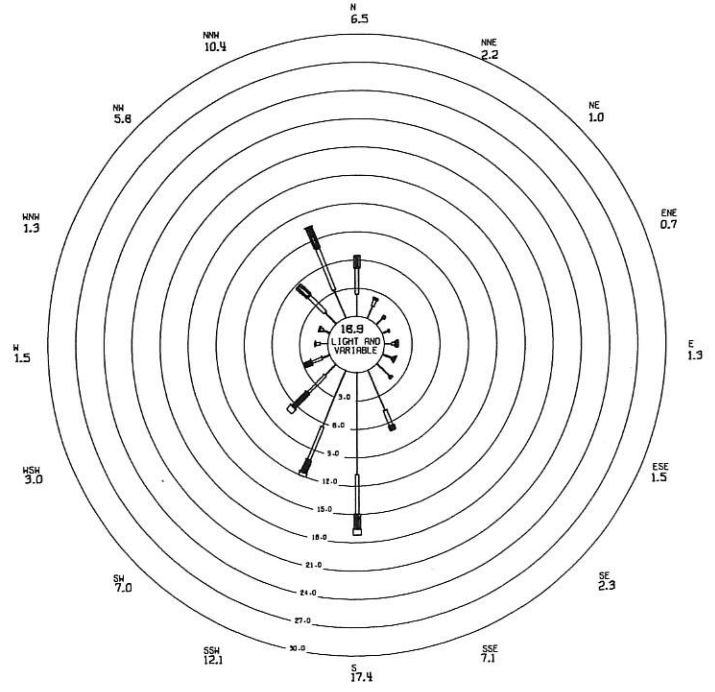
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 6,313

1.1- 4.0- 7.0- 11.0- 17.0- OVER
3.9 6.9 10.9 16.9 21.9 21.9
KNOTS

0.0 3.0 6.0 9.0 12.0 15.0
PERCENT



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

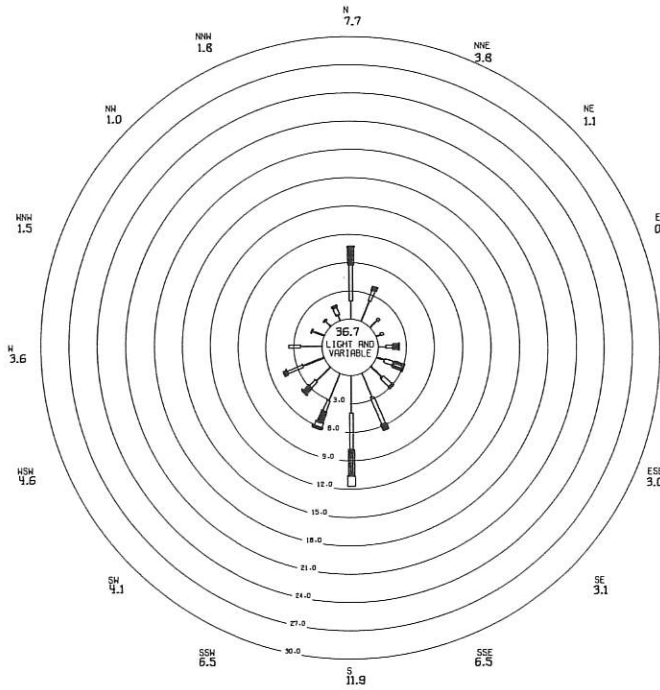
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SOUTHCENTER, 401 ANDOVER PARK E, TUKWILA, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 8,130

1.1- 4.0- 7.0- 11.0- 17.0- OVER
3.9 6.9 10.9 16.9 21.9 21.9
KNOTS

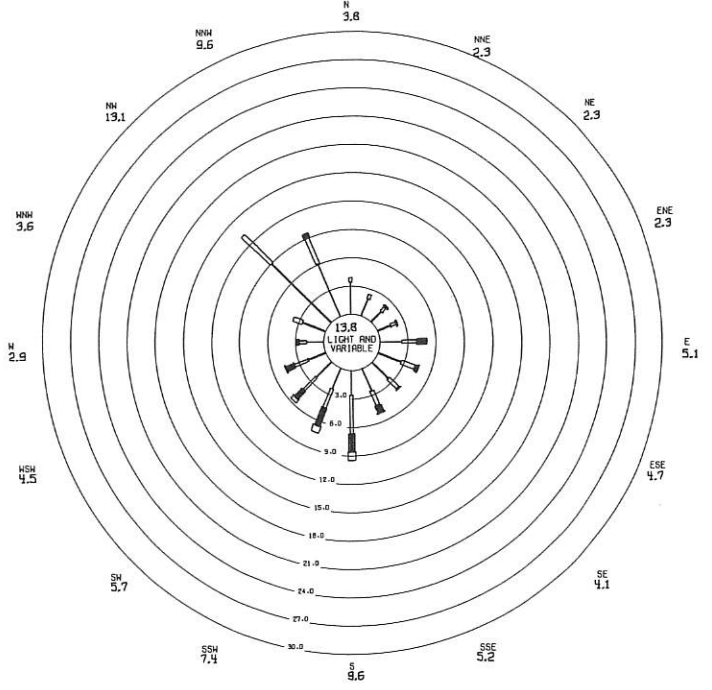
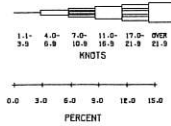
0.0 3.0 6.0 9.0 12.0 15.0
PERCENT



