State of Vermont

Environmental Radiation Surveillance Report

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2004 Summary

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Vermont Department of Health
Office of Radiological Health

ENVIRONMENTAL RADIATION SURVEILLANCE SUMMARY FOR 2004

ALL SAMPLES FOR THE YEAR 2004 ARE WITHIN THE EXPECTED HISTORICAL RANGE

Sample Media	Historical Range*			2004
Air Filter (pCi/m^3)	Gross Alpha		< LLD to 0.0071	< LLD to 0.0057
	Gross Beta		< LLD to 0.0251	0.0078 to 0.0215
Biota (pCi/kg)	Plant	Cs-137	< LLD to 540	< LLD
		K-40	2,000 to 13,000	2,660 to 8,880
		Be-7	< LLD to 4,000	< LLD to 2,570
	Fungi	Cs-137	50 to 9,000	1050
		K-40	1,000 to 12,000	2400
		Be-7	< LLD	< LLD
		Cs-134	< LLD to 45*	< LLD
	Fern	Cs-137	< LLD to 540	NS
		K-40	4,000 to 11,000	NS
		Be-7	100 to 4,000	NS
	Honey	Cs-137	< LLD to 200	NS
		K-40	300 to 2,000	NS
		Be-7	< LLD	NS
Fish (pCi/kg)	Cs-137		< LLD to 100	< LLD to 20.5
	K-40		1,000 to 5,000	2,180 to 2,580
Iodine Cartridges (pCi/m^3)	I-131		< LLD	< LLD
Milk (pCi/L)	I-131		< LLD	< LLD
	K-40		1,200 to 2,000	1,330 to 1,570

Sample Media	Historical Range*		2004
Sediment (pCi/kg)	Cs-137	< LLD to 500	< LLD to 109
	K-40	6,000 to 22,000	10,600 to 14,800
	Be-7	< LLD to 5,000	< LLD to 1,040
Soil (pCi/kg)	Cs-137	< LLD to 500	86 to 137
	K-40	7,000 to 20,000	11,800 to 14,300
	Be-7	< LLD to 600	< LLD
Special Study Sediments (pCi/kg)	Be-7	< LLD to 3,000	< LLD to 1,770
	Co-60	< LLD to 2500	< LLD to 254
	K-40	6,000 to 26,000	10,900 to 20,400
	Cs-137	< LLD to 500	39 to 182
TLD (mR/quarter)	Gross Gamma	0 to 12.5	0 to 12
Tritium in Water (nCi/L)	H-3	< LLD	< LLD
Water (pCi/L)	Alpha	< LLD to 15	< LLD to 8.9
	Beta	< LLD to 15	< LLD to 5.2

LLD = Lower Limit of Detection
NS = No Sample
* Due to Chernobyl event.

AIR SAMPLES 2004

All Air Samples for the Year 2004 are within the expected historical range.

The historical range for alpha is from less than the detection limit to 0.0071 pCi/m^3. The samples for 2004 range from less than the detection limit to 0.0057 pCi/m^3.

The historical range for beta is from less than the detection limit to 0.0251 pCi/m^3. The samples for 2004 range from less than the detection limit to 0.0215 pCi/m^3.

Air samples are taken at various fixed locations using a line powered piston type compressor operating at a rate of 1 cubic foot per minute nominal. The sample is collected on a fiberglass 2" diameter filter. Collection time is continuous with a nominal sampling period of four weeks. The air filters are analyzed for gross alpha and gross beta using an alpha/beta proportional counter. Results are reported in picoCuries per cubic meter of air with 2 sigma (standard deviation) value.

(picoCuries/Cubic Meter)

Sample Period	Windham County Court*		Brattleboro State Police	
	Alpha	Beta	Alpha	Beta
1/16 – 2/11/04	0.0026 ± 0.0009	0.0149 ± 0.0018	0.0024 ± 0.0008	0.0140 ± 0.0015
2/11 – 3/25/04	0.0029 ± 0.0008	0.0160 ± 0.0013	0.0027 ± 0.0006	0.0149 ± 0.0011
3/25 – 4/7/04	< 0.0020	0.0116 ± 0.0024	< 0.0016	0.0097 ± 0.0019
4/7 – 5/12/04	0.0038 ± 0.0010	0.0145 ± 0.0014	0.0001 ± 0.0003*	0.0010 ± 0.0005*
5/12 – 6/22/04	0.0035± 0.0008	0.0123 ± 0.0012	0.0032 ± 0.0007	0.0115 ± 0.0010
6/22 – 7/28/04	0.0032 ± 0.0009	0.0115 ± 0.0013	0.0021 ± 0.0007	0.0095 ± 0.0011
7/28 – 8/26/04	0.0028 ± 0.0009	0.0151 ± 0.0017	0.0021 ± 0.0008	0.0128 ± 0.0014
8/26 – 9/23/04	0.0024 ± 0.0010	0.0166 ± 0.0018	0.0024 ± 0.0008	0.0116 ± 0.0013
9/23 – 10/13/04	0.0039 ± 0.0011	0.0215 ± 0.0025	0.0026 ± 0.0008	0.0143 ± 0.0018
10/13 – 11/10/04	0.0038 ± 0.0014	0.0208 ± 0.0025	0.0017 ± 0.0007	0.0110 ± 0.0013
11/10 – 12/8/04	0.0035 ± 0.0011	0.0198 ± 0.0020	0.0033 ± 0.0009	0.0148 ± 0.0015
12/8 – 1/10/05	0.0005 ± 0.0043***	0.0112 ± 0.0080***	0.0024 ± 0.0007	0.0138 ± 0.0013

AIR SAMPLES 2004
(picoCuries/Cubic Meter)

Sample Period	Guilford Town Garage		Henry Transportation, Vernon	
	Alpha	Beta	Alpha	Beta
1/16 – 2/11/04	0.0034 ± 0.0010	0.0150 ± 0.0017	0.0028 ± 0.0008	0.0124 ± 0.0014
2/11 – 3/25/04	0.0049 ± 0.0009	0.0172 ± 0.0013	0.0032 ± 0.0007	0.0154 ± 0.0011
3/25 – 4/7/04	0.0026 ± 0.0016	0.0106 ± 0.0021	0.0025 ± 0.0014	0.0080 ± 0.0017
4/7 – 5/12/04	0.0038 ± 0.0009	0.0135 ± 0.0013	0.0032 ± 0.0008	0.0110 ± 0.0011
5/12 – 6/22/04	0.0028 ± 0.0007	0.0085 ± 0.0010	0.0023 ± 0.0006	0.0100 ± 0.0010
6/22 – 7/28/04	0.0028± 0.0008	0.0087 ± 0.0011	0.0022 ± 0.0007	0.0097 ± 0.0011
7/28 – 8/26/04	0.0023 ± 0.0008	0.0128 ± 0.0015	0.0030 ± 0.0009	0.0123 ± 0.0013
8/26 – 9/23/04	0.0025 ± 0.0009	0.0124 ± 0.0014	0.0023 ± 0.0008	0.0118 ± 0.0013
9/23 – 10/13/04	0.0030 ± 0.0009	0.0171 ± 0.0021	0.0031 ± 0.0008	0.0142 ± 0.0018
10/13 – 11/10/04	0.0020 ± 0.0008	0.0113 ± 0.0014	0.0016 ± 0.0007	0.0094± 0.0012
11/10 – 12/8/04	0.0032 ± 0.0010	0.0181 ± 0.0018	0.0027 ± 0.0009	0.0145 ± 0.0014
12/8 – 1/10/05	0.0049± 0.0011	0.0195 ± 0.0016	0.0029 ± 0.0008	0.0135 ± 0.0012

AIR SAMPLES 2004
(picoCuries/Cubic Meter)

Sample Period	Power Line River Crossing		Renaud Brothers (Puffers)	
	Alpha	Beta	Alpha	Beta
1/16 – 2/11/04	0.0029 ± 0.0009	0.0158 ± 0.0016	0.0034 ± 0.0009	0.0117 ± 0.0014
2/11 – 3/25/04	0.0057 ± 0.0009	0.0176 ± 0.0012	0.0032 ± 0.0007	0.0136 ± 0.0011
3/25 – 4/7/04	0.0025 ± 0.0015	0.0109 ± 0.0021	0.0021 ± 0.0014	0.0101 ± 0.0020
4/7 – 5/12/04	0.0032 ± 0.0008	0.0133 ± 0.0012	0.0033 ± 0.0008	0.0122 ± 0.0012
5/12 – 6/22/04	0.0028 ± 0.0007	0.0112 ± 0.0011	0.0021 ± 0.0006	0.0078 ± 0.0009
6/22 – 7/28/04	0.0021 ± 0.0007	0.0107 ± 0.0012	0.0025 ± 0.0008	0.0118 ± 0.0012
7/28 – 8/26/04	0.0032 ± 0.0009	0.0141 ± 0.0015	0.0027 ± 0.0008	0.0128 ± 0.0014
8/26 – 9/23/04	0.0035 ± 0.0010	0.0149 ± 0.0015	0.0022 ± 0.0008	0.0099 ± 0.0013
9/23 – 10/13/04	0.0036 ± 0.0009	0.0169 ± 0.0020	0.0031 ± 0.0010	0.0165 ± 0.0016
10/13 – 11/10/04	0.0025 ± 0.0008	0.0111 ± 0.0013	0.0015 ± 0.0007	0.0101 ± 0.0013
11/10 – 12/8/04	0.0026 ± 0.0009	0.0178± 0.0016	0.0028 ± 0.0009	0.0159 ± 0.0016
12/8 – 1/10/05	0.0027 ± 0.0008	0.0174 ± 0.0014	0.0031 ± 0.0009	0.0148 ± 0.0013

AIR SAMPLES 2004
(picoCuries/Cubic Meter)

Sample Period	Wilmington State Highway Garage	
	Alpha	Beta
1/16 – 2/11/04	0.0025 ± 0.0008	0.0123 ± 0.0014
2/11 – 3/25/04	0.0038 ± 0.0007	0.0131 ± 0.0010
3/25 – 4/7/04	0.0016 ± 0.0013	0.0086 ± 0.0018
4/7 – 5/12/04	0.0022 ± 0.0007	0.0108 ± 0.0011
5/12 – 6/22/04	0.0032 ± 0.0007	0.0102 ± 0.0010
6/22 – 7/28/04	0.0025 ± 0.0007	0.0084 ± 0.0010
7/28 – 8/26/04	0.0026 ± 0.0008	0.0117 ± 0.0013
8/26 – 9/23/04	0.0022 ± 0.0008	0.0119 ± 0.0013
9/23 – 10/13/04	0.0028 ± 0.0008	0.0150 ± 0.0019
10/13 – 11/10/04	0.0021 ± 0.0007	0.0099 ± 0.0012
11/10 – 12/8/04	0.0028 ± 0.0009	0.0139 ± 0.0014
12/8 – 1/10/05	0.0023 ± 0.0007	0.0133 ± 0.0012

AIR SAMPLES 2004
(picoCuries/Cubic Meter)

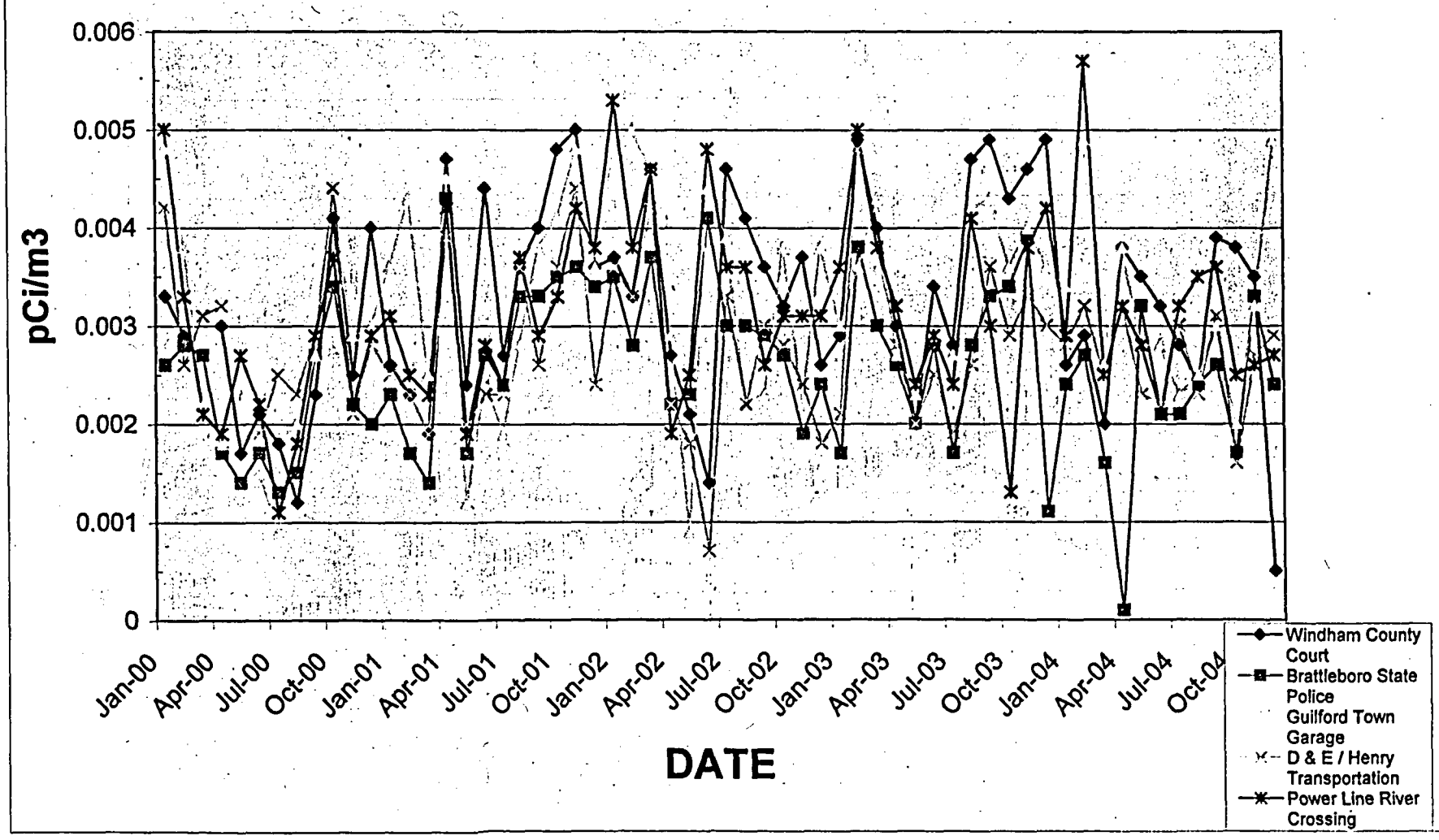
Sample Period	Vernon Elementary School		Brattleboro Union High School	
	Alpha	Beta	Alpha	Beta
1/16 – 2/11/04	0.0029 ± 0.0008	0.0133 ± 0.0015	0.0024 ± 0.0008	0.0141 ± 0.0015
2/11 – 3/25/04	0.0049 ± 0.0008	0.0158 ± 0.0012	0.0042 ± 0.0008	0.0166 ± 0.0012
3/25 – 4/7/04	0.0021 ± 0.0014	0.0088 ± 0.0019	0.0022 ± 0.0014	0.0122 ± 0.0021
4/7 – 5/12/04	0.0027 ± 0.0008	0.0115 ± 0.0012	0.0035 ± 0.0009	0.0122 ± 0.0013
5/12 – 6/22/04	0.0021 ± 0.0006	0.0108 ± 0.0011	0.0036 ± 0.0008	0.0112 ± 0.0010
6/22 – 7/28/04	0.0027 ± 0.0008	0.0105 ± 0.0012	**	**
7/28 – 8/26/04	0.0025 ± 0.0008	0.0131 ± 0.0014	**	**
8/26 – 9/23/04	0.0022 ± 0.0008	0.0120 ± 0.0014	**	**
9/23 – 10/13/04	0.0027 ± 0.0008	0.0174 ± 0.0020	**	**
10/13 – 11/10/04	0.0017 ± 0.0007	0.0111 ± 0.0013	**	**
11/10 – 12/8/04	0.0031 ± 0.0005	0.0112 ± 0.0007	**	**
12/8 – 1/10/05	0.0034 ± 0.0009	0.0154 ± 0.0014	**	**

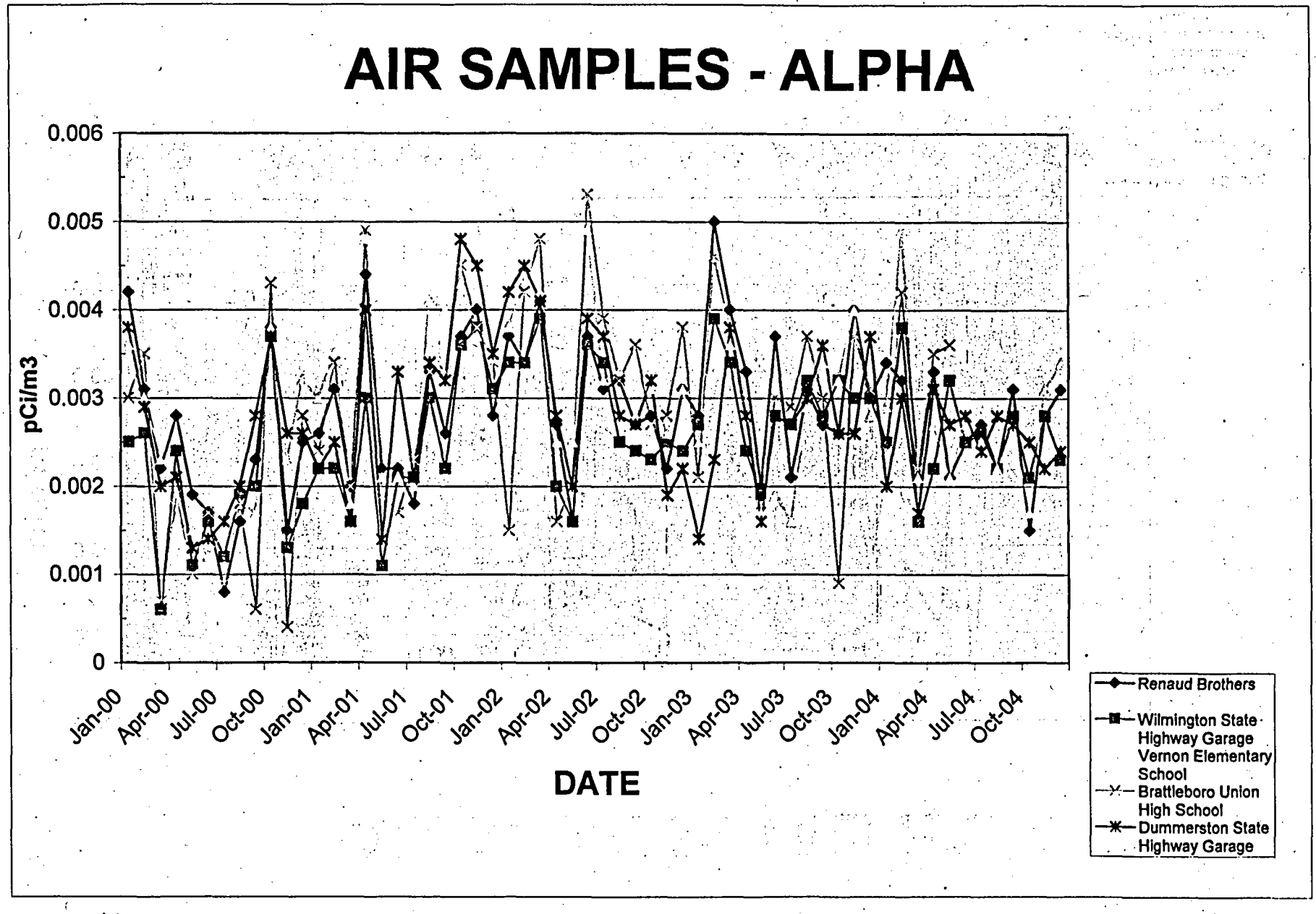
AIR SAMPLES 2004
(picoCuries/Cubic Meter)

Sample Period	Dummerston State Highway Garage	
	Alpha	Beta
1/16 – 2/11/04	0.0020 ± 0.0007	0.0118 ± 0.0014
2/11 – 3/25/04	0.0030 ± 0.0007	0.0155 ± 0.0012
3/25 – 4/7/04	< 0.0017	0.0090 ± 0.0019
4/7 – 5/12/04	0.0031 ± 0.0008	0.0120 ± 0.0012
5/12 – 6/22/04	0.0027 ± 0.0007	0.0112 ± 0.0011
6/22 – 7/28/04	0.0028 ± 0.0008	0.0098 ± 0.0011
7/28 – 8/26/04	0.0024 ± 0.0008	0.0130 ± 0.0014
8/26 – 9/23/04	0.0028 ± 0.0009	0.0124 ± 0.0014
9/23 – 10/13/04	0.0027 ± 0.0008	0.0150 ± 0.0019
10/13 – 11/10/04	0.0025 ± 0.0008	0.0099 ± 0.0013
11/10 – 12/8/04	0.0022 ± 0.0009	0.0165 ± 0.0016
12/8 – 1/10/05	0.0024 ± 0.0008	0.0153 ± 0.0014

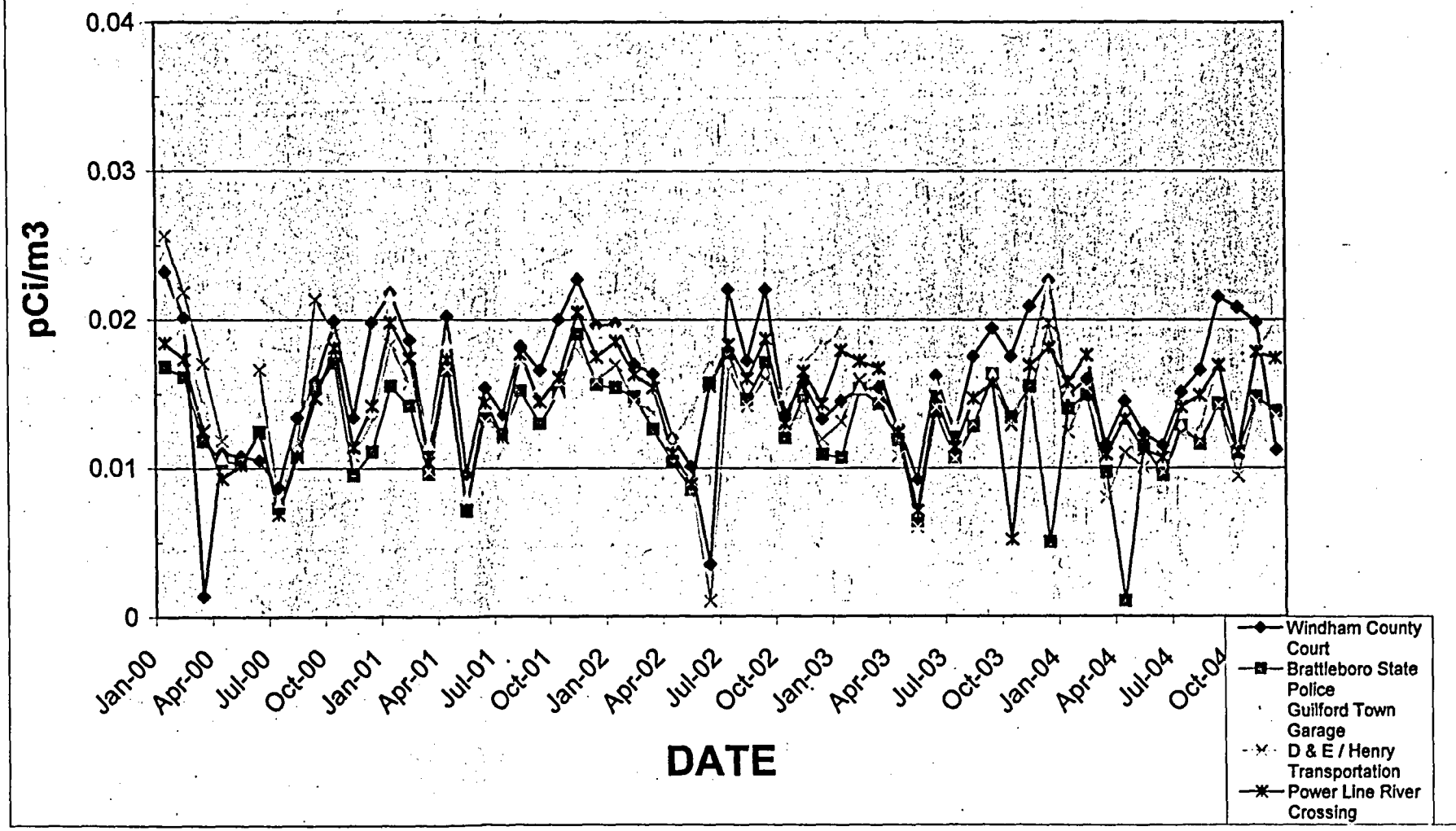
* Filter was seated improperly in the holder.
** No Data Available Sampling Station was recycled by BUHS Contractors
***High error due to loss of electricity to air sampler resulting in a total air volume of 142.2 m^3 for the period.

