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NSY PORTSMOUTH
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MINUTES OF MEETING

SUBJECT: Technical Review Committee (TRC) Meeting
Portsmouth Naval Shipyard (PNS)
RCRA Facility Investigation/Corrective Measures Program

PURPOSE: The TRC meeting was called by the Navy to update the TRC members on the Air Quality Monitoring Study.

LOCATION: Portsmouth Naval Shipyard
Kittery, Maine

DATE: April 7, 1992

PREPARED BY: Stephen F. Urschel, Manager Geoscience
Project Manager
McLaren/Hart Environmental Engineering Corporation
28 Madison Ave. Ext.
Albany, NY 12203
(518) 869-6192

April 9, 1992

McLaren Hart

ATTENDEES:

Community/Public Representatives

Phil McCarthy, Town of Kittery
Maria Barth, Town of Kittery
Jeffrey Clifford, Town of Kittery
John Nelson, New Hampshire Fish and Game
Onil A. Roy, Town of Kittery

USEPA Region I

Ernest Waterman, Project Manager

Maine DEP

Pamela Parker, Environmental Specialist
Mark Hyland, Federal Facilities Unit
Camille Parrish, Geologist

US Navy- PNS

Paul Clark, Director, Environmental Affairs
Jim Tayon, Environmental Engineer
CDR. Paul Chamberlin, PNS-Public Works Officer
Mike Pedersen, Environmental Affairs
Kimm Hubby, OSH
Ralph Hickson, OSH
Len Sargent, OSH

US Navy- Northern Division, Philadelphia

Linda Dietz, Remedial Project Manager
Jim Szykman, Technical Manager

McLaren/Hart Environmental Engineering Corporation

Stephen J. Myers, Project Director, Albany, NY
Stephen Urschel, Project Manager, Albany, NY
Willard Smith, Air Monitoring Program Manager, Albany, NY

BACKGROUND

The subject TRC meeting was held at Building 156 at the Portsmouth Naval Shipyard, Kittery, Maine to update committee members on the findings of the air quality monitoring study. The air monitoring study was conducted during the fall of 1991 in support of the RCRA Facility Investigation. In particular the air study was implemented to assess air as a possible migration pathway for contaminant releases from the DRMO and the Jamaica Island Landfill.

DISCUSSION

The meeting was opened by Linda Dietz followed by Jim Tayon who briefly discussed the shipyard's community relations plan. Each attendee then introduced him/herself.

The subject Air Quality Monitoring Study presentation was provided by William Smith of McLaren/Hart Environmental Engineering, consultants to the US Navy. All attendees were provided with a comprehensive handbook of the air study information that was presented. The meeting agenda was contained in the handbook.

Since the handbook provided the core information of the presentation, these minutes will not repeat the presented information but will summarize the presentation and supplement the handbook by representing comments and questions raised during discussions.

Summary

Will Smith provided a brief introduction by summarizing the purpose and objectives of the study. Will continued with a discussion of the selection of monitoring locations. The type of data collected at the meteorological station was discussed and photographs were shown of the monitoring equipment. Will then discussed the selection of target compounds and the Federal and New York State action levels or guidance values used for data comparison. The Federal action levels and New York State guidance values were chosen for comparison since no comparable local or state guidance or standards presently exist. A discussion followed of the contaminants detected during the study. Maps of the shipyard showing daily graphical results were then presented. Maps presenting the daily data were followed by conclusions and recommendations. After the presentation Will provided examples of sampling equipment for inspection.

- Findings and conclusions included:

  - Volatile mercury was measured at high concentrations on two of eleven sample days at a total of six stations.
  - Wind direction suggests that the source of volatile mercury may have been localized.
  - No volatile mercury was measured at the background sampling stations.
  - Arsenic was measured at all stations at low concentrations.
  - Benzene concentrations were typical for other areas of the country.
  - Tetrachloroethylene exceeded typical concentrations on three out of eleven sample days at three stations.
  - Cadmium concentrations were slightly elevated and widespread.
  - Both inhalable and total suspended particulate concentrations were high.
  - Prevailing wind was from the west northwest but was highly variable.

- Linda Dietz ask about the sources for phthalates and metals measured during the study.

  Response- Will refered everyone to the Acronym/Abreviations pages of the handout.

- Linda Dietz ask for assistance from Pam Parker (MDEP) and Ernest Waterman (EPA) to determine the need for additional monitoring for selected compounds.

  Response- Both agency representatives agreed to study the issue and make recommendations to the Navy.

- Paul Clark asked whether modeling could be used to determine the source of contamination.

  Response- Modeling may sometimes be helpful but the current data set may not be appropriate for that particular use.

- Ernest Waterman questioned whether the source of volatile mercury was believed to be on-site.

  Response- Will indicated that the wind data supported the interpretation that it was likely that volatile mercury was from on-site.

- A question arose as to why the study was conducted in the fall rather than summer.

  Response- Will indicated that there were unavoidable delays resulting in a later start date than planned but that the study was constrained by a tight schedule requiring data collection as soon as possible. To postpone to the following summer was not possible because of the schedule requirements of the corrective action permit.

- Mark Hyland, MEDEP questioned whether typical shipyard operations were ongoing during the study period.

  Response- Paul Clark indicated that the shipyard was under normal operation during the period in question.

- CDR. Paul Chamberlin asked if the risk assessment was going to take into account all of the compounds measured during the air study.

  Response- Yes, all contaminants are being considered.

- An attendee questioned how long the meteorological station was in operation before air sample collection began.

  Response- Meteorological station was in operation for 30 days prior to sample collection.

- A question arose as to whether the particulate samples could distinguish the type of particles caught on the filters.

  Response- No determination of particle type is possible with the methods used.

- An attendee questioned whether the risk assessment would include residential exposure scenarios for data from the DRMO since dust from the DRMO was probably reaching the residences "S"and "N".

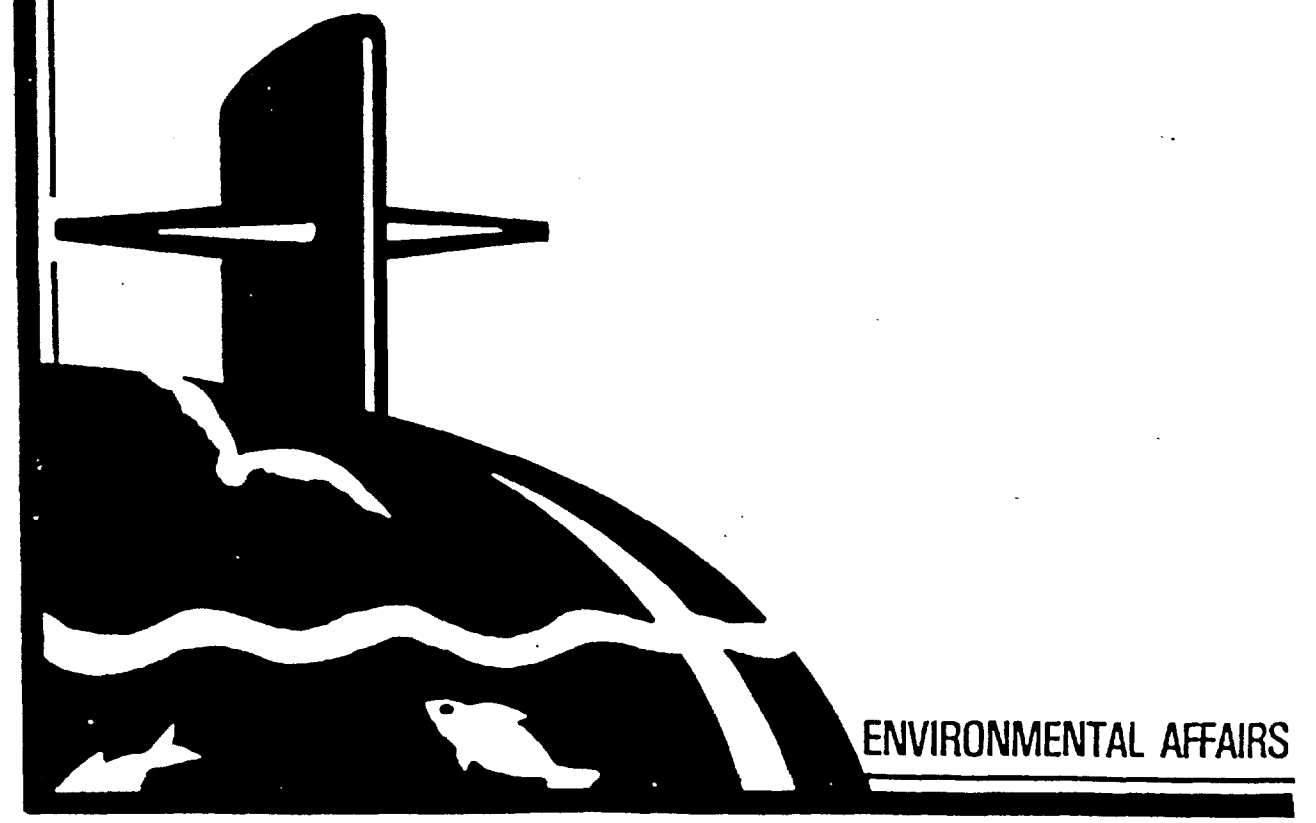
  Response- Yes, both industrial and residential exposure senarios will be explored. Quarters "S" and "N" were identified as potential sensitive receptors by McLaren/Hart toxicologists prior to development of the scope of work for the air study.

- Kimm Hubby questioned whether OSHA standards were being considered during evaluation of the air data.

  Response- Will indicated that the New York State Air Guide One data used for comparison was developed to be protective of human health and incorporated OSHA standards. Linda added that the environmental values used by the toxicologists for the risk assessment are more conservative than the OSHA standards.

- Linda Dietz closed the meeting thanking all attendees for attending the meeting. Linda scheduled the next TRC meeting for June 9, 1992 at 10:30 AM. The meeting will include a presentation on the findings of the Phase I off-shore study conducted by ERLN and NCCOSC.

AMBIENT AIR MONITORING STUDY
TECHNICAL REVIEW COMMITTEE MEETING
APRIL 7, 1992



PORTSMOUTH NAVAL SHIPYARD

TRC MEETING SLIDES

Slide N°	Description
1	Agenda for the TRC Meeting
2	Purpose and Approach of Study
3	Objectives of Study
4	Basis for Selection of Monitoring Sites
5	Map of Monitoring Stations with Wind Rose
6	Basis for Selection of Air Contaminants
7	Air Contaminants of Concern
8	Meteorological Parameters
9-11	Photographs of Air Monitoring Equipment
12	Proposed Federal Cleanup Action Levels for Air Contaminants and New York State Air Guide-1 Guideline Concentration Limits for Air Toxics (Text)
13	Air Monitoring Findings at the Portsmouth Naval Shipyard
14-25	Maps of Air Contaminant Exceedances by Sampling Date
26-27	Conclusions of Air Monitoring at the DRMO (Sites 1, 2)
28-29	Conclusions of Air Monitoring at the JILF (Sites 3-7)
30	Conclusions of Air Monitoring at the Background Sites (8, 9)
31	Conclusions of Meteorological Monitoring
32-34	Comparison of Certain Air Contaminant Levels Found at PNS with Other Areas of the Country

AGENDA FOR THE TRC MEETING

- INTRODUCTION TO AMBIENT AIR MONITORING PROGRAM
- BASIS FOR MONITORING PROGRAM
- AIR MONITORING LOCATIONS AND CONTAMINANTS OF CONCERN
- FINDINGS OF AIR MONITORING
- FINDINGS OF METEOROLOGICAL MONITORING
- CONCLUSIONS AND RECOMMENDATIONS

ACRONYMS/ABBREVIATIONS

	Amines	A family of compounds that contain nitrogen that may be considered as derived from ammonia (NH_3)
As	Arsenic	Alloying Additive for Metals, Especially Lead and Copper (Battery Grids, Cable Sheaths, Boiler Tubes); Paint Pigments; Herbicides and Rodenticides; Wood Preservatives
	Benzene	Maleic anhydride; solvent; anti-knock gasoline
Be	Beryllium	Moderator and Reflector in Nuclear Reactors; in Gyroscopes, Computer Parts, Inertial Guidance Systems; Spot-welding Electrodes
Cd	Cadmium	Metal coatings; low-melting and Brazing Alloys; Electrical Equipment; Storage Batteries; Power Transmission Wire; Ceramic Glazes; Fungicides
Cr	Chromium	Constituent of Inorganic Paint Pigments; Stainless Steel; Alloying and Plating Element on Metals
DCM	Methylene Chloride (Dichloro-methane)	Paint removers; propellant for aerosol sprays; solvent degreasing; plastic processing; blowing agent in foams; solvent extraction
PAH	Polycyclic Aromatic Hydrocarbons	Class of compounds containing two or more fused benzene rings; semi-volatile; Associated with Petroleum products
Pb	Lead	Storage Batteries, Tetraethyl Lead (Gasoline Additive); Radiation Shielding; Corrosion Inhibiting Pigments

ACRONYMS/ABBREVIATIONS (CONTINUED)

PM-10	Inhalable Particulates	Particulate matter in the air having an aero-dynamic particle diameter size of 10 microns or less; linked to respiratory ailments and associated adverse health effects
	Heavy Metals	A Metal of Atomic Weight Greater Than Sodium (22.9) That Forms Soaps on Reaction With Fatty Acids (e.g., Chromium, Cadmium, Lead)
Hg	Mercury	Anti-Fouling Paints; Thermometers; Barometers; Mercury Vapor Lamps
MEK	Methyl Ethyl Ketone (2-Butanone)	Solvent in Nitrocellulose and Vinyl Coatings; Paint Removers and Thinners
NAAQS		National Ambient Air Quality Standard
		<u>PM-10</u> 150 micrograms per cubic meter (24-hour average)
		80 micrograms per cubic meter (annual arithmetic mean)
		<u>LEAD</u> 1.5 micrograms per cubic meter (arithmetic mean averaged quarterly)
ng/m^3		Nanograms per cubic meter of ambient air -- a unit of concentration
Ni	Nickel	Alloys (low-alloy steel, stainless-steel, copper and brass, permanent magnets, electrical resistance alloys); electroplated protective coatings; electroformed coatings; alkaline storage batteries; fuel cell electrodes; ceramics

ACRONYMS/ABBREVIATIONS (CONTINUED)