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

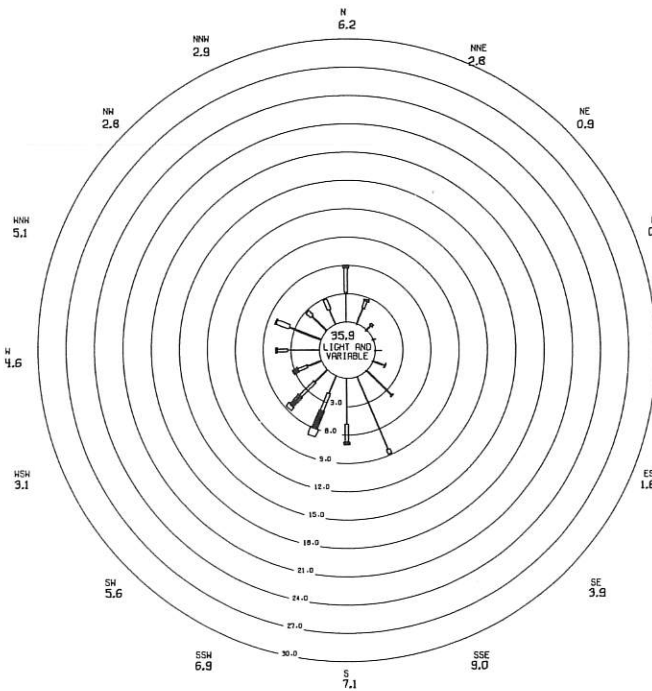
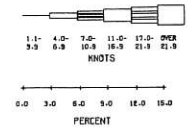
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
22916 86TH AVE S, KENT, WA
INCLUSIVE DATES- ALL MONTHS 1979
TOTAL OBSERVATIONS- 6,611



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

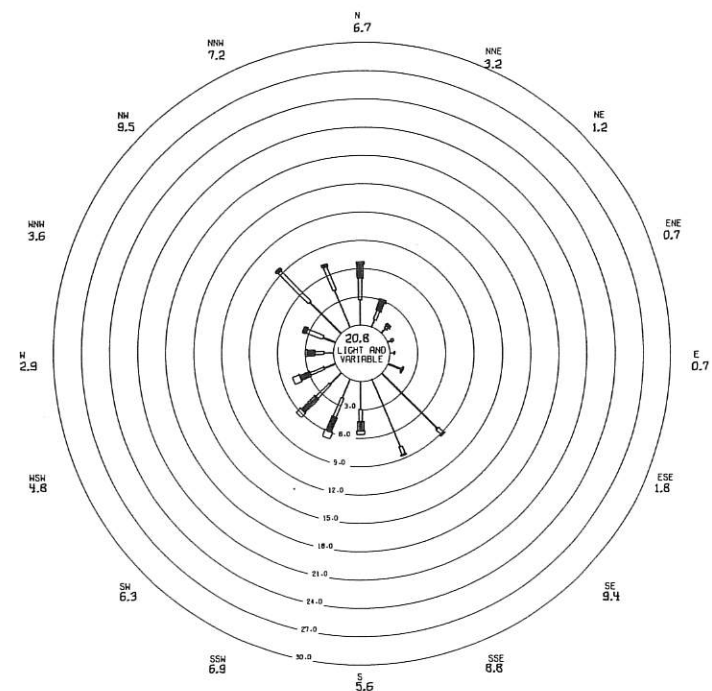
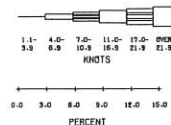
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
FEDERAL WAY HS, 1401 S 304 ST, FEDERAL WAY, WA
INCLUSIVE DATES- JUN, JUL, AUG, SEP, OCT, NOV, DEC, 1979
TOTAL OBSERVATIONS- 4,993



HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

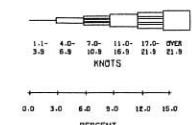
STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SUMNER JR HS, 1508 WILLOW ST, SUMNER, WA
INCLUSIVE DATES- ALL MONTHS 1979
TOTAL OBSERVATIONS- 8,458