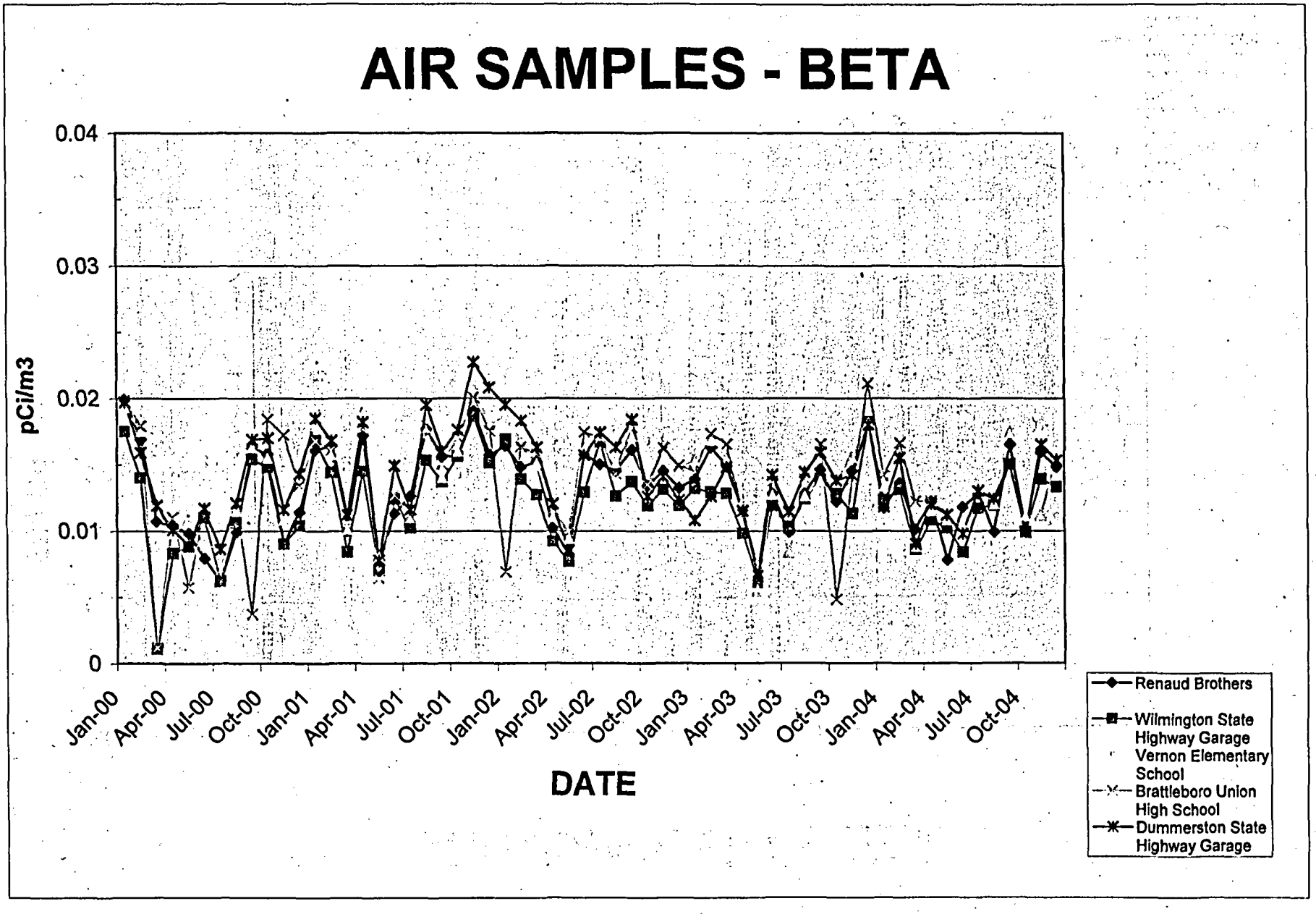
AIR SAMPLES - ALPHA



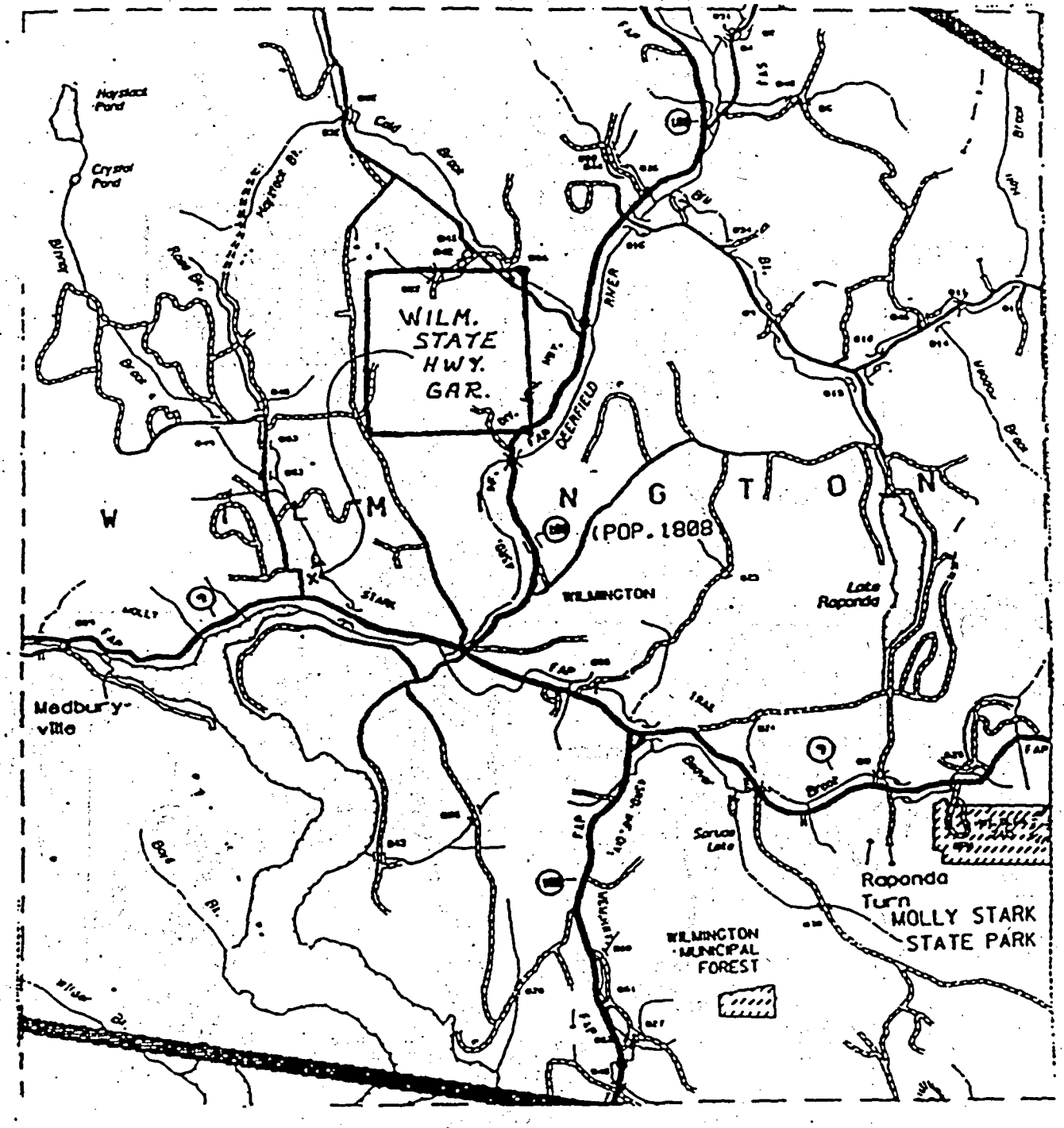

AIR SAMPLES - ALPHA
pCi/m3
0.006
0.005
0.004
0.003
0.002
0.001
0
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
DATE
Renaud Brothers
Wilmington State Highway Garage
Vernon Elementary School
Brattleboro Union High School
Dummerston State Highway Garage

AIR SAMPLES - BETA

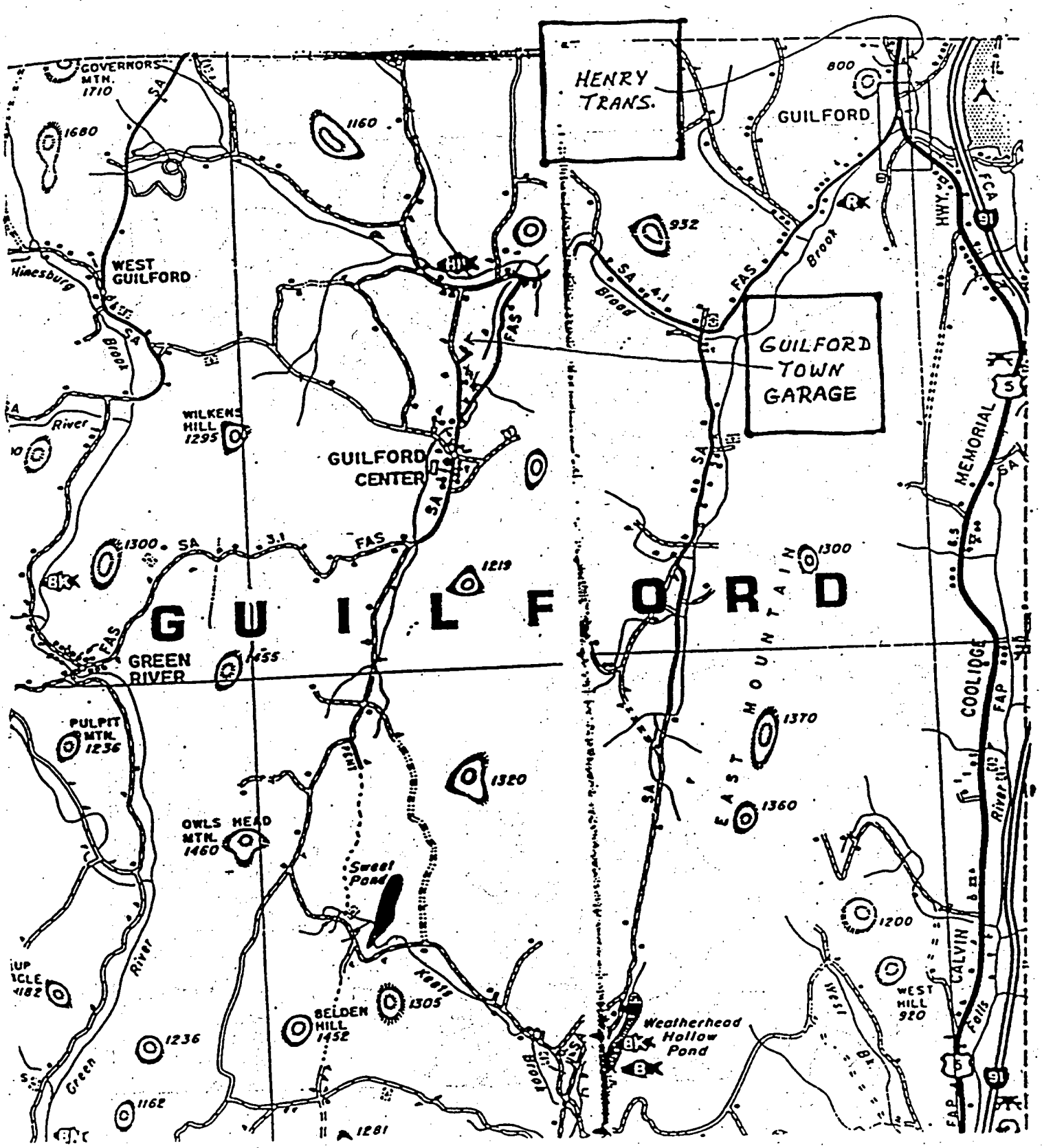



AIR SAMPLES - BETA
pCi/m3
0.04
0.03
0.02
0.01
0
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01
Jan-02
Apr-02
Jul-02
Oct-02
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
DATE
Renaud Brothers
Wilmington State Highway Garage
Vernon Elementary School
Brattleboro Union High School
Dummerston State Highway Garage

AIR

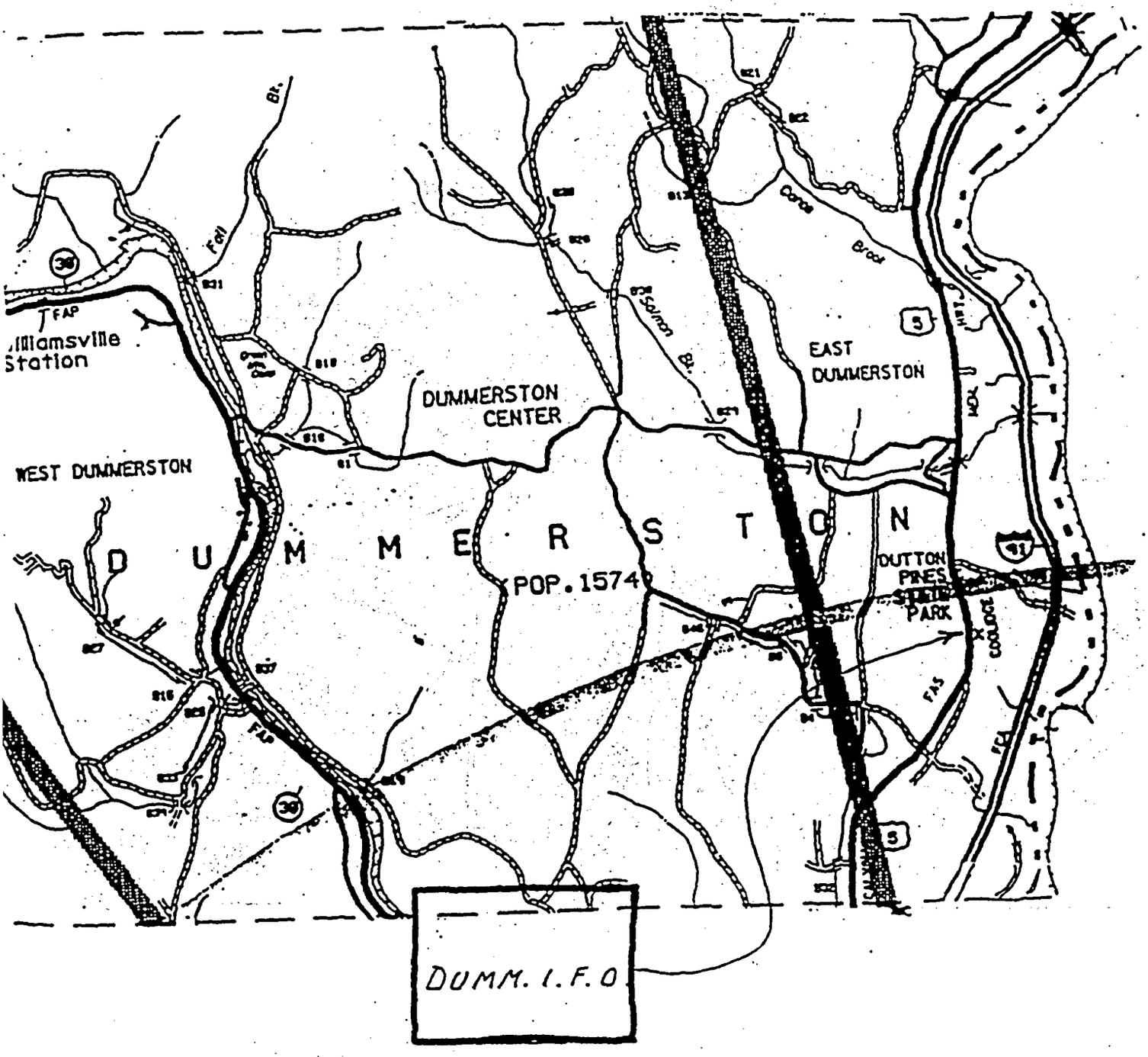

Haystack Pond
Crystal Pond
Cold Brook
Haystack Bl.
WILM. STATE HWY. GAR.
DEERFIELD RIVER
W I L M I N G T O N
(POP. 1808
WILMINGTON
Lake Raponda
Medbury-ville
Spruce Lake
Raponda Turn
MOLLY STARK STATE PARK
WILMINGTON MUNICIPAL FOREST

AIR

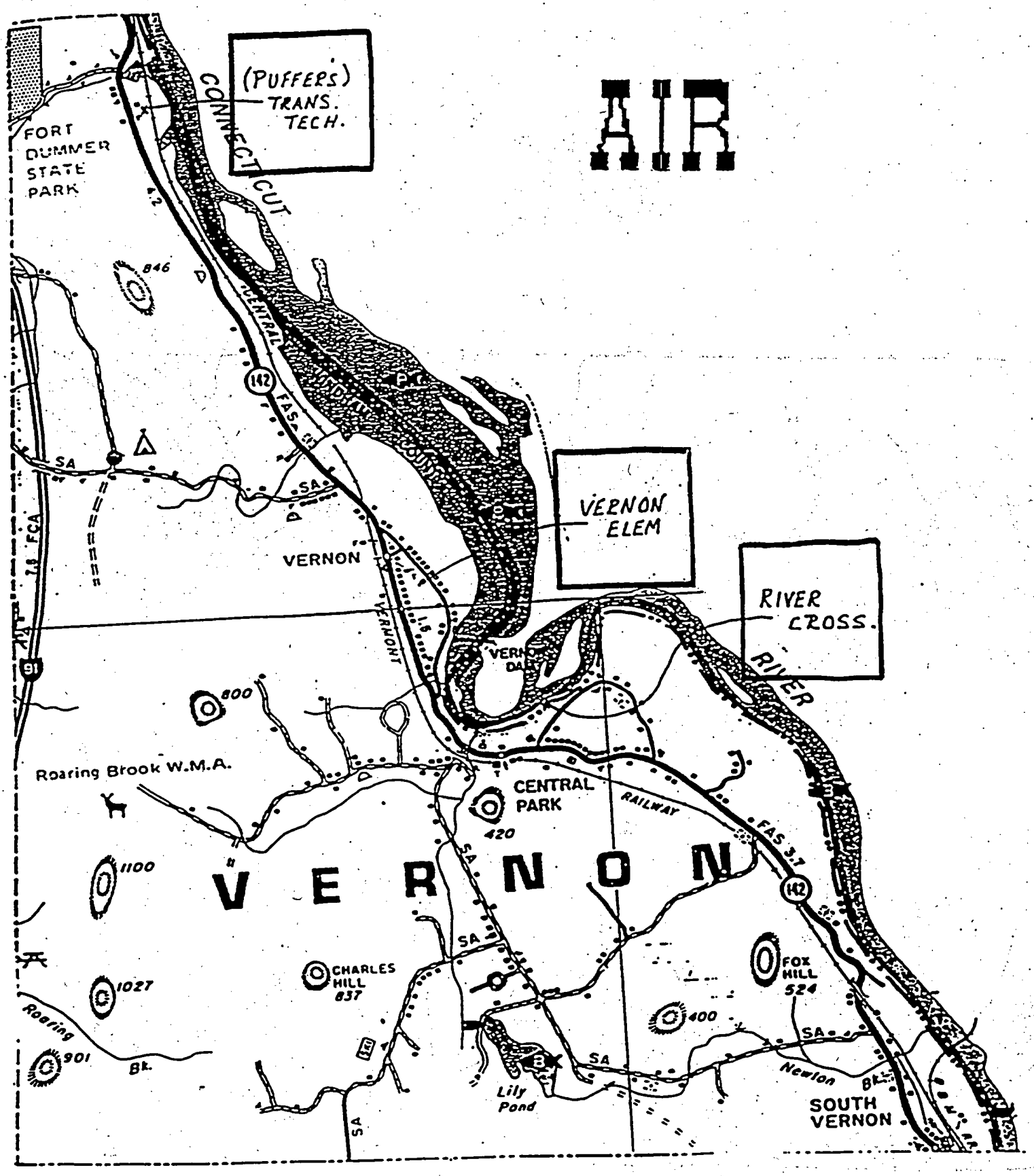


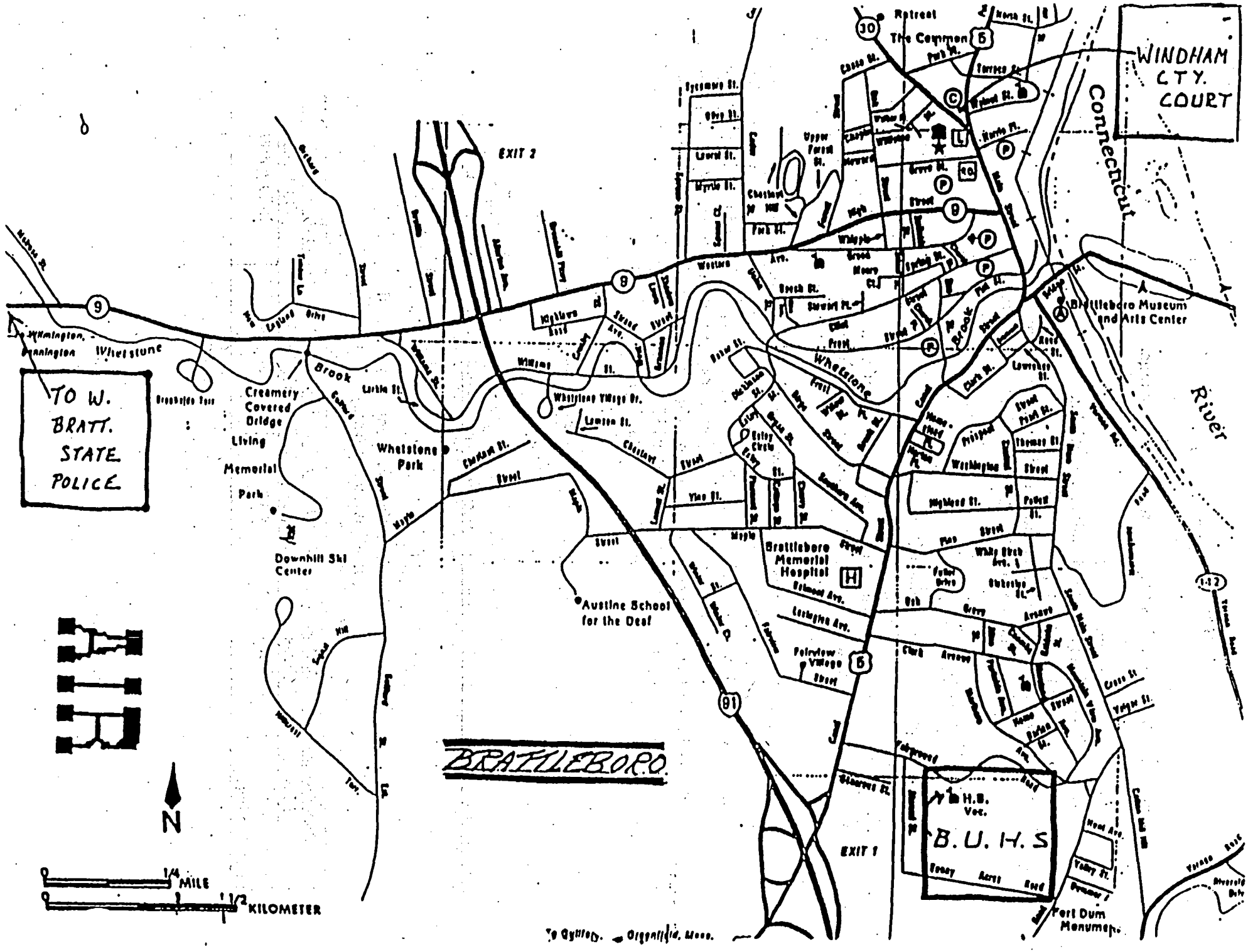
HENRY TRANS.
GUILFORD TOWN GARAGE
GUILFORD
GUILFORD CENTER
WEST GUILFORD
GREEN RIVER
GOVERNORS MTN. 1710
1680
1160
800
932
WILKENS HILL 1295
1300
1219
1300
1455
PULPIT MTN. 1236
1320
1370
1360
OWLS HEAD MTN. 1460
Sweet Pond
1200
WEST HILL 920
BELDEN HILL 1452
1305
1236
1162
1281
Weatherhead Hollow Pond
EAST MOUNTAIN
MEMORIAL
COOLIDGE
CALVIN
HWY.
FCA
FAS
SA
FAP
Hinesburg
Brook
River
Green
Keats
West Bk.
Falls

AIR



Williamsville Station
FAP
Fall Bk.
WEST DUMMERSTON
DUMMERSTON CENTER
Salmon Bk.
Conoe Brook
EAST DUMMERSTON
D U M M E R S T O N
POP. 1574
DUTTON PINES STATE PARK
COOLIDGE
FAS
FEA
DUMM. I.F.O


AIR
(PUFFERS) TRANS. TECH.
CONNECTICUT
FORT DUMMER STATE PARK
846
CENTRAL
142
FAS
SA
VERNON
VERNON ELEM
RIVER CROSS.
RIVER
VERMONT
91
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
1100
VERNON
CHARLES HILL 837
1027
Roaring
901
Bk.
FOX HILL 524
400
Lily Pond
Newton
Bk.
SOUTH VERNON


WINDHAM CTY. COURT
TO W. BRATT. STATE POLICE
BRATTLEBORO
Connecticut River
Wheelstone Brook
Brattleboro Museum and Arts Center
Brattleboro Memorial Hospital
Austine School for the Deaf
Whetstone Park
Creamery Covered Bridge
Living Memorial Park
Downhill Ski Center
B.U.H.S
H.B. Voc.
Fort Dum Monument
EXIT 1
EXIT 2
The Common
Retreat
Upper Forest St.
Fairview Village
Whetstone Village Dr.
Lawton St.
Chestnut St.
Maple St.
Vine St.
Walnut St.
Grove St.
High Street
Canal St.
Cross St.
Vernon St.
Valley St.
Spencer St.
Fairgrounds Road
Thomas Road
Tower Road
Riverside Drive
Brook Road
Little St.
Wilmot St.
Highland Ave.
Fairview Village Street
Lexington Ave.
Clark Avenue
Gray Avenue
Pleasant St.
Thomas St.
Washington Street
Potter St.
Elm Street
Oak St.
Ash St.
Hemlock St.
Sycamore St.
Myrtle St.
Linden St.
Elm St.
Pine St.
Birch St.
Sumner Pl.
Clark St.
Lawrence St.
Reed St.
Fairview St.
Bridge St.
Canal St.
Cedar Hill Road
Hillside Ter.
Upland Drive
Orchard
Brooks Road
Dunham Road
Chestnut Hill Road
Spring Hill Road
Hillside Road
Wilmot Road
Whetstone Road
Chestnut Street
Maple Street
Vine Street
Walnut Street
Grove Street
Cross Street
Vernon Street
Valley Street
Spencer Street
Fairgrounds Road
Thomas Road
Tower Road
Riverside Drive
Brook Road
Canal Street
Cedar

BIOTA 2004

All Biota for the Year 2004 are within the expected historical range.

The historical ranges for plant material:

Cesium-137* is less than the detection limit to 540 pCi/kg,
Potassium-40** is from 2,000 to 13,000 pCi/kg,
Beryllium-7*** is from less than the detection limit to 4,000 pCi/kg.

The plant sample for 2004 lies within these historical ranges. See table below.

The historical ranges for fungi:

Cesium-137 is 50 to 9,000 pCi/kg,
Potassium-40 is from 1,000 to 12,000 pCi/kg,
Beryllium-7 is less than the detection limit,
Cesium-134**** is from less than the detection limit to 45 pCi/kg.

The fungi sample for 2004 lies within these historical ranges. See table below.

Occasional sampling, most often once a year, is done on forage or wild foods as available or needed. Samples are collected (usually in the Northwest quadrant) within a mile or two from the facility. These normally consist of ferns (fiddleheads), edible fungi (Clavaria sp., Boleti sp., Russlae sp., grapes, etc.) and grass. Sample sizes range from 250 to 1,000 grams. The samples are weighed, placed wet in reentrant beakers and analyzed in the Gamma Spectrometer System using a reverse germanium detector. Usual spectra include primordial radionuclides, archival Cesuim-137 and occasional cosmogenic Beryllium-7. Reporting units are picoCuries per kilogram with 2 sigma (standard deviation) value.

Vernon – Rte 142 Indian Point Park
(picoCuries/kilogram)

Season	Biota	Cesium-137*	Potassium-40**	Beryllium-7***
Summer (July)	Fungi	1050 ± 100	2400 ± 100	ND

Vernon – North of Vernon Elementary School
(picoCuries/kilogram)

Season	Biota	Cesium-137*	Potassium-40**	Beryllium-7***
Spring (May)	Grass	ND	6520 ± 590	580 ± 142
Fall (September)	Grass	ND	8880 ± 740	2570 ± 300

BIOTA 2004

Vernon – Miller Farm Outside Milking Parlor
(picoCuries/kilogram)

Season	Biota	Cesium-137*	Potassium-40**	Beryllium-7***
Summer (June)	Grass	ND	7790 ± 1840	ND

Vernon – North Side of Blodgett Road
(picoCuries/kilogram)

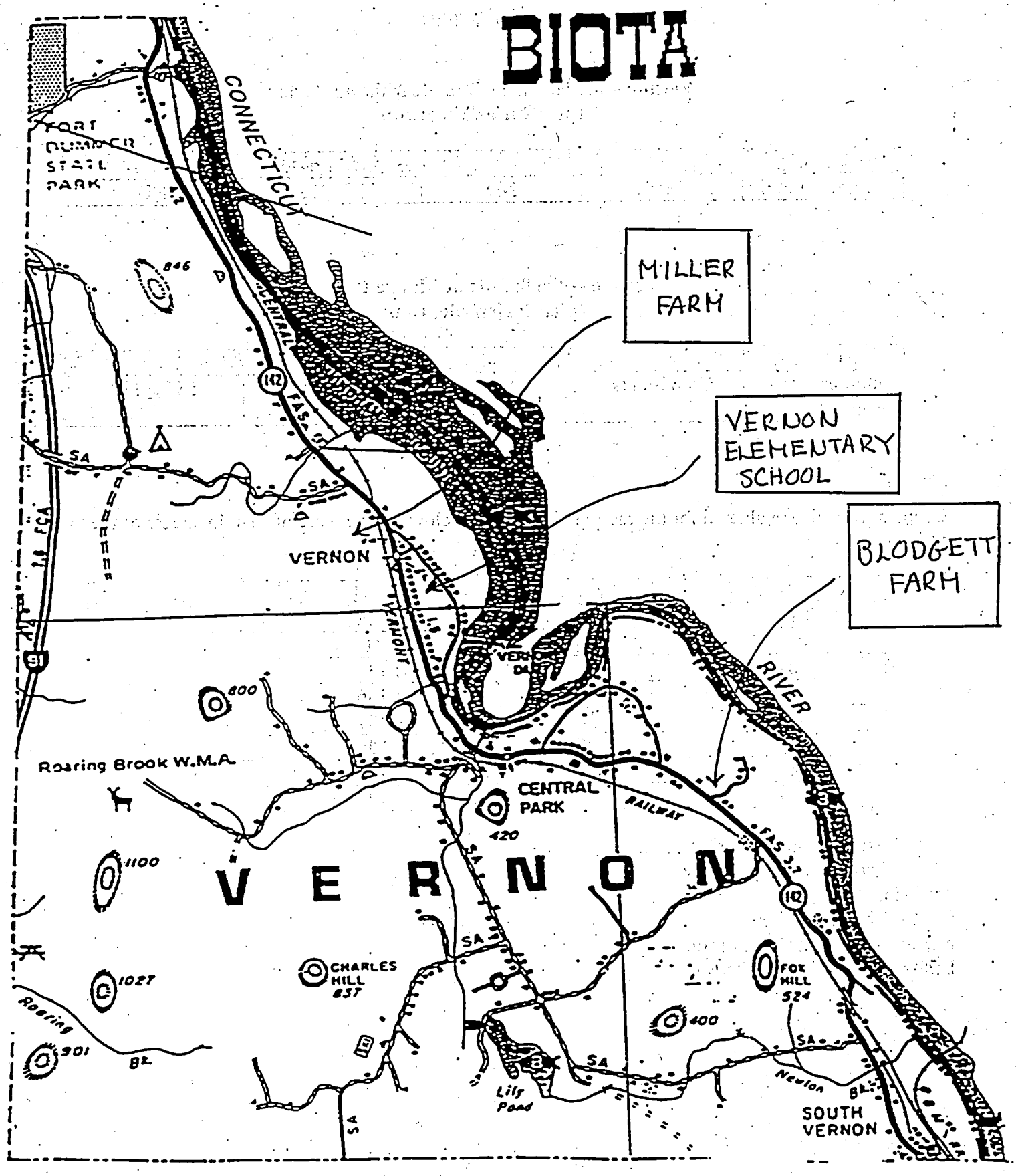
Season	Biota	Cesium-137*	Potassium-40**	Beryllium-7***
Summer (August)	Corn Stalks	ND	2660 ± 290	585 ± 117

Samples were also evaluated for the radionuclides listed below. None were present in excess of the lower limits of detection.