PCE (Perc)	Tetrachloro-ethylene (Perchloro-ethylene)	Dry Cleaning Solvent; Vapor Degreasing Solvent
	Phthalates Phthalate Esters	A family of compunds used as plasticizers
Sb	Antimony	Hardening alloy for lead, especially storage batteries and cable sheaths; bearing metal; type metal; solder; pyrotechnics; semi-conductor technology
SVOCs	Semi-Volatile Organic Compounds	Class of compounds which do not tend to easily go into the vapor state. Includes PAHs, PCBs, pesticides
TCE	Trichloro-ethylene	Metal Degreaser; Dry Cleaning; Dilutent in Paints; Cleaning and Drying of Electronic Parts
TSP	Total Suspended Particulates	Particulate matter in the air having an aerodynamic particle diameter size of 100 microns or less; linked to health effects and environmental deposition problems
ug/m^3		Micrograms per cubic meter of ambient air -- a unit of concentration 1000 times greater than 1 ng/m^3
VC	Vinyl Chloride	Monomer in the manufacture of polyvinyl chloride and copolymers; adhesives for plastics; daughter product of TCE
VOCs	Volatile Organic Compounds	Class of Compounds Which Tend to Easily (i.e., at Ambient Temperatures) Go Into the Vapor State

FIELD SAMPLING/ANALYTICAL METHODS

Parameter	McLaren/Hart Standard Operating Procedures for the Collection of Stated Ambient Air Parameters	Upstate Laboratories Standard Operating Procedures for the Analysis of Stated Ambient Air Parameters
Total Suspended Particulates (TSP) Including Heavy Metals	High Volume Air Sampler Section V	EPA 40 CFR, Part 50, Appendix B Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere--Method 7000 Atomic Absorption Methods--Appendix D
Inhalable Particulates (PM-10)	PM-10 High Volume Air Sampler Section VI	EPA 40 CFR, Part 50, Appendix J Reference Method for Determination of Particulate Matter as PM-10 in the Atmosphere--Appendix D
Volatile Organic Compounds (VOC)	Nutech Summa Canister Sampler Section VII	EPA Method TO-14 Determination of Volatile Organic Compounds in Ambient Air Using Summa-Passivated Canister Sampling and Gas Chromatographic Analysis--Appendix D
Semi-Volatile Organic Compounds (SVOC)	PUF Cartridge Sampler Section VIII	EPA Method 8080 Organochlorine Pesticides and PCBs. EPA Method TO13--Determination of Benzo(a)Pyrene and other Polynuclear Aromatic Hydrocarbons in Ambient Air Using Gas Chromatographic and High Performance Liquid Chromatographic Analysis--Appendix D
N-Nitrosodiphenylamines	Sorbent Cartridge Sampling	EPA TO-7 (modified) Analytical Method for the Determination of N-Nitrosodiphenylamine in Ambient Air Using Gas Chromatographic--Appendix D
Hg (Volatile)	Sorbent Tube Sampling	NIOSH Method 6009, Mercury

AMBIENT AIR MONITORING STUDY
AT THE
PORTSMOUTH NAVAL SHIPYARD

PURPOSE:

- TO PROVIDE AMBIENT AIR QUALITY DATA TO SUPPORT THE HUMAN HEALTH RISK ASSESSMENT PORTION OF THE PUBLIC HEALTH AND ENVIRONMENTAL RISK EVALUATION (PHERE)

- TO PROVIDE DATA TO ADEQUATELY ASSESS POTENTIAL REMEDIAL ACTIONS AT THE NAVAL SHIPYARD AS PART OF THE ON-GOING RCRA CORRECTIVE ACTION PROGRAM

- TO PROVIDE BACKGROUND AMBIENT AIR QUALITY DATA PRIOR TO ANY INTERIM AND/OR FINAL REMEDIATION EFFORTS AT THE NAVAL SHIPYARD

APPROACH:

- THIRTY-THREE (33) DIFFERENT AIR CONTAMINANTS MEASURED INCLUDING INHALABLE AND TOTAL SUSPENDED PARTICULATES

- ELEVEN (11) DISCREET 24-HOUR SAMPLES TAKEN FOR EACH CONTAMINANT OVER A 23-DAY STUDY PERIOD

- NINE (9) DIFFERENT AMBIENT AIR MONITORING STATIONS UTILIZED. TOTAL INCLUDED TWO (2) BACKGROUND MONITORING SITES

- ONE (1) METEOROLOGICAL MONITORING STATION UTILIZING A 10-METER TOWER WAS ESTABLISHED FOR STUDY PERIOD

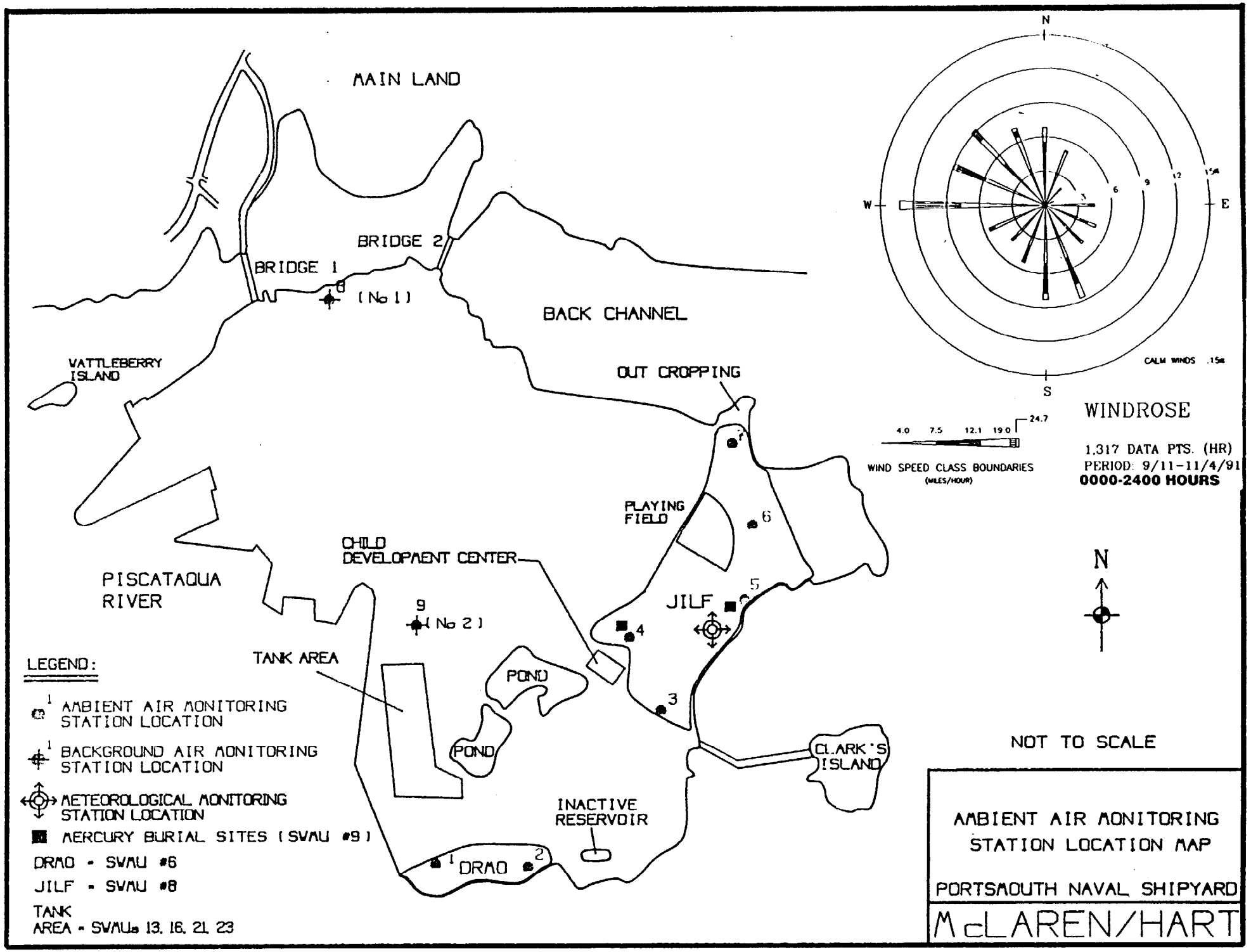
AMBIENT AIR MONITORING STUDY
AT THE
PORTSMOUTH NAVAL SHIPYARD

OBJECTIVES:

- TO DETERMINE TYPES AND CONCENTRATION LEVELS OF AIR CONTAMINANTS AT SITE
- TO DETERMINE NUMBER OF EXCEEDANCES OF EXISTING REGULATORY/TOXICOLOGICAL LIMITS
- TO COMPARE CONCENTRATION LEVELS OF AIR CONTAMINANTS ON SITE WITH AMBIENT LEVELS FOUND ELSEWHERE
- TO DETERMINE THE METEOROLOGY OF THE AREA
- TO DETERMINE THE IMPACT, IF ANY, FROM OFF-SITE SOURCES OF THESE AIR CONTAMINANTS
- TO PROVIDE PRELIMINARY DATA TO ASSESS THE NEED FOR POSSIBLE INTERIM CORRECTIVE MEASURES

BASIS FOR SELECTION OF MONITORING SITES

- PROXIMITY TO SENSITIVE RECEPTORS
- PROXIMITY TO POTENTIAL AIR CONTAMINANT SOURCES
- IN UNOBSTRUCTED LOCATIONS (AIR AND METEOROLOGICAL)
- IN PREVAILING UPWIND LOCATIONS (BACKGROUND SITES)
- ACCESS TO ELECTRICAL POWER


MAIN LAND
BRIDGE 2
BRIDGE 1
(No 1)
BACK CHANNEL
VATTLEBERRY ISLAND
OUT CROPPING
PLAYING FIELD
CHILD DEVELOPMENT CENTER
PISCATAQUA RIVER
JILF
9
(No 2)
TANK AREA
POND
POND
CLARK'S ISLAND
INACTIVE RESERVOIR
DRMO
LEGEND:
AMBIENT AIR MONITORING STATION LOCATION
BACKGROUND AIR MONITORING STATION LOCATION
METEOROLOGICAL MONITORING STATION LOCATION
MERCURY BURIAL SITES (SWMU #9)
DRMO - SWMU #6
JILF - SWMU #8
TANK AREA - SWMUs 13, 16, 21, 23
N
W
E
S
CALM WINDS .15%
WINDROSE
4.0 7.5 12.1 19.0 24.7
WIND SPEED CLASS BOUNDARIES (MILES/HOUR)
1,317 DATA PTS. (HR)
PERIOD: 9/11-11/4/91
0000-2400 HOURS
NOT TO SCALE
AMBIENT AIR MONITORING STATION LOCATION MAP
PORTSMOUTH NAVAL SHIPYARD
McLAREN/HART

METEOROLOGICAL MONITORING PARAMETERS
FOR
NAVFAC AMBIENT AIR MONITORING STUDY

- WIND DIRECTION
- WIND SPEED
- HORIZONTAL SIGMA - based on variability of wind direction a measure of stability
- AMBIENT AIR TEMPERATURE
- AMBIENT SOIL TEMPERATURE
- BAROMETRIC PRESSURE
- RELATIVE HUMIDITY
- PRECIPITATION

BASIS FOR SELECTION OF AIR CONTAMINANTS

- SOILS AND GROUNDWATER SAMPLING RESULTS FROM PHASES I, II, AND III BY McLAREN/HART

- SOIL GAS SURVEYS CONDUCTED BY McLAREN/HART

- RECOMMENDATIONS BY McLAREN/HART TOXICOLOGIST

- FINDINGS FROM PRIOR CONSULTANT REPORTS

TARGET COMPOUND LIST FOR NAVFAC AIR MONITORING

I. VOLATILES

II. SEMI-VOLATILES

- PAH's
- PCB's
- PESTICIDES

III. HEAVY METALS

IV. PARTICULATES

- INHALABLE (PM-10)
- TOTAL SUSPENDED (TSP)

PROPOSED FEDERAL ACTION LEVELS FOR AIR CONTAMINANTS FROM HAZARDOUS WASTE SITES

- USED FOR COMPARATIVE PURPOSES ONLY AT PNS. MEDIA PROTECTION STANDARDS TO BE DEVELOPED FROM RISK ASSESSMENT
- USED TO INDICATE POTENTIAL AIR CONTAMINANT PROBLEMS FROM SWMUs AND POSSIBLE CORRECTIVE MEASURES