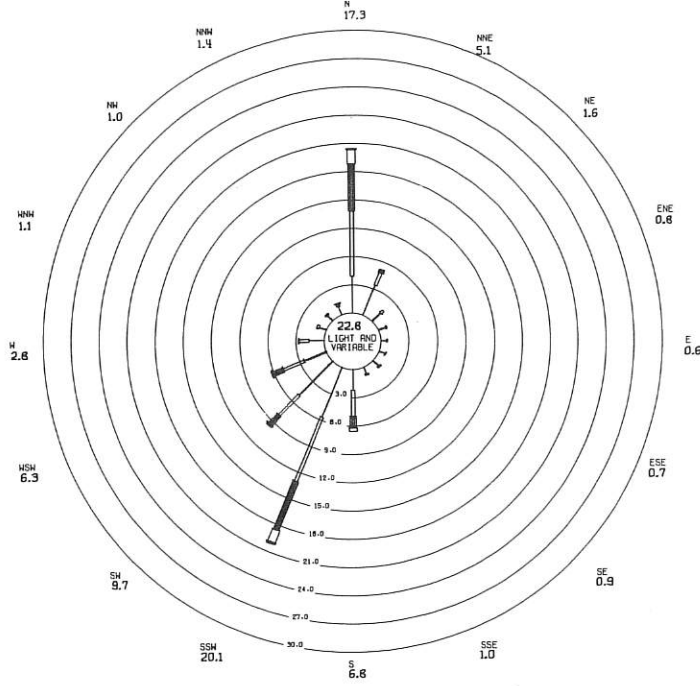


HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA
INCLUSIVE DATES- ALL MONTHS 1979
TOTAL OBSERVATIONS- 6,605





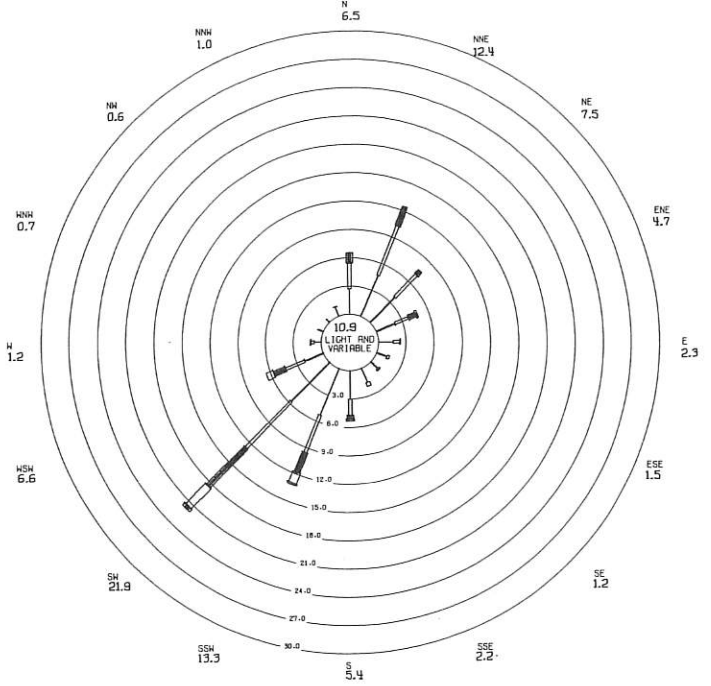
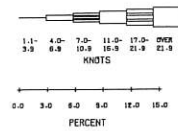
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
WILLARD SCHOOL, S 32ND & S 'D' ST, TACOMA, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 8,607



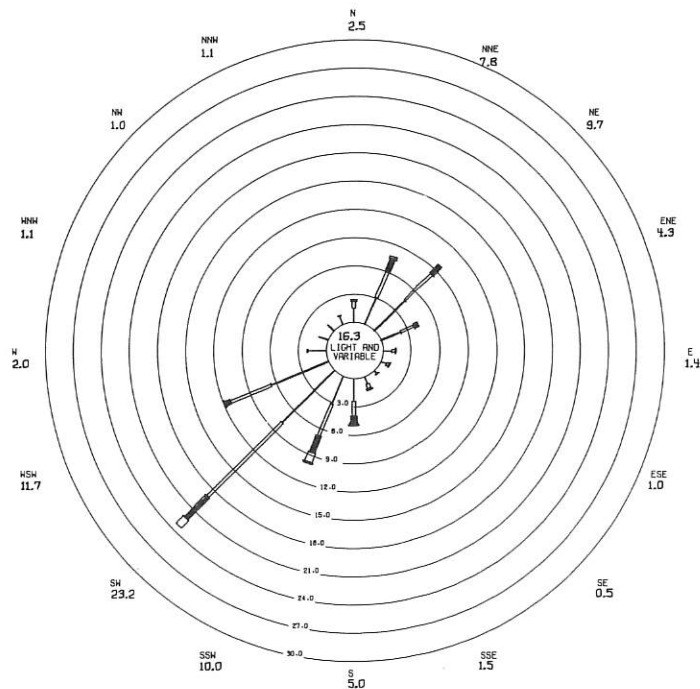
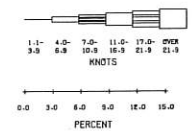
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
SW 283RD & 101ST AVE SW, MAURY ISLAND, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 8,246