Radionuclide	LLD	Radionuclide	LLD
Cr-51	69	Sb-126	18
Mn-54	15	I-131	27
Co-56	15	Cs-134	58
Co-60	21	Cs-136	18
Zn-65	18	Cs-137	5
Sr-85	86	Ce-139	93
Ru/Rh-103	32	Ce-141	98
Sb-124	18	Ce-144	98

* = Archival atmospheric testing
** = Terrestrial radioactivity
*** = Cosmogenic
**** = Chernobyl event
ND = Below Detection Limits
LLD = Lower Limit of Detection

BIOTA



MILLER FARM
VERNON ELEMENTARY SCHOOL
BLODGETT FARM
CONNECTICUT
RIVER
FORT DUMMER STATE PARK
846
CENTRAL
FAS
142
SA
VERNON
VERMONT
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
1100
V E R N O N
1027
CHARLES HILL
837
FOX HILL
524
400
Roaring
901
Bk.
Lily Pond
Newton
Bk.
SOUTH VERNON

FISH 2004

All Fish Samples for the Year 2004 are within the expected historical range.

The historical range for Cesium-137* is from less than the detection limit to 100 pCi/kg. The samples for 2004 range from less than the detection limit to 20.5 pCi/kg.

The historical range for Potassium-40** is from 1,000 to 5,000 pCi/kg. The samples for 2004 range from 2,180 to 2,580 pCi/kg.

Two locations (3-4 Vernon Pond and 3-8 Route 9 Highway bridge) provide fish samples in the Spring and Fall of about one kilogram for each sample. Fish are captured via an electroshock method. The fish are frozen whole, weighed, and chopped or blended (entire) for loading into a reentrant beaker. It is subsequently analyzed with a Gamma Spectrometer System using a reverse germanium detector. Radionuclides detected usually include naturally occurring Potassium-40, Thorium and Uranium with daughters, archival Cs-137 due to former open atmospheric nuclear tests, and occasional traces of cosmogenic Beryllium-7. Reporting units are picoCuries per kilogram with 2 sigma (standard deviation) value.

Spring
(picoCuries/kilogram)

Site	Cesium-137 Wet Weight	Natural Potassium-40 Wet Weight
3-4	20.5 ± 8.1	2580 ± 340
3-8	ND	2390 ± 320

Fall
(picoCuries/kilogram)

Site	Cesium-137 Wet Weight	Natural Potassium-40 Wet Weight
3-4	ND	2250 ± 300
3-8	ND	2180 ± 290

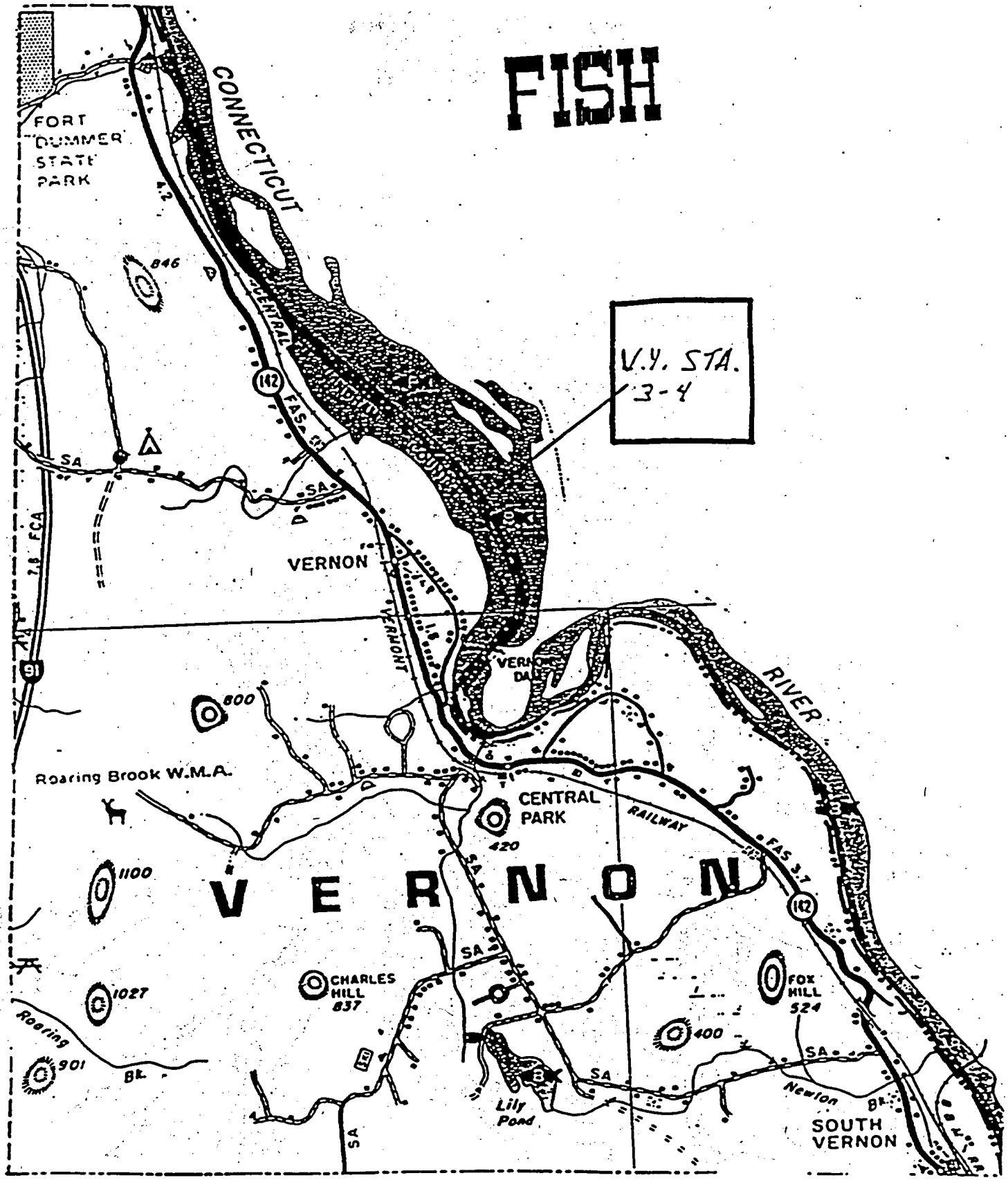
FISH 2004

Samples were also evaluated for the radionuclides listed below. None were present in excess of the lower limits of detection (LLD) which are shown in pCi/kg.

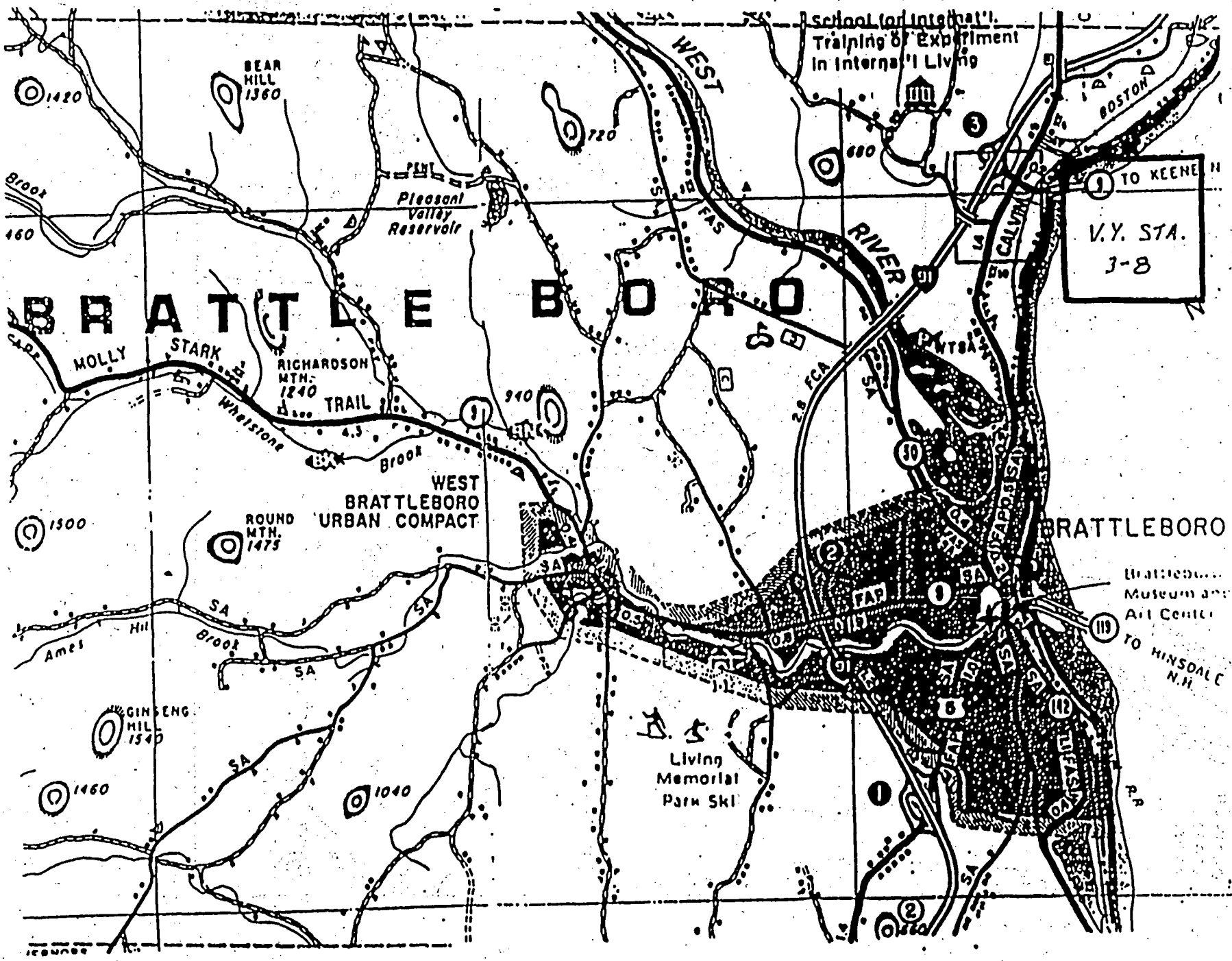
Radionuclide	LLD	Radionuclide	LLD
Cr-51	69	Sb-126	18
Mn-54	15	I-131	27
Co-56	15	Cs-134	58
Co-60	21	Cs-136	18
Zn-65	18	Cs-137	5
Sr-85	86	Ce-139	93
Ru/Rh-103	32	Ce-141	98
Sb-124	18	Ce-144	98

* = Archival atmospheric testing
** = Terrestrial radioactivity
ND = Below Detection Limit
LLD = Lower Limit of Detection

FISH



V.Y. STA. 3-4
CONNECTICUT
RIVER
FORT DUMMER STATE PARK
846
CENTRAL
142
FAS
SA
VERNON
VERMONT
VERNON DAM
91
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
1100
VERNON
142
CHARLES HILL 837
1027
Roaring
901
Bk.
FOX HILL 524
400
Lily Pond
Newton
Bk.
SOUTH VERNON



School for Internat'l.
Training of Experiment
in Internat'l Living
BEAR HILL 1360
1420
720
680
WEST
RIVER
BOSTON
TO KEENE N
V.Y. STA. 3-8
Pleasant Valley Reservoir
Brook
460
BRATTLE BORO
MOLLY STARK TRAIL
RICHARDSON MTN. 1240
Whetstone Brook
940
WEST BRATTLEBORO URBAN COMPACT
1500
ROUND MTN. 1475
BRATTLEBORO
Museum and Art Center
TO HINSDALE N.H.
Ames Hill Brook
GINSENG HILL 1540
1460
1040
Living Memorial Park Ski

FISH

IODINE CARTRIDGES 2004

All Iodine Cartridges for the Year 2004 are within the expected historical range.

The historical range for iodine-131 in air cartridges is less than the detection limit. The samples for 2004 were less than the detection limit.

Air samples are taken at various fixed locations using a line powered piston type compressor operating at a rate of 1 cubic foot per minute nominal. The sample is collected on a charcoal cartridge loaded with TEDA for iodine collection. The charcoal cartridge follows the filtration of air by a glass fiber filter in the air sampling train at all air sampling stations. Collection time is continuous with a nominal sampling period of four weeks. Response to Chernobyl iodine release was marked, proving the sensitivity to environmental trace levels of iodine of this system. The air cartridges are analyzed for Iodine-131 with the Gamma Spectrometer System using a reverse germanium detector. The nominal lower limit of detection is 2×10^{-5} pCi/l of air.

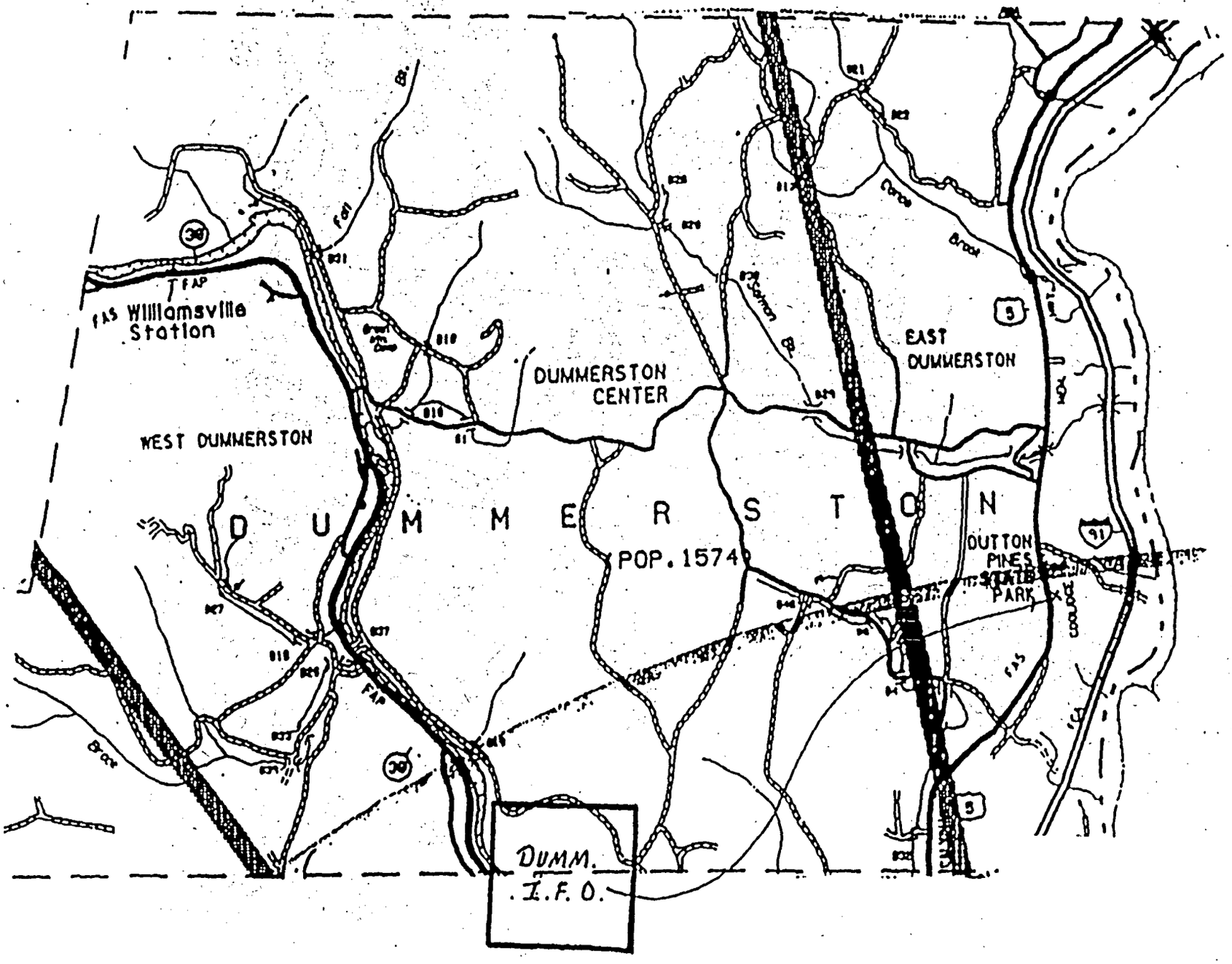
Sample Period	Dummerston Highway Garage	Vernon School	Renaud Bros Vernon	Brattleboro Union High School
January	X	X	X	X
February	X	X	X	X
March	X	X	X	X
April	X	X	X	X
May	X	X	X	X
June	X	X	X	X
July	X	X	X	*
August	X	X	X	*
September	X	X	X	*
October	X	X	X	*
November	X	X	X	*
December	X	X	X	*

Sample Period	Brattleboro State Police	Windham County Court
January	X	X
February	X	X
March	X	X
April	X	X
May	X	X
June	X	X
July	X	X
August	X	X
September	X	X
October	X	X
November	X	X
December	X	X

IODINE CARTRIDGES 2004

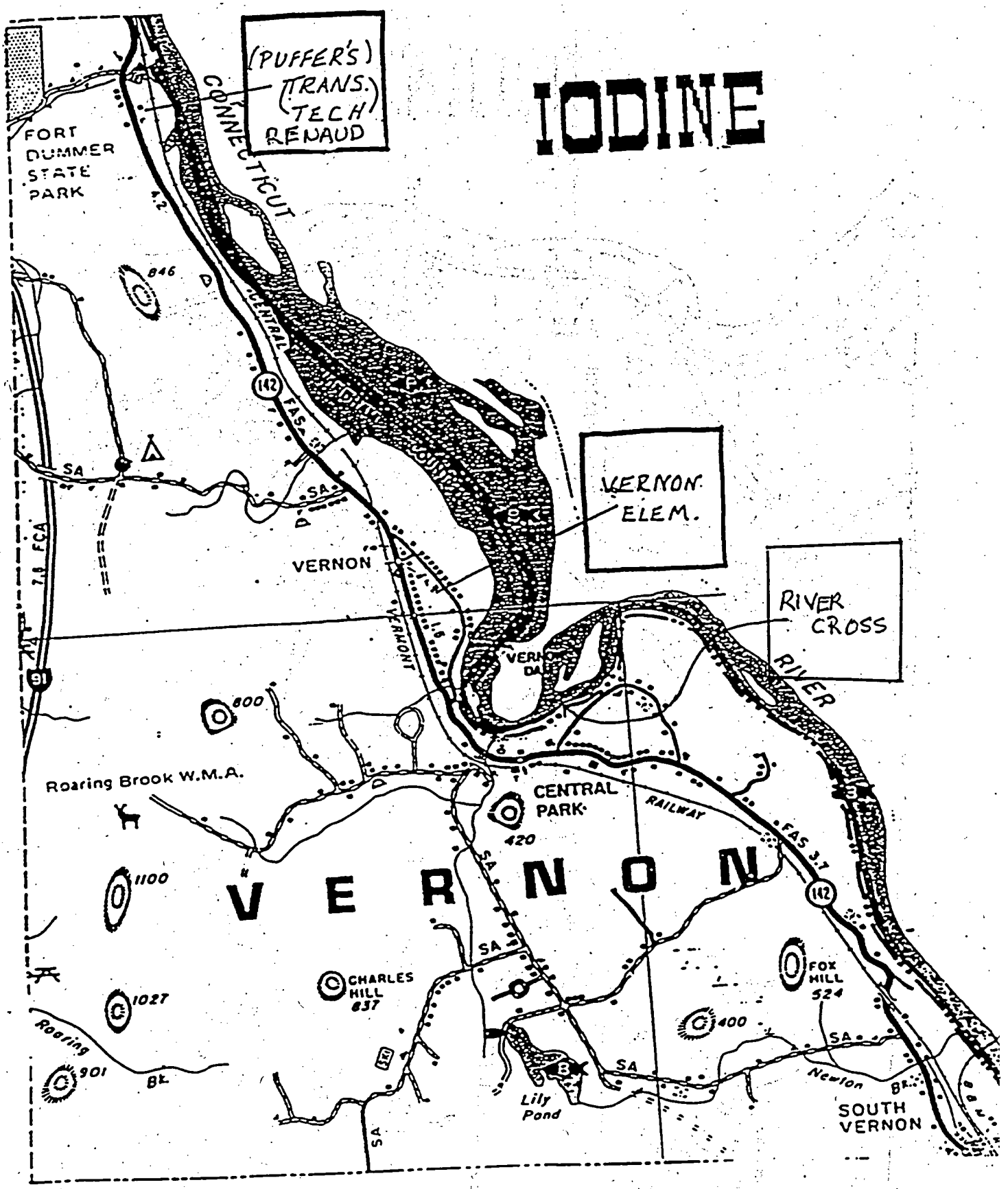
Sample Period	Powerline River Crossing	Guilford Highway Garage	Wilmington State Highway	D & E Henry's
January	X	X	X	X
February	X	X	X	X
March	X	X	X	X
April	X	X	X	X
May	X	X	X	X
June	X	X	X	X
July	X	X	X	X
August	X	X	X	X
September	X	X	X	X
October	X	X	X	X
November	X	X	X	X
December	X	X	X	X

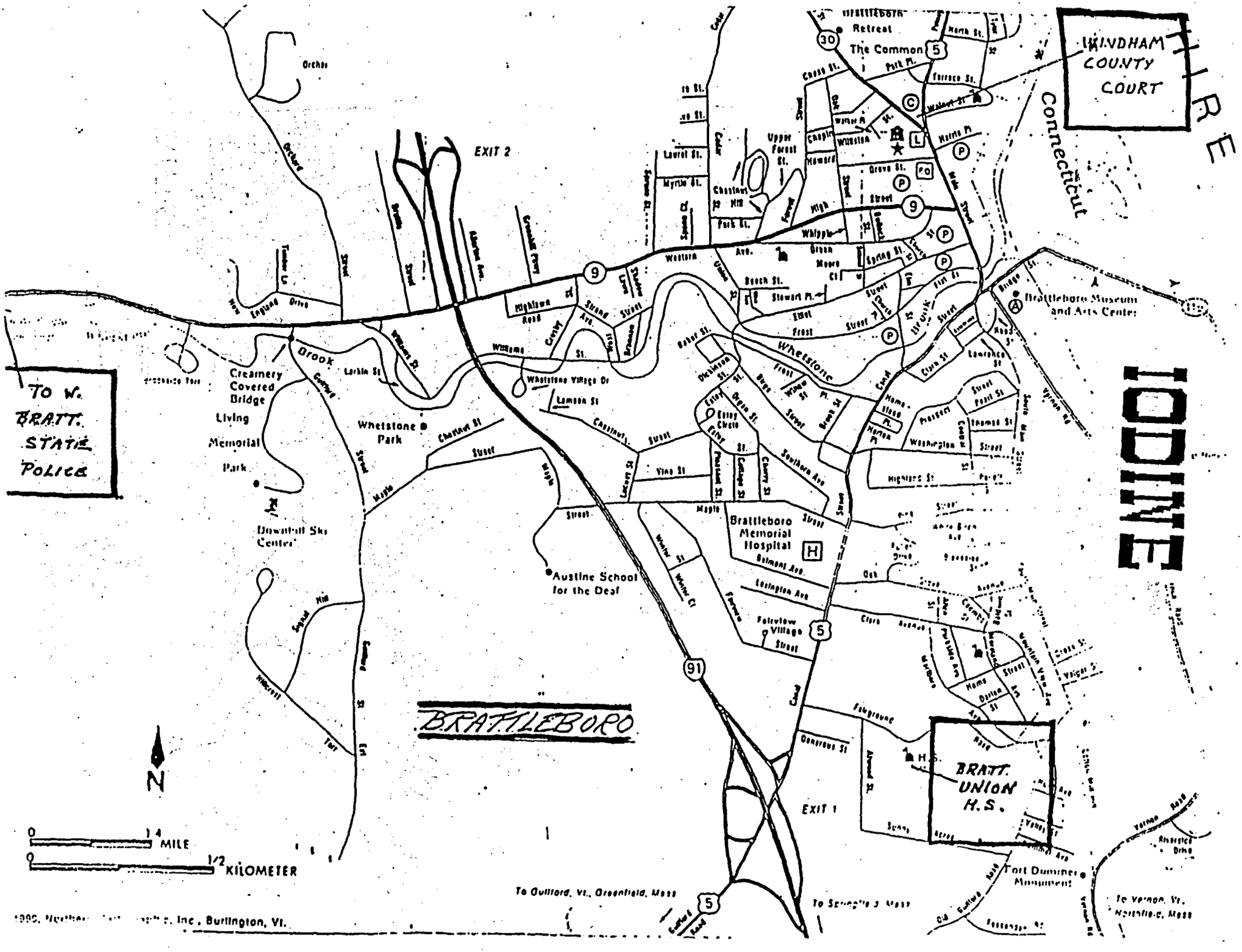
X = No Evidence of Iodine-131
* = No Data Available - Sampling Station was recycled by BUHS Contractors



Williamsville Station
FAS
FAP
WEST DUMMERSTON
DUMMERSTON CENTER
EAST DUMMERSTON
D U M M E R S T O N
POP. 1574
DUTTON PINES STATE PARK
Fall Br.
Salmon Br.
Conce Brook
Brook
DUMM. I.F.O.