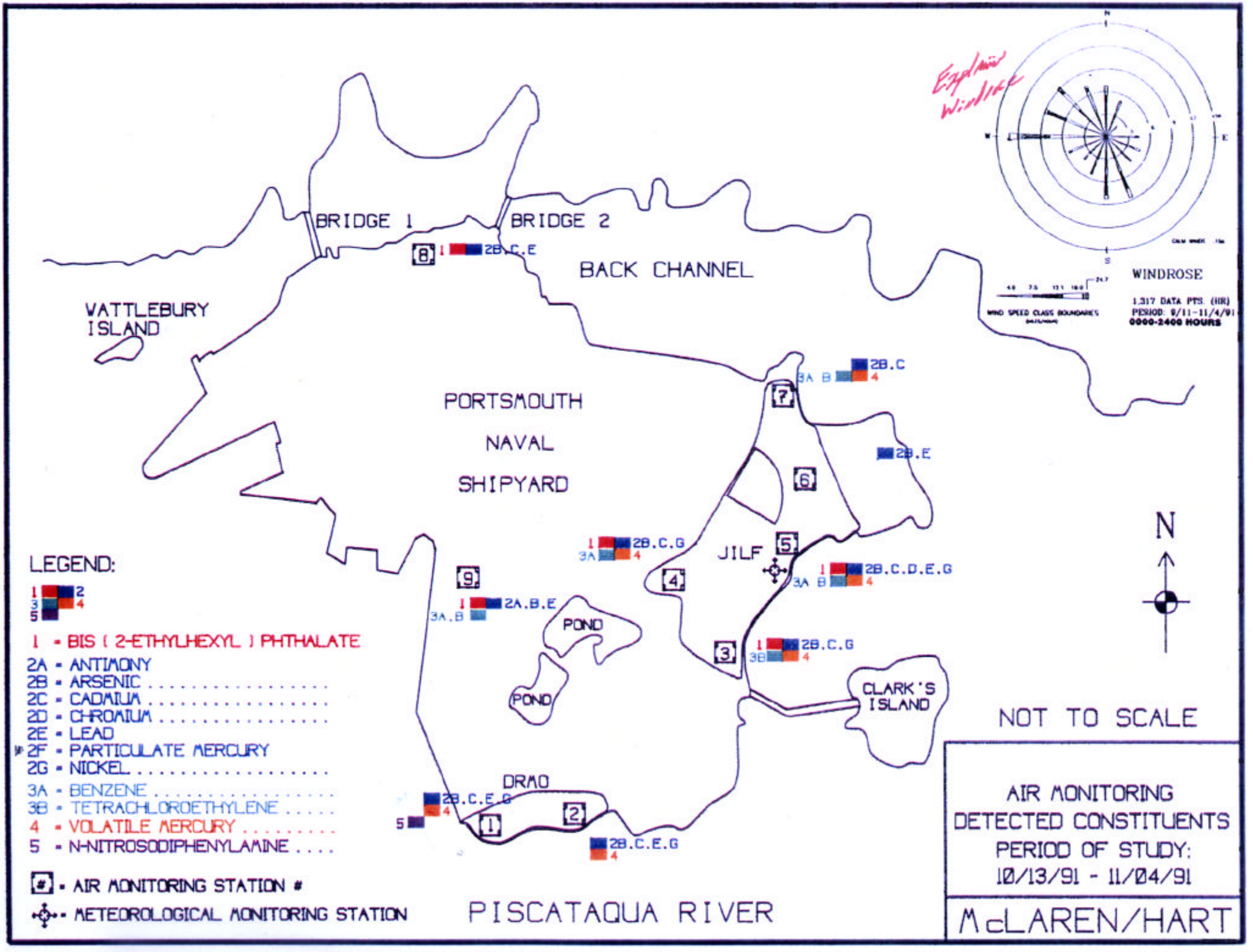
NEW YORK STATE AIR GUIDE-1 AMBIENT AIR TOXIC CONCENTRATIONS

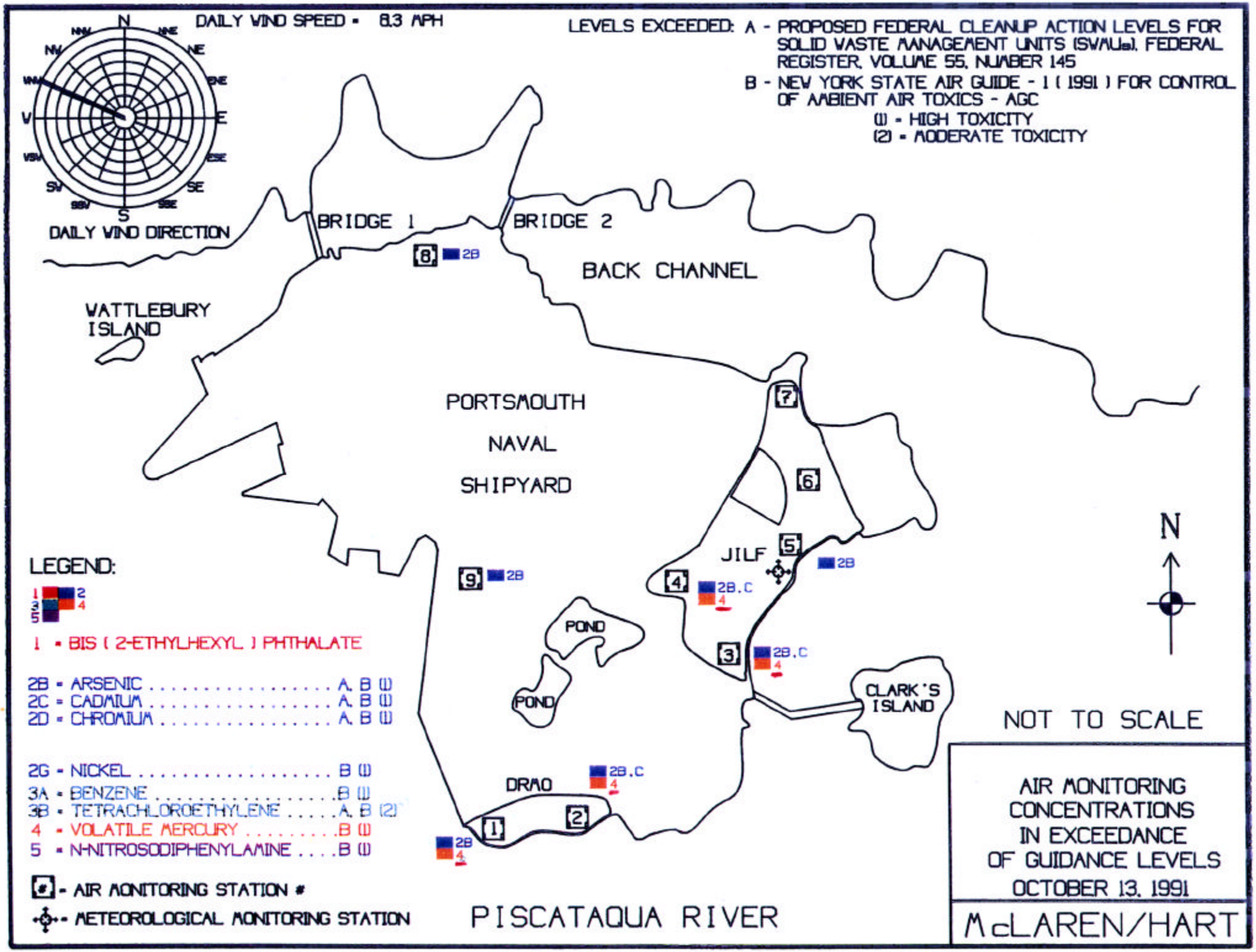
- USED FOR COMPARATIVE PURPOSES ONLY AT PNS
- CONTAINS COMPREHENSIVE LIST OF AMBIENT AIR POLLUTANTS WITH GUIDELINE AMBIENT CONCENTRATION LIMITS
- USED AS SUPPLEMENT WHERE FEDERAL ACTION LEVELS ARE NOT AVAILABLE FOR CERTAIN AIR CONTAMINANTS
- USED BECAUSE NO COMPARABLE LISTS AVAILABLE FROM STATES OF MAINE AND NEW HAMPSHIRE

AIR MONITORING FINDINGS AT THE PORTSMOUTH NAVAL SHIPYARD

- THE FOLLOWING TWELVE (12) AIR CONTAMINANTS <u>WERE</u> DETECTED IN AIR SAMPLES:

  - Arsenic
  - Nickel
  - Cadmium
  - Lead
  - Particulate Mercury
  - Chromium
  - Volatile Mercury
  - Antimony
  - Tetrachloroethylene (PCE)
  - Benzene
  - N-Nitrosodiphenylamine
  - Bis(2-ethylhexyl)phthalate - No actual levels of guidance on phthalates


Explain Windrose
WINDROSE
1,317 DATA PTS. (HR)
PERIOD: 9/11-11/4/91
0000-2400 HOURS
WIND SPEED CLASS BOUNDARIES
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRAO
CLARK'S ISLAND
PISCATAQUA RIVER
8
1 2B.C.E
7
3A B 2B.C 4
2B.E
6
5
1 2B.C.D.E.G 3A B 4
4
1 2B.C.G 3A 4
9
1 2A.B.E 3A.B
3
1 2B.C.G 3B 4
1
2
2B.C.E.G 4 5
2B.C.E.G 4
N
NOT TO SCALE
LEGEND:
1 2 3 4 5
1 - BIS (2-ETHYLHEXYL) PHTHALATE
2A - ANTIMONY
2B - ARSENIC
2C - CADMIUM
2D - CHROMIUM
2E - LEAD
2F - PARTICULATE MERCURY
2G - NICKEL
3A - BENZENE
3B - TETRACHLOROETHYLENE
4 - VOLATILE MERCURY
5 - N-NITROSODIPHENYLAMINE
- AIR MONITORING STATION
METEOROLOGICAL MONITORING STATION
AIR MONITORING
DETECTED CONSTITUENTS
PERIOD OF STUDY:
10/13/91 - 11/04/91
McLAREN/HART


DAILY WIND SPEED = 8.3 MPH
N
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SSE
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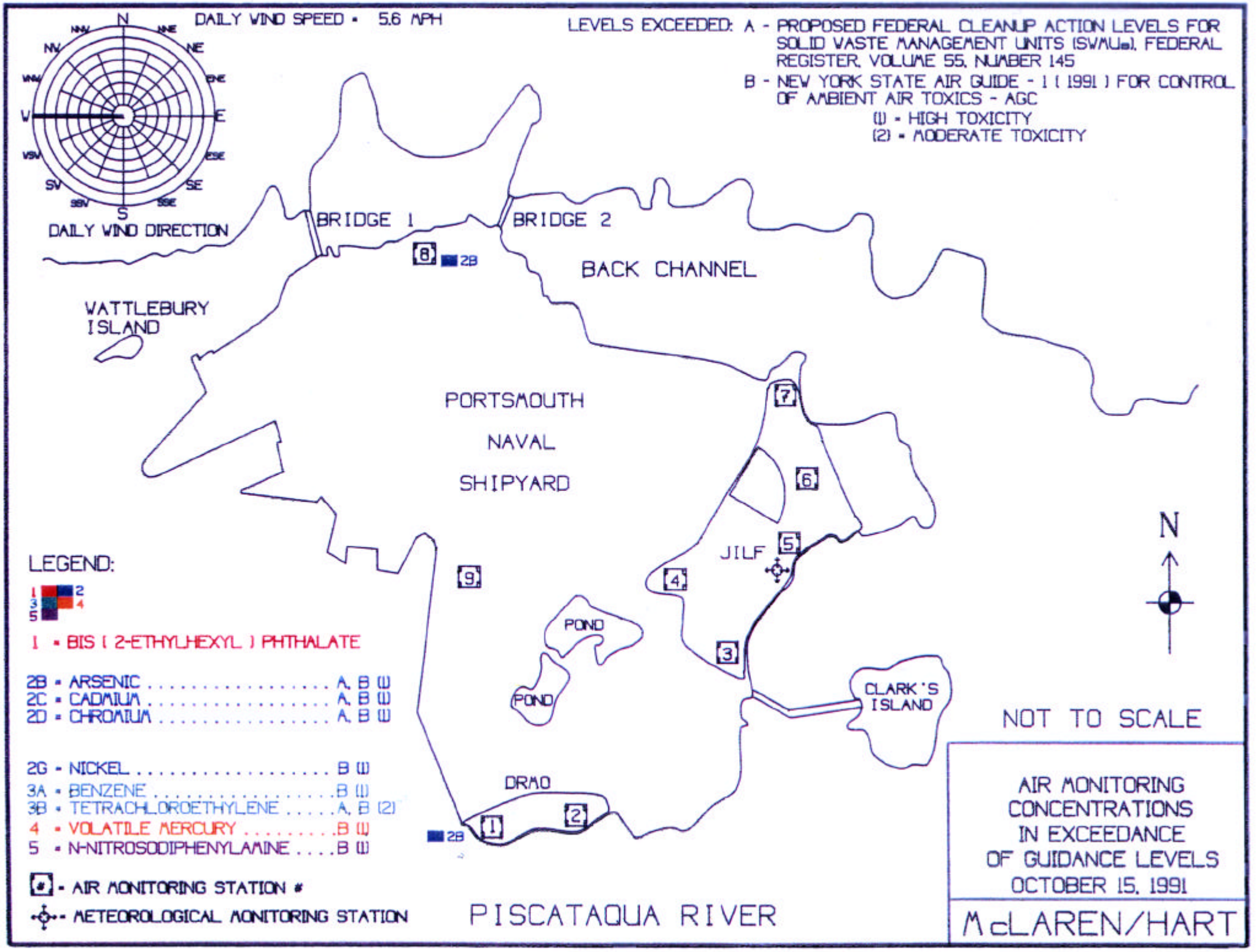
SSW
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRAO
CLARK'S ISLAND
PISCATAQUA RIVER
8
2B
7
6
5
2B
4
2B,C
4
3
2B,C
4
9
2B
2B,C
4
1
2
2B
4
N
NOT TO SCALE
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# - AIR MONITORING STATION #
- METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS
OCTOBER 13, 1991
McLAREN/HART