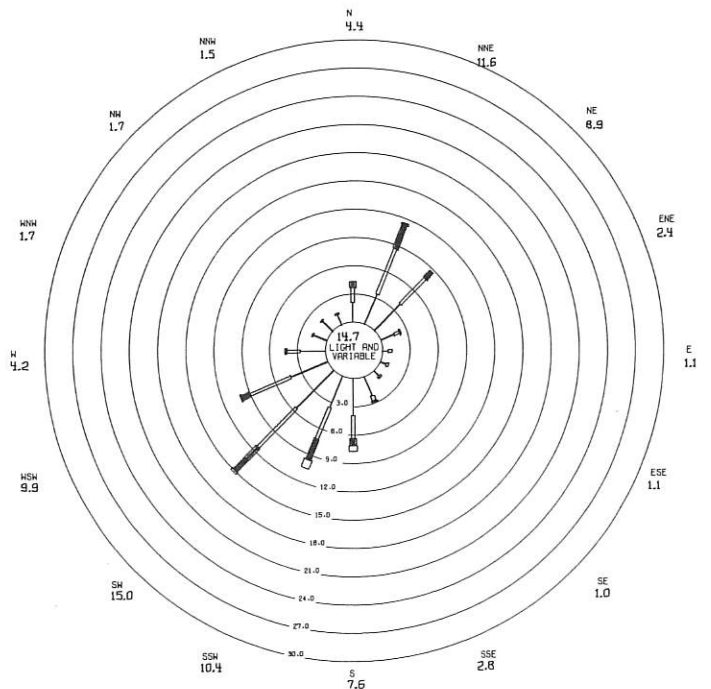
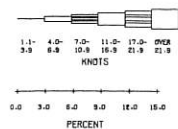
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 37TH & VASSAULT STS, TACOMA, WA

INCLUSIVE DATES- JUN, JUL, AUG, SEP, OCT, NOV, DEC, 1979

TOTAL OBSERVATIONS- 4,883



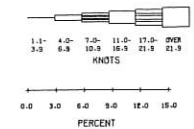
HOUR AVERAGE SURFACE WINDS

PERCENTAGE FREQUENCY OF OCCURRENCE

STATION LOCATION- PUGET SOUND AIR POLLUTION CONTROL AGENCY
NORTH 26TH & PEARL STS, TACOMA, WA

INCLUSIVE DATES- ALL MONTHS 1979

TOTAL OBSERVATIONS- 8,245



Introduction

The stability wind rose summarizes individual observations of wind direction and wind speed plus an objective calculation of low level stability existing at the same time. Each hourly observation is added to a three dimensional table at the position indicated by the wind direction assigned to the nearest of 16 compass points, by the wind speed assigned to one of 6 separate intervals, and by the low level stability category. The graphical presentation is similar to the wind rose except that separate wind roses are constructed for each stability category.

Determination of Stability

The low level stability is calculated following an objective procedure documented by D. Bruce Turner in the "Journal of Applied Meteorology", February, 1964. Low level stability depends primarily upon net radiation and wind speed. In this technique the estimate of daytime incoming radiation is developed from solar altitude for time of day and time of year at the particular location. Incoming radiation is then decreased for increased cloud cover and lower cloud ceiling height. The estimate of nighttime outgoing radiation is also decreased for increased total cloud cover.

Stability Classes

- A. EXTREMELY UNSTABLE. Daytime occurrence with high positive net radiation and wind speed 5 knots or less.
- B. UNSTABLE. Daytime occurrence with wind speed less than 10 knots.
- C. SLIGHTLY UNSTABLE. Daytime occurrence.
- D. NEUTRAL. Characterized by low or zero net radiation. Separated into daytime or nighttime occurrence by local daily sunrise and sunset times.
- E. STABLE. Nighttime occurrence in conjunction with lighter wind speeds. All stable conditions are combined

within this class since urban areas do not become as stable in the lower layers as rural areas.