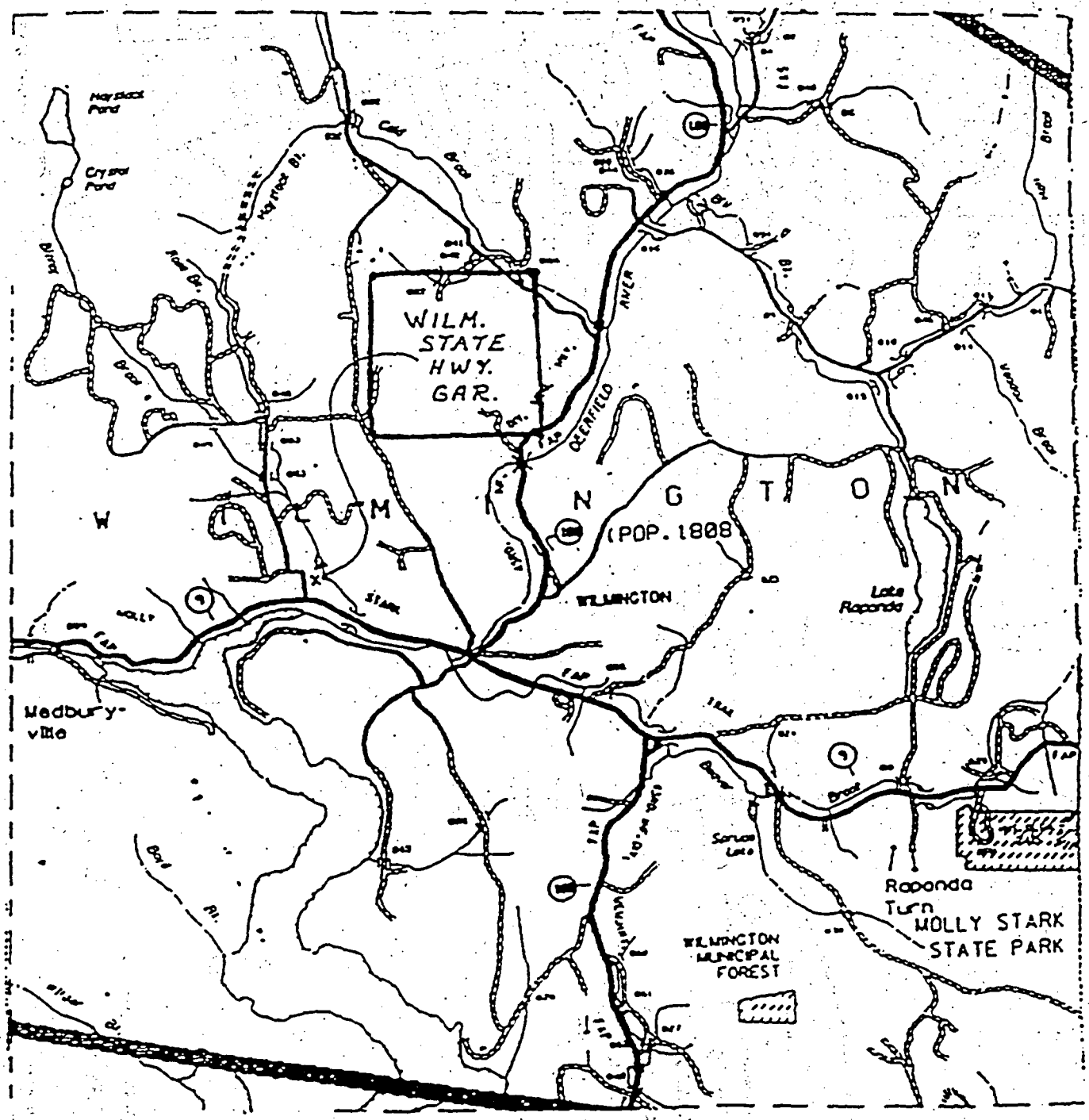
IODINE


IODINE
(PUFFER'S) (TRANS. TECH) RENAUD
CONNECTICUT
FORT DUMMER STATE PARK
846
CENTRAL
142
FAS
SA
VERNON ELEM.
VERNON
VERMONT
RIVER CROSS
RIVER
7.8 FCA
91
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
142
1100
VERNON
CHARLES HILL 837
FOX HILL 524
1027
400
Roaring
901
Bk.
Lily Pond
Newton
SOUTH VERNON



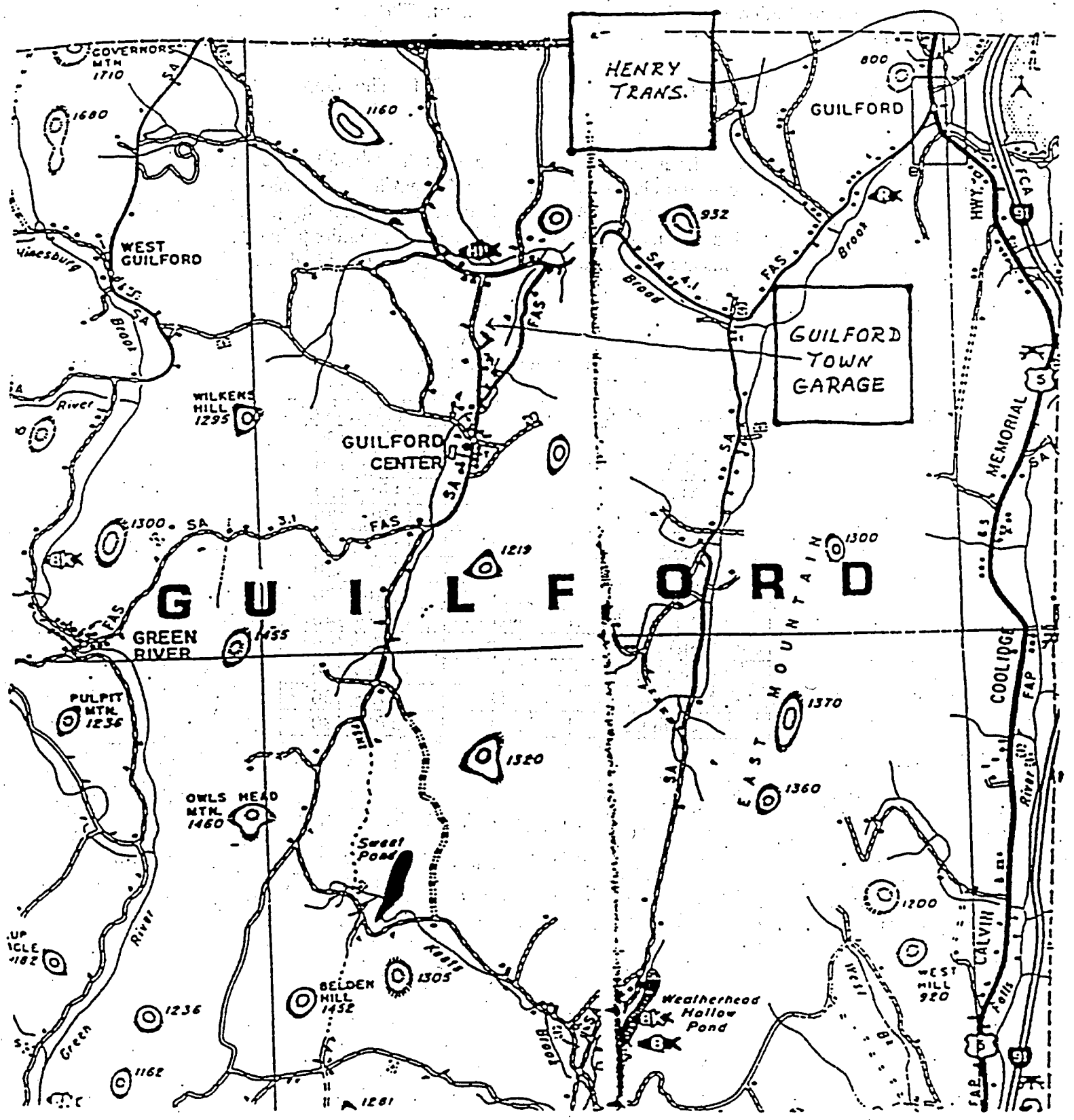
WINDHAM COUNTY COURT
HIRE
Connecticut
IODINE
TO W. BRATT. STATE POLICE
BRATTLEBORO
BRATT. UNION H.S.
EXIT 2
EXIT 1
Brattleboro Retreat
The Common
Brattleboro Museum and Arts Center
Whetstone Park
Creamery Covered Bridge
Living Memorial Park
Downhill Ski Center
Austine School for the Deaf
Brattleboro Memorial Hospital
Fairview Village
Fort Dummer Monument
Whetstone Village Dr
Whetstone Brook
Upper Forest St.
Chestnut Hill
Western Ave.
Main Street
Canal
Fairground
Orchard
Maple Street
Chestnut Street
Williams St.
Lamson St
Vine St
Southern Ave
Belmont Ave.
Lexington Ave
Clark Avenue
Oak
Fairview
Winter St
Winter Ct
Lucust St
Cherry St
Pleasant St.
Estey Circle
Estey St.
Dickinson St.
Baker St.
Frost
Elliot
Spring St.
Beech St.
Stewart Pl.
Grove St.
Whipple
Green
Moore Ct
Chapin
Willston
Howard
Chase St.
Park Pl.
Terrace St.
Walnut St
Harris Pl
Park St.
Myrtle St.
Laurel St.
Spruce St.
Cedar
Highlawn Road
Strand Ave.
Crosby
Brannon
Lawrence St
Clark St
Washington
Highland St
Prospect
Thomas St
Vernon Rd
Riverside Drive
Old Guilford Road
Fessenden Rd
To Guilford, Vt., Greenfield, Mass
To Springfield, Mass
To Vernon, Vt., Northfield, Mass
N
0 1/4 MILE
0 1/2 KILOMETER

IODINE



WILM.
STATE
HWY.
GAR.
W I L M I N G T O N
(POP. 1808)
WILMINGTON
Lake Raponda
Medbury-
ville
Raponda
Turn
MOLLY STARK
STATE PARK
WILMINGTON
MUNICIPAL
FOREST
DEERFIELD
RIVER
Crystal Pond

IODINE



HENRY TRANS.
GUILFORD TOWN GARAGE
GUILFORD
GUILFORD CENTER
WEST GUILFORD
GREEN RIVER
GUILFORD
EAST MOUNTAIN
COVERNORS MTN 1710
1680
1160
800
932
WILKENS HILL 1295
1300
1219
1300
1455
PULPIT MTN. 1236
1320
1370
1360
OWLS HEAD MTN. 1460
Sweet Pond
1200
WEST HILL 920
BELDEN HILL 1452
1305
1236
1162
1281
Weatherhead Hollow Pond
Hinesburg
Brook
River
Green
Keats
Brook
Brook
Falls
HWY.
FCA
MEMORIAL
COOLIDGE
CALVIN
FAP
SA
FAS

MILK 2004

All Milk Samples for the Year 2004 are within the expected historical range.

The historical range for Iodine-131 is less than the detection limit. The samples for 2004 are all less than the detection limit.

The historical range for Potassium-40* is from 1,200 to 2,000 pCi/L. The samples for 2004 range from 1,330 to 1,570 pCi/L.

Milk sampling is performed at a frequency of once per month. The samples are measured, placed into reentrant beakers and analyzed in the Gamma Spectrometer System using a reverse germanium detector. Usual spectra include terrestrial Potassium-40. The nominal detection limit for Iodine-131 is 10 picoCuries/liter. Significant indications of the presence of any other radionuclides are investigated and reported if found. Reporting units are picoCuries per liter with 2 sigma (standard deviation) value.

Blodgett Farm
(picoCuries/liter)

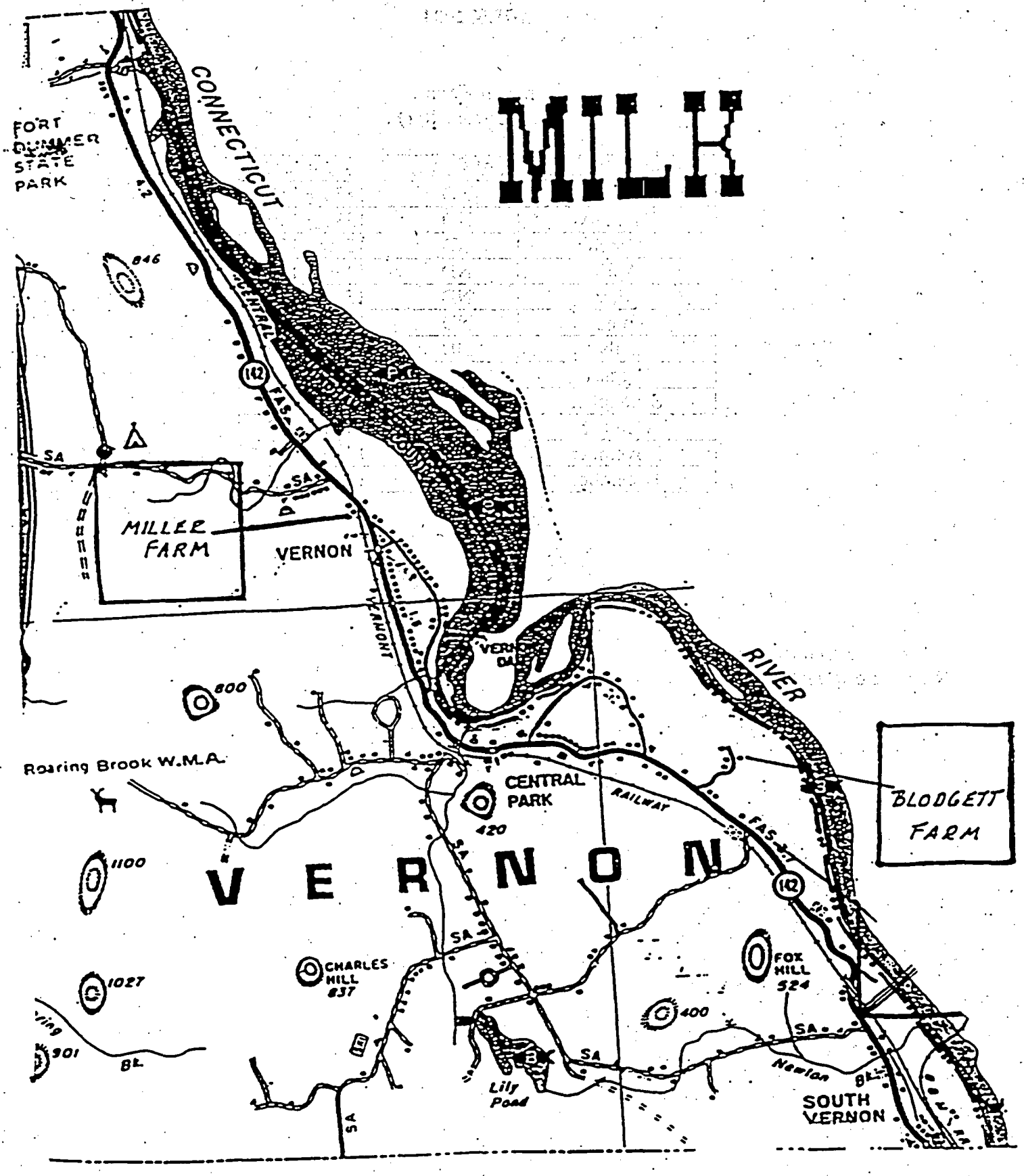
Sample Period	Iodine-131	Potassium-40*
January	ND	1480 ± 130
February	ND	1500 ± 120
March	ND	1470 ± 130
April	ND	1450 ± 130
May	ND	1550 ± 120
June	ND	1540 ± 130
July	ND	1330 ± 130
August	ND	1570 ± 140
September	ND	1480 ± 130
October	ND	1510 ± 130
November	ND	1440 ± 130
December	ND	1570 ± 130

MILK 2004

Miller Farm
(picoCuries/liter)

Sample Period	Iodine-131	Potassium-40*
January	ND	1470 ± 110
February	ND	1530 ± 130
March	ND	1520 ± 120
April	ND	1490 ± 120
May	ND	1540 ± 130
June	ND	1560 ± 130
July	ND	1500 ± 120
August	ND	1550 ± 120
September	ND	1510 ± 120
October	ND	1430 ± 120
November	ND	1470 ± 120
December	ND	1400 ± 110

* = Terrestrial Radioactivity
ND = Below Detection Limit


MILK
CONNECTICUT
RIVER
FORT DUMMER STATE PARK
846
CENTRAL
142
FAS
SA
MILLER FARM
VERNON
VERMONT
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
BLODGETT FARM
1100
VERNON
CHARLES HILL 837
1027
901
FOX HILL 524
400
Lily Pond
Newton
SOUTH VERNON

SEDIMENT 2004

All Sediment Samples for the Year 2004 are within the expected historical range.

The historical range for Cesium-137* is from less than the detection limit to 500 pCi/kg. The samples for 2004 range from less than the detection limit to 109 pCi/kg.

The historical range for Potassium-40** is from 6,000 to 22,000 pCi/kg. The samples for 2004 range from 10,600 to 14,800 pCi/kg.

The historical range for Beryllium-7*** is from less than the detection limit to 5,000 pCi/kg. The samples for 2004 range from less than the detection limit to 1040 pCi/kg.

Sediment samples are taken biannually in the spring and fall. A sediment sample is taken ranging from approximately 0.75 to 1.25 kilograms from the Connecticut River at three separate locations in the spring and fall of each year. The sample is dried, weighed on a top loaded balance and placed in a 500 milliliter HDPE bottle. The sample is counted on the Gamma Spectrometer System using a reverse germanium detector. A normal spectrum will include primordial radionuclides with daughters, and archival Cesium-137 from former open atmospheric nuclear testing. On occasion short-lived cosmogenic Beryllium-7 can be discerned. Reporting units are picoCuries per kilogram with 2 sigma (standard deviation) value.

SPRING
(pCi/kilogram)

Site	Cesum-137	Potassium-40	Beryllium-7
3-3	85.5 ± 19.4	10600 ± 1300	ND
3-4	60.3 ± 15.6	10600 ± 1300	ND
3-8	ND	13800 ± 1600	ND

FALL
pCi/kilogram

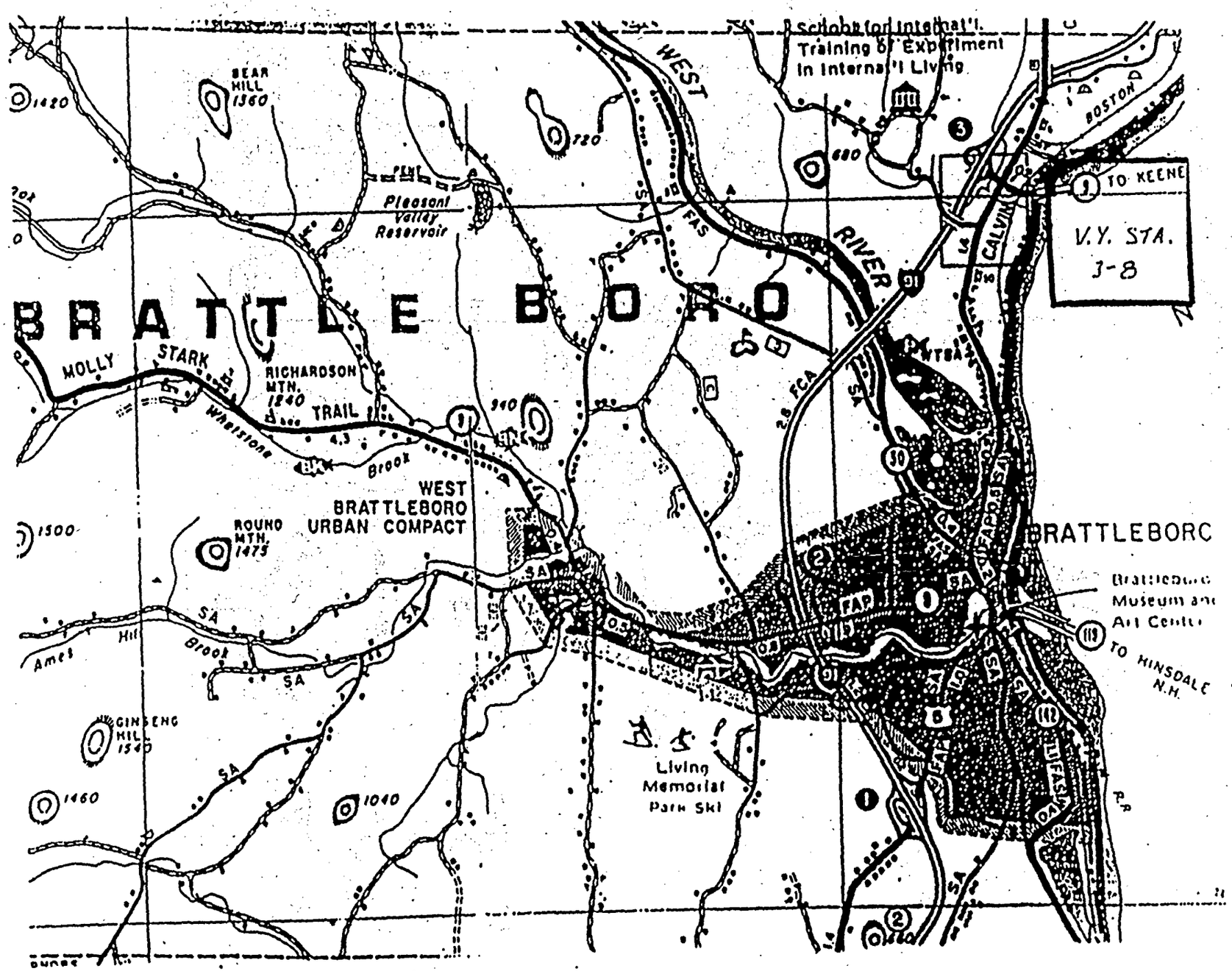
Site	Cesum-137	Potassium-40	Beryllium-7
3-3	52.1 ± 29.5	12400 ± 1500	1040 ± 440
3-4	109 ± 47	14800 ± 1800	ND
3-8	37.3 ± 18.9	11300 ± 1400	ND

SEDIMENT 2004

Samples were also evaluated for the radionuclides listed below. None were present in excess of the lower limits of detectability which are shown in pCi/kg.

Radionuclide	LLD	Radionuclide	LLD
Cr-51	69	Sb-126	18
Mn-54	15	I-131	27
Co-56	15	Cs-134	58
Co-60	21	Cs-136	18
Zn-65	18	Cs-137	5
Sr-85	86	Ce-139	93
Ru/Rh-103	32	Ce-141	98
Sb-124	18	Ce-144	98

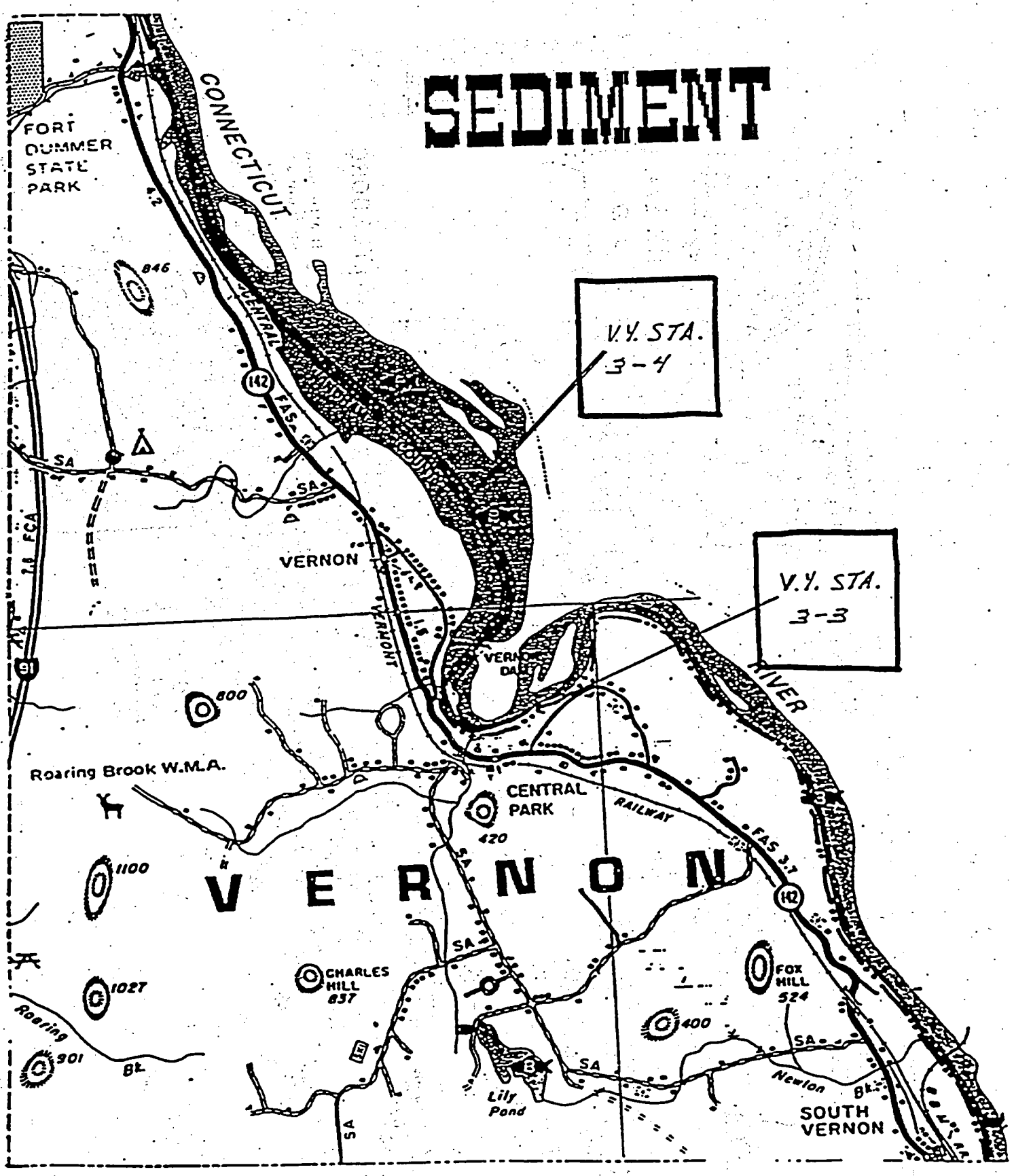
* = Archival atmospheric testing
** = Terrestrial radioactivity
*** = Cosmogenic
ND = None Detected
LLD = Lower Limit of Detection



BRATTLE BORO
BEAR HILL 1360
1420
720
680
Pleasant Valley Reservoir
WEST
RIVER
Training of Experiment
In Internat'l Living
BOSTON
TO KEENE
V.Y. STA. 3-8
CALVIN
MOLLY STARK TRAIL
RICHARDSON MTN. 1240
Whetstone Brook
940
WEST BRATTLEBORO URBAN COMPACT
ROUND MTN. 1475
1500
BRATTLEBORO
Museum and Art Center
TO HINSDALE N.H.
Ames Hill Brook
GINSENG HILL 1540
1460
1040
Living Memorial Park Ski

SEDIMENT

SEDIMENT



FORT DUMMER STATE PARK
CONNECTICUT
V.Y. STA. 3-4
V.Y. STA. 3-3
846
CENTRAL
142
FAS
SA
VERNON
VERMONT
VERNON DAM
RIVER
91
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
1100
VERNON
142
CHARLES HILL 837
FOX HILL 524
1027
Roaring
901
Bk.
400
Lily Pond
Newton
Bk.
SOUTH VERNON

SOIL 2004

All Soil Samples for the Year 2004 are within the expected historical range.

The historical range for Cesium-137* is from less than the detection limit to 500 pCi/kg. The samples for 2004 range from 86 to 137 pCi/kg.

The historical range for Potassium-40** is from 7,000 to 20,000 pCi/kg. The samples for 2004 range from 11,800 to 14,300 pCi/kg.

The historical range for Beryllium-7*** is from less than the detection limit to 600 pCi/kg. The samples for 2004 are less than the detection limit.

Occasional sampling, most often once a year, is done on other soils as available or needed. Samples are collected (usually in the Northwest quadrant) within a mile or two from the facility. Sample sizes range from 250 to 1,000 grams. The samples are weighed, dried and placed in 500 ml wide mouth HDPE bottles and analyzed on the Gamma Spectrometer System using a reverse germanium detector. Usual spectra include primordial radionuclides, archival Cesuim-137 and occasional cosmogenic Beryllium-7. Reporting units are picoCuries per kilogram with 2 sigma (standard deviation) value.

Northwest Corner Vermont Yankee Fence
(picoCuries/kilogram)

Season	Cesium-137*	Potassium-40	Beryllium-7**
Fall (October)	86.1 ± 25.4	11800 ± 1400	ND

Miller Farm Outside of Milking Parlor
(picoCuries/kilogram)

Season	Cesium-137*	Potassium-40	Beryllium-7**
Summer (June)	137 ± 25	14300 ± 1700	ND

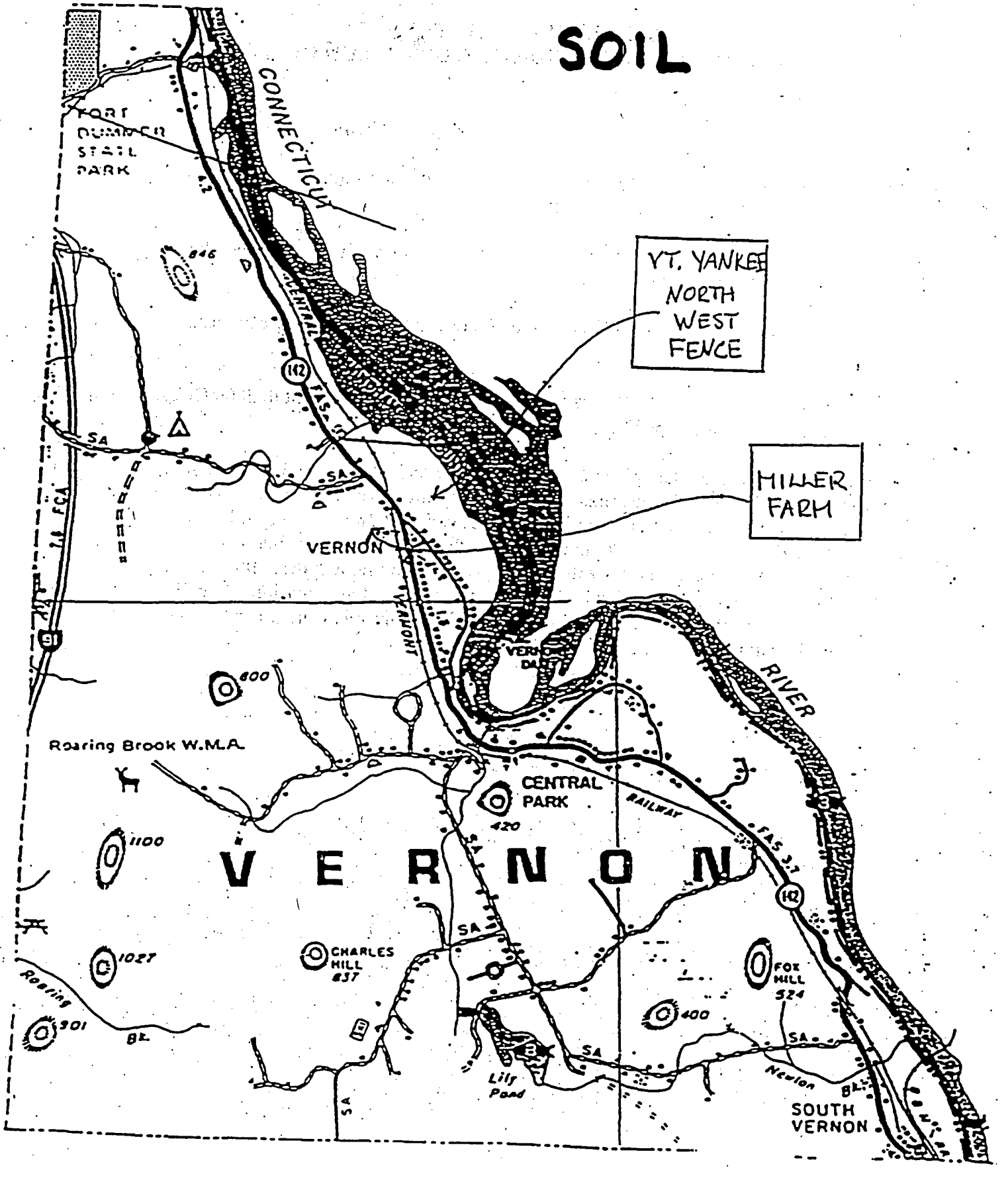
SOIL 2004

Samples were also evaluated for the radionuclides listed below. None were present in excess of the lower limits of detectability which are shown in pCi/kg.