DAILY WIND SPEED = 5.6 MPH
N
NNE
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SSE
S
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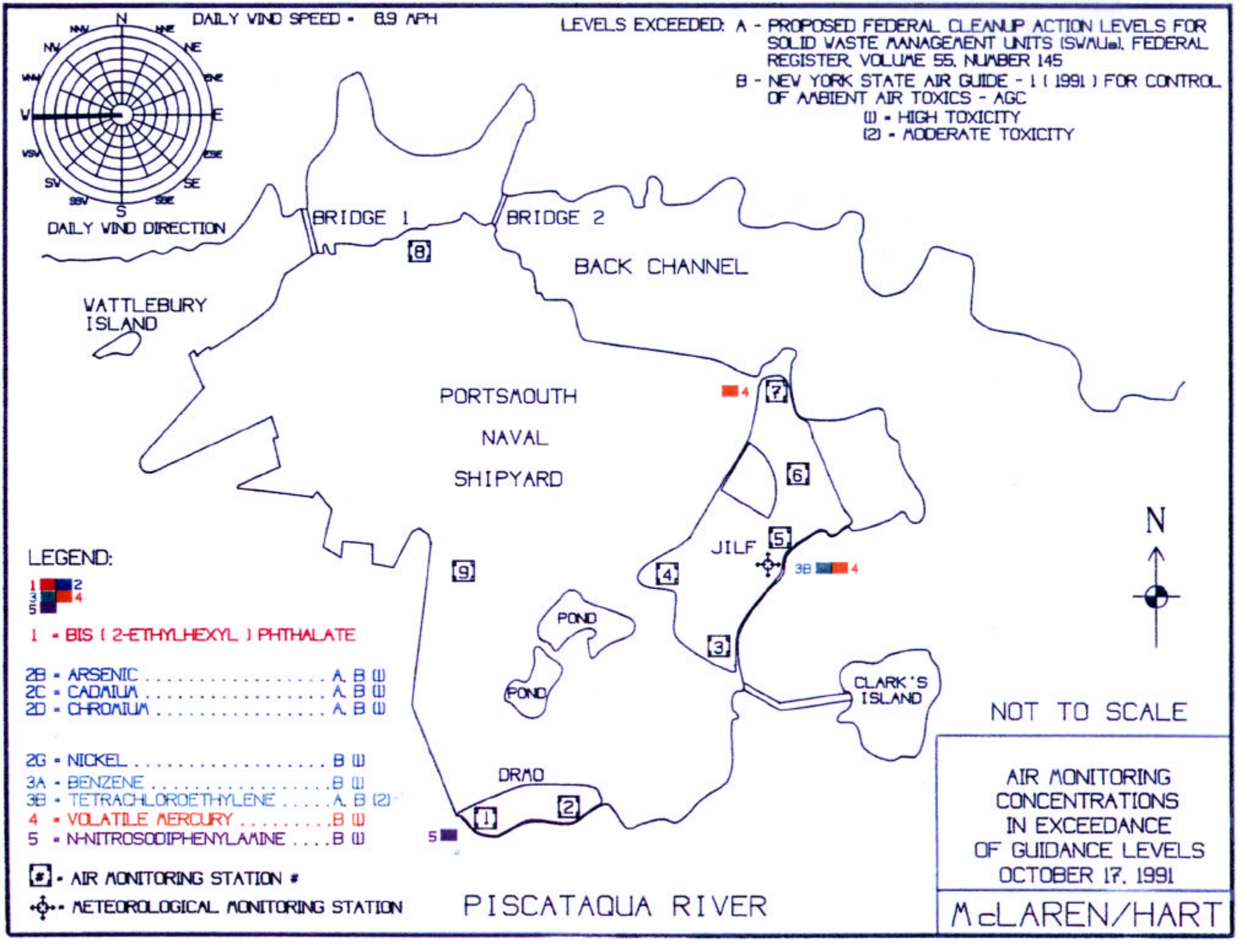
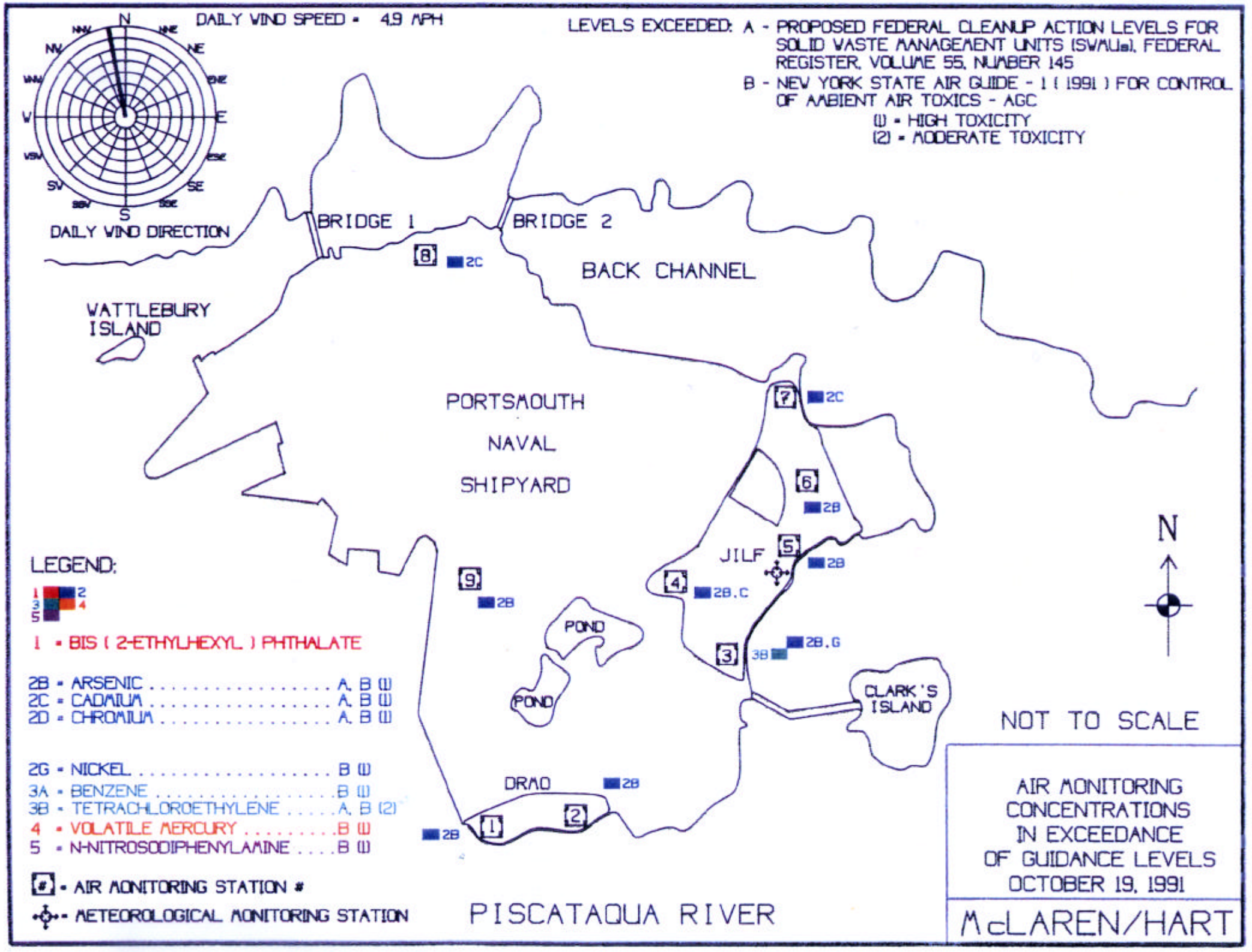
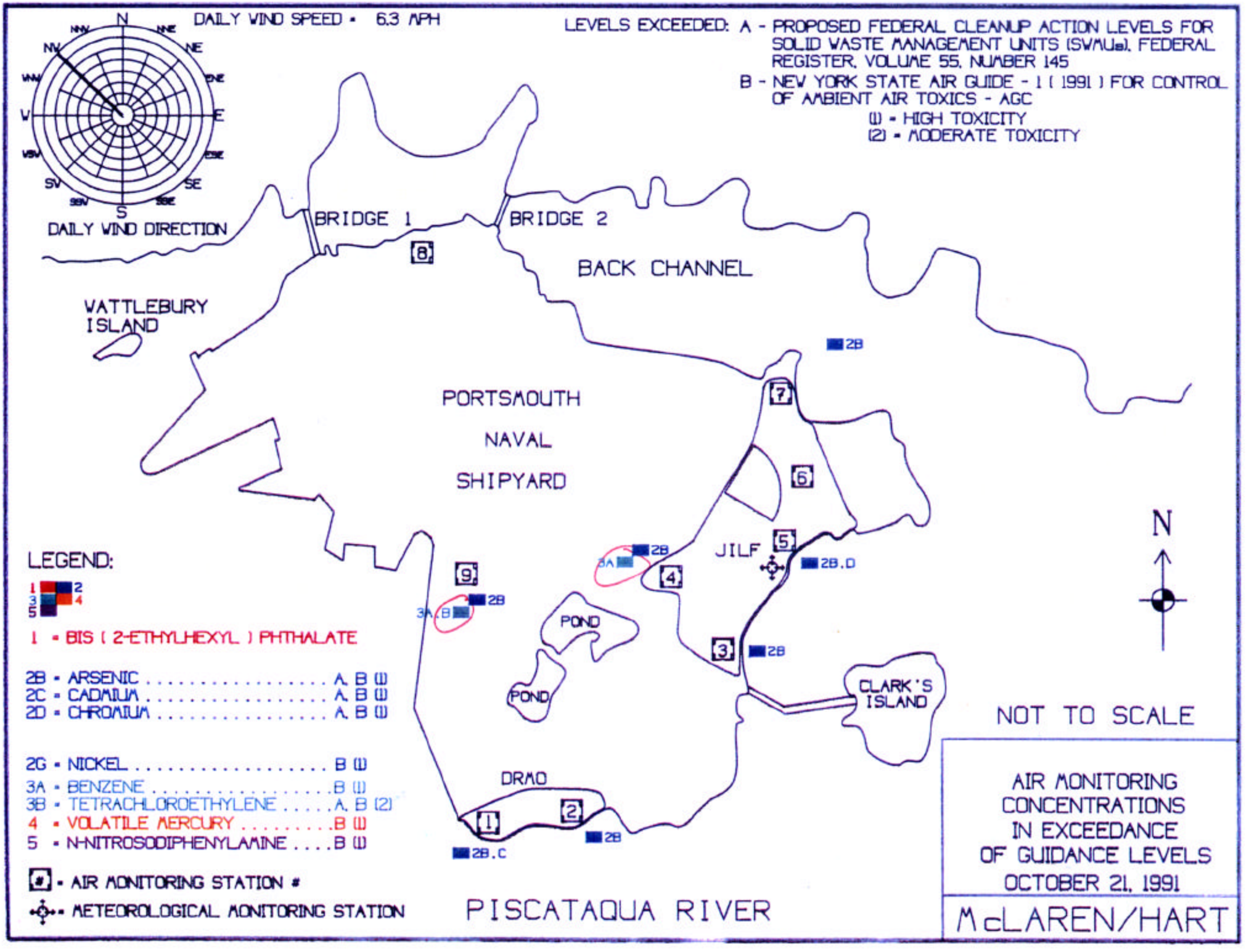
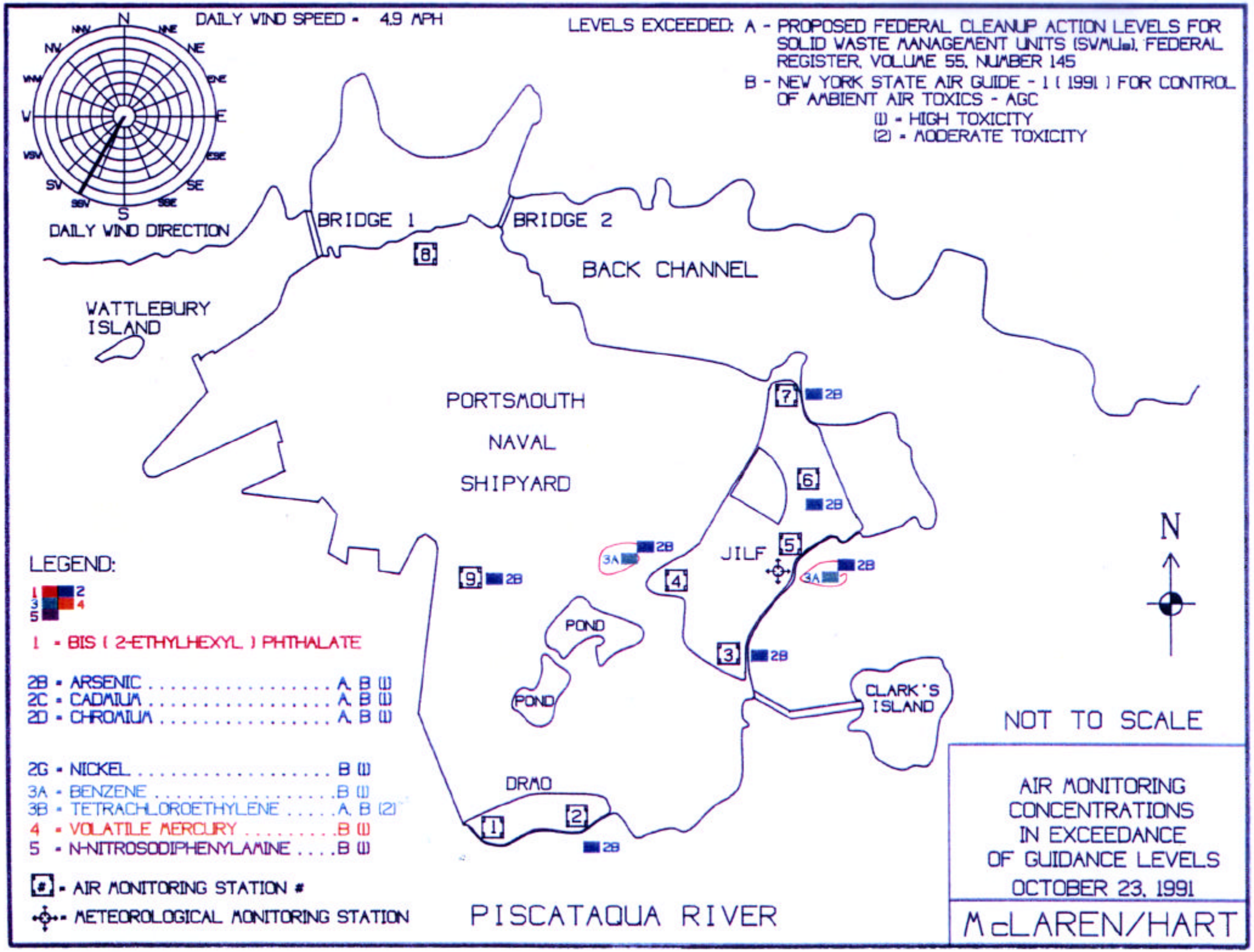
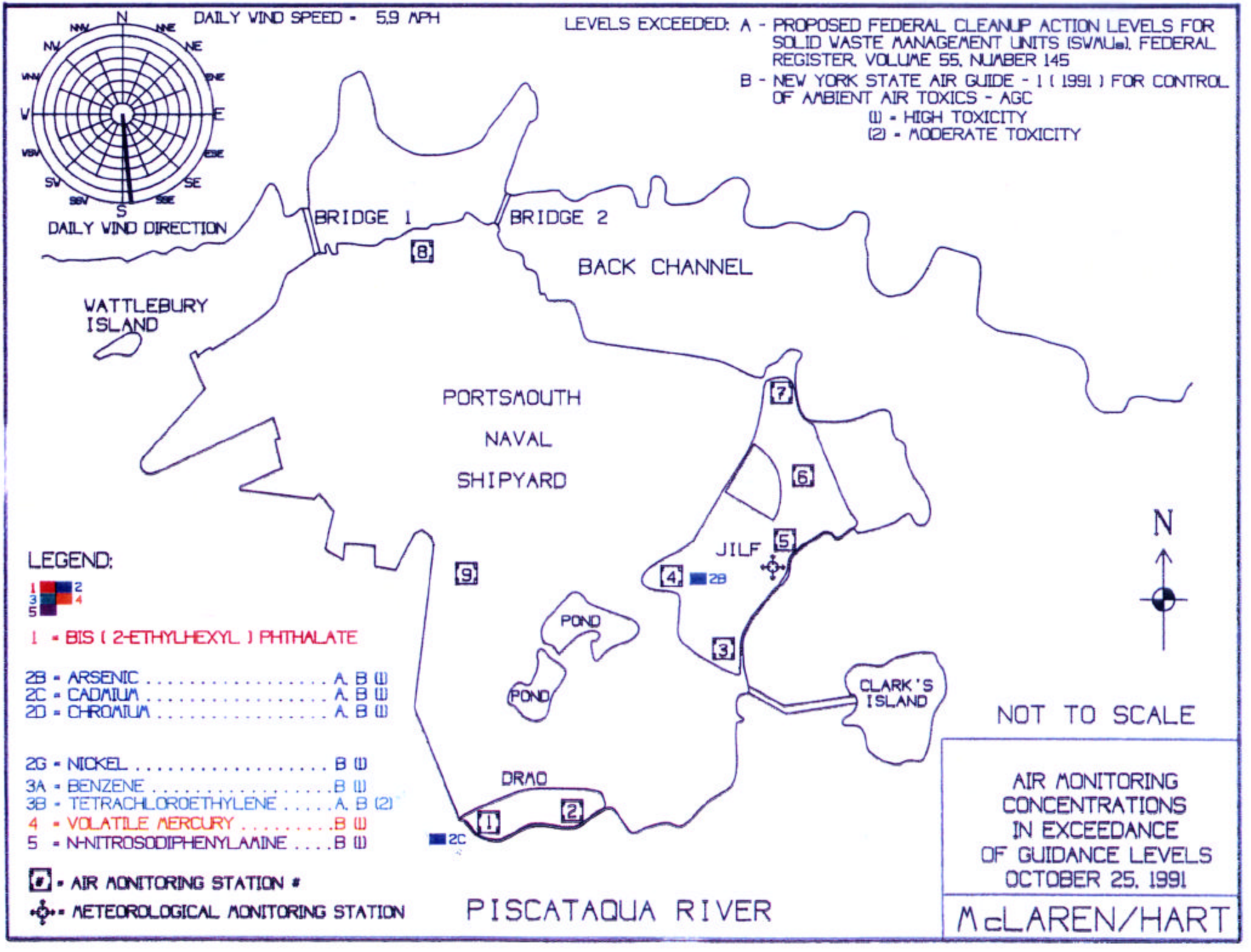
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRAD
CLARK'S ISLAND
PISCATAQUA RIVER
8
2B
7
6
5
4
3
9
1
2
2B
N
LEGEND:
1 2 3 4 5
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# - AIR MONITORING STATION #
- METEOROLOGICAL MONITORING STATION
NOT TO SCALE
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 15, 1991
McLAREN/HART