Discussion of Local Stability Wind Roses

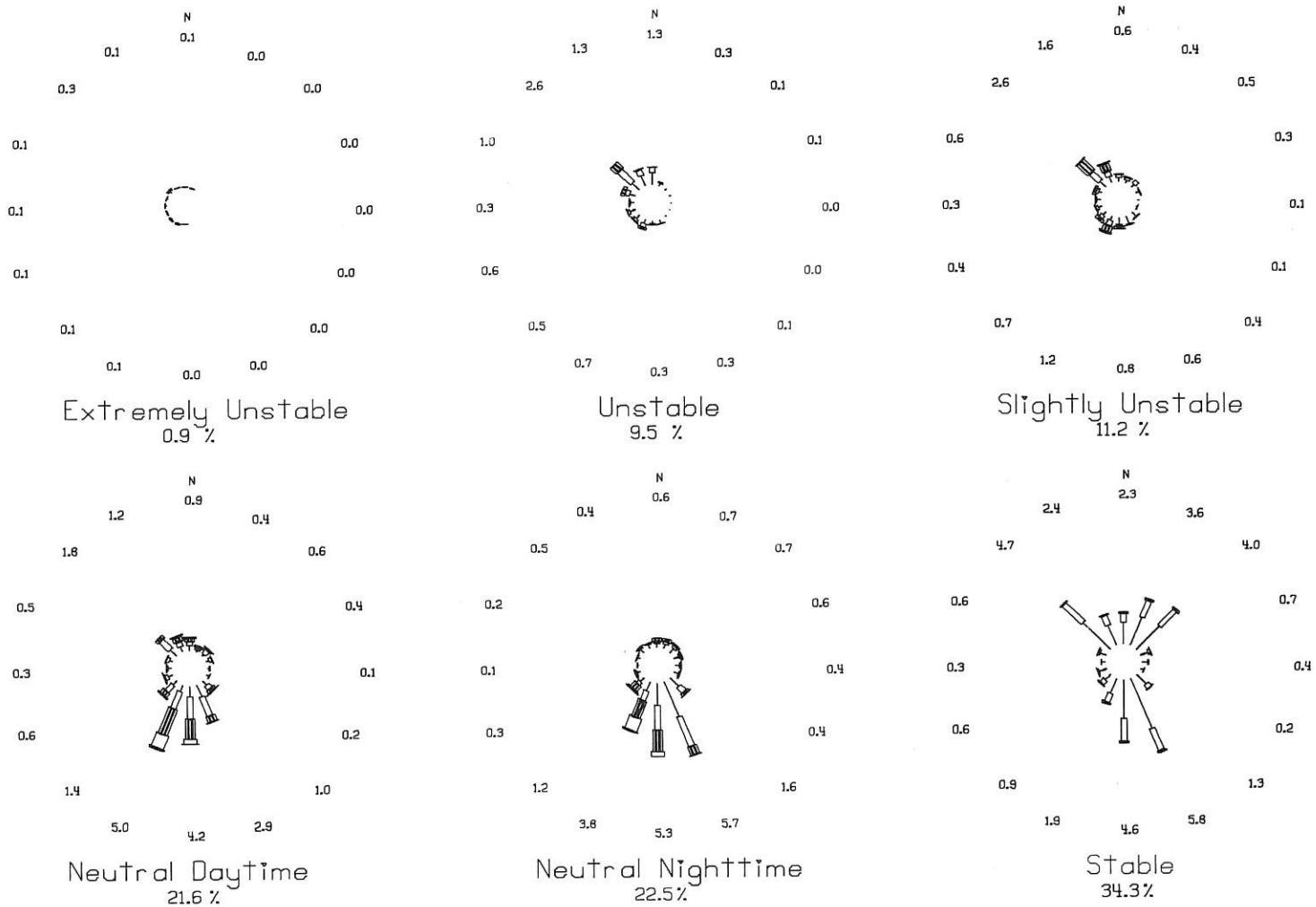
The local area stability wind roses are developed using 3 hour interval cloud data recorded for Seattle Tacoma International Airport. Persistence in cloud data is assumed for the hour preceding and the hour following the observation. This cloud data is then interfaced with the 1 hour average wind data observed at the location for which the stability wind rose is constructed.

Stability wind roses for three locations in the Puget Sound region follow this discussion. The wind rose for each stability class may be interpreted by reviewing the discussion in the preceding section on wind roses. There are two main differences. First, percent frequencies refer to the total of all observations. Thus the sum of the frequency of winds from 16 compass points displayed around each wind rose equals the frequency of occurrence for that stability class. Second, light and variable wind cases are distributed within the lowest wind speed class based upon actual occurrences in the lowest two wind speed classes.

The stability wind rose summaries are required for air quality modeling. The Climatological Dispersion Model uses tabular summaries from which the accompanying stability wind roses were plotted.

Clearly the most significant difference between locations is in the wind fields. The frequency of occurrence of each stability class is about the same at each location. Neutral stability exists about 45 percent of the time. Stable nighttime conditions occur about 34 percent of the time. The wind rose associated with these stable conditions is probably the most important in describing poor pollutant dispersion and is generally different than that occurring during any other stability class.

