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THE TRENDS OF CONTAMINATION OBSERVED IN THE AIR, THE COLUMBIA

RIVER, VEGETATION, AND WASTE AT THE HANFORD ENGINEER WORKS FOR THE PERIOD

JANUARY 1, 1947 TO MARCH 25, 1947.

The attached graphs and maps illustrate the contamination observed in and around the Hanford Engineer Works, for the period January 1 to March 25, 1947.

The air conditions at the Meteorology Building are summarized to show the proportion of time that various wind directions exist during the usual period of metal dissolution. The prevailing wind direction is northwest. About 53% of the time the wind was coming from a Northerly direction and about 25% of the wind was coming from a Southerly direction. The low wind dilution of the stack off-gases has gradually increased during this period thereby indicating a shorter period of ideal dissolving conditions.

A summary of the average air-borne contamination collected on filter units indicates that the 100-D Area, Benton City, and Gable Mt. seem to have more air-borne contamination than is indicated by the vegetation samples from the same location (ratio of Graph II to Graph IV). The maximum value for air contamination (1.7×10^{-6} $\mu\text{c}/\text{liter}$) was obtained on a hand pump filter near the 200-W Patrol Building during a period when the smoke fume was looping, and a dilution factor of 750:1 was reported. An estimate of the radio-iodine evolved during the two minute period immediately preceding this sample indicated a concentration of 0.6 $\mu\text{c}/\text{liter}$ at the top of the stack. This would indicate a dilution factor of 350,000:1 at the time of sampling.

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In addition to the filter collection summary of air-borne contaminants, a table of the amount of contamination observed with detachable ionisation chambers has been included. (See Table I).

Vegetation contamination is lower this year than in a similar period in 1946*, but only three areas or regions have averaged below the tolerance concentration of radio-iodine ($0.20 \mu\text{Ci/kg}$)**. However, since January most of the over-tolerance areas have trended to under-tolerance conditions. In all areas, the prevalent vegetation has been sampled. At Route 48, Mi. 4 (200-E), several different types of samples were obtained weekly, and are summarized as (1) the average of the weekly maximums; and (2), the average of the weekly averages.

A summary of the Columbia River contamination in conjunction with the average contamination observed coming from the 107 Basins shows that there is not much mixing of this effluent by the time it reaches Hanford. Based on an average flow of 350,000 gallons per second, a dilution ratio of 350:1 should have resulted, but the ratio of activity between 107 and the Columbia River at Hanford is an average of 215:1; however, by the time the water reaches Richland its activity is about 1/700th of the activity observed at the 107 Basins.

The graph of the maximum weekly contamination observed around the waste ditches in the 200-North Area indicates a rapid increase in the 'N' Area ditch resulting from paint removal of tank cars.

Several graphs have been attached to indicate the trend of the alpha, beta and gamma contamination observed in samples of mud and water taken from the 300 Area retention pond.

METHODS OF EVALUATION

All samples that are evaluated in terms of μCi have been counted with a standard thin, mica-window beta and gamma chamber, and corrected for the known counting geometry. Correction for self-absorption or per cent recovery has been applied only for the vegetation results***. Correction for the decay rate between the time of sampling and the time of counting has been applied for vegetation, Columbia River water, and air filter samples.

All samples that are evaluated in terms of alpha disintegrations per minute have been counted with a standard alpha set and corrected for a counting geometry of 50%.

-
- * L.D. Turner and J.W. Healy to file, "Vegetation Contamination for First Quarter of 1946", Doc. #5-3493, 5/1/46
 - ** E.M. Parker to W.D. Norwood, M.D., "Tolerable Concentration of Radio-Iodine on Edible Plants", Doc. #7-3217, 1/14/46
 - *** J.W. Healy and L.D. Fahnke to File, "Vegetation Analysis For I^{131} ", Doc. #5-3598, 8/1/46
-

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TABLE I

Contamination Observed With
Detachable Ionization Chambers
in wrep/24 hrs.

<u>Location</u>	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Average</u>
100 Area and Environs				0.7
Rt. 1 Mile 8 (100-B)	0.7	0.7	0.7	
Rt. 2-N Mile 10 (100-D)	1.0	0.5	0.5	
Rt. 2-N Mile 5 (100-F)	0.7	0.7	0.7	
Rt. 11-A Mile 1 (Hanford)	1.0	1.2	1.0	
Rt. 1 and Rt. 4-N	0.7	0.7	0.7	
Within 5 miles of 200 Areas				1.7
Rt. 4-S Mile 6	1.7	2.4	2.4	
Rt. 11-A Mile 6	1.7	1.7	1.7	
Rt. 3 Mile 1 (meteorology)	1.4	2.2	1.4	
Meteorology 200' Level	1.2	1.0	1.7	
Cable Mountain Summit	1.7	1.2	1.2	
Within 10 miles of 200 Areas				1.0
Rt. 4-S Mile 10	1.2	1.2	1.2	
Rt. 10 Mile 1	1.0	1.0	0.7	
Rt. 10 Mile 3	1.2	1.2	1.0	
Rt. 2-S Mile 4	1.0	1.0	0.7	
Near 300 Area				0.8
Rt. 4-S Mile 16	1.0	1.0	0.7	
Rt. 4-S Mile 22	1.0	0.7	0.7	

All the above values include the background measurements at the monitored locality.