Radionuclide	LLD	Radionuclide	LLD
Cr-51	69	Sb-126	18
Mn-54	15	I-131	27
Co-56	15	Cs-134	58
Co-60	21	Cs-136	18
Zn-65	18	Cs-137	5
Sr-85	86	Ce-139	93
Ru/Rh-103	32	Ce-141	98
Sb-124	18	Ce-144	98

* = Archival atmospheric testing
** = Terrestrial radioactivity
*** = Cosmogenic
ND = Below Detection Limits
LLD = Lower Limit of Detection

SOIL



CONNECTICUT
FORT DUMMER STATE PARK
VT. YANKEE NORTH WEST FENCE
MILLER FARM
VERNON
VERMONT
RIVER
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
VERNON
CHARLES HILL
837
FOX HILL
524
Lily Pond
Newton Bk.
SOUTH VERNON
Roaring Bk.
1100
1027
901
800
846
400
142
91

SPECIAL STUDY – SEDIMENT 2004
VERMONT YANKEE - NORTH STORM DRAIN OUTFALL

All Special Sediments for the Year 2004 are within the expected historical range.

The historical range for Beryllium-7** is from less than the detection limit to 3,000 pCi/kg. The samples for 2004 range from less than the detection limit to 1,770 pCi/kg.

The historical range for Cobalt-60*** is from less than the detection limit to 2,500 pCi/kg. The samples for 2004 range from less than the detection limit to 254 pCi/kg.

The historical range for Potassium-40**** is from 6,000 to 26,000 pCi/kg. The samples for 2004 range from 10,900 to 20,400 pCi/kg.

The historical range for Cesium-137***** is from less than the detection limit to 500 pCi/kg. The samples for 2004 ranged from 38.6 to 182 pCi/kg.

Special sediment samples are taken biannually in the spring and fall. A sediment sample is taken ranging from approximately 0.75 to 1.25 kilograms from the Connecticut River at up to 40 separate locations in a grid around the discharge structure. The sample is dried, weighed on a top loaded balance and placed in a 500 milliliter HDPE bottle. The sample is counted on the Gamma Spectrometer System using a reverse germanium detector. A normal spectrum will include primordial radionuclides with daughters, and archival Cesium-137 from former open atmospheric nuclear testing. On occasion short-lived cosmogenic Beryllium-7 and Cobalt-60 can be discerned. Reporting units are picoCuries per kilogram with 2 sigma (standard deviation) value.

SPRING 2004
(picoCurie/kilogram)

Grid Location	Beryllium-7	Cobalt-60	Potassium-40	Cesium-137
S-1	ND	125 ± 34	16700 ± 2100	172 ± 44
S-2	ND	89.8 ± 22.2	16500 ± 1900	120 ± 28
S-3	*	*	*	*
S-4	*	*	*	*
S-5	*	*	*	*
T-1	ND	ND	10900 ± 1300	38.6 ± 14.3
T-2	ND	ND	13800 ± 1600	102 ± 27
T-3	ND	ND	17200 ± 2000	176 ± 42
T-4	*	*	*	*
T-5	*	*	*	*
U-1	ND	ND	11700 ± 1400	80.3 ± 26.4
U-2	ND	ND	15700 ± 1900	139 ± 36
U-3	ND	ND	15400 ± 1800	116 ± 27
U-4	ND	ND	16900 ± 2000	80.4 ± 28.9
U-5	*	*	*	*
V-1	*	*	*	*
V-2	*	*	*	*
V-3	*	*	*	*
V-4	ND	ND	18300 ± 2100	106 ± 29
V-5	ND	ND	13900 ± 1700	109 ± 28
W-1	*	*	*	*
W-2	*	*	*	*
W-3	*	*	*	*
W-4	ND	ND	15100 ± 1800	117 ± 36
W-5	ND	ND	15000 ± 1800	121 ± 37
X-1	*	*	*	*
X-2	*	*	*	*
X-3	*	*	*	*
X-4	*	*	*	*
X-5	*	*	*	*
Y-1	*	*	*	*
Y-2	*	*	*	*
Y-3	*	*	*	*
Y-4	*	*	*	*
Y-5	*	*	*	*
Z-1	*	*	*	*
Z-2	*	*	*	*
Z-3	*	*	*	*
Z-4	*	*	*	*
Z-5	*	*	*	*

SPECIAL STUDY – SEDIMENT 2004
VERMONT YANKEE - NORTH STORM DRAIN OUTFALL

FALL 2004
(picoCurie/kilogram)

Grid Location	Beryllium-7	Cobalt-60	Potassium-40	Cesium-137
S-1	ND	ND	19200 ± 2300	141 ± 36
S-2	ND	ND	18800 ± 2200	155 ± 41
S-3	*	*	*	*
S-4	*	*	*	*
S-5	*	*	*	*
T-1	1770 ± 390	ND	12900 ± 1500	134 ± 28
T-2	ND	ND	17700 ± 2100	168 ± 34
T-3	ND	ND	17700 ± 2100	164 ± 34
T-4	*	*	*	*
T-5	*	*	*	*
U-1	295 ± 247	ND	15500 ± 1900	114 ± 30
U-2	ND	254 ± 29	17000 ± 2000	110 ± 31
U-3	ND	ND	20400 ± 2400	158 ± 40
U-4	ND	ND	17700 ± 2100	182 ± 43
U-5	*	*	*	*
V-1	*	*	*	*
V-2	*	*	*	*
V-3	*	*	*	*
V-4	ND	ND	16700 ± 2000	118 ± 42
V-5	ND	ND	17000 ± 2000	103 ± 28
W-1	*	*	*	*
W-2	*	*	*	*
W-3	*	*	*	*
W-4	ND	ND	16700 ± 2000	125 ± 35
W-5	ND	ND	15300 ± 1800	107 ± 25
X-1	*	*	*	*
X-2	*	*	*	*
X-3	*	*	*	*
X-4	*	*	*	*
X-5	*	*	*	*
Y-1	*	*	*	*
Y-2	*	*	*	*
Y-3	*	*	*	*
Y-4	*	*	*	*
Y-5	*	*	*	*
Z-1	*	*	*	*
Z-2	*	*	*	*
Z-3	*	*	*	*
Z-4	*	*	*	*
Z-5	*	*	*	*

SPECIAL STUDY – SEDIMENT 2004

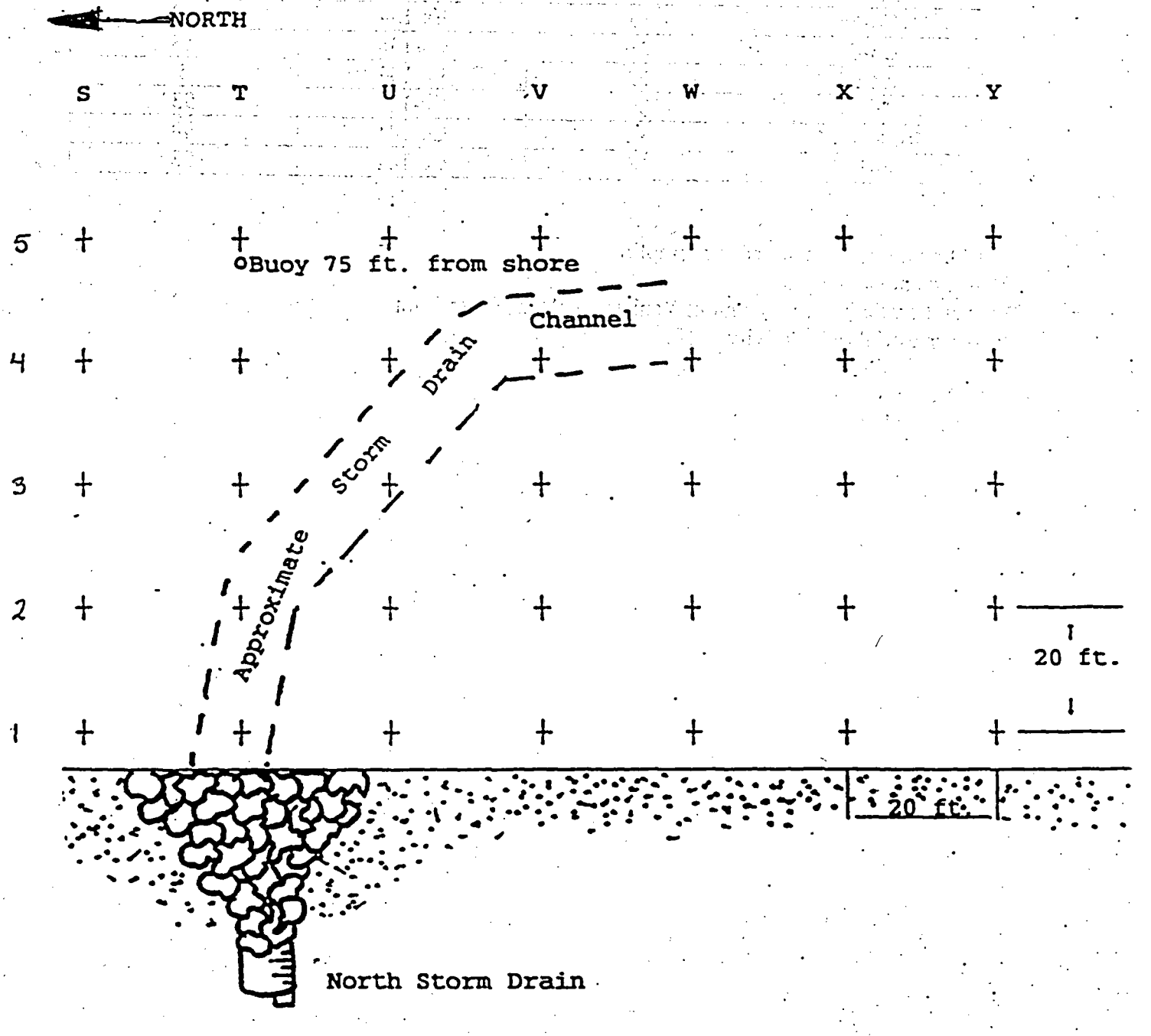
Samples were also evaluated for the radionuclides listed below. None were present in excess of the lower limits of detectability which are shown in pCi/kg.

Radionuclide	LLD	Radionuclide	LLD
Cr-51	69	Sb-126	18
Mn-54	15	I-131	27
Co-56	15	Cs-134	58
Co-60	21	Cs-136	18
Zn-65	18	Cs-137	5
Sr-85	86	Ce-139	93
Ru/Rh-103	32	Ce-141	98
Sb-124	18	Ce-144	98

* = Location not included for sampling
** = Cosmogenic
*** = Hot particles from Vermont Yankee Nuclear Power Plant
**** = Terrestrial radioactivity
***** = Archival atmospheric testing
ND = None Detected
LLD = Lower Limit of Detection

APPENDIX A

RADIOLOGICAL SAMPLING PROGRAM OF BOTTOM SEDIMENT
NORTH STORM DRAIN



THERMOLUMINESCENT DOSIMETRY (TLD) DATA 2004

All TLDs for the Year 2004 are within the expected historical range.

The annual exposure at the boundary of Vermont Yankee is less than 20 ± 5 mrem for 2004.

The historical range for TLDs ranges from 0 to 12.5 mR/quarter. The samples for 2004 range from 0 to 12.0 mR/quarter.

Thermoluminescent detectors are provided to the State of Vermont by Proxtronics, Inc. and are deployed for a quarterly sampling interval. This method samples direct gamma radiation in the environment. Detectors utilize crystals, which store energy from gamma and x-rays until analyzed for their cumulative energy exposure experience. Vermont has forty selected locations where direct radiation levels are measured for. Some of these sites are located where other types of samples are taken (e.g. air, milk, water, etc.). Levels of direct radiation from the natural environment are routinely detected at each site. Reporting units are milliRoentgens/quarter with 2 sigma (standard deviation) value. The exposure above background, as listed below, is the exposure for each location minus the average of the exposures at the Putney Town Clerk's Office in Putney and the Vermont State Highway Garage in Wilmington.

The reporting format for TLD exposures will change in 2005 such that the data produced by the Vermont Department of Health, and that of Vermont Yankee, can be more easily compared. Additionally, we anticipate some potential change in the readings themselves due to our adoption of a new type of TLD, an increase in the number of chips utilized at each station, an increase in the number of TLD stations which will involve additional locations, the use of a new laboratory for analysis and changes in background TLD stations. Lastly, the 2005 report will incorporate the use of a fixed background exposure rate. These changes should provide us with more accurate data, greater quality control and more readily comparable data.

EXPOSURE RATES
(milliRoentgens/quarter)

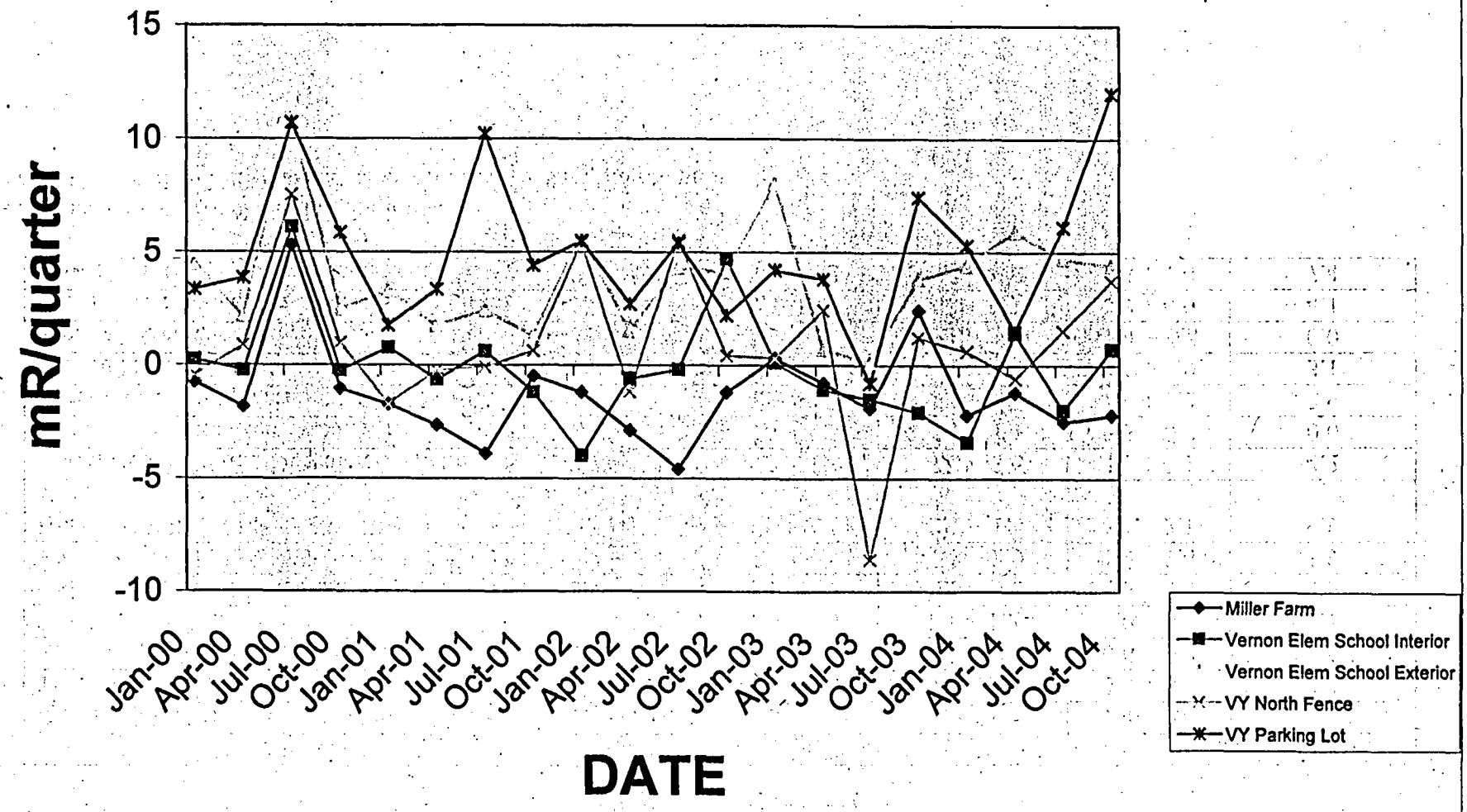
Location	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	YEAR
Miller Farm, Vernon	-2.2 ± 3.6	-1.2 ± 1.8	-2.5 ± 2.6	-2.2 ± 1.3	0.0
Elementary School Exterior, Vernon *	-3.4 ± 0.7	1.4 ± 2.3	-2.0 ± 7.0	0.7 ± 0.2	2.1
Elementary School Interior, Vernon	4.4 ± 0.3	5.9 ± 4.9	4.7 ± 3.6	4.4 ± 1.3	19.4
VY North Fence, Vernon	0.6 ± 1.7	-0.6 ± 2.0	1.5 ± 1.2	3.7 ± 2.4	5.8
VY Parking Lot Fence, Vernon	5.3 ± 0.5	1.5 ± 0.7	6.1 ± 0.9	12.0 ± 3.0	24.9
Dummerston State Highway Garage (IFO)*	-1.5 ± 3.4	-7.2 ± 0.0	-5.5 ± 1.2	3.1 ± 1.3	3.1
VY Southwest Fence, Vernon	1.4 ± 0.5	-3.4 ± 1.1	-7.5 ± 2.0	0.4 ± 1.2	1.8
Renaud Bros. (Puffers), Vernon*	0.2 ± 2.2	-4.1 ± 4.1	-3.4 ± 0.3	3.5 ± 0.6	3.7
Tyler Hill & Franklin Road, Vernon	-1.8 ± 3.6	-0.4 ± 2.1	1.3 ± 2.4	2.4 ± 0.8	3.7
Power Line River Crossing, Vernon *	2.4 ± 2.6	-2.2 ± 1.8	-3.0 ± 1.0	3.9 ± 2.4	6.3
Blodgett Farm, Vernon	-2.5 ± 1.7	-2.7 ± 0.2	-4.8 ± 1.4	0.6 ± 1.4	0.6
Brattleboro U.H.S., Brattleboro*	-1.7 ± 2.4	**	**	**	**
Henry Transportation/D&E Tree, Guilford *	-0.9 ± 1.3	-5.1 ± 1.5	-3.4 ± 1.1	1.5 ± 1.8	1.5
Guilford Town Highway Garage, Guilford *	-2.1 ± 3.6	-0.7 ± 1.3	-4.1 + 1.7	3.1 ± 0.9	3.1
Evans Farm, Guilford	1.9 ± 0.1	-3.1 ± 0.1	-3.6 ± 2.0	-0.4 ± 1.3	1.9
Putney Town Clerk, Putney	-1.2 ± 1.0	-1.5 ± 1.4	-2.1 ± 2.4	-1.4 ± 0.7	0.0
State Highway Garage, Wilmington *	1.2 ± 0.0	1.5 ± 0.0	2.1 ± 5.1	1.4 ± 0.4	6.2
West Brattleboro State Police*	-0.7 ± 0.4	-5.3 ± 0.4	-2.7 ± 2.8	2.3 ± 2.6	2.3
Windham County Courthouse, Brattleboro*	0.4 ± 0.2	-8.0 ± 3.3	-4.1 ± 0.0	-5.6 ± 0.5	0.4
Smead Lumber, Vernon	-3.7 ± 0.7	0.1 ± 3.4	2.7 ± 4.0	0.8 ± 1.7	3.6
Rte. 142 N & Pond Rd., Vernon	-2.5 ± 1.0	-5.3 ± 1.1	-4.8 ± 1.1	3.1 ± 2.2	3.1
Engle Dr., West Rd., Vernon	-1.9 ± 0.0	-4.2 ± 0.6	0.1 ± 3.0	-0.1 ± 3.4	0.1
Fairman Rd., Vernon	1.0 ± 1.8	-5.6 ± 0.3	-0.4 ± 2.5	2.0 ± 1.0	3.0
Pond Rd. & Houghton Hill Rd., Vernon	-0.1 ± 1.2	-0.5 ± 1.8	-4.8 ± 2.0	5.2 ± 1.0	5.2
Rte. 5, Wolosko, Guilford (10)	1.3 ± 0.5	1.6 ± 0.2	-0.8 ± 3.2	3.0 ± 1.0	5.9
Rte. 5, Andrews Cemetery, Guilford (40)	-0.5 ± 0.1	-0.8 ± 1.1	-0.2 ± 5.3	1.4 ± 1.9	1.4

EXPOSURE RATES 2004
(milliRoentgens/quarter)

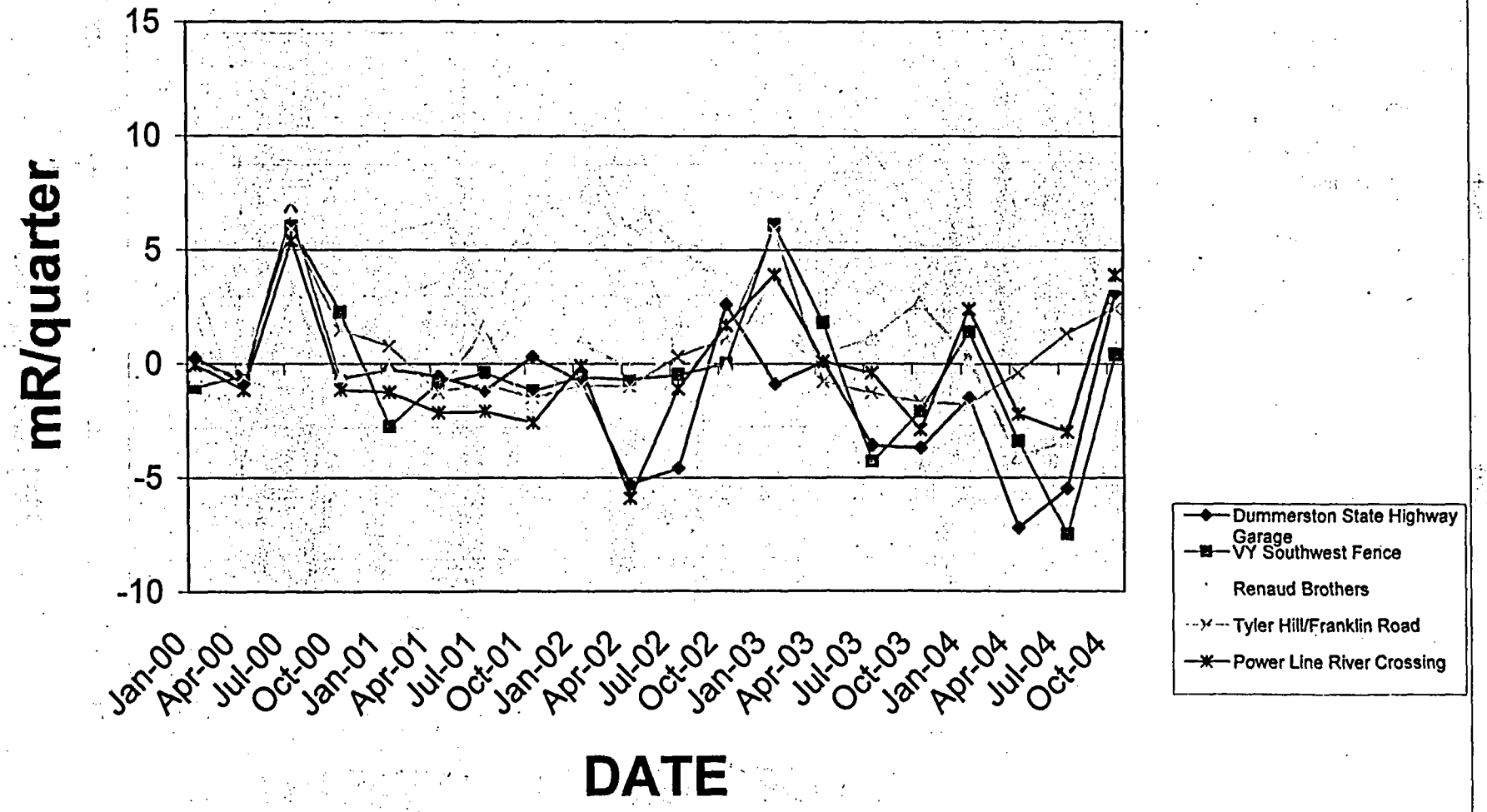
Location	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	YEAR
Rte. 5 & Tkaczyk Farm Rd., Guilford (11)	-1.0 ± 2.0	-1.6 ± 0.8	-3.1 ± 0.5	1.4 ± 0.6	1.4
Tyler Hill Rd., Vernon	-1.7 ± 1.5	-0.1 ± 0.8	0.8 ± 3.8	3.5 ± 0.4	4.3
Rte. 142 N of Transmission Line, Vernon	-2.8 ± 1.7	-4.0 ± 2.3	-5.1 ± 0.8	0.6 ± 0.2	0.6
Rte. 5 & Guilford Ctr. Rd., Guilford (14)	-2.1 ± 0.7	-1.0 ± 3.6	1.1 ± 1.2	2.0 ± 0.4	3.1
Guilford Ctr Rd. & Tater Rd., Guilford	-3.7 ± 3.2	-6.1 ± 0.7	-0.5 ± 0.6	1.5 ± 0.4	1.5
Weatherhead Hollow & Stony Hill Rds, Gfd	-0.4 ± 0.4	-4.8 ± 0.5	-1.8 ± 2.0	1.9 ± 1.6	1.9
Huckle Hill Rd. N of VT/MA Border, Vernon	0.2 ± 1.7	3.6 ± 2.7	-2.1 ± 1.4	6.1 ± 2.1	9.9
Dummerston School, Dummerston, Rte. 5	-3.2 ± 0.7	-5.7 ± 1.3	-7.3 ± 3.6	4.2 ± 0.1	4.2
Pond Rd., Vernon Rec. Area, Vernon	-2.1 ± 1.0	-5.7 ± 0.3	-5.7 ± 1.1	0.6 ± 0.8	0.6
Vernon Fire Dept., Vernon, Rte. 142	0.7 ± 1.2	-4.1 ± 2.2	0.3 ± 3.9	1.9 ± 1.2	2.9
Rte. 142 S & Pond Rd., Vernon	-1.8 ± 0.8	-3.8 ± 1.0	-3.8 ± 1.2	3.1 ± 1.0	3.1
Rte. 142 & Newton Rd., Vernon	-3.9 ± 3.0	-5.3 ± 2.8	-3.9 ± 1.0	-2.1 ± 0.4	0.0
Rte. 142 & Depot St., VT/MA Line, Vernon	-1.0 ± 2.5	-2.5 ± 3.0	2.2 ± 3.3	1.9 ± 0.0	4.1
Gov. Hunt Rd. at Vernon Elem. School	-0.2 ± 1.3	-3.6 ± 1.2	-3.4 ± 0.0	7.4 ± 1.6	7.4

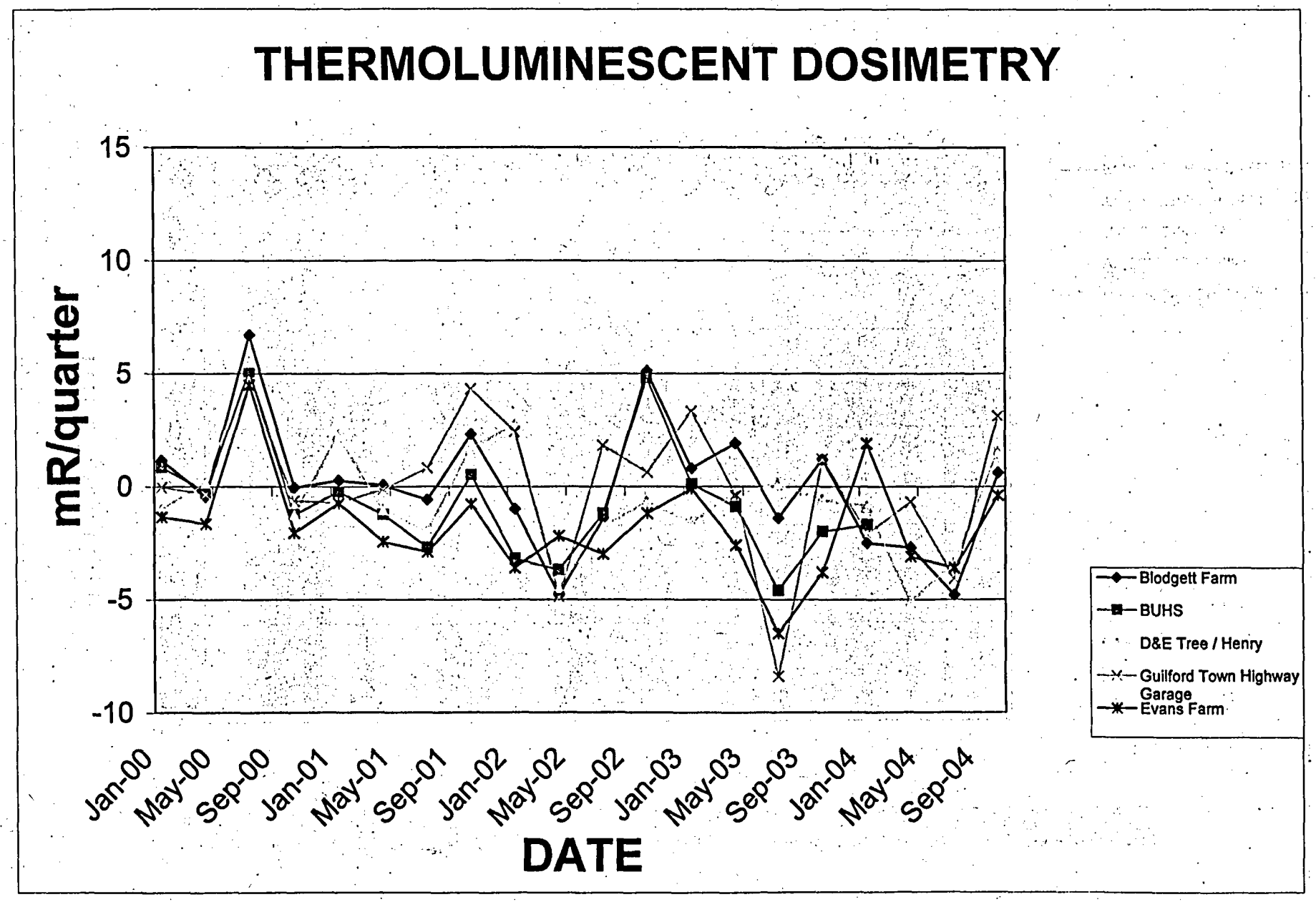
* = Collocated with Air Sampling Station
** = No Data. BUHS TLD was recycled with the Air Sampling Station.