PUGET SOUND AIR POLLUTION CONTROL AGENCY



STABILITY WIND ROSES

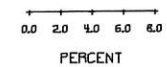
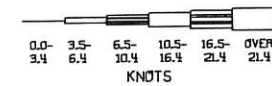
DUWAMISH, 4500 E MARGINAL WAY S, SEATTLE, WA

Period of Record: JAN 1979 to DEC 1979

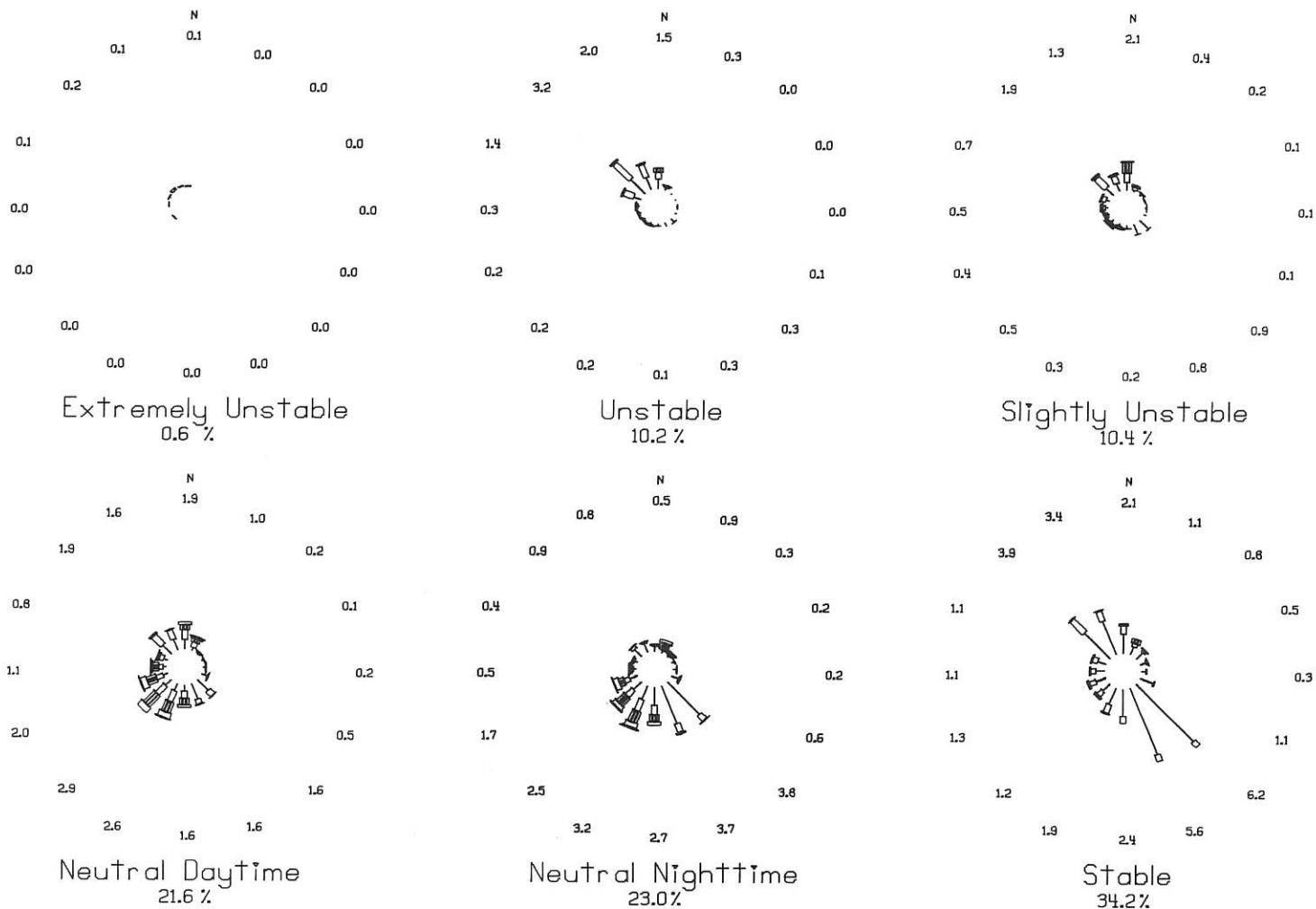
1 Hr Wind Location: DUWAMISH 4500 E MARGINAL WAY S, SEATTLE, WA

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

Percentage Frequency of Occurrence



PUGET SOUND AIR POLLUTION CONTROL AGENCY



STABILITY WIND ROSES

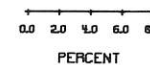
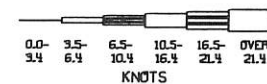
FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