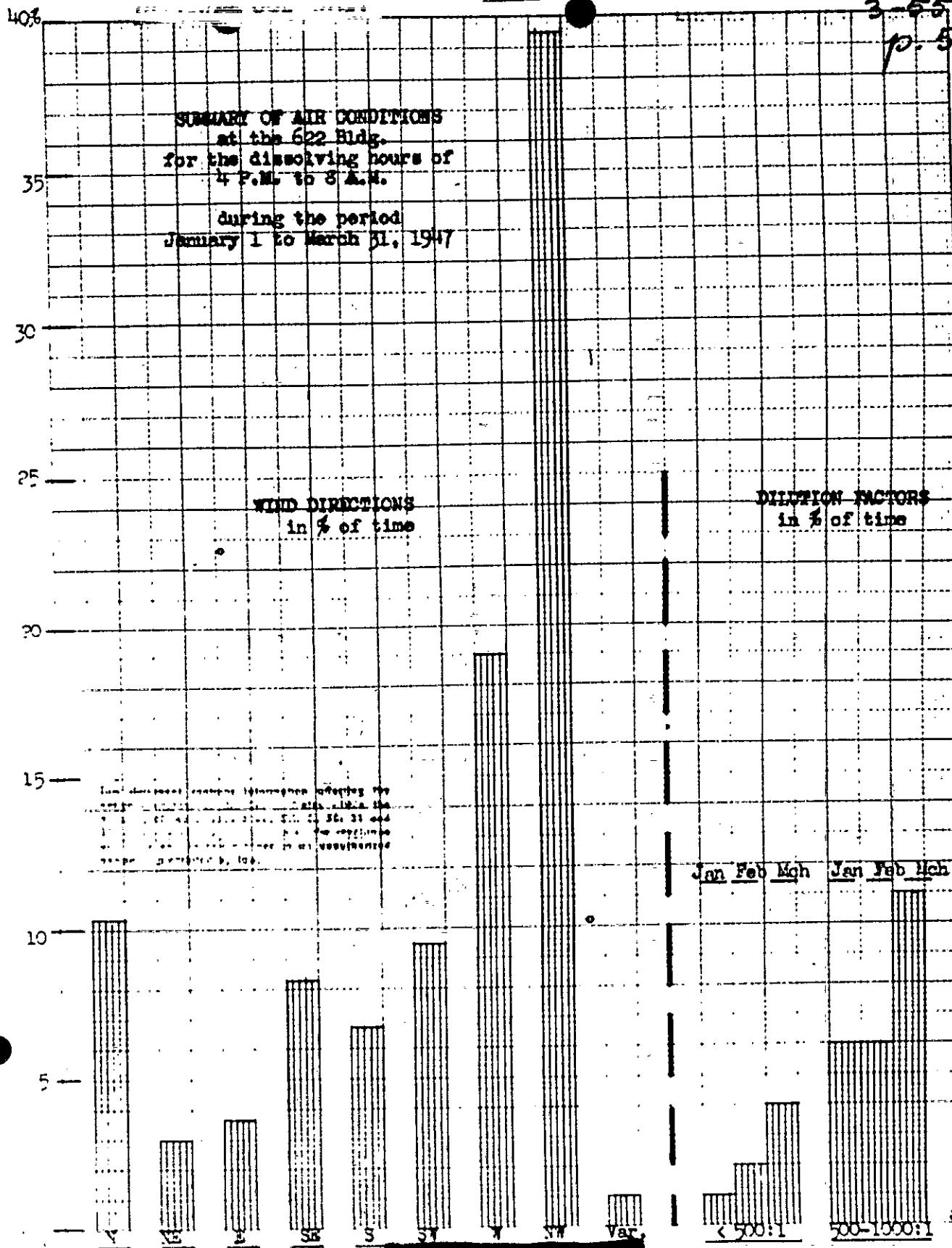
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SUMMARY OF AIR CONDITIONS
at the 622 Bldg.
for the dissolving hours of
4 P.M. to 8 A.M.
during the period
January 1 to March 31, 1947



$\mu\text{C/kg}$

~~200 E Area~~

Maximum values



2.0

Ave. of all samples

Meteorology

1.0

0.8

D.6

C.4

0.2

0.0

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µc/Liter
x10⁵

SUMMARY OF THE AVERAGE
COLUMBIA RIVER CONTAMINATION (B & G)
in µc/Liter
for the period
January 1 to March 25, 1947

107 F

STUDIES & RESEARCH CO. N. Y. NO. 38-111
COLUMBIA RIVER CONTAMINATION
January 1 to March 25, 1947200
100
0

HARTFORD

South Fork

Middletown

North Fork

100

Richland

107 F

107 B

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7-8

300

mc/Liter
 $\times 10^{10}$

270

300 East Area

SUMMARY OF THE AVERAGE
AIR CONTAMINATION (B & G)
in mc/L
for the period
January 1 to March 25, 1947