THERMOLUMINESCENT DOSIMETRY

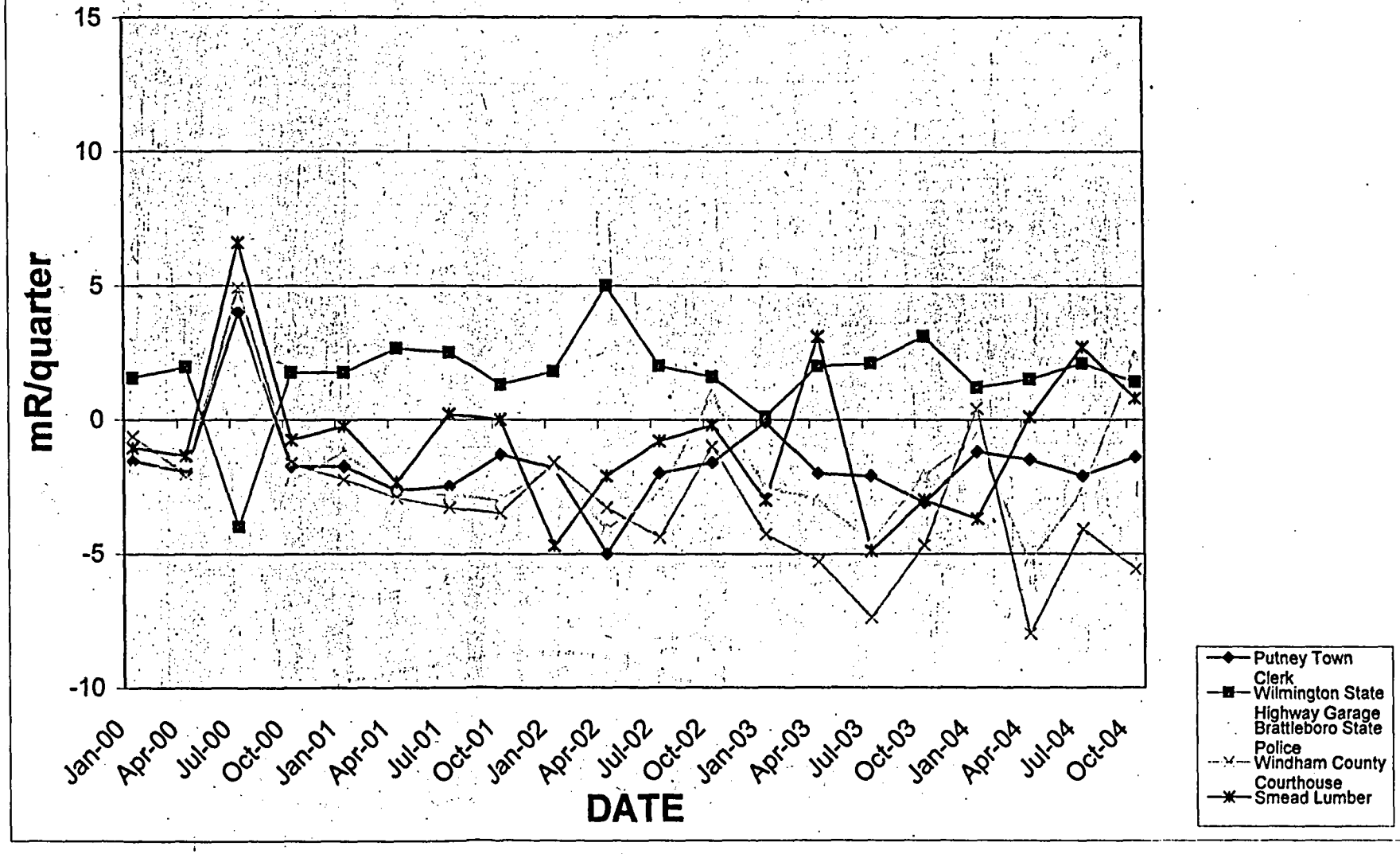


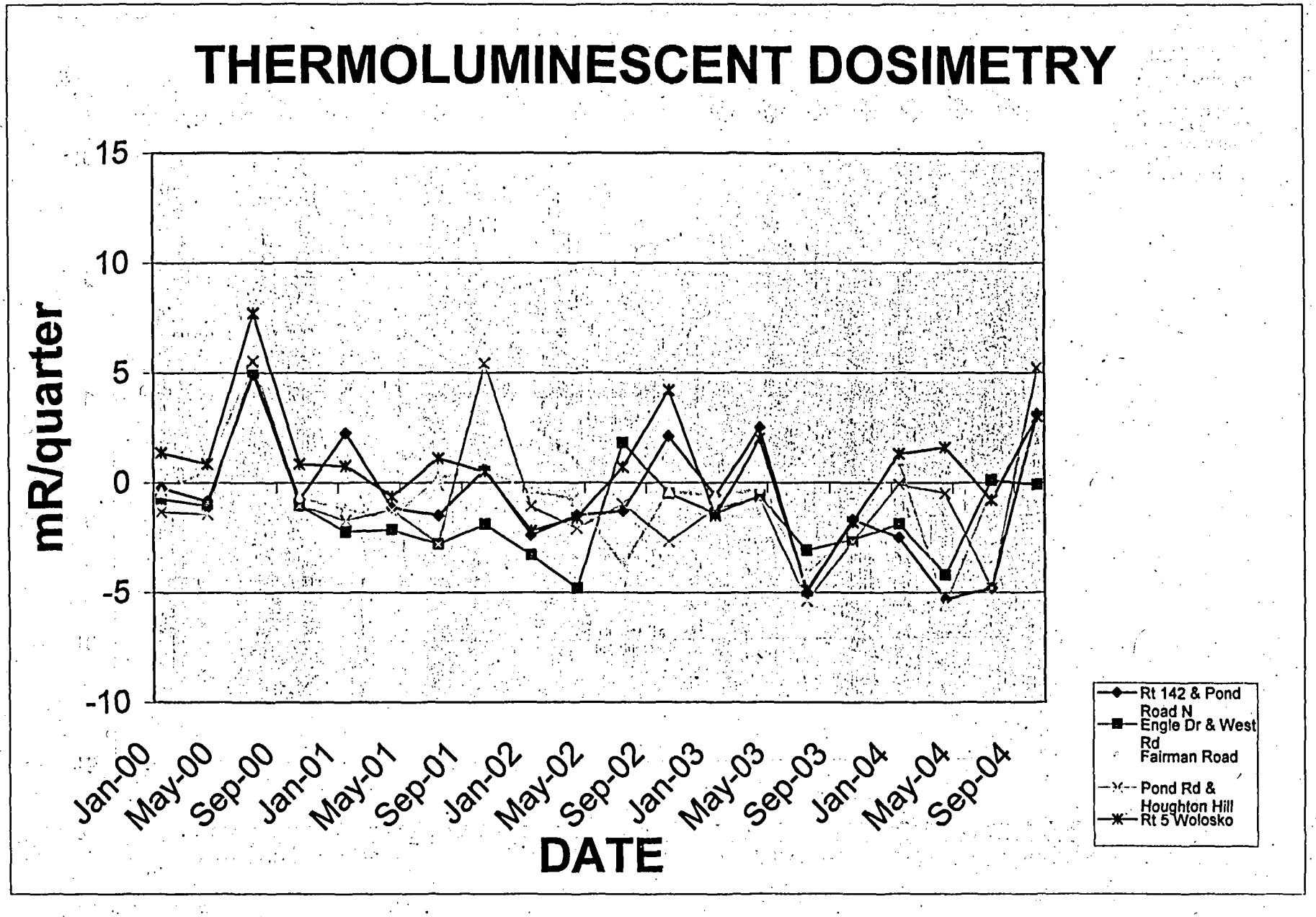
THERMOLUMINESCENT DOSIMETRY



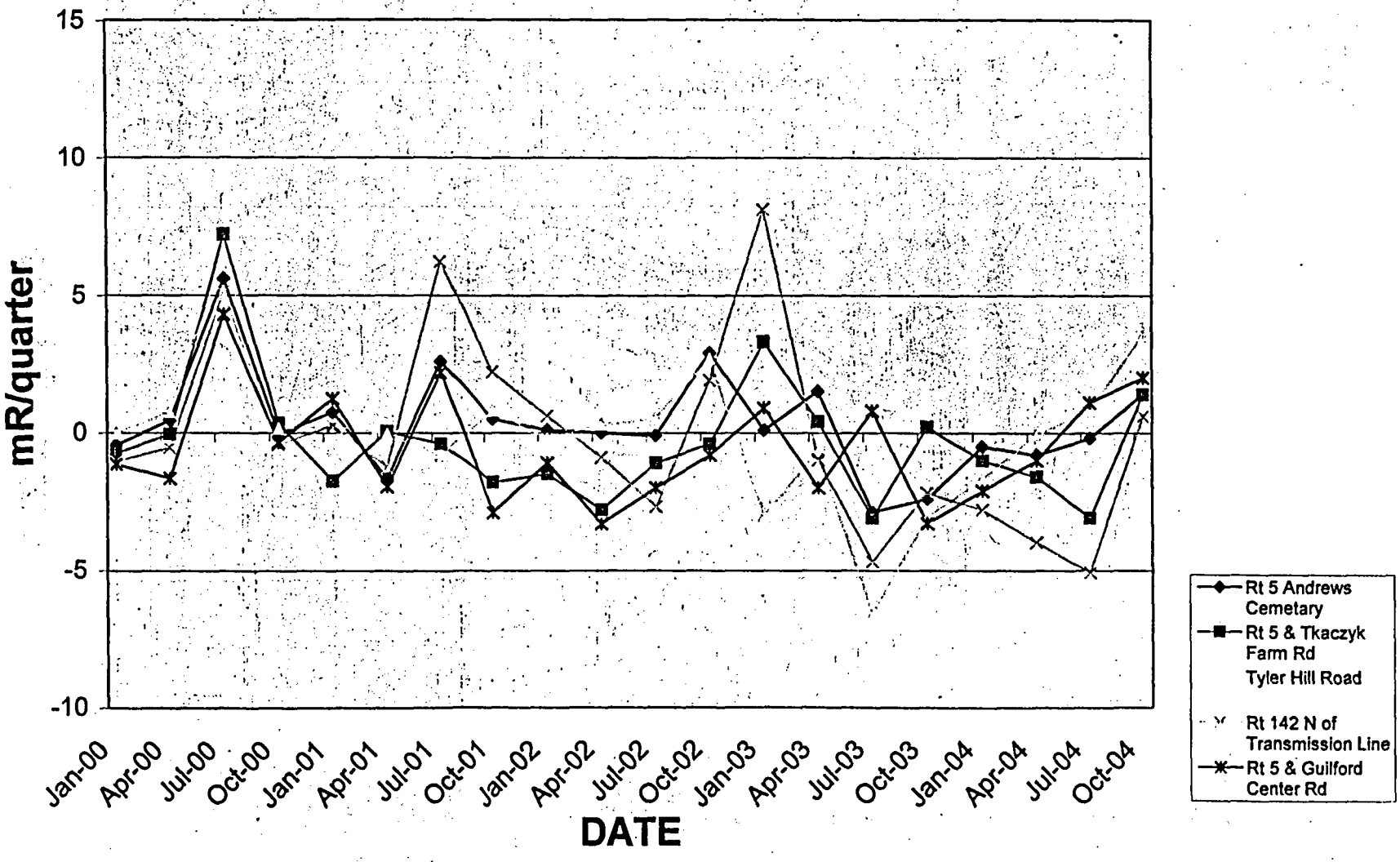

THERMOLUMINESCENT DOSIMETRY
mR/quarter
15
10
5
0
-5
-10
Jan-00
May-00
Sep-00
Jan-01
May-01
Sep-01
Jan-02
May-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
DATE
Blodgett Farm
BUHS
D&E Tree / Henry
Guilford Town Highway Garage
Evans Farm

THERMOLUMINESCENT DOSIMETRY

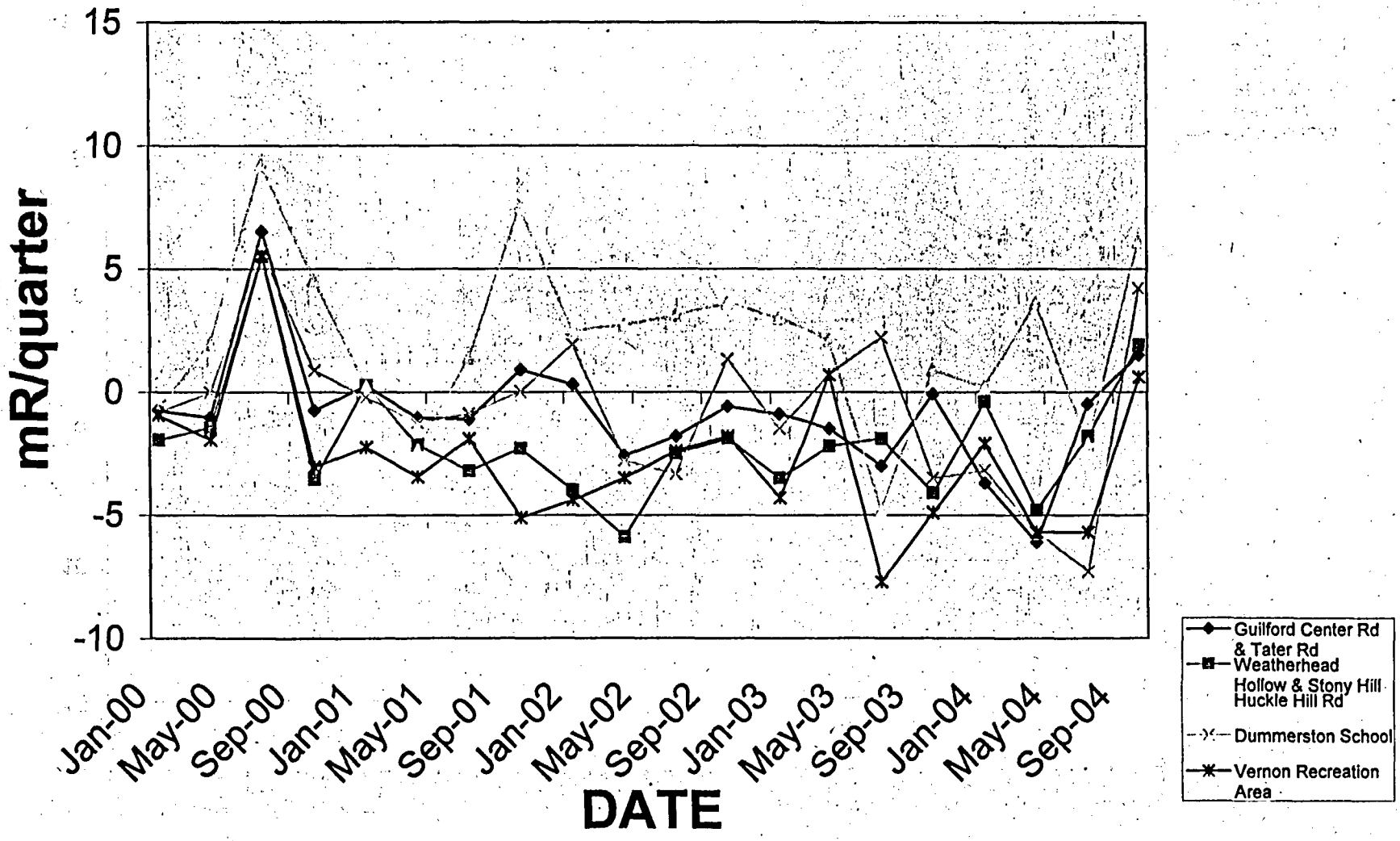



THERMOLUMINESCENT DOSIMETRY
mR/quarter
15
10
5
0
-5
-10
Jan-00
May-00
Sep-00
Jan-01
May-01
Sep-01
Jan-02
May-02
Sep-02
Jan-03
May-03
Sep-03
Jan-04
May-04
Sep-04
DATE
Rt 142 & Pond Road N
Engle Dr & West Rd
Fairman Road
Pond Rd & Houghton Hill
Rt 5 Wolosko

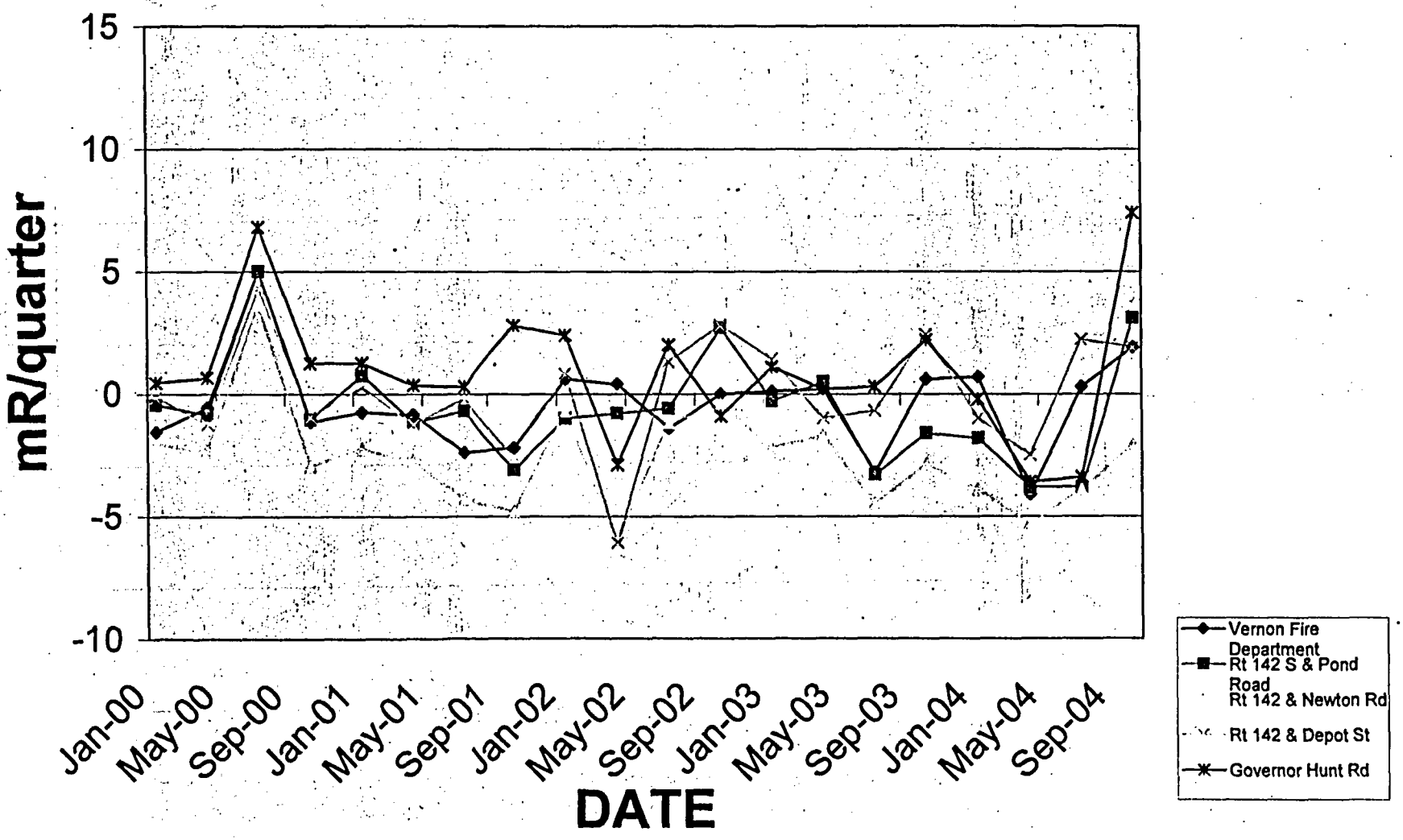
THERMOLUMINESCENT DOSIMETRY

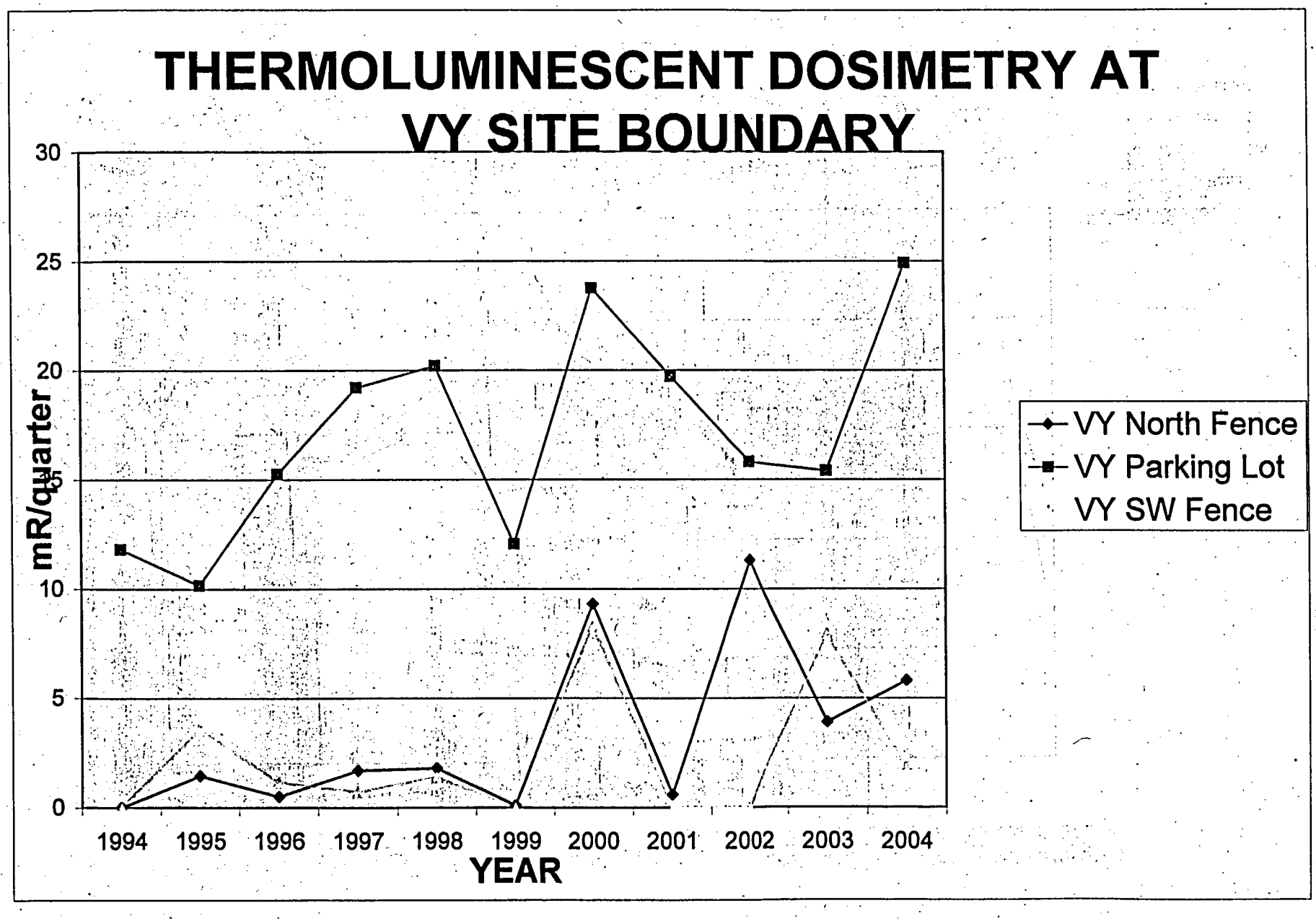


THERMOLUMINESCENT DOSIMETRY



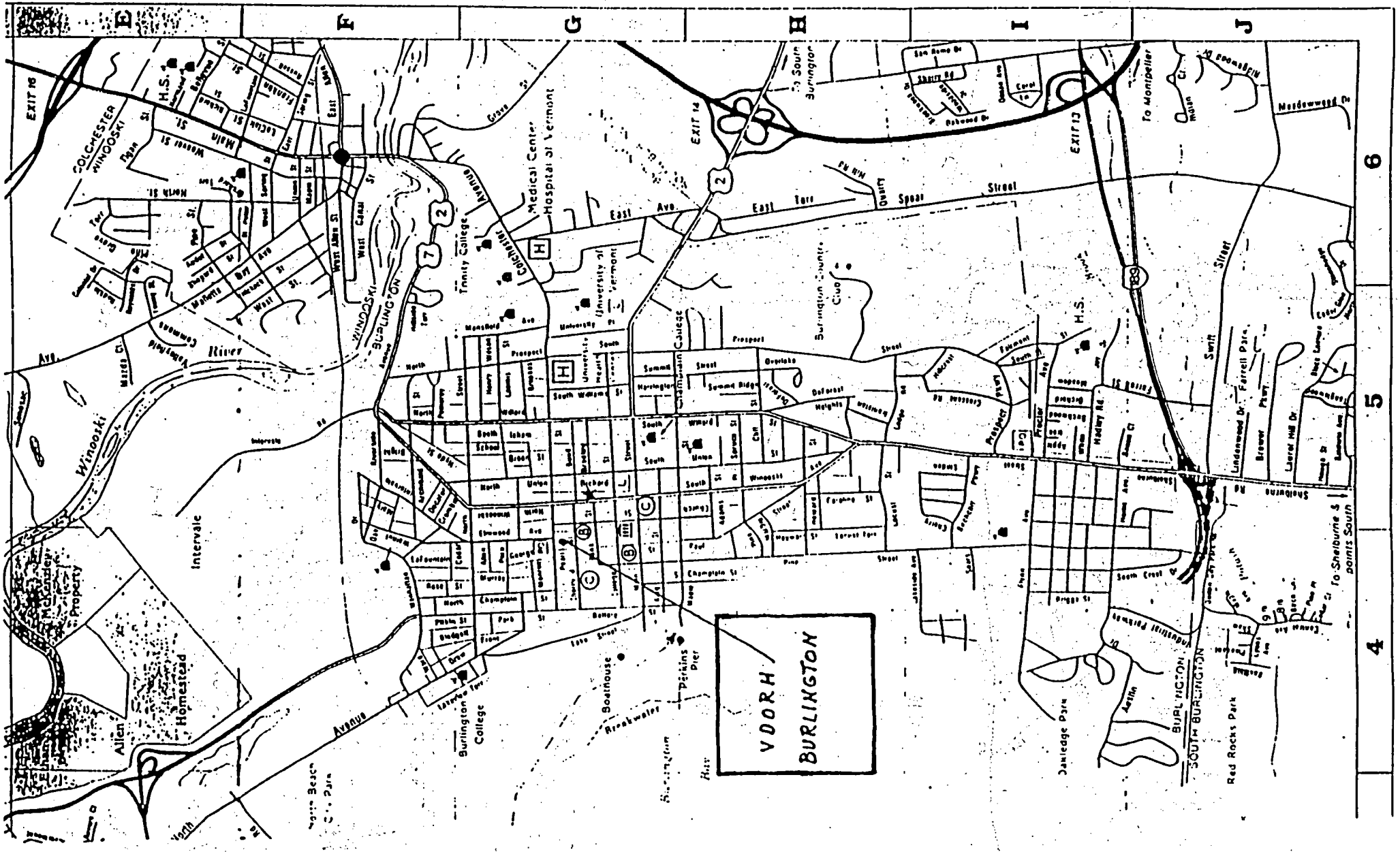
THERMOLUMINESCENT DOSIMETRY

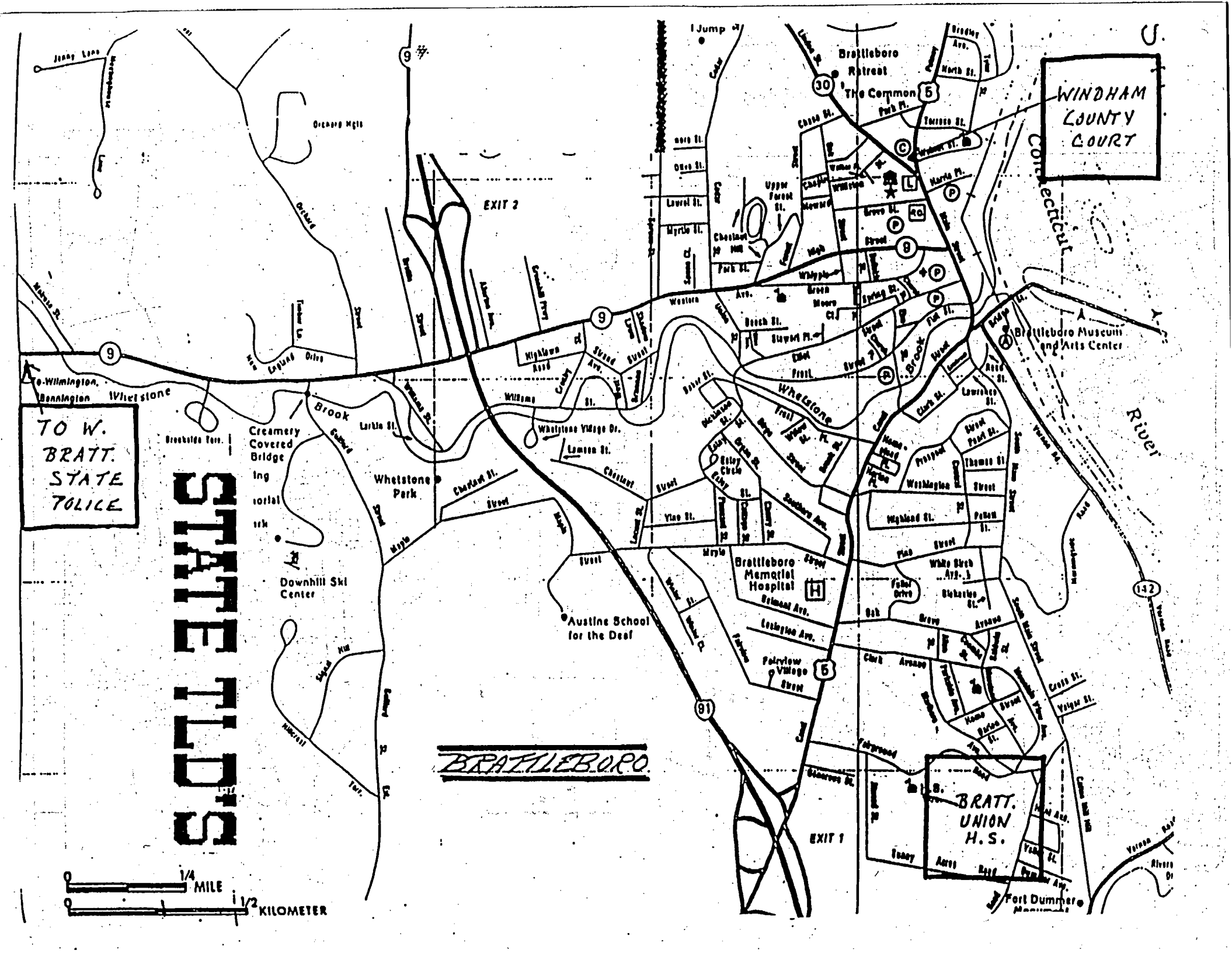



THERMOLUMINESCENT DOSIMETRY AT VY SITE BOUNDARY
mR/quarter
30
25
20
15
10
5
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
YEAR
VY North Fence
VY Parking Lot
VY SW Fence