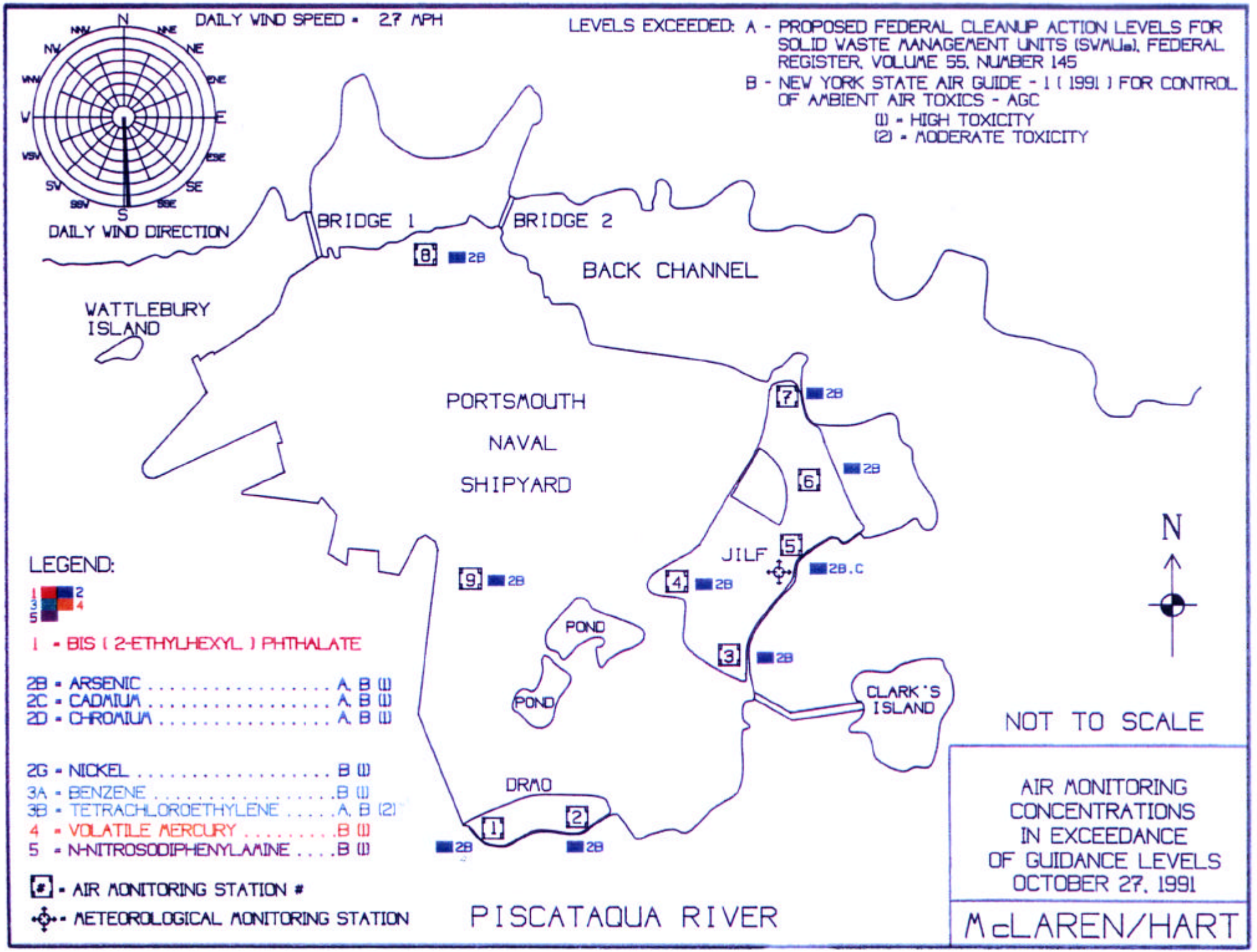

DAILY WIND SPEED - 8.9 MPH
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) - HIGH TOXICITY
(2) - MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
CLARK'S ISLAND
DRAO
PISCATAQUA RIVER
N
NOT TO SCALE
LEGEND:
1 - BIS (2-ETHYLHEXYL) PHTHALATE
2B - ARSENIC . . . . . A, B (1)
2C - CADMIUM . . . . . A, B (1)
2D - CHROMIUM . . . . . A, B (1)
2G - NICKEL . . . . . B (1)
3A - BENZENE . . . . . B (1)
3B - TETRACHLOROETHYLENE . . . . . A, B (2)
4 - VOLATILE MERCURY . . . . . B (1)
5 - N-NITROSODIPHENYLAMINE . . . . B (1)
- AIR MONITORING STATION
METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 17, 1991
McLAREN/HART

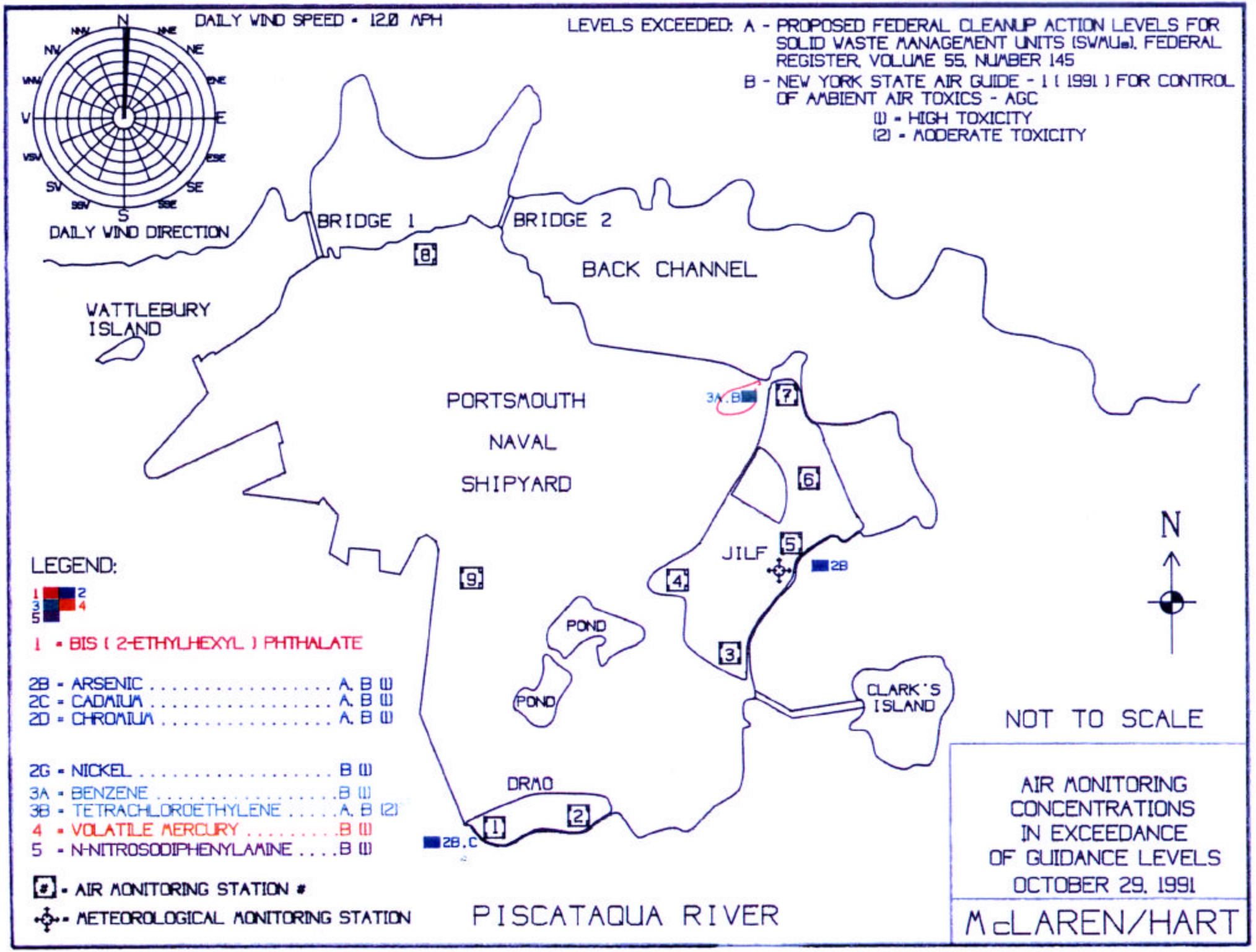

DAILY WIND SPEED = 4.9 MPH
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRAD
CLARK'S ISLAND
PISCATAQUA RIVER
8
2C
7
2C
6
2B
5
2B
4
2B.C
3
3B
2B.G
9
2B
2B
1
2
N
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# = AIR MONITORING STATION #
= METEOROLOGICAL MONITORING STATION
NOT TO SCALE
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 19, 1991
McLAREN/HART

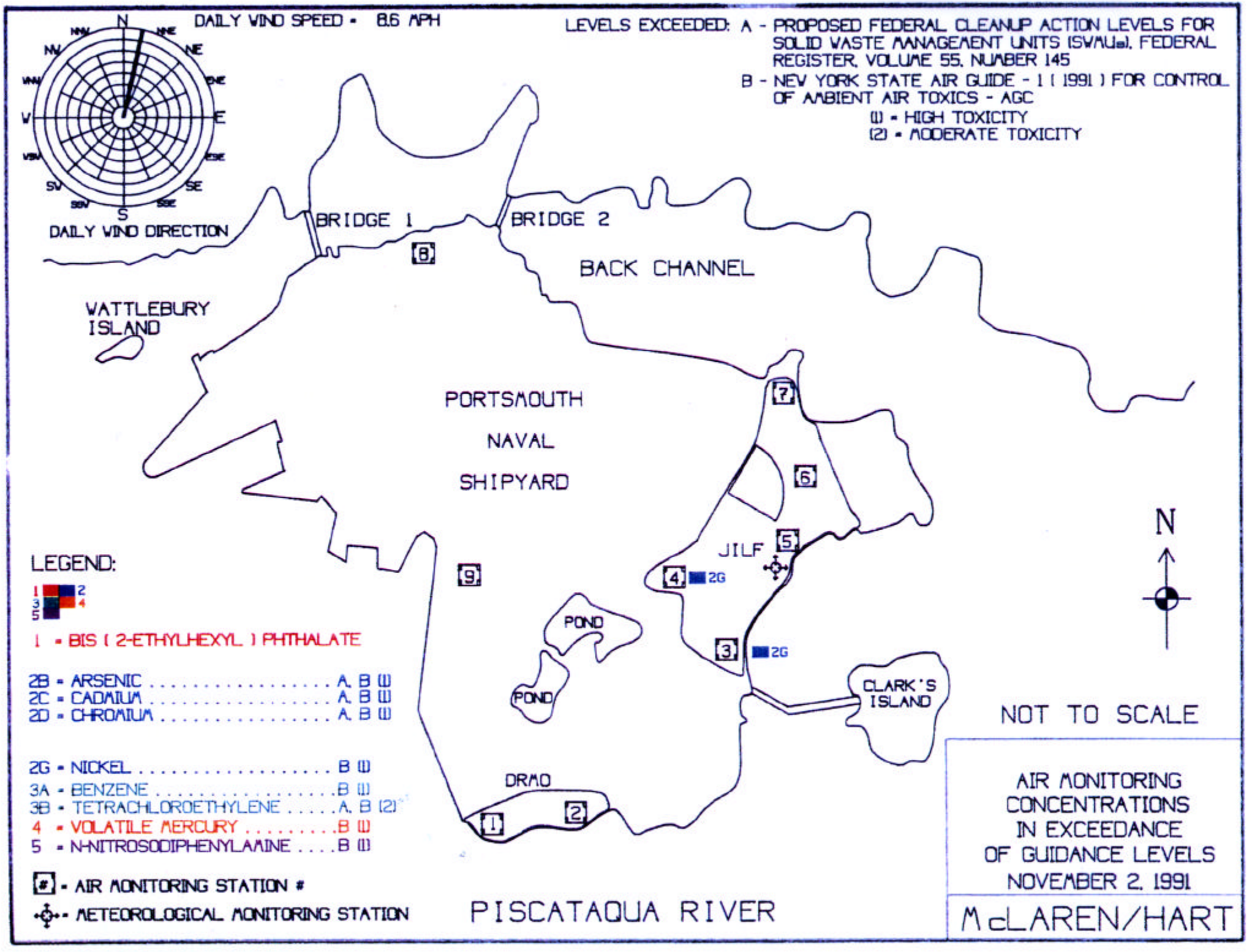

DAILY WIND SPEED = 6.3 MPH
N
NNW
NNE
NW
NE
WNW
ENE
W
E
WSW
ESE
SW
SE
SSW
SSE
S
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRMO
CLARK'S ISLAND
PISCATAQUA RIVER
8
7
6
5
4
3
2
1
9
2B
2B.D
2B.C
3A
3A,B
N
NOT TO SCALE
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# = AIR MONITORING STATION #
= METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS
OCTOBER 21, 1991
McLAREN/HART