240

210

Cable Mountain

180

150

100 D Area

120

Benton City

90

60

30

300 Area

Pasco

700 Area

207
4/11

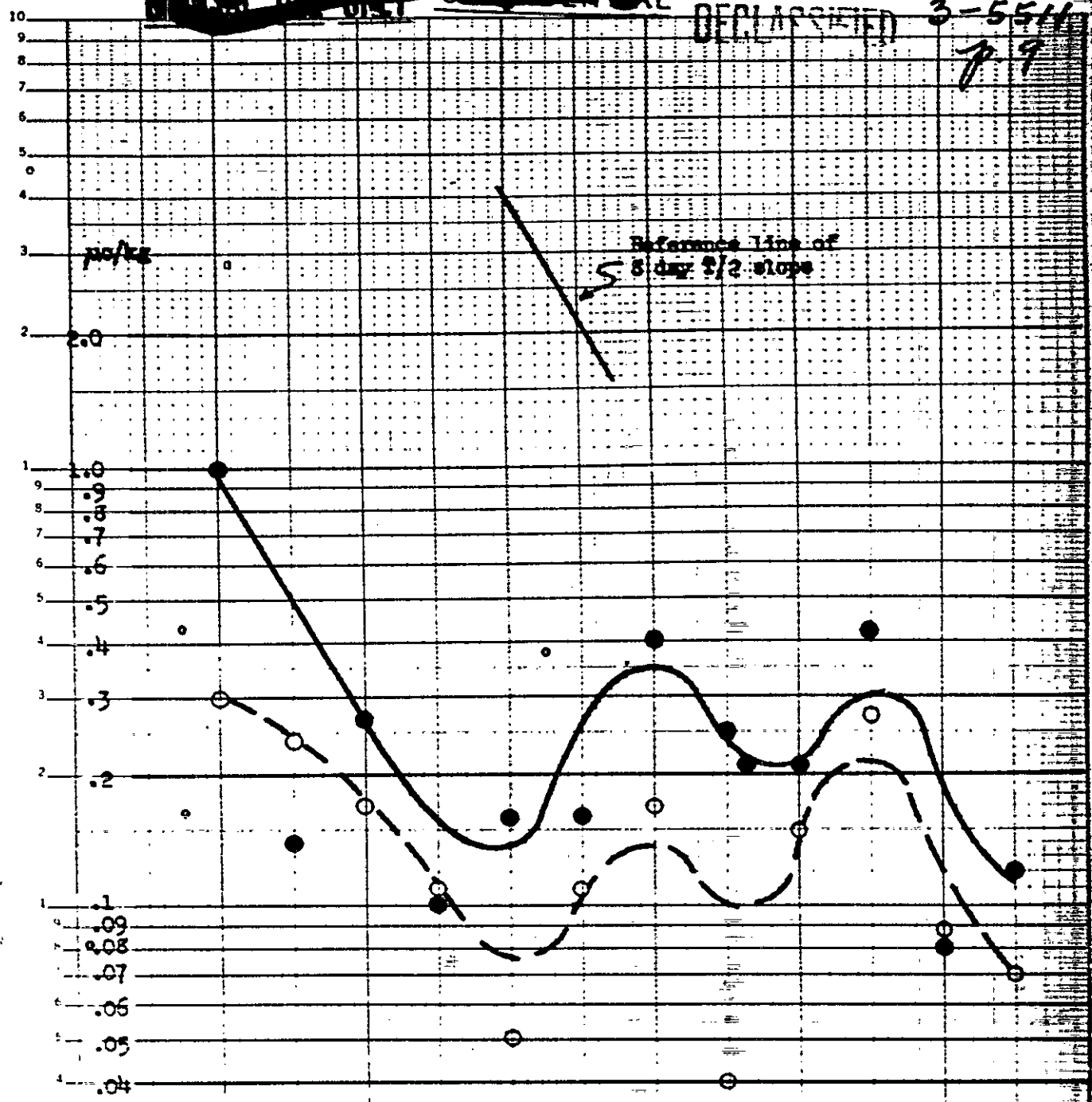
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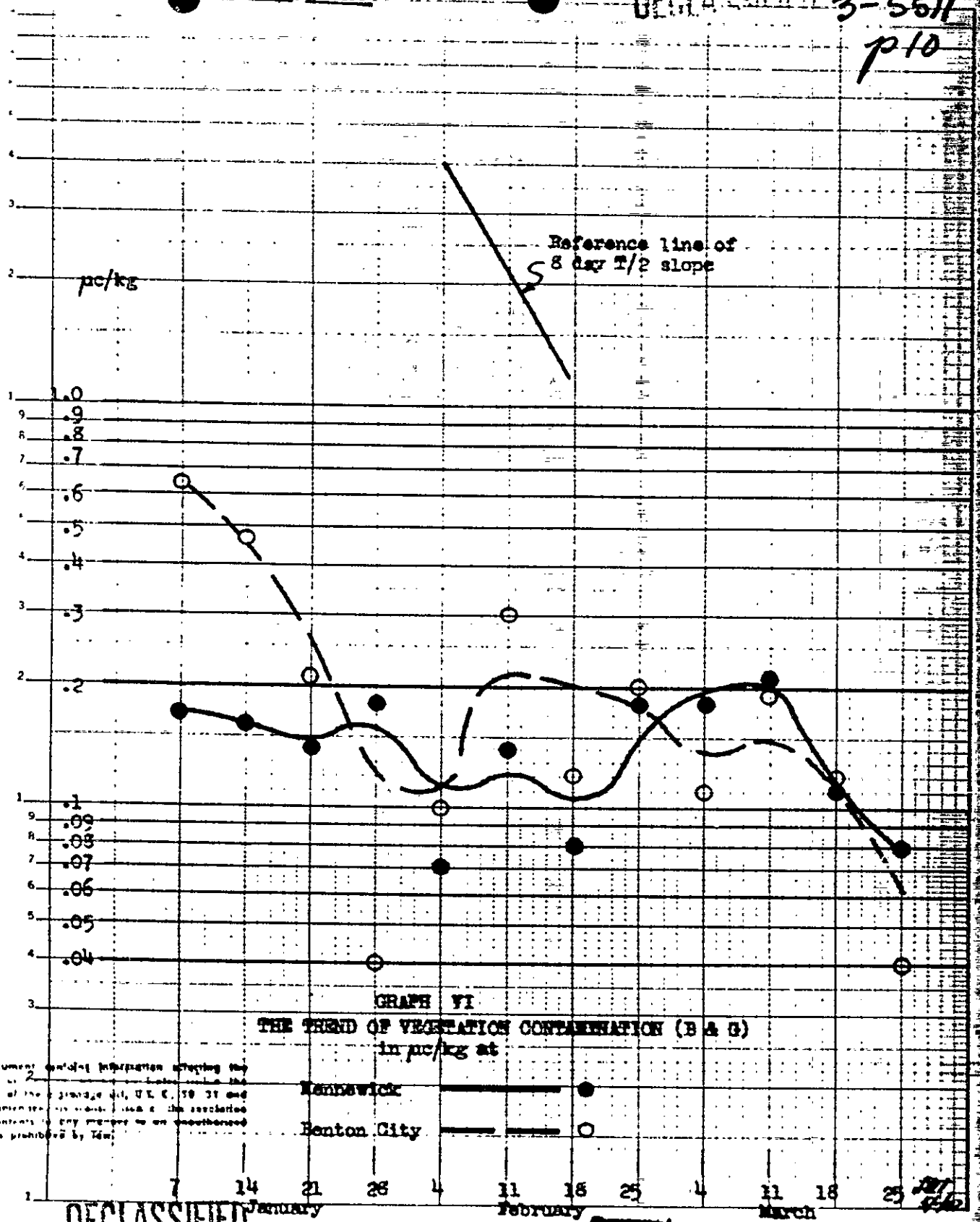
GRAPH V
THE FIELD OF VEGETATION CONTAMINATION (3 & 3)