Period of Record: JAN 1979 to DEC 1979

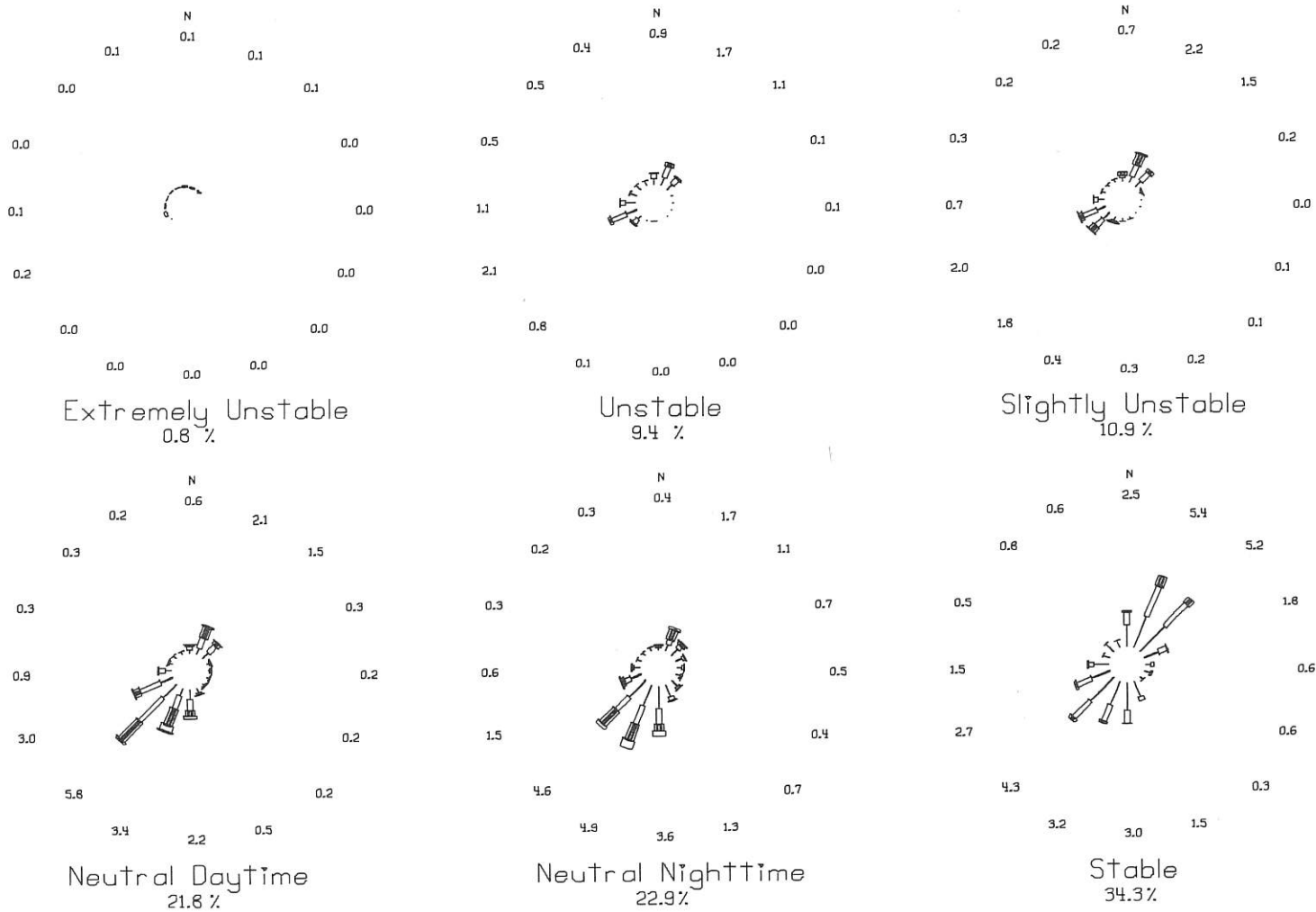
1 Hr Wind Location: FIRE STATION #12, 2316 E 11TH ST, TACOMA, WA

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

Percentage Frequency of Occurrence



PUGET SOUND AIR POLLUTION CONTROL AGENCY



STABILITY WIND ROSES

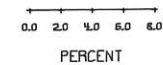
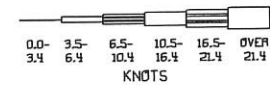
NORTH 26TH & PEARL STS., TACOMA, WA

Period of Record: JAN 1979 to DEC 1979

1 Hr Wind Location: NORTH 26TH & PEARL STS. TACOMA, WA

3 Hr Cloud Location: SEATTLE TACOMA INTERNATIONAL AIRPORT, WA

Percentage Frequency of Occurrence



AIR QUALITY UNITS CONVERSION TABLE

Air quality standards for gases are defined in terms of micrograms (μg) or milligrams (mg) per cubic meter as well as in parts per million (ppm). As this data summary expresses measurements for gaseous pollutants in terms of ppm, the following conversion table is for the convenience of those of our readers who wish to interpret our results in terms of $\mu\text{g}/\text{m}^3$ or mg/m^3 . Conversion factors, extracted from the Federal Register, assume a pressure of 760 mm Hg and a temperature of 25°C .