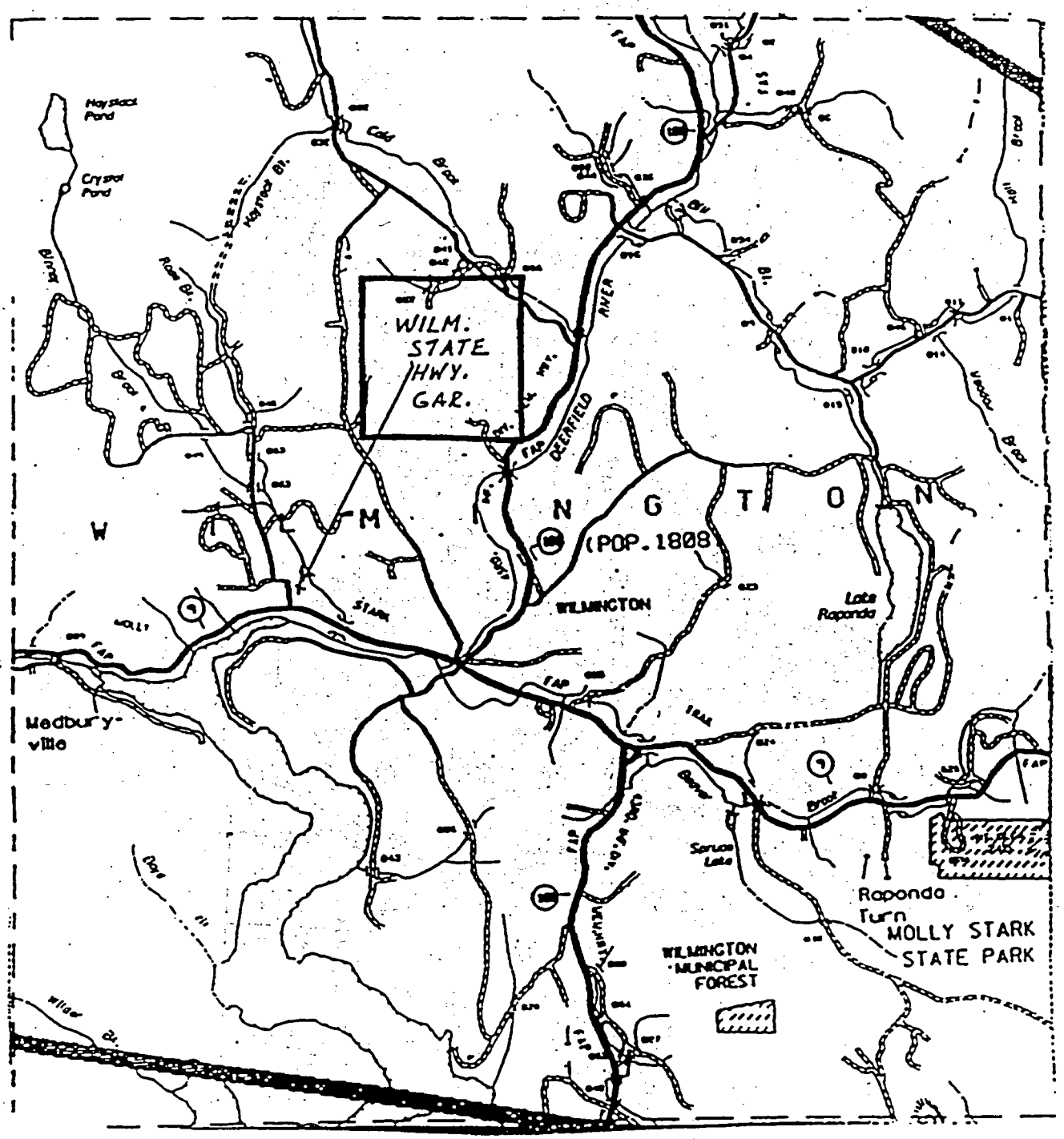
STATE TLD'S

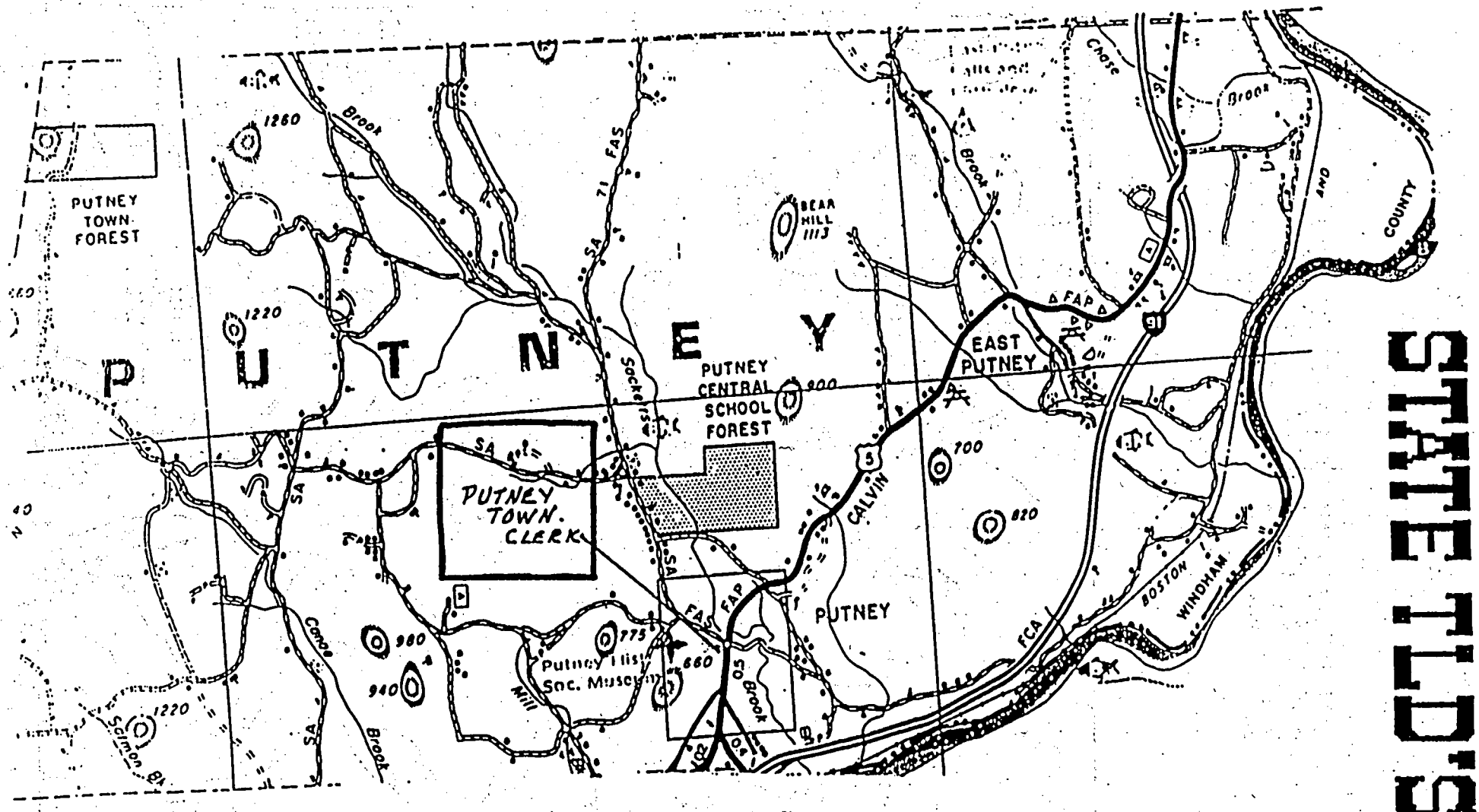
Burlington



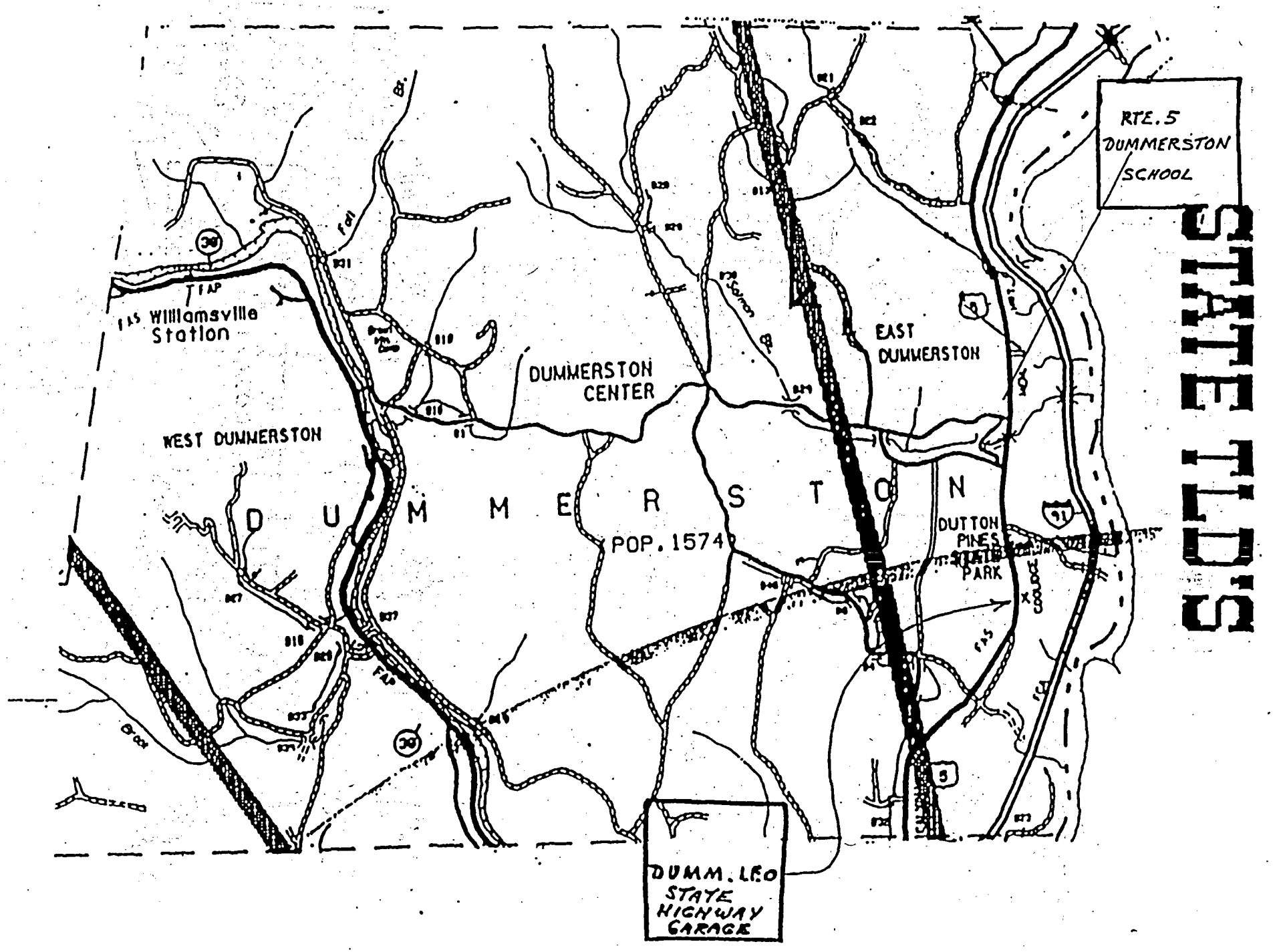

WINDHAM COUNTY COURT
TO W. BRATT. STATE POLICE
STATE POLICE
BRATTLEBORO
BRATT. UNION H.S.
Brattleboro Retreat
The Common
Brattleboro Museum and Arts Center
Brattleboro Memorial Hospital
Austine School for the Deaf
Whetstone Park
Creamery Covered Bridge
Downhill Ski Center
Fort Dummer
Connecticut River
Whetstone Brook
EXIT 1
EXIT 2
Orchard Hill
Chestnut Hill
Upper Forest St.
Fairview Village
Highland St.
Western Ave.
Canal St.
Williams St.
Chestnut St.
Maple St.
Elliot St.
Frost St.
Clark St.
Thomas St.
Washington St.
Prospect St.
West Point St.
Vine St.
Myrtle St.
Laurel St.
Oak St.
Grove St.
Elm St.
Cross St.
Valley St.
Green St.
Canal St.
Linden St.
Brooks St.
Orchard St.
Jenny Lane
Wilmington, Bennington
Whetstone
Brookside Terr.
Lorna St.
Whetstone Village Dr.
Lawson St.
Highlawn Road
Upper Forest St.
Chestnut Hill
Fort St.
Beach St.
Summit Pl.
Elliot St.
Frost St.
Clark St.
Lawrence St.
Thomas St.
Washington St.
Highland St.
Pelton St.
White Birch Apts.
Bickerstaff St.
Fuller Drive
Oak Grove Avenue
Belmont Ave.
Lexington Ave.
Fairview Village
Cross St.
Valley St.
Green St.
Canal St.
Linden St.
Brooks St.
Orchard St.
Vernon Rd.
Vernon Rd.
Fairground
Glenwood St.
Tuney
Acres Road
Vera St.
Hard Ave.
Canal St.

STATE TLD'S

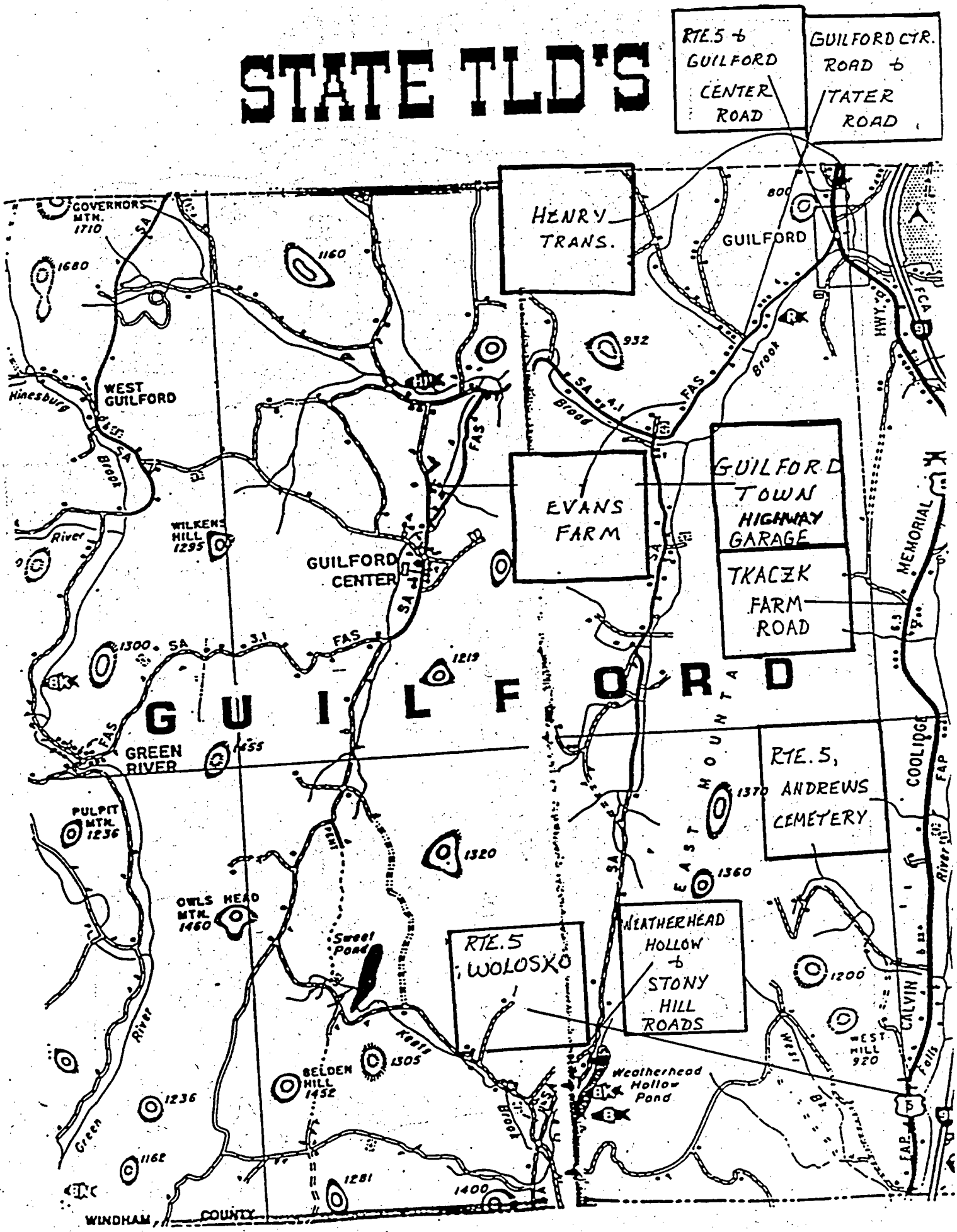

WILM.
STATE
HWY.
GAR.
W I L M I N G T O N
(POP. 1808)
WILMINGTON
DEERFIELD
RIVER
Haystack Pond
Crystal Pond
Lake Raponda
Medbury-ville
Raponda Turn
MOLLY STARK STATE PARK
WILMINGTON MUNICIPAL FOREST


PUTNEY TOWN FOREST
PUTNEY
PUTNEY CENTRAL SCHOOL FOREST
PUTNEY TOWN. CLERK
EAST PUTNEY
PUTNEY
BEAR HILL 1113
Putney Hist Soc. Museum
Brook
Sackets
Mill
Canoe
Salmon Bk
Chase
CALVIN
FAP
FCA
BOSTON
WINDHAM
AND
COUNTY
SA
FAS
1260
1220
900
700
820
980
940
775
660

STATE TLD'S

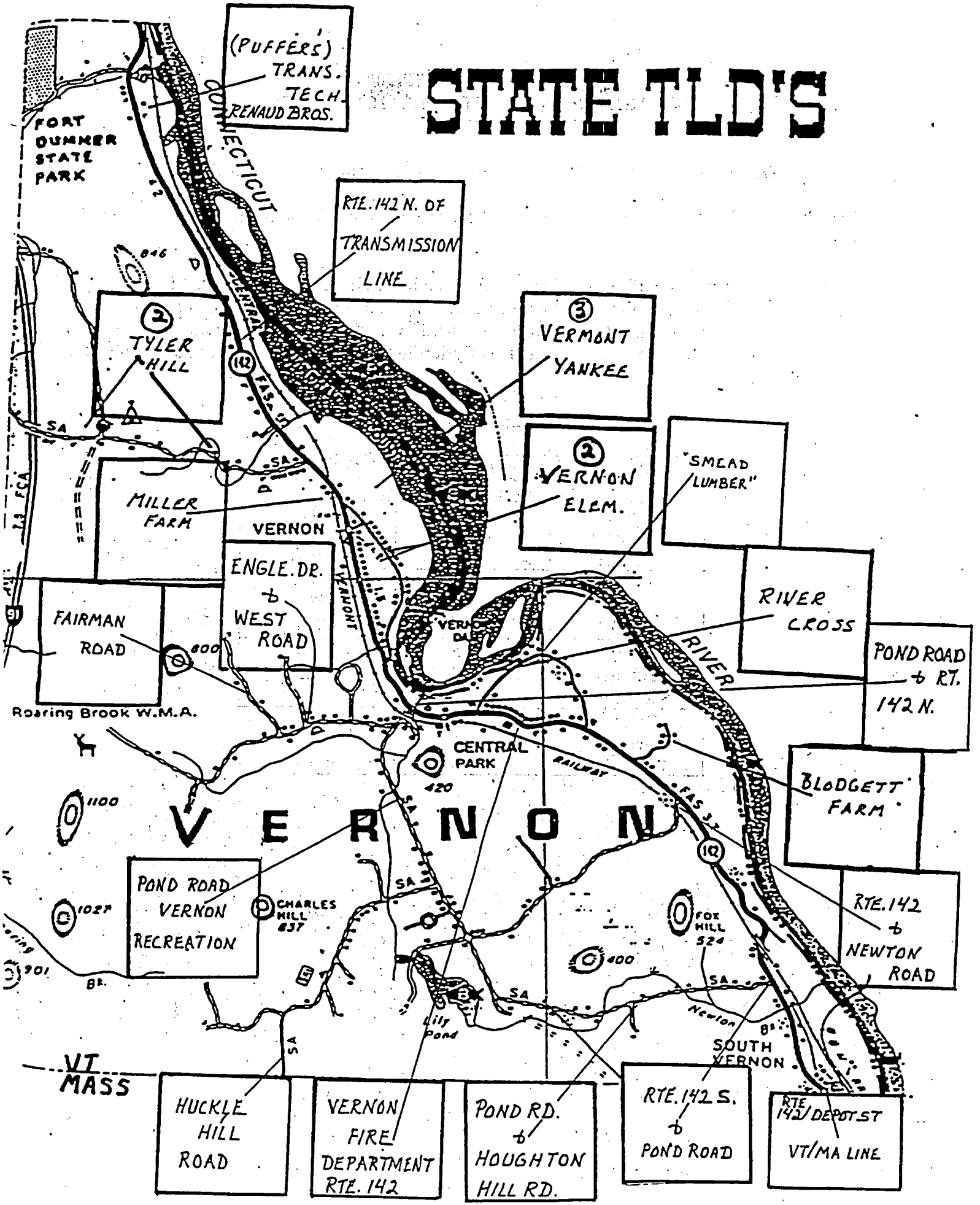

STATE TLDS
RTE. 5
DUMMERSTON
SCHOOL
FAS Williamsville
Station
WEST DUMMERSTON
DUMMERSTON CENTER
EAST DUMMERSTON
D U M M E R S T O N
POP. 1574
DUTTON PINES
STATE PARK
DUMM. LEO
STATE
HIGHWAY
GARAGE

STATE TLD'S



RTE.5 & GUILFORD CENTER ROAD
GUILFORD CTR. ROAD & TATER ROAD
HENRY TRANS.
GUILFORD
EVANS FARM
GUILFORD TOWN HIGHWAY GARAGE
TKACZK FARM ROAD
RTE.5, ANDREWS CEMETERY
RTE.5 WOLOSKO
WEATHERHEAD HOLLOW & STONY HILL ROADS
GOVERNORS MTN. 1710
WEST GUILFORD
WILKENS HILL 1295
GUILFORD CENTER
GREEN RIVER
PULPIT MTN. 1236
OWLS HEAD MTN. 1460
Sweet Pond
BELDEN HILL 1452
Weatherhead Hollow Pond
WEST HILL 920
GUILFORD
EAST MOUNTAIN
WINDHAM COUNTY
Hinesburg Brook
Green River
Keats Brook
Broad Brook
West Br.
Falls River
MEMORIAL
COOLIDGE
CALVIN
HWY.
FCA
FAP
FAS
SA
1680
1160
932
800
1300
1219
1455
1370
1320
1360
1200
1305
1236
1162
1281
1400

STATE TLD'S


(PUFFER'S) TRANS. TECH. RENAUD BROS.
FORT DUMMER STATE PARK
CONNECTICUT
RTE. 142 N. OF TRANSMISSION LINE
② TYLER HILL
③ VERMONT YANKEE
② VERNON ELEM.
"SMEAD LUMBER"
MILLER FARM
VERNON
ENGLE DR. & WEST ROAD
FAIRMAN ROAD
RIVER CROSS
POND ROAD & RT. 142 N.
RIVER
Roaring Brook W.M.A.
CENTRAL PARK
RAILWAY
BLODGETT FARM
V E R N O N
POND ROAD VERNON RECREATION
CHARLES HILL 837
FOX HILL 524
RTE. 142 & NEWTON ROAD
Lily Pond
Newton
SOUTH VERNON
VT
MASS
HUCKLE HILL ROAD
VERNON FIRE DEPARTMENT RTE. 142
POND RD. & HOUGHTON HILL RD.
RTE. 142 S. & POND ROAD
RTE 142/DEPOT ST VT/MA LINE

TRITIUM IN WATER 2004
VERMONT YANKEE (CONNECTICUT RIVER)

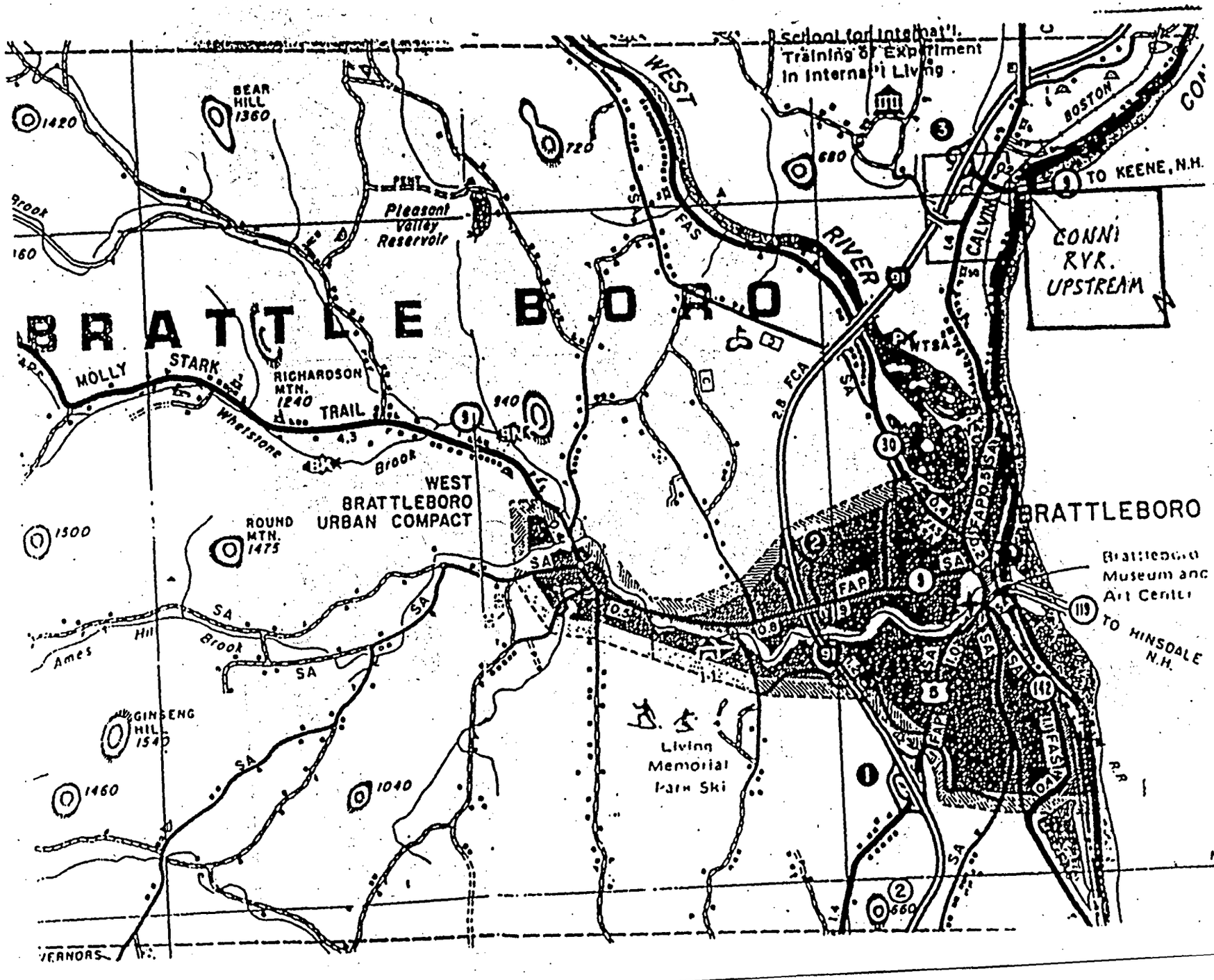
All Tritium in Water Samples for the Year 2004 are within the expected historical range.