in mc/kg at

Richland ———— ●
Pasco - - - - - ○

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S. 10th St., Lincoln, Nebraska 68502

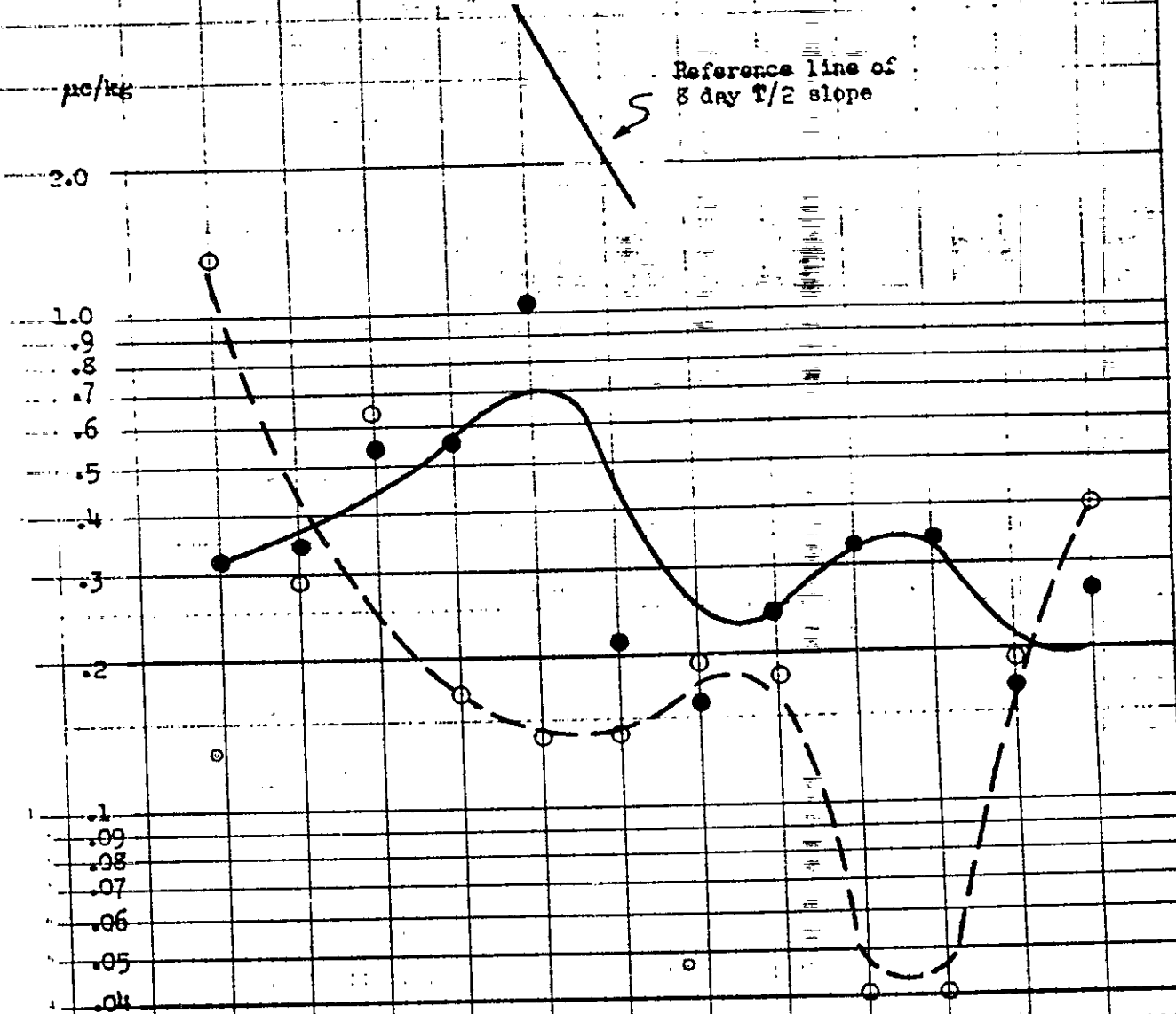
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GRAPH VII
THE TREND OF VEGETATION CONTAMINATION (E & G)
in pc/kg at