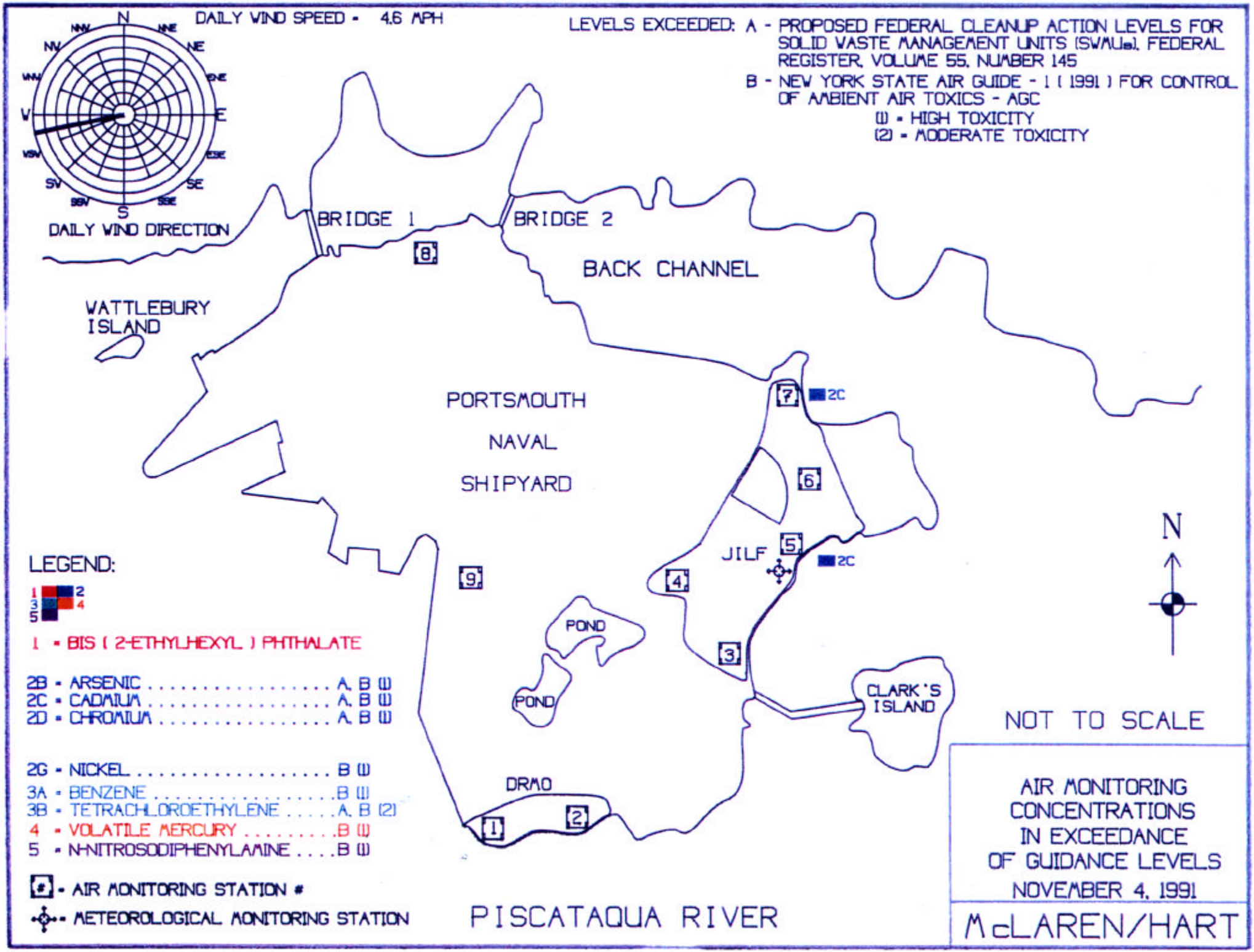

DAILY WIND SPEED - 4.9 MPH
DAILY WIND DIRECTION
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) - HIGH TOXICITY
(2) - MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRMO
CLARK'S ISLAND
PISCATAQUA RIVER
8
7
6
5
4
3
2
1
9
2B
3A
N
NOT TO SCALE
LEGEND:
1 - BIS (2-ETHYLHEXYL) PHTHALATE
2B - ARSENIC . . . . . A, B (1)
2C - CADMIUM . . . . . A, B (1)
2D - CHROMIUM . . . . . A, B (1)
2G - NICKEL . . . . . B (1)
3A - BENZENE . . . . . B (1)
3B - TETRACHLOROETHYLENE . . . . . A, B (2)
4 - VOLATILE MERCURY . . . . . B (1)
5 - N-NITROSODIPHENYLAMINE . . . . B (1)
- AIR MONITORING STATION
METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS
OCTOBER 23, 1991
McLAREN/HART


DAILY WIND SPEED - 5.9 MPH
DAILY WIND DIRECTION
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) - HIGH TOXICITY
(2) - MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRAD
CLARK'S ISLAND
PISCATAQUA RIVER
2B
2C
1
2
3
4
5
6
7
8
9
N
NOT TO SCALE
LEGEND:
1 - BIS (2-ETHYLHEXYL) PHTHALATE
2B - ARSENIC . . . . . A, B (1)
2C - CADMIUM . . . . . A, B (1)
2D - CHROMIUM . . . . . A, B (1)
2G - NICKEL . . . . . B (1)
3A - BENZENE . . . . . B (1)
3B - TETRACHLOROETHYLENE . . . . . A, B (2)
4 - VOLATILE MERCURY . . . . . B (1)
5 - N-NITROSODIPHENYLAMINE . . . . B (1)
- AIR MONITORING STATION
- METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 25, 1991
McLAREN/HART


DAILY WIND SPEED = 2.7 MPH
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRMO
CLARK'S ISLAND
PISCATAQUA RIVER
8
2B
7
2B
6
2B
5
2B.C
4
2B
3
2B
9
2B
1
2B
2
2B
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# = AIR MONITORING STATION #
= METEOROLOGICAL MONITORING STATION
N
NOT TO SCALE
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 27, 1991
McLAREN/HART


DAILY WIND SPEED = 12.0 MPH
N
NNW
NNE
NW
NE
WNW
ENE
W
E
WSW
ESE
SW
SE
SSW
SSE
S
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
3A,B
7
6
5
JILF
2B
4
3
9
8
POND
POND
CLARK'S ISLAND
DRMO
1
2
2B,C
PISCATAQUA RIVER
N
NOT TO SCALE
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# = AIR MONITORING STATION #
= METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS OCTOBER 29, 1991
McLAREN/HART


DAILY WIND SPEED = 8.6 MPH
N
NNW
NNE
NW
NE
WNW
ENE
W
E
WSW
ESE
SW
SE
SSW
SSE
S
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) = HIGH TOXICITY
(2) = MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
POND
POND
DRMO
CLARK'S ISLAND
PISCATAQUA RIVER
N
NOT TO SCALE
LEGEND:
1 = BIS (2-ETHYLHEXYL) PHTHALATE
2B = ARSENIC . . . . . A, B (1)
2C = CADMIUM . . . . . A, B (1)
2D = CHROMIUM . . . . . A, B (1)
2G = NICKEL . . . . . B (1)
3A = BENZENE . . . . . B (1)
3B = TETRACHLOROETHYLENE . . . . . A, B (2)
4 = VOLATILE MERCURY . . . . . B (1)
5 = N-NITROSODIPHENYLAMINE . . . . B (1)
# = AIR MONITORING STATION #
METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS NOVEMBER 2, 1991
McLAREN/HART


DAILY WIND SPEED - 4.6 MPH
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
DAILY WIND DIRECTION
LEVELS EXCEEDED: A - PROPOSED FEDERAL CLEANUP ACTION LEVELS FOR SOLID WASTE MANAGEMENT UNITS (SWMUs), FEDERAL REGISTER, VOLUME 55, NUMBER 145
B - NEW YORK STATE AIR GUIDE - 1 (1991) FOR CONTROL OF AMBIENT AIR TOXICS - AGC
(1) - HIGH TOXICITY
(2) - MODERATE TOXICITY
BRIDGE 1
BRIDGE 2
BACK CHANNEL
WATTLEBURY ISLAND
PORTSMOUTH NAVAL SHIPYARD
JILF
2C
POND
POND
DRMO
CLARK'S ISLAND
PISCATAQUA RIVER
N
NOT TO SCALE
LEGEND:
1 - BIS (2-ETHYLHEXYL) PHTHALATE
2B - ARSENIC . . . . . A, B (1)
2C - CADMIUM . . . . . A, B (1)
2D - CHROMIUM . . . . . A, B (1)
2G - NICKEL . . . . . B (1)
3A - BENZENE . . . . . B (1)
3B - TETRACHLOROETHYLENE . . . . . A, B (2)
4 - VOLATILE MERCURY . . . . . B (1)
5 - N-NITROSODIPHENYLAMINE . . . . B (1)
- AIR MONITORING STATION
METEOROLOGICAL MONITORING STATION
AIR MONITORING CONCENTRATIONS IN EXCEEDANCE OF GUIDANCE LEVELS
NOVEMBER 4, 1991
McLAREN/HART

CONCLUSIONS OF AIR MONITORING AT THE DRMO (SITES 1, 2)

- ARSENIC WAS EXCEEDED 55% OF THE TIME AT THE DRMO; HOWEVER THE LEVELS FOUND WERE BELOW TYPICAL BACKGROUND LEVELS FOUND IN OTHER AREAS.

- CADMIUM WAS EXCEEDED 18% OF THE TIME AT THE DRMO WITH HIGHEST LEVEL FOUND AT PNS. LEVELS ARE HIGHER THAN TYPICAL BACKGROUND LEVELS IN OTHER AREAS, INDICATING ON-SITE RELEASE. LEVELS ARE CONSIDERED ABOVE ACCEPTABLE LEVELS FOR LONG-TERM EXPOSURE. LEVELS ARE NOT CONSIDERED HIGH ENOUGH TO POSE AN IMMEDIATTE RISK TO ON-SITE PERSONNEL.

- VOLATILE MERCURY WAS EXCEEDED TWICE AT SITES 1 AND 2 ON THE SAME DAY AT LEVELS MUCH HIGHER THAN TYPICAL LEVELS FOUND ELSEWHERE, INDICATING PROBABLE ON-SITE SOURCE(S).

- N-NITROSODIPHENYLAMINE WAS EXCEEDED ONCE AT SITE 1 AT A LEVEL MUCH HIGHER THAN THE NYS AIR GUIDE CONCENTRATION LIMIT VALUE. THIS COMPOUND WAS NOT FOUND AT ANY OTHER SITE, INDICATING A POSSIBLE LOCAL, TRANSIENT SOURCE.

CONCLUSIONS OF AIR MONITORING AT THE DRMO (SITES 1, 2) (CONTINUED)

- **INHALABLE PARTICULATE LEVELS WERE ELEVATED; ABOVE AVERAGE PORTSMOUTH AREA LEVELS. LEVELS DID NOT EXCEED THE NATIONAL AMBIENT AIR QUALITY STANDARD.**

- **TOTAL SUSPENDED LEVELS WERE ELEVATED AND ABOVE AVERAGE LEVELS FOUND IN THE PORTSMOUTH AREA.**

CONCLUSIONS OF AIR MONITORING AT THE JILF (SITES 3 - 7)

- ARSENIC WAS EXCEEDED 46% OF THE TIME AT THE JILF AT LEVELS BELOW TYPICAL LEVELS FOUND IN OTHER AREAS.

- CADMIUM WAS EXCEEDED 14% OF THE TIME AT THE JILF AT LEVELS HIGHER THAN TYPICAL BACKGROUND LEVELS IN OTHER AREAS, INDICATING ON-SITE RELEASE.

- CHROMIUM VI (HEXAVALENT) WAS EXCEEDED ONCE AT SITE 5 AT A LEVEL MUCH HIGHER THAN THE PROPOSED FEDERAL ACTION LEVEL. CHROMIUM VI WAS NOT FOUND AT ANY OTHER SITES, INDICATING THE EXCEEDANCE MAY BE A POSSIBLE ANOMALY.

- NICKEL WAS EXCEEDED THREE (3) TIMES AT THE JILF AT LEVELS TWICE AS HIGH AS FOUND IN THE PORTSMOUTH AREA.

CONCLUSIONS OF AIR MONITORING AT THE JILF (SITES 3 - 7) (CONTINUED)

- TETRACHLOROETHYLENE (PCE) WAS EXCEEDED THREE (3) TIMES AT LEVELS MUCH HIGHER THAN TYPICAL LEVELS FOUND IN OTHER AREAS OF THE COUNTRY, EXCEPT LOS ANGELES. THE HIGHEST LEVELS FOR PCE WERE FOUND AT SITES 3, 5, AND 7. RECOMMEND ADDITONAL MONITORING AT HIGHER AMBIENT TEMPERATURES TO QUANTIFY VOC RELEASES.

- BENZENE WAS EXCEEDED FOUR (4) TIMES AT SITES 4 AND 9 ON THE SAME DAY.

- VOLATILE MERCURY WAS EXCEEDED TWICE AT SITES 3 AND 4 ON THE SAME DAY THAT VOLATILE MERCURY WAS FOUND AT SITES 1 AND 2. THE HIGHEST LEVEL WAS AT SITE 4, WITH THE SECOND HIGHEST AT SITE N° 3. WITH THE PREVAILING WIND FROM THE WEST-NORTHWEST AND THE BACKGROUND SITES SHOWING NO MERCURY LEVELS, A PROBABLE EMISSION RELEASE OCCURRED ON-SITE, UPWIND OF THESE SITES. SITES 5 AND 7 ALSO SHOWED A SIMILAR EXCEEDANCE EACH FOR VOLATILE MERCURY ON ANOTHER SAMPLING DAY.

CONCLUSIONS OF MONITORING AT THE BACKGROUND AIR MONITORING SITES (SITES 8, 9)

- ARSENIC WAS EXCEEDED 36% OF THE TIME AT BOTH BACKGROUND SITES. AIR MONITORING DATA SHOW WIDESPREAD DISTRIBUTION OF ARSENIC AT PNS. LEVELS ARE NOT CONSIDERED HIGH ENOUGH TO REPRESENT AN IMMEDIATE RISK TO ON-SITE PERSONNEL.