<u>Pollutant</u>	<u>Multiply PPM by</u>	<u>To Obtain</u>
CO	1.145	mg/m^3
NO ₂	1880	$\mu\text{g}/\text{m}^3$
O ₃	1961	$\mu\text{g}/\text{m}^3$
SO ₂	2619	$\mu\text{g}/\text{m}^3$

AMBIENT AIR QUALITY STANDARDS

SULFUR OXIDES

The presence of sulfur oxides in the ambient air has been associated with a variety of respiratory diseases and increased mortality rates. They represent a significant economic burden and have a nuisance impact. When sulfur oxides are inhaled with small particles, the effect on health is increased. Inhalation of sulfur dioxide can cause increased airway resistance by constricting lung passages.

PARTICULATES

Small discrete masses of solid or liquid matter dispersed in the atmosphere, especially those of one micron or less in diameter, are associated with a variety of adverse effects on public health and welfare. Particulate matter in the respiratory tract may produce injury by itself, or it may act in conjunction with gases to increase the effect on the body. Small particles suspended in the air are chiefly responsible for reduced visibility in the Puget Sound area. Soiling of buildings and other property is a common effect of high particulate levels.

CARBON MONOXIDE

Carbon monoxide reacts with the hemoglobin in red blood cells to decrease the oxygen-carrying capacity of the blood. The national primary standard for carbon monoxide was based on evidence that levels of carboxyhemoglobin in human blood as low as 2.5% may be associated with impairment of ability to discriminate time intervals. The national ambient air quality standards for carbon monoxide are intended to protect against the occurrence of carboxyhemoglobin levels above 2%. Note: Smoking up to 2 packs of cigarettes a day raises carboxyhemoglobin levels to about 5%. This is equivalent to exposure for 8 or more hours to 30 ppm of carbon monoxide.

NATIONAL

WASHINGTON STATE

PUGET SOUND REGION

	PRIMARY	SECONDARY	Notes		Notes		Notes
	ppm	ppm					
SULFUR OXIDES							
Annual Average	0.03		a	0.02	a	0.02	a
30 day Average						0.04	a
24-hour Average	0.14		b	0.10	b	0.10	a
3-hour Average		0.50	b				
1-hour Average				0.25	c	0.25	c
1-hour Average				0.40	b	0.40	a
5 min. Average						1.00	d
SUSPENDED PARTICULATES	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$	
Annual Geo. Mean	75	60	a	60	a	60	a
24-hour Average	260	150	b	150	b	150	b
CARBON MONOXIDE	ppm						
8-hour Average	9	same	b	same		same	
1-hour Average	35		b				
OZONE	ppm						
1-hour Average	0.12	same	e	same		same	
NITROGEN DIOXIDE	ppm						
Annual Average	0.05	same	a	same		same	
HYDROCARBONS (Less Methane)	ppm						
3-hour Average	0.24	same	b f				
LEAD	$\mu\text{g}/\text{m}^3$						
Calendar Quarter Average	1.5	same	a			same as National	

- a Never to be exceeded
- b Not to be exceeded more than once per year
- c Not to be exceeded more than twice in seven days
- d Not to be exceeded more than once in eight hours
- e Standard attained when expected number of days per year with maximum hourly average above 0.12 ppm is equal to or less than one
- f Applies 6 a.m. to 9 a.m. daily

ppm = parts per million

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

OZONE

Oxidants are produced in the atmosphere when nitrogen oxides and some hydrocarbons are exposed to sunlight. Ozone is the oxidant found in largest amounts. It is a pulmonary irritant that affects lung tissues and respiratory functions. Ozone impairs the normal function of lung and, at concentrations between 0.15 and 0.25 ppm, causes lung tightness, coughing, and wheezing. Other oxidants, produced in smaller amounts than ozone, cause eye irritation. Persons with chronic respiratory problems such as asthma seem most sensitive to changes in ozone concentration.

NITROGEN DIOXIDE

Nitric oxide results from the fixation of nitrogen and oxygen at high temperatures as in fuel combustion. There are several atmospheric reactions which lead to the oxidation of nitric oxide to nitrogen dioxide, and the presence of nitrogen dioxide in ambient air is essential to the production of photochemical oxidants. The presence of nitrogen dioxide in ambient air has been associated with a variety of respiratory diseases.

HYDROCARBONS

Defined as organic compounds composed exclusively of carbon and hydrogen, hydrocarbons are primarily associated with the use of petroleum products. They are the main components of photochemical smog. Hydrocarbons alone have no known effect on human health; therefore the sole purpose of prescribing a hydrocarbon standard is to control photochemical oxidants.

LEAD

Lead affects humans in numerous ways, but the greatest effects appear to be on the blood-forming system, the nervous system, and the kidneys. It affects some persons more than others. Young children (ages 1-5) are particularly sensitive to lead exposure. The standard for lead in air is intended to prevent most children from exceeding blood lead levels of 30 micrograms per deciliter of blood.