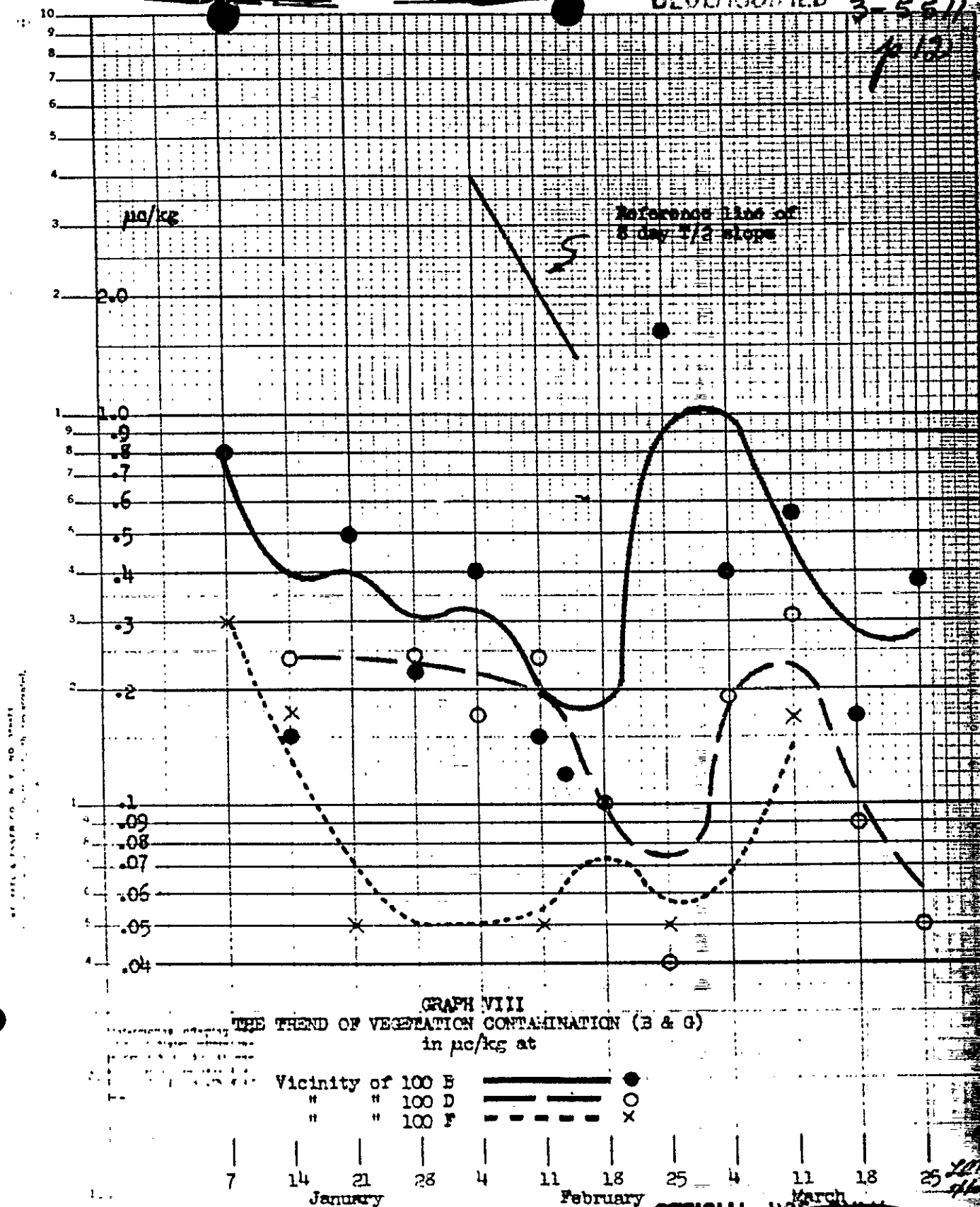
Hanford

300 Area

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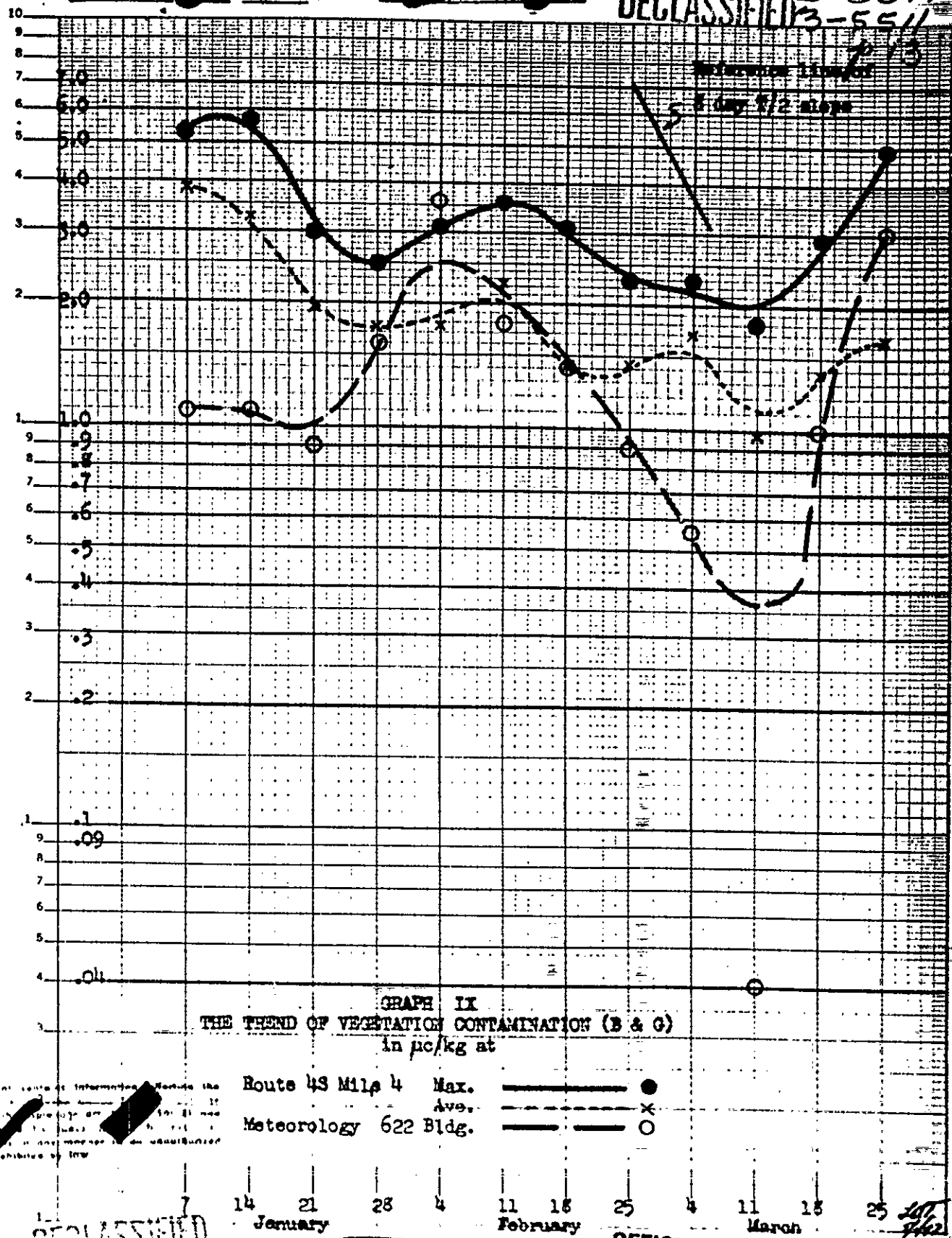
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SCOTT & BAKER CO., N.Y. NO. 35071
 -JANUARY 1964

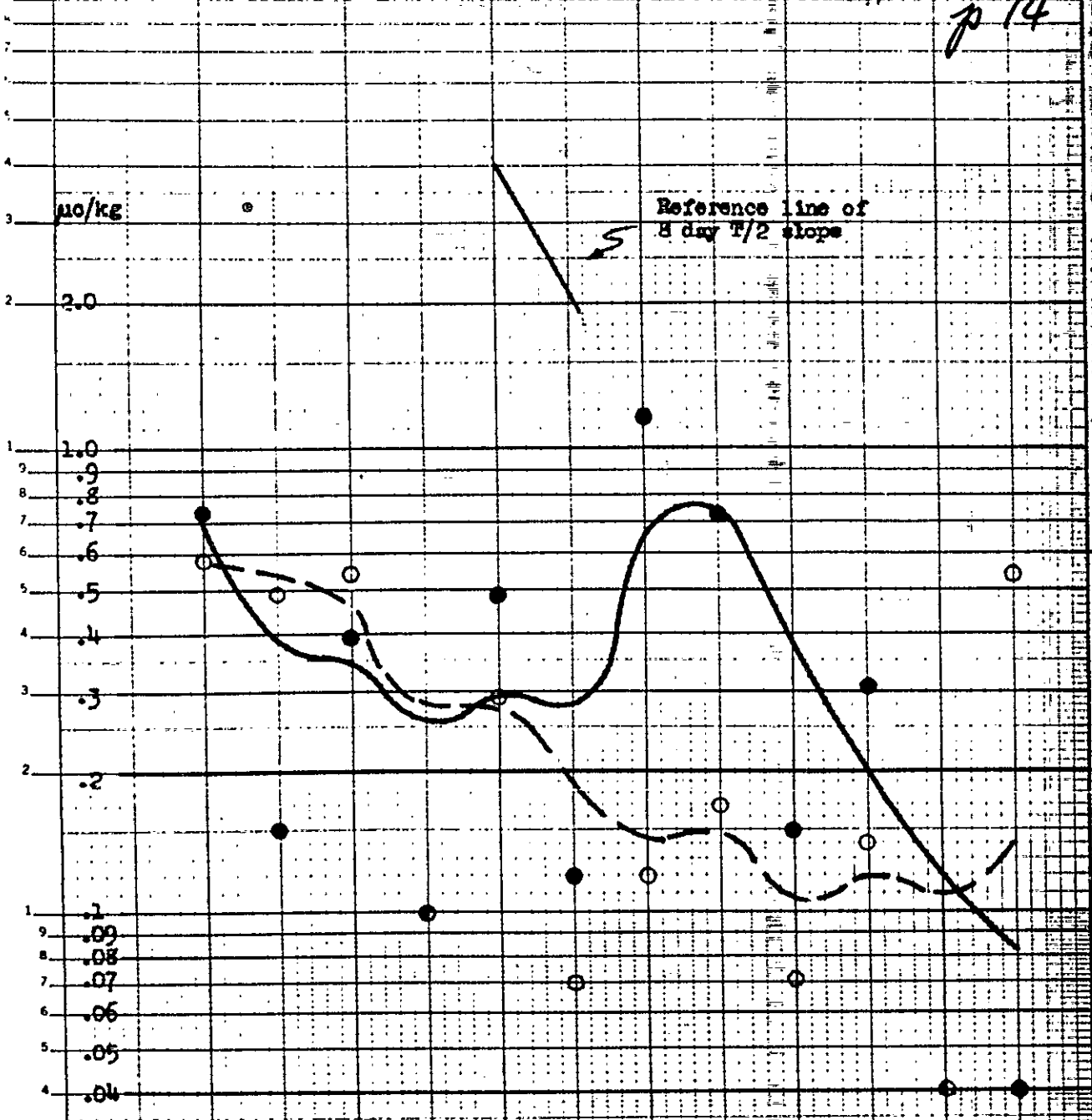
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GRAPH I
THE TREND OF VEGETATION CONTAMINATION (E & G)
in pCi/kg at