- CADMIUM WAS EXCEEDED ONCE AT SITE 8 AT A LEVEL COMPARABLE TO LEVELS FOUND AT THE OTHER PNS MONITORING SITES.

- BENZENE AND TETRACHLOROETHYLENE (PCE) WERE EXCEEDED ONCE EACH AT SITE 9 AT ELEVATED LEVELS.

- VOLATILE MERCURY WAS NOT DETECTED AT EITHER BACKGROUND SITE. LEVELS FOUND AT OTHER PNS SITES INDICATE PROBABLE RELEASE OF MERCURY BETWEEN THE JILF AND BACKGROUND SITE AREAS. ADDITIONAL MONITORING RECOMMENDED TO QUANTIFY AND IDENTIFY SOURCE(S).

CONCLUSIONS OF METEOROLOGICAL MONITORING

METEOROLOGICAL MONITORING DATA INDICATE:

1) MOST AIR CONTAMINANT RELEASES WOULD BE TRANSPORTED AWAY FROM POPULATED AREAS AS A RESULT OF THE PREVAILING WIND DIRECTION (FROM WEST-NORTHWEST)

2) THE UNSTABLE ATMOSPHERE AND THE HIGHER AVERAGE WIND SPEEDS FOUND AT PNS WILL HELP TO LOWER GROUND-LEVEL AIR CONTAMINANT CONCENTRATIONS.

COMPARISON OF CERTAIN AIR CONTAMINANT LEVELS FOUND AT PNS WITH OTHER AREAS OF THE COUNTRY

Contaminant	Concentration Levels (ng/m3)	Location
PCE	7,000-14,000	PNS (24-Hour Averages)
	4,700	PNS (Study Average)
	400	West Virginia (12-Month Average)
	4,200	New Jersey (12-Month Average)
	8,000	Los Angeles, California (12-Month Average)
Arsenic	0.50-2.0	PNS (24-Hour Averages)
	0.65	PNS (Study Average)
	< 8	Portsmouth, New Hampshire (24-Hour Averages)
	3-7	Upstate New York
	3-5	New York City (Annual Averages)
	13-200	Texas-Mexico Border (Long-term Averages)
	2.9	Typical Background (Annual Average)
Cadmium	2.0-5.0	PNS (24-Hour Averages)
	1.3	PNS (Study Average)
	.5-1.0	Rural New York State (Annual Averages)
	1.3-3.5	New York City (Annual Averages)
	0.6	Typical Background (Annual Average)
	< 3	Portsmouth, New Hampshire (24-Hour Averages)

COMPARISON OF CERTAIN AIR CONTAMINANT LEVELS FOUND AT PNS WITH OTHER AREAS OF THE COUNTRY (CONTINUED)

Contaminant	Concentration Levels (ng/m3)	Location
Benzene	7,000-20,000	PNS (24-Hour Averages)
	3,900	PNS (Study Average)
	3,170	Portsmouth, New Hampshire (6-month Average)
	17,000	Boston, Massachusetts (3-month Average)
	11,600	Raleigh, North Carolina (3-month Average)
	16,000	Los Angeles, California (Annual Average)
	4,700	West Virginia (Annual Average)
	9,700	New Jersey (Annual Average)
Nickel	14-31	PNS (24-Hour Averages)
	8	PNS (Study Average)
	< 3-9	Portsmouth, New Hampshire (24-Hour Averages)
	3-27	New York State (Annual Averages)
	9-54	New York City (Annual Averages)

1.) How do these numbers relate to people living across the back channel from J.I.

2.) What was the avg. temp. during the monitoring period, and how does this relate to volitale cmpds.

COMPARISON OF CERTAIN AIR CONTAMINANT LEVELS FOUND AT PNS WITH OTHER AREAS OF THE COUNTRY (CONTINUED)

Contaminant	Concentration Levels (ng/m3)	Location
Mercury	3,000-17,000	PNS (24-Hour Averages)
	1879	PNS (Study Average)
	< 1-3	Remote New York State
	1-12	Rural New York State
	1.8-45	Suburban New York State
	1-270	Urban New York State
	10	Typical Background
Lead	37-220	PNS (24-Hour Averages)
	32	PNS (Study Average)
	40-230	Portland, Maine (Annual Averages)
	15-110	Kittery, Maine (Annual Averages)
	20-70	Rural New York State
	60-780	New York City (Annual Averages)
	23	Typical Background (Annual Average)
TSP	870	PNS (24-Hour Maximum Average)
	76	PNS (Study Average)
	28-47	Portsmouth, New Hampshire (Annual Averages)
	30-39	Kittery, Maine (Annual Averages)
	47-61	New York State (Annual Averages)
PM-10	81	PNS (24-Hour Maximum Average)
	14	PNS (Study Averages)
	19-23	Portsmouth, New Hampshire (Annual Averages)
	27-66	New York City (Annual Averages)
	22-27	Biddeford, Maine (Annual Averages)

APPENDIX

TARGET COMPOUND LIST FOR NAVFAC AIR MONITORING

I. VOLATILES

Trichloroethylene (TCE)
Tetrachloroethylene (PCE)
Vinyl Chloride
Benzene
Methylene Chloride (DCM)

II. SEMI-VOLATILES

- PAHs
  - Benzo(a)Pyrene
  - Benzo(a)Anthracene
  - Benzo(b)Fluoroanthene
  - Benzo(j)Fluoroanthene
  - Benzo(k)Fluoroanthene
  - Benzo(g,h,i)Perylene
  - Indeno(1,2,3-cd)Pyrene
  - Bis(2-ethylhexyl)Phthalate
  - Cyclopentadieno(c,d)Pyrene
  - Dibenz(a,h)Anthracene
  - Pyrene
  - Chrysene
  - Nitrosodiphenylamine
- Pesticides
  - DDD
  - DDE
  - DDT
- PCBs

TARGET COMPOUND LIST FOR NAVFAC AIR MONITORING (CONTINUED)

III. METALS (HEAVY)

Arsenic
Chromium
Antimony
Mercury (Particulate and Volatile)
Nickel
Lead
Beryllium
Cadmium

IV. PARTICULATES

Inhalable (PM-10)
Total Suspended (TSP)

PROPOSED FEDERAL ACTION LEVELS (ng/m3)	
CONTAMINANT	CONCENTRATION LIMIT
Arsenic	0.07
Nickel	N.A.
Cadmium	0.60
Lead	N.A.
Particulate Mercury	N.A.
Chromium	0.09
Volatile Mercury	N.A.
Antimony	N.A.
Tetrachloroethylene (PCE)	1000
Benzene	N.A.
N-Nitrosodiphenylamine	N.A.
Bis(2-ethylexyl)phthalate	N.A.

NEW YORK STATE AIR GUIDE - 1 AMBIENT AIR TOXIC CONCENTRATION LIMITS (ng/m3)		
CONTAMINANT	CONCENTRATION LIMIT	
	SGC[1]	AGC[2]
Arsenic	20	0.23
Nickel	1,500	200
Cadmium	200	0.50
Lead	N.A.	N.A.
Particulate Mercury	12,000	300
Chromium	100	0.02
Volatile Mercury	1,000	240
Antimony	120,000	1,200
Tetrachlorethylene (PCE)	$81,000 \times 10^3$	75
Benzene	30,000	120
N-Nitrosodiphenylamine	N.A.	0.07
Bis(2-ethylhexyl)phthalate	N.A.	N.A.

[1] Short-Term Guideline Concentration

[2] Annual Guideline Concentration

SPECIAL SECTION

Lab Instrumentation And Air Monitoring

Research groups and instrument companies are developing new devices capable of collecting air data easily, routinely and with minimal technical assistance.

By James Ryan

The Clean Air Act Amendments (CAAA) of 1990 promise to have a major impact on the American environmental landscape. Prior to the amendments, most measurement and monitoring programs established by EPA analyzed solid or liquid samples for low levels of toxic organic and inorganic contaminants. These samples came from wastewater effluent streams, drinking water plants, Superfund sites and so on. Air monitoring efforts were relatively modest in comparison.

Now, government and private industry will have to begin determining levels of volatile organic hydrocarbons and other toxic volatile chemicals in ambient air and industrial emissions. With provisions impacting state and local governments, industrial facilities and waste remediation sites, air monitoring promises to do for analytical chemistry and air methods in the 1990s what industrial wastewater testing did for analytical chemistry and water methods in the 1970s — expand the need for government, industrial and commercial laboratory operations. Without doubt, a lot of new, never-before-collected air monitoring data are to be gathered over the remainder of this decade.

However, there cannot be air monitoring data without air monitoring instruments. Research groups within EPA are working in their own laboratories and with instrument companies to develop new devices capable of collecting air monitoring data easily, routinely and with a minimum of technical assistance.

Automated Processes

While all methods for the identification and quantification of volatile organics depend on some type of chromatography, EPA, in cooperation with instrument companies, is working on ways of automating these chromatographic processes, making them capable of hourly sample collection, unattended data reduction and data transfer to centralized computers.

Yet even with these cost and labor saving efforts, the International Association for Environmental Testing Laboratories (Arlington, Va.) in its report, "An Analysis of the Market and Business Opportunities in the Environmental Testing Laboratory Industry," (October 1991) estimates that air testing will cost as much as $100 million for states, localities and private industry in the year 2000.

The CAAA has 11 major sections or titles, up from three in the original 1970 act. The new sections require that standards be set to limit acid rain deposition, toxic emissions from industrial plants and from solid waste combustion facilities. Two sections that will have the greatest impact on analytical air monitoring instrumentation are Title I and Title III. The former, often referred to as the "Non-Attainment of Ambient Air Standards" section, deals with those states and localities that chronically exceed EPA's ozone limitation standard.

The latter title, referred to as the "Air Toxics" section, ultimately will require industrial facilities in the United States to obtain an air discharge permit for air toxic chemicals much as they are now required to have a water discharge permit to release aqueous chemicals.

The air monitoring program depends on fixed analytical methods developed by EPA's Office of Research and Development and promulgated for use by the appropriate EPA regulatory office. The program requires the analysis of air samples not

continued on page 31

James Ryan is manager of environmental marketing for the Perkin-Elmer Corp. in Norwalk, Conn.

Table 1. Toxic Organic Air Monitoring Methods

Number	Description	Types of Compounds Determined
TO-1	Tenax GC Adsorption and GC/MS Analysis	Volatile, nonpolar organics (e.g., aromatic hydrocarbons, chlorinated hydrocarbons) having boiling points in the range of 80 degrees to 200 degrees C.
TO-2	Carbon Molecular Sieve Adsorption and GC/MS Analysis	Highly volatile, nonpolar organics (e.g., vinyl chloride, vinylidene chloride, benzene, toluene) having boiling points in the range of -15 degrees to +120 degrees C.
TO-3	Cryogenic Trapping and GC/FID or ECD Analysis	Volatile, nonpolar organics having boiling points in the range of -10 degrees to +200 degrees C.
TO-4	High Volume PUF Sampling and GC/ECD Analysis	Organochlorine pesticides and PCBs
TO-5	Dinitrophenylhydrazine Liquid Impinger Sampling and HPLC/U[illegible]	[illegible] and Ketones
[illegible]	High Performance Liquid Chromatography [illegible]	[illegible]
TO-7	Thermosorb/N Adsorption	[illegible]amylamine
[illegible]	Sodium Hydroxide Liquid Impinger [illegible]	[illegible]
TO-9	High Volume Polyurethane Foam [illegible] graphy/High Resolution Mass Spectrometry (HRGC/HRMS)	[illegible]
TO-10	Low Volume Polyurethane Foam (PUF) Sampling With Gas Chromatography/Electron Capture Detector (GC/ECD)	Pesticides
TO-11	Adsorbent Cartridge Followed By High Performance Liquid Chromatography (HPLC) Detection	[illegible]
TO-12	Cryogenic Preconcentration and Direct Flame Ionization Detection (PDFID)	Non-Methane Organic Compounds (NMOC)
TO-13	PUF/XAD-2 Adsorption with Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC) Detection	Polynuclear Aromatic Hydrocarbons (PAHS)
TO-14	SUMMA® Passivated Canister Sampling with Gas Chromatography	Semi-Volatile and Volatile Organic Compounds (SVOC/VOCs)

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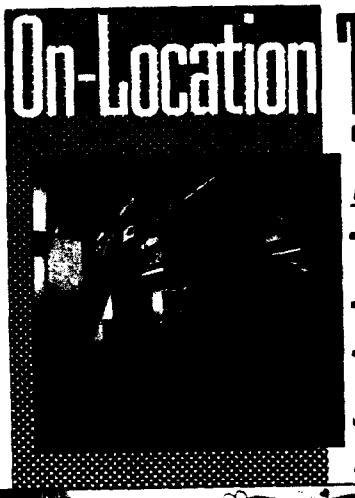

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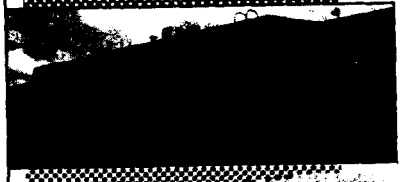

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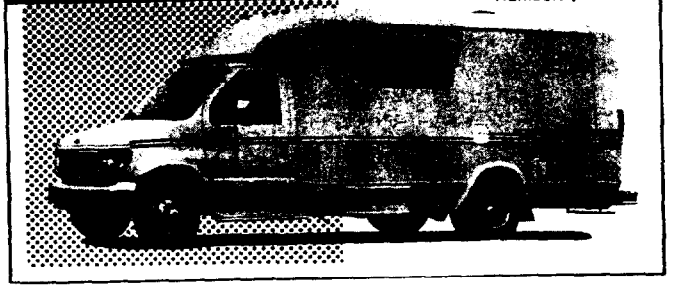

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to identify and quantify every possible toxic chemical constituent, but rather to determine a fixed list of analytes, some of which are toxic, some of which may only be considered harbingers of environmental pollution.

TO Series Methods

Though air monitoring regulations are not yet in place, EPA has developed the Toxic Organic (TO) series methods for analyzing volatile hazardous air pollutants specifically listed in the 1990 CAAA. A description of these methods and their analytes are shown in Table 1 on page 30.

Much air monitoring sampling and analysis for organics is based on evacuated stainless steel canister technology, (that is, the collection and storage of air samples in large stainless steel vessels). Air samples typically are collected in 6-liter aliquots that are shipped to a laboratory for analysis. To reduce adsorptive losses of VOCs, the interior canister surface is treated with a proprietary SUMMA™ polishing process.