The historical range for tritium in water is less than the detection limit. The samples for 2004 are less than the detection limit.

As part of the water sampling effort, an aliquot of the monthly grab samples is analyzed for Hydrogen-3. Two locations are reported monthly for Hydrogen-3 content from the Connecticut River (upstream and downstream of the power station). The samples are analyzed by liquid scintillation counting. The detection limit for tritium is 0.5 nCi/l. Reporting units are nanoCuries/liter with 2 sigma (standard deviation) value.

WATER
(nanoCuries/liter)

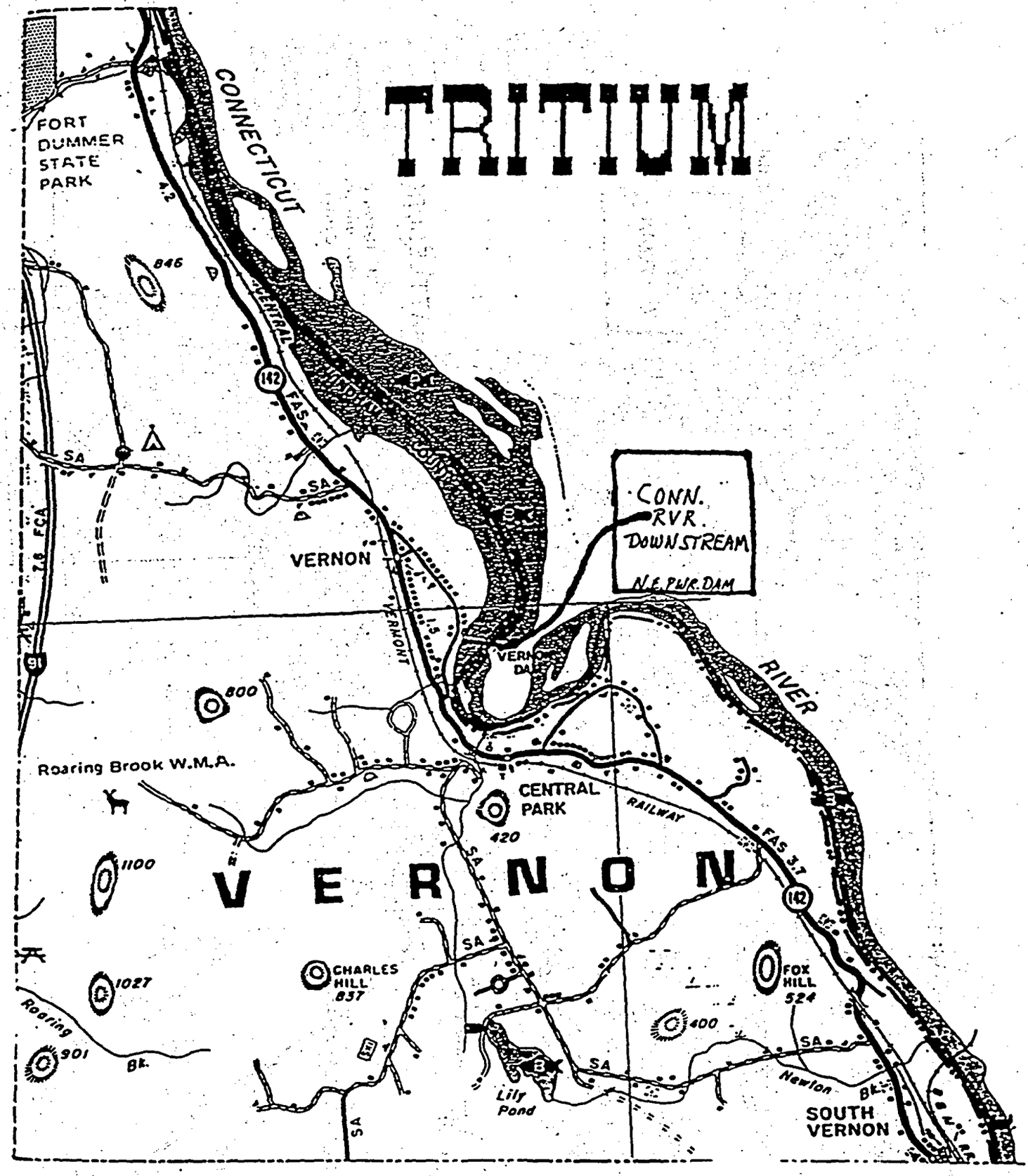
Month	Downstream (3-4)	Upstream (3-8)
January	< 0.5	< 0.5
February	< 0.5	< 0.5
March	< 0.5	< 0.5
April	< 0.5	< 0.5
May	< 0.5	< 0.5
June	< 0.5	< 0.5
July	< 0.5	< 0.5
August	< 0.5	< 0.5
September	< 0.5	< 0.5
October	< 0.5	< 0.5
November	< 0.5	< 0.5
December	< 0.5	< 0.5



BRATTLE BORO
BEAR HILL 1360
1420
720
680
Pleasant Valley Reservoir
WEST RIVER
School for Internat'l. Training of Experiment in Internat'l Living
BOSTON
TO KEENE, N.H.
CONNI RVR. UPSTREAM
CALVIN
MOLLY STARK TRAIL
RICHARDSON MTN. 1240
Whetstone Brook
940
WEST BRATTLEBORO URBAN COMPACT
ROUND MTN. 1475
1500
BRATTLEBORO
Brattleboro Museum and Art Center
TO HINSDALE N.H.
Ames Hill Brook
GINSENG HILL 1540
1460
1040
Living Memorial Park Ski
660
VERNORS

TRITIUM

TRITIUM



FORT DUMMER STATE PARK
CONNECTICUT
RIVER
CONN. RVR. DOWNSTREAM
N.E. PWR. DAM
VERNON
VERNON DAM
VERMONT
CENTRAL
RAILWAY
FAS 3.7
FAS
142
91
846
800
1100
1027
901
420
400
Roaring Brook W.M.A.
CENTRAL PARK
CHARLES HILL 837
FOX HILL 524
Roaring Bk.
Lily Pond
Newton Bk.
SOUTH VERNON
SA

WATER SAMPLES 2004

All Water Samples for the Year 2004 are within the expected historical range.

The historical range for alpha is from less than the detection limit to 15 pCi/l. The samples for 2004 range from less than the detection limit to 8.9 pCi/l.

The historical range for beta is from less than the detection limit to 15 pCi/l. The samples for 2004 range from less than the detection limit to 5.2 pCi/l.

Water samples are collected monthly from 8 sites. One gallon of water is placed in a reentrant beaker and analyzed on the Gamma spectrometer system using a reverse germanium detector. Usual spectra include primordial radionuclides. Reporting units are picoCuries per liter with 2 sigma (standard deviation) value.

WATER 2004
(picoCuries/Liter)

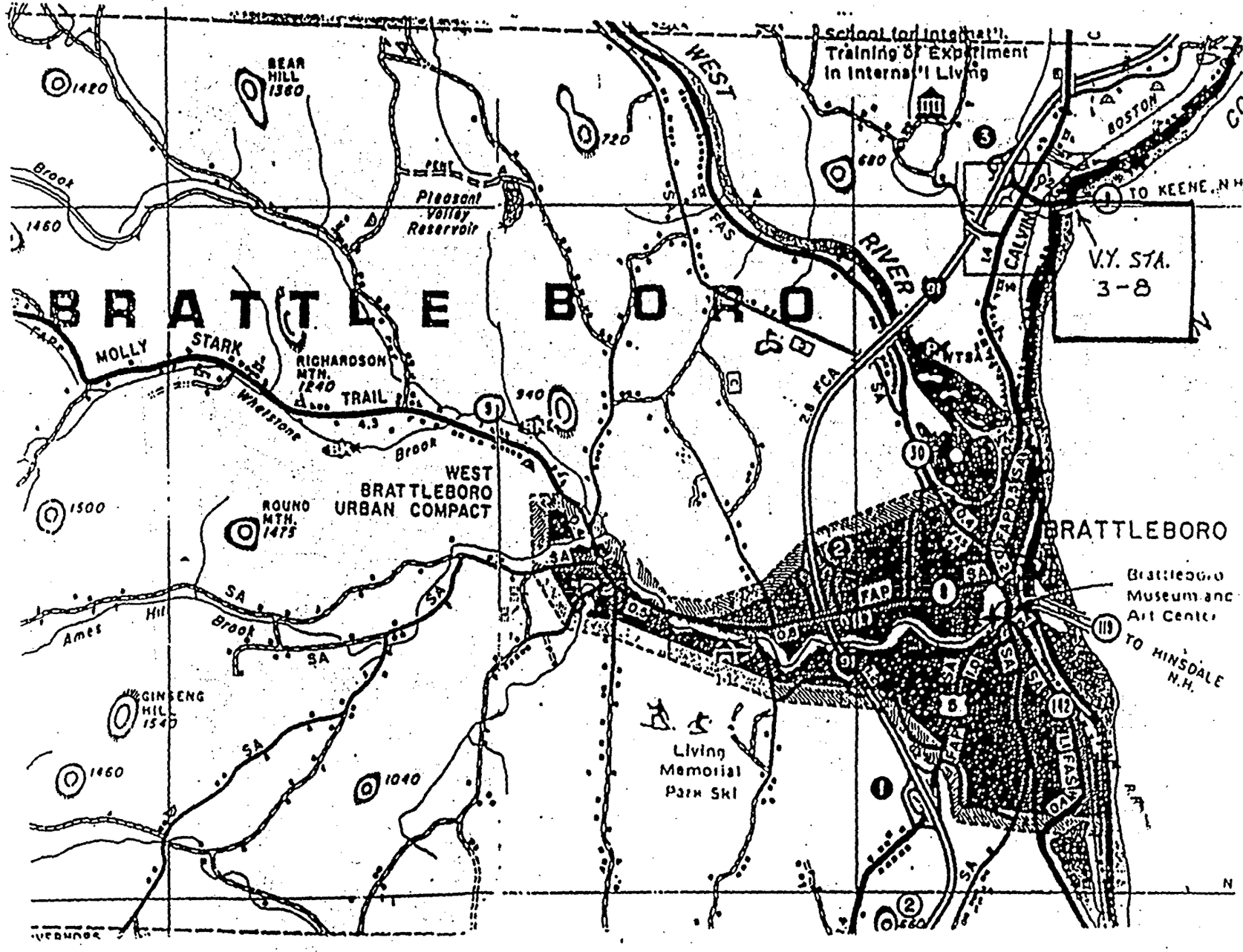
Month	Test	Vernon School Well	NE Power Dam	VY Discharge	Brattleboro Town
January	Alpha	6.8 ± 1.2	< 2.4	< 2.4	< 2.4
	Beta	4.8 ± 1.8	< 2.8	4.1 ± 1.8	< 2.8
	Gamma	*	ND	ND	ND
February	Alpha	5.4 ± 1.0	< 2.3	< 2.3	< 2.2
	Beta	5.2 ± 2.0	< 3.0	3.1 ± 1.9	< 3.0
	Gamma	*	ND	ND	ND
March	Alpha	5.3 ± 1.1	< 2.7	< 2.6	< 2.4
	Beta	3.5 ± 2.0	< 3.1	< 3.1	< 3.1
	Gamma	*	ND	ND	ND
April	Alpha	5.6 ± 1.1	2.4 ± 1.1	< 2.5	< 1.5
	Beta	< 3.1	< 1.5	< 3.0	< 1.5
	Gamma	*	ND	ND	ND
May	Alpha	6.4 ± 1.1	< 1.4	< 2.3	< 1.4
	Beta	< 3.1	1.8 ± 1.0	5.4 ± 2.0	< 1.4
	Gamma	*	ND	ND	ND
June	Alpha	6.5 + 1.2	< 2.7	< 2.7	< 2.5
	Beta	< 2.8	< 2.8	< 2.8	< 2.8
	Gamma	ND	ND	ND	ND
July	Alpha	4.8 ± 1.1	< 2.8	< 2.9	< 1.6
	Beta	4.4 ± 1.9	< 2.9	< 2.9	< 1.4
	Gamma	ND	ND	ND	ND
August***	Alpha	8.9 ± 1.4	1.2 ± 1.6	0.3 ± 1.6	2.1 ± 1.7
	Beta	4.8 ± 1.9	1.1 ± 1.8	2.8 ± 1.8	1.5 ± 1.8
	Gamma	*	ND	ND	ND
September	Alpha	6.1 ± 1.2	-0.3 ± 1.6	0.9 ± 1.6	0.6 ± 1.7
	Beta	4.0 ± 1.9	2.0 ± 1.9	0.2 ± 1.8	2.6 ± 1.9
	Gamma	*	ND	ND	ND
October	Alpha	8.9 ± 1.3	0.3 ± 1.5	0.6 ± 1.6	-0.3 ± 1.4
	Beta	4.0 ± 1.9	2.2 ± 1.9	1.4 ± 1.8	-0.2 ± 1.8
	Gamma	*	ND	ND	ND
November	Alpha	5.9 ± 1.2	2.0 ± 1.5	1.1 ± 1.4	1.1 ± 1.4
	Beta	4.9 ± 1.8	1.1 ± 1.7	2.6 ± 1.8	2.0 ± 1.7
	Gamma	*	ND	ND	ND
December	Alpha	7.1 ± 1.2	2.2 ± 1.4	1.1 ± 1.4	3.7 ± 1.5
	Beta	3.1 ± 1.8	-1.5 ± 1.7	1.9 ± 1.8	0.3 ± 1.7
	Gamma	*	ND	ND	ND

WATER 2004
(picoCuries/Liter)

Month	Test	Powerline River Crossing (3-3)	Island Park	Conn. River Upstream (3-8)	Conn. River Downstream (3-4)
January	Alpha	< 2.4	No Sample	< 2.4	< 2.4
	Beta	< 2.8	Taken **	< 2.8	< 2.8
	Gamma	ND		ND	ND
February	Alpha	< 2.3	No Sample	1.8 ± 0.8	< 2.2
	Beta	< 3.0	Taken **	1.9 ± 1.0	< 3.0
	Gamma	ND		ND	ND
March	Alpha	< 2.6	< 2.7	< 2.5	< 2.6
	Beta	< 3.1	< 3.1	< 3.1	< 3.1
	Gamma	ND	ND	ND	ND
April	Alpha	< 1.5	Lab Accident	< 2.6	< 1.5
	Beta	2.1 ± 1.0	Sample Not	< 3.0	< 2.7
	Gamma	ND	Analyzed	ND	ND
May	Alpha	< 2.4	< 1.4	< 2.3	< 2.3
	Beta	< 3.1	< 1.6	< 3.1	< 3.1
	Gamma	ND	ND	ND	ND
June	Alpha	< 2.5	< 2.7	< 2.6	< 2.7
	Beta	< 2.8	< 2.8	< 2.8	< 2.8
	Gamma	ND	ND	ND	ND
July	Alpha	< 3.0	< 2.8	< 2.8	< 2.9
	Beta	< 2.9	< 2.9	< 2.9	< 2.9
	Gamma	ND	ND	ND	ND
August***	Alpha	1.0 ± 1.7	0.3 ± 1.6	0.6 ± 1.6	0.7 ± 1.7
	Beta	3.6 ± 1.8	2.3 ± 1.8	2.3 ± 1.8	2.5 ± 1.8
	Gamma	ND	ND	ND	ND
September	Alpha	2.5 ± 1.8	0.9 ± 1.7	0.9 ± 1.6	0.9 ± 1.6
	Beta	1.8 ± 1.9	1.4 ± 1.8	-0.9 ± 1.8	-2.1 ± 1.8
	Gamma	ND	ND	ND	ND
October	Alpha	1.4 ± 1.6	0.0 ± 1.5	0.6 ± 1.6	-0.6 ± 1.5
	Beta	3.7 ± 1.9	1.0 ± 1.8	3.1 ± 1.9	2.6 ± 1.9
	Gamma	ND	ND	ND	ND
November	Alpha	0 ± 1.3	1.1 ± 1.4	2.0 ± 1.5	0.6 ± 1.4
	Beta	1.1 ± 1.7	3.3 ± 1.8	3.5 ± 1.8	2.3 ± 1.8
	Gamma	ND	ND	ND	ND
December	Alpha	2.2 ± 1.4	1.6 ± 1.4	0 ± 1.3	0.3 ± 1.3
	Beta	1.0 ± 1.8	0.7 ± 1.8	1.5 ± 1.8	1.0 ± 1.8
	Gamma	ND	ND	ND	ND

WATER 2004

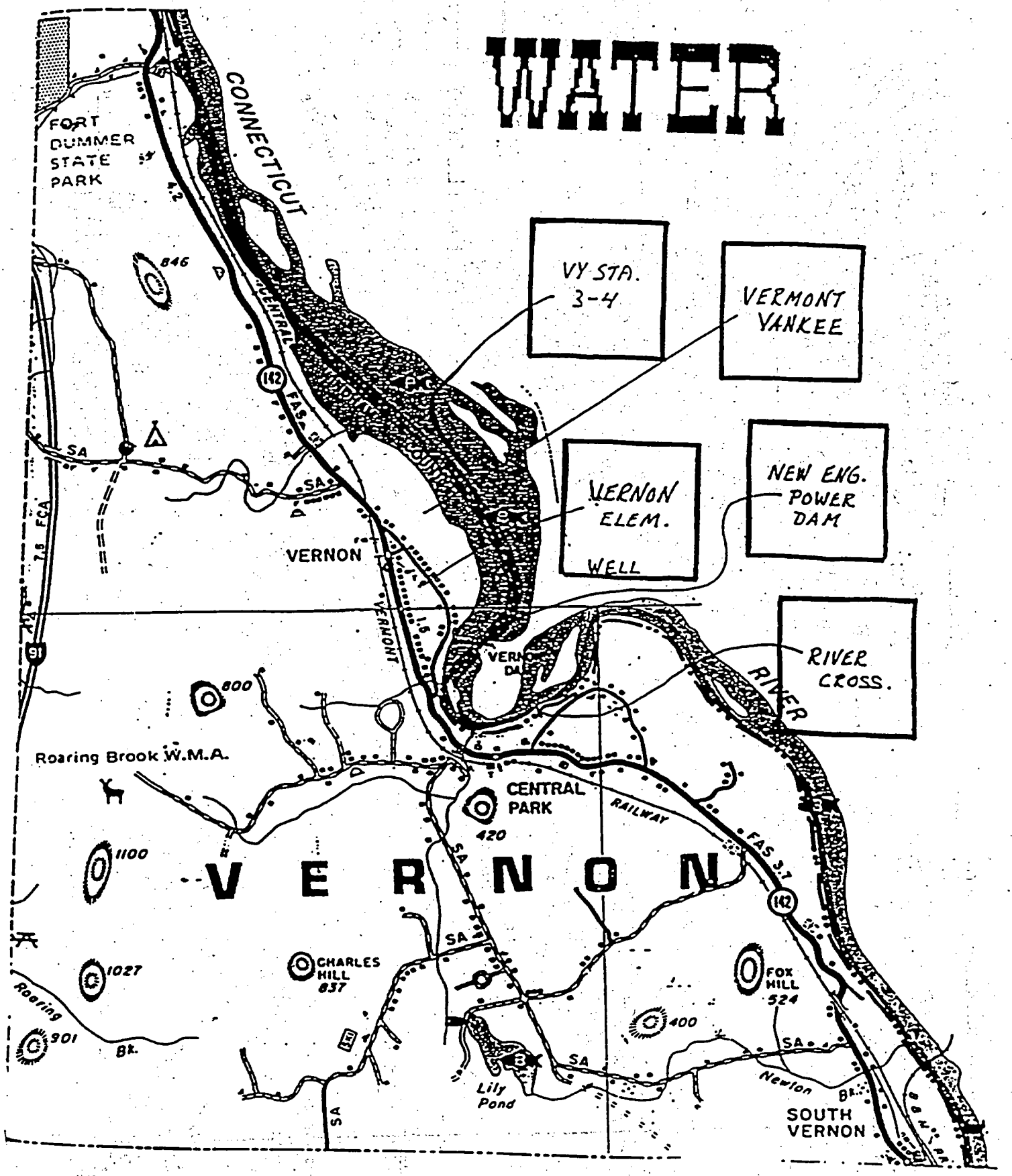
* = Naturally Occurring Radionuclides
** = River was frozen at this location in both January and February.
*** = Data from VDH Laboratory requested to be reported to VDH Radiological Health in the format of the actual measurement and 2 standard deviations.
ND = Below Detection Limits
A Priori Detection Limits: Alpha = 3 pCi/L
Beta = 4 pCi/L



BRATTLE BORO
BEAR HILL 1360
1420
720
680
1460
Brook
Pleasant Valley Reservoir
WEST
RIVER
School for Internat'l. Training of Experiment in Internat'l Living
BOSTON
TO KEENE, N.H.
CALVIN
V.Y. STA. 3-8
MOLLY STARK TRAIL
RICHARDSON MTN. 1240
Whetstone Brook
940
WEST BRATTLEBORO URBAN COMPACT
1500
ROUND MTN. 1475
BRATTLEBORO
Brattleboro Museum and Art Center
TO HINSDALE N.H.
Ames Hill Brook
GINSENG HILL 1540
1460
1040
Living Memorial Park Ski

WATER

WATER



CONNECTICUT
FORT DUMMER STATE PARK
846
VY STA. 3-4
VERMONT YANKEE
VERNON ELEM. WELL
NEW ENG. POWER DAM
RIVER CROSS.
RIVER
VERNON
VERMONT
CENTRAL
FAS
142
SA
FCA
91
800
Roaring Brook W.M.A.
CENTRAL PARK
420
RAILWAY
FAS 3.7
1100
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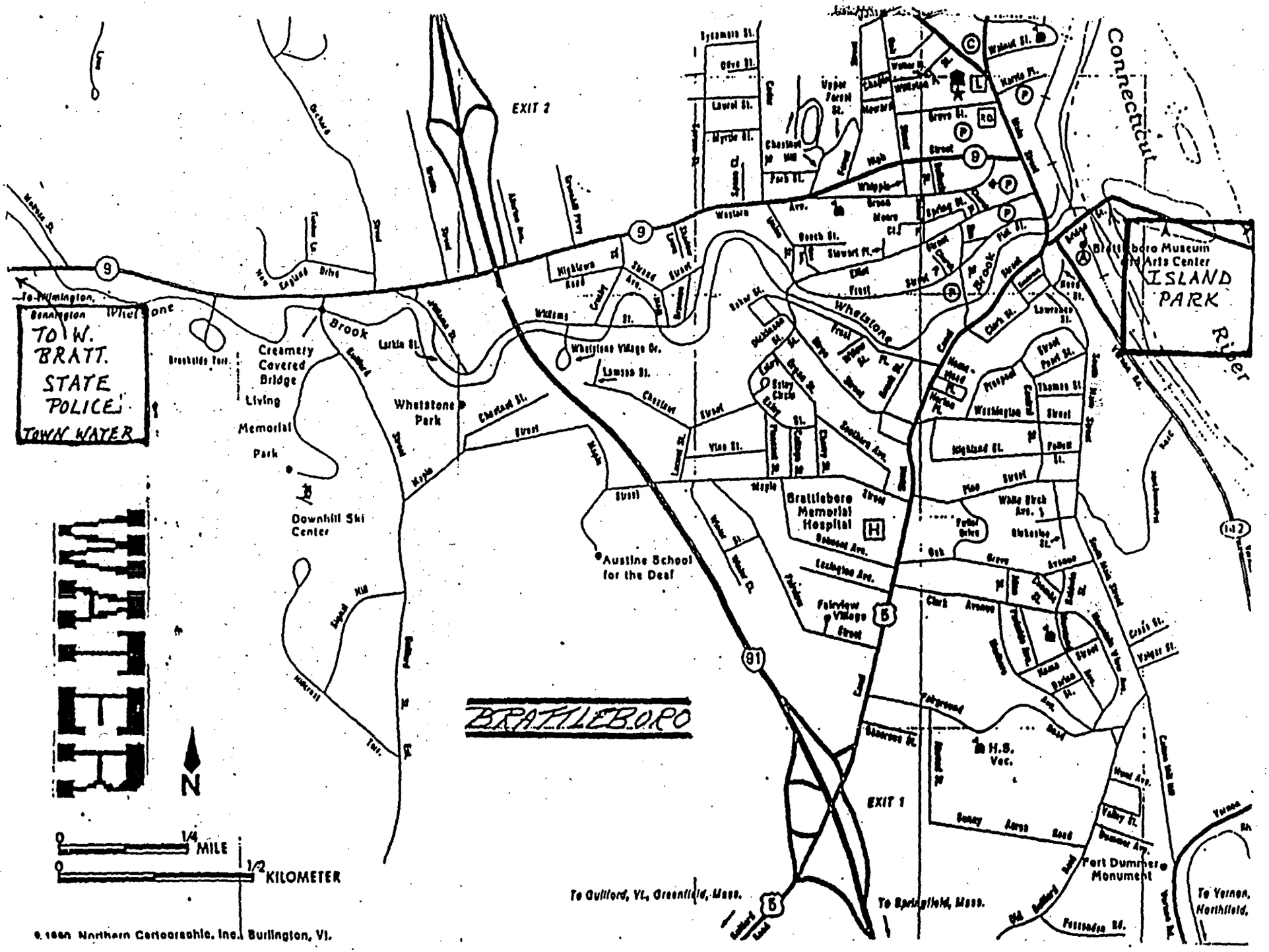
Bk.
SOUTH VERNON


TO W. BRATT. STATE POLICE TOWN WATER
EXIT 2
EXIT 1
Connecticut River
ISLAND PARK
Brattleboro Museum & Arts Center
Creamery Covered Bridge
Living Memorial Park
Whetstone Park
Downhill Ski Center
Austine School for the Deaf
Brattleboro Memorial Hospital
Fairview Village Street
H.S. Vec.
Fort Dummer Monument
BRATTLEBORO
To Guilford, Vt., Greenfield, Mass.
To Springfield, Mass.
To Vernon, Northfield.
To Wilmington, Bennington
1/4 MILE
1/2 KILOMETER
N
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