Haverland

Midway Power

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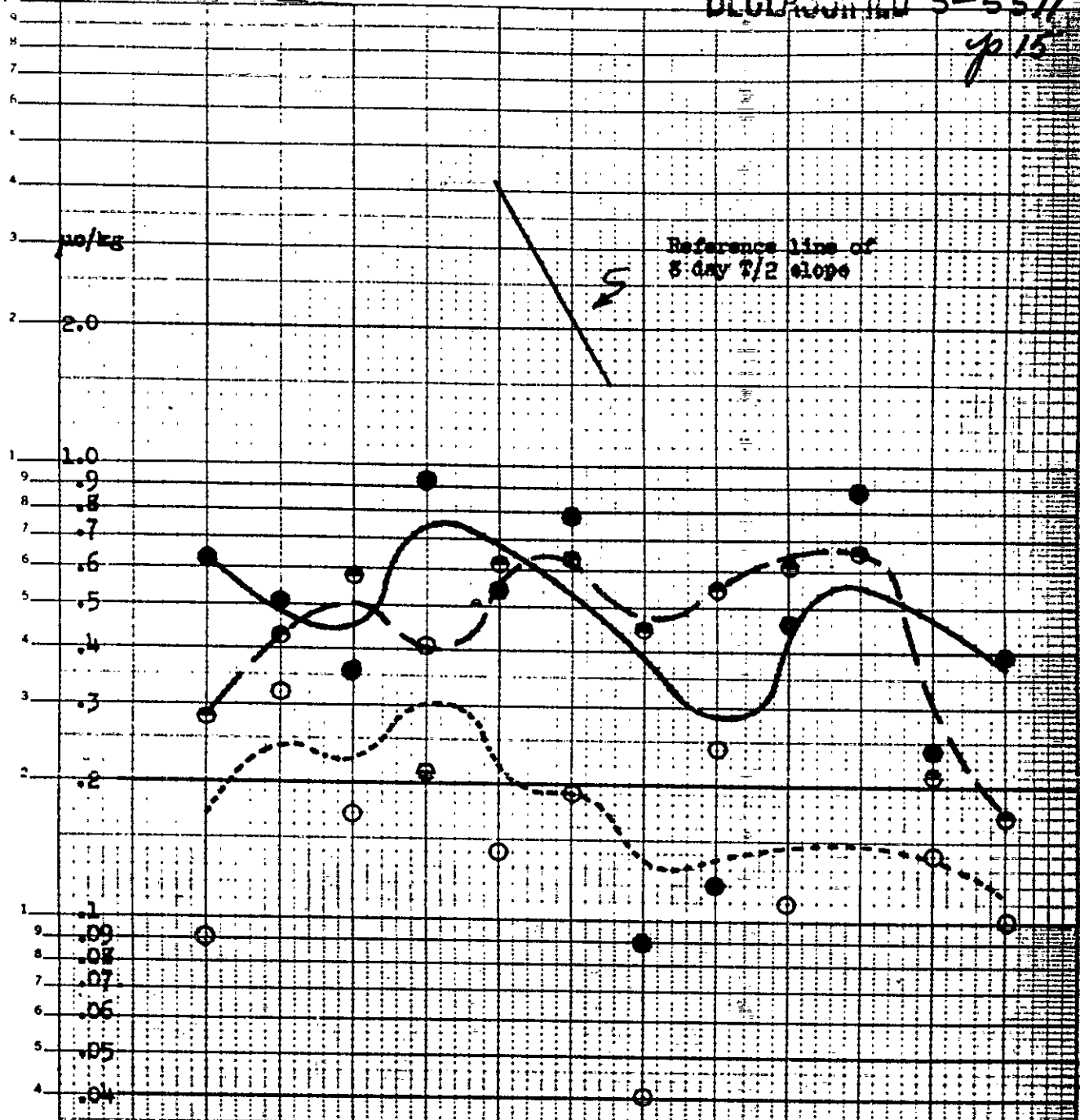
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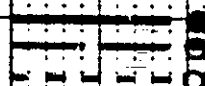
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GRAPH XI

TREND OF VEGETATION CONTAMINATION (S & O)
in pp/kg at

Cable Mountain East end
Cable Mountain West end
Columbia Camp



7 14 21 28 4 11 18 25 4 11 18 25
January February March

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REUPPEL & ESENER CO., N. Y. NO. 354771
Semi-Logarithmic, 1 Cycle. 10 to the left, 10 lines vertical,
width 4.1 x 1.4

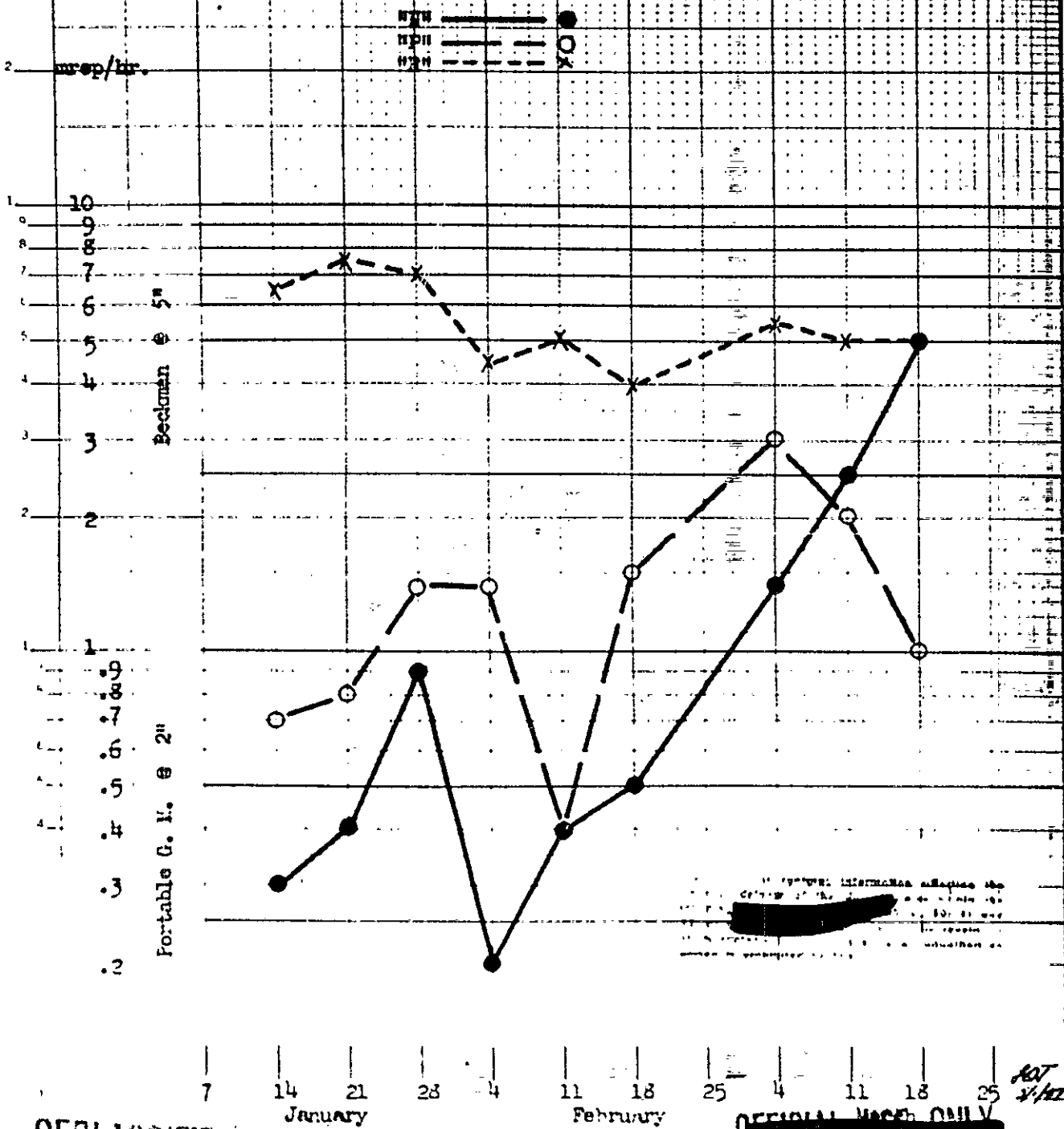
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GRAPH III
THE TREND OF THE MAXIMUM WEEKLY CONTAMINATION (B & G)
OBSERVED AROUND THE WASTE DITCHES
in the 200 North area