While canisters may be used for air sampling, they are relatively large and bulky, expensive to transport and can be somewhat difficult to clean. Also, they do not lend themselves to the analysis of the diurnal variations in hydrocarbon analyte levels. If one wanted to collect hourly or even trihourly samples for one or two days, the number of canisters would rapidly become too numerous to be handled easily. However, canisters do have the advantage of permitting more than one analysis to be performed on a single sample.

Considerable research has gone into developing the means of avoiding the air sampling canister, either by placing the analytical instrument in the field (thus eliminating the necessity of sample transport), or by using small adsorbent-filled stainless steel or glass tubes through which air can be drawn.

In an adsorbent system, the VOCs are trapped on the polymer surface. These tubes then can be shipped to a laboratory where each sample is thermally desorbed either manually or automatically, and the air toxic constituents are chromatographed and identified. Compared to canisters, adsorbent tubes are easier to use, cheaper to ship and convenient to prepare and store.

There have been questions raised about possible chromatographic artifacts coming not from the air sample, but from adsorbent degradation during the thermal desorption process. However, recently developed nonpolymer adsorbents show promise as being artifact free, and air monitoring method development currently is under way to evaluate these adsorbents.

Duplicate samples can be gathered only with tandem sample collection wherein two side-by-side tubes are exposed simultaneously to an air stream. In addition, certain chemicals may degrade while adsorbed, or a chemical may not be able to be collected in sufficient quantity to permit

continued on page 32

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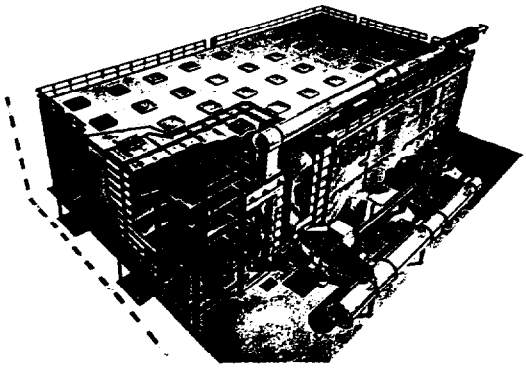

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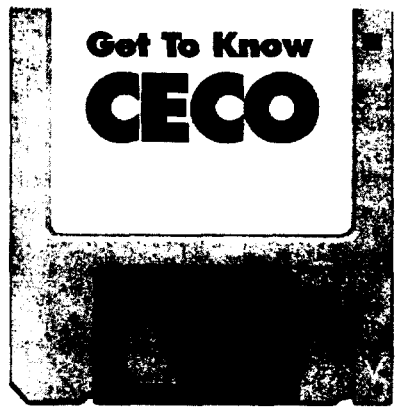

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continued from page 31

analysis due to its extreme volatility.

Field instruments, SUMMA™ polished canisters, adsorbent tubes — all are being evaluated or used in air monitoring, but for regulations coming from different titles of the 1990 CAAA.

Ambient Air Standards

The Clean Air Act charged EPA with setting health-based ambient air standards, of which there are now six. These standards are for SO_x, NO_x, O_3, CO, Pb and PM_{10} (the latter meaning limits on particulate matter less than 10 microns in size). These ambient air regulatory limits notwithstanding, there are almost two dozen urban areas in the United States that routinely fail to meet the ozone standard. This failure is the result of hydrocarbons in the air that react with NO_x in the presence of sunlight to form an ozone-rich unhealthful summer haze.

CAAA Title I charges EPA and the states with developing an ozone abatement strategy based not only on ozone, but on NO_x and the hydrocarbon ozone precursors as well. Between two and five field-based chromatographic stations are required per non-attainment region under the monitoring rules. Each field-instrument setup must be capable of collecting samples for a minimum of three hours. Thus there will be at least eight samples per day per instrument, and more likely 24. Table 2 on page 33 lists the VOC hydrocarbons for which monitoring will have to be performed under Title I.

Analyzing for these VOCs obviously requires some form of gas chromatography (GC). Not so obvious is the need for capillary column GC and sub-ambient temperature operation. Capillary column GC is required to separate these compounds for retention time identification, and some form of cooling is required to "focus" the VOCs in a narrow band prior to chromatography to achieve baseline separation.

Since these instruments are placed in the field, routine delivery of liquid nitrogen is difficult. Thus gas chromatographic instruments are being developed that use Peltier (that is, electrically powered) cooling devices to focus the VOCs, and that have two capillary GC columns, one for the extremely volatile C_2 to C_6

Table 2. Ozone precursor hydrocarbons to be analyzed by field-based gas chromatography.

Ethane	trans-2-Hexene
Ethylene	cis-2-Hexene
Propane	Toluene
Propene	Methylcyclopentane
Isobutane	2,4-Dimethylpentane
n-Butane	Benzene
[illegible]	[illegible]

compounds, and a second to separate the higher molecular weight species.

Air Toxics Monitoring

Industrial plants will be required to obtain air monitoring discharge permits comparable to those they now have for aqueous discharge. In keeping with the usual EPA monitoring program, these discharge permits will likely have fixed methods and a fixed list of analytes specified explicitly in the 1990 CAAA. To date, neither the required methods nor the monitoring frequency have been specified.

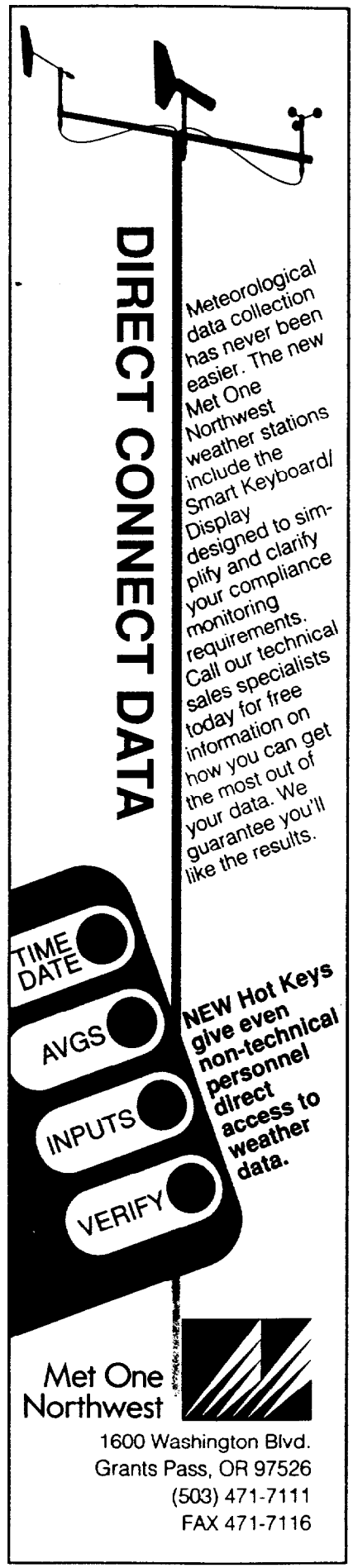
Canisters have been used for some time to collect samples for air toxic analysis, but research is under way to develop adsorbent-based methods. The canister methods are variations on EPA's TO-14 method, "Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA™ Polished Canister Sampling and Gas Chromatographic (GC) Analysis" (EPA-600/4-89-017, June 1988). This method, like all the TO methods, are guidance to states, but at present, there is no requirement to use these methods.

Research evaluating adsorbents as a means of sampling for air toxics has led to the development of new devices. There are even small battery-powered devices that can be used to draw a known quantity of air through a tube with a small pump for an hour, following which the device automatically indexes to the next sample tube. At the end of 24 hours, the tubes would be returned to a central lab for analysis.

Conclusions

Given the monitoring requirement in the 1990 Clean Air Act Amendments, there will be a large impact on traditional laboratory chromatographic instruments. Remote, unattended operation for the determination of ozone precursor hydrocarbons now is available. Both canister and adsorbent tube sampling for air toxics are being evaluated to see which is easier to use, more cost effective and provides the best determinations.

Following the development of EPA's industrial wastewater monitoring program in the 1970s and the Superfund monitoring program in the 1980s, air monitoring seems likely to be the next wave. EPA, and the instrument companies with whom they work, are developing new analytical methodologies and new instruments to make the data collection cost effective and yet comprehensive. EP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CALCULATION OF HAZARD INDEX FOR NON CARCINOGENS

SITE: DRMO at PNSY, Kittery, ME
MEDIUM: Surface Soil
PATHWAY: Ingestion
RECEPTOR: Adult Worker

EQUATIONS: I. CDI = (C*IR*EF*ED)/(BW*AT)

Parameter	Value	Source
CDI = Chronic Daily Intake	To be calculated	
C = Contaminant Concentration	Maximum conc.	soil data
IR = Ingestion Rate	100 mg/day	~~EPA, 3/91~~ McLAREN/HART
EF = Exposure Frequency	250 days/yr	EPA, 3/91
ED = Exposure Duration	25 yr	EPA, 3/91
BW = Body Weight	70 kg	EPA, 3/91
AT = Averaging Time	9125 days	ED*365d/yr

II. HQ = CDI/RfD

HQ = Hazard Quotient
RfD = Reference Dose See below

III. HI = SUM of HQs
HI = Hazard Index

CALCULATIONS:

Analyte	Soil Conc. (mg/kg)	CDI (mg/kg/d)	RfD (mg/kg/d)	Source	HQ
Arochlor 1254	5	4.89E-06	NA	IRIS	
Benzo(a)pyrene	1.05	1.03E-06	NA	IRIS	
Dieldrin	0.19	1.86E-07	5.00E-05	IRIS	0.00
Antimony	580	5.68E-04	4.00E-04	IRIS	1.42
Arsenic	20.6	1.00E-03	1.00E-03	HEAST	1.00
Beryllium	3.6	3.52E-06	5.00E-03	IRIS	0.00
Lead	255000	2.50E-01	NA	IRIS	
			TOTAL HAZARD INDEX		2.42

CALCULATION OF RISK PROBABILITY FOR CARCINOGENS

SITE: DRMO at PNSY, Kittery, ME
MEDIUM: Surface Soil
PATHWAY: Ingestion
RECEPTOR: Adult Worker

EQUATIONS: I. CDI = (C*IR*EF*ED)/(BW*AT)

Parameter	Value	Source
CDI = Chronic Daily Intake	To be calculated	
C = Contaminant Concentration	Maximum conc.	soil data
IR = Ingestion Rate	100 mg/day	~~EPA, 3/91~~ McLAREN/HART
EF = Exposure Frequency	250 days/yr	EPA, 3/91
ED = Exposure Duration	25 yr	EPA, 3/91
BW = Body Weight	70 kg	EPA, 3/91
AT = Averaging Time	25550 days	ED*365d/yr

II. RISK = CDI*SF

RISK = Probability of Increased Cancer Risk
SF = Slope Factor See below

CALCULATIONS:

Analyte	Soil Conc. (mg/kg)	CDI (mg/kg/d)	SF (mg/kg/d)−1	Source	Risk
Arochlor 1254	5	1.75E−06	7.70E+00	IRIS	1.35E−05
Benzo(a)pyrene	1.05	3.67E−07	1.15E+01	IRIS	4.22E−06
Dieldrin	0.19	6.64E−08	1.60E+01	IRIS	1.06E−06
Antimony	580	2.03E−04	NA	IRIS	
Arsenic	20.6	7.20E−06	1.75E+00	IRIS	1.26E−05
Beryllium	3.6	1.26E−06	4.30E+00	IRIS	5.41E−06
Lead	255000	8.91E−02	NA	IRIS	
			TOTAL CANCER RISK:		3.67E−05

CALCULATION OF HAZARD INDEX FOR NON CARCINOGENS

SITE: DRMO at PNSY, Kittery, ME
MEDIUM: Air
PATHWAY: Inhalation
RECEPTOR: Adult Worker

EQUATIONS: I. CDI = (C*IR*EF*ED)/(BW*AT)

Parameter	Value	Source
CDI = Chronic Daily Intake	To be calculated	
C = Contaminant Concentration	Maximum conc.	air data
IR = Inhalation Rate	20 m^3/day	EPA, 3/91
EF = Exposure Frequency	250 days/yr	EPA, 3/91
ED = Exposure Duration	25 yr	EPA, 3/91
BW = Body Weight	70 kg	EPA, 3/91
AT = Averaging Time	9125 days	ED*365d/yr

II. HQ = CDI/RfD

HQ = Hazard Quotient
RfD = Reference Dose See below

III. HI = SUM of HQs
HI = Hazard Index

CALCULATIONS:

Analyte	Air Conc. (ng/m^3)	CDI (mg/kg/d)	RfD (mg/kg/d)	Source	HQ
N-nitrosodiphenylamine	16000	3.13E-03	NA	IRIS	
Arsenic	2	3.91E-07	1.00E-03	HEAST	0.00
Cadmium	5	9.78E-07	1.00E-03	IRIS	0.00
Lead	220	4.31E-05	NA	IRIS	
Mercury	7000	1.37E-03	9.00E-06	HEAST ~~IRIS~~	152.21
			TOTAL HAZARD INDEX		152.21

WRONG VALUE

NEEDS CHECKING

CALCULATION OF RISK PROBABILITY FOR CARCINOGENS

SITE: DRMO at PNSY, Kittery, ME
MEDIUM: Air
PATHWAY: Inhalation
RECEPTOR: Adult Worker

EQUATIONS: I. CDI = (C*IR*EF*ED)/(BW*AT)

Parameter	Value	Source
CDI = Chronic Daily Intake	To be calculated	
C = Contaminant Concentration	Maximum conc.	air data
IR = Inhalation Rate	20 m^3/day	EPA, 3/91
EF = Exposure Frequency	250 days/yr	EPA, 3/91
ED = Exposure Duration	25 yr	EPA, 3/91
BW = Body Weight	70 kg	EPA, 3/91
AT = Averaging Time	25550 days	ED*365d/yr

II. RISK = CDI*SF

RISK = Probability of Increased Cancer Risk
SF = Slope Factor See below

CALCULATIONS:

Analyte	Air Conc. (ng/m^3)	CDI (mg/kg/d)	SF (mg/kg/d)−1	Source	Risk
N−nitrosodiphenylamine	16000	1.12E−03	4.90E−03	IRIS	5.48E−06
Arsenic	2	6.99E−07	5.00E+01	IRIS	3.49E−05
Cadmium	5	1.75E−06	8.00E+00	IRIS	1.40E−05
Lead	220	7.69E−05	NA	IRIS	
Mercury	7000	2.45E−03	NA	IRIS	
			TOTAL CANCER RISK:		5.44E−05