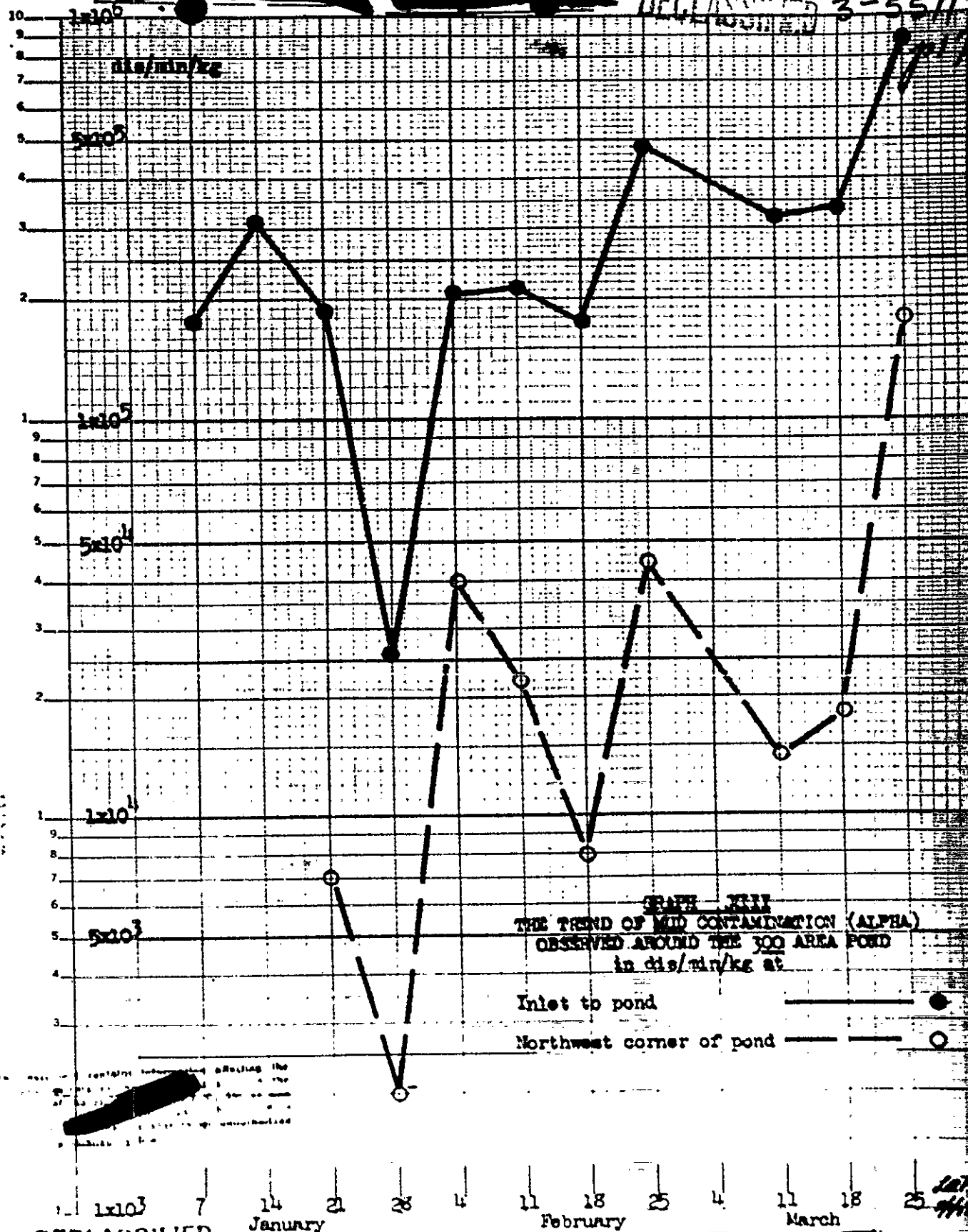


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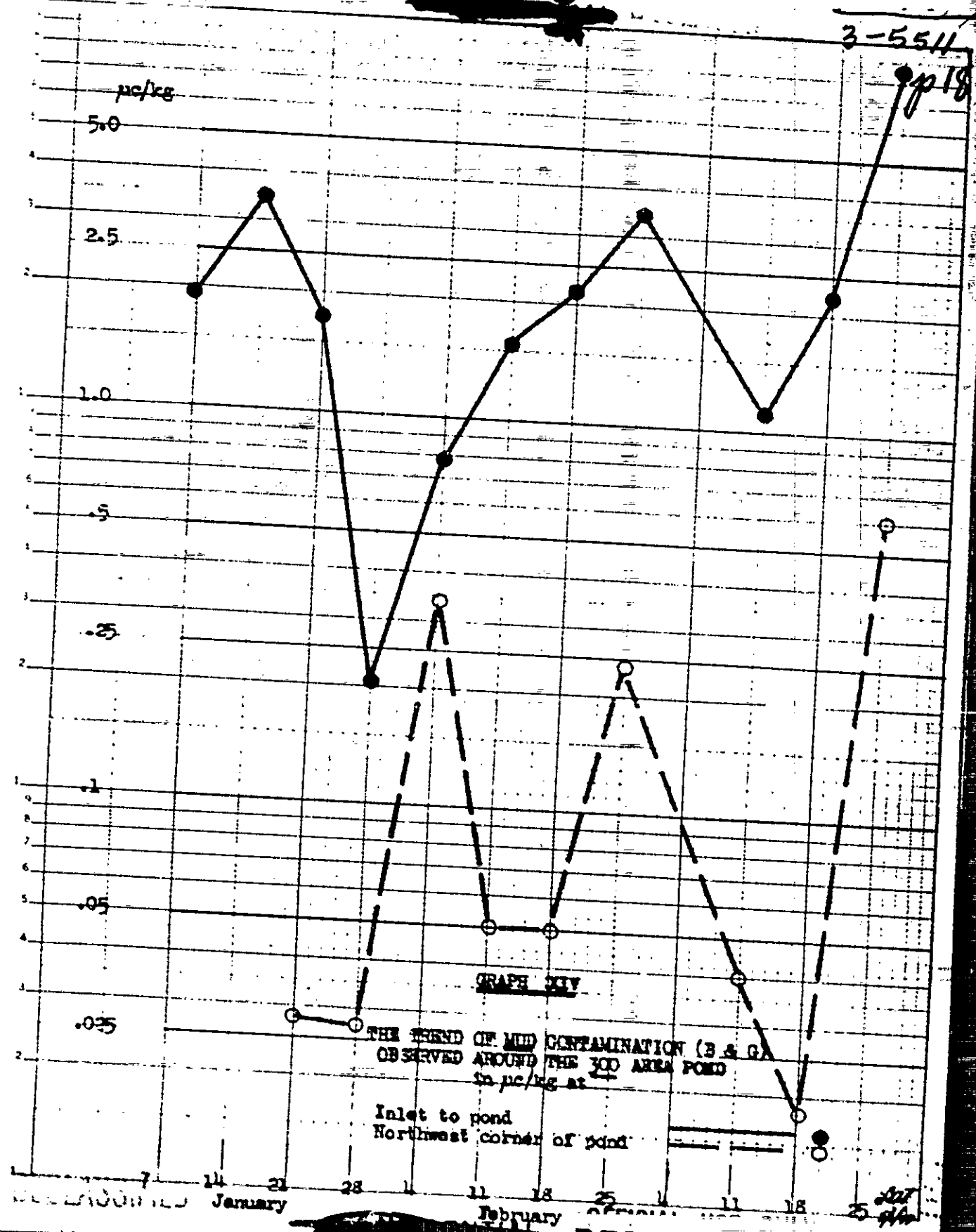
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REFUEL & ENGINE CO. N.Y. NO. 38001
 No. 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000



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1000

dis/min/liter

500

250

100

50

25

10

5

2.5

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GRAPH XV

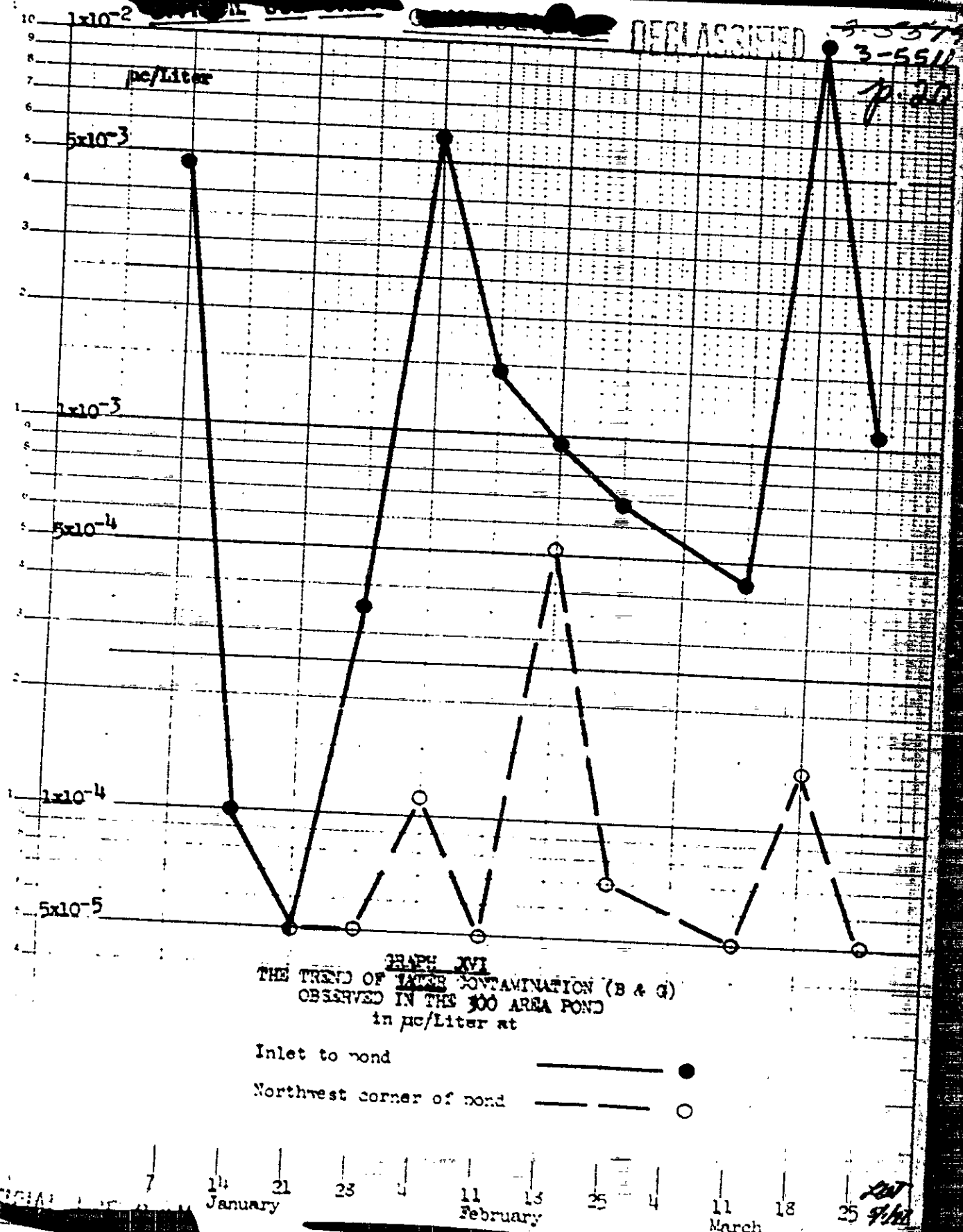
THE TEND OF WATER CONTAMINATION (ALPHA)
OBSERVED IN THE 300 AREA POND
in dis/min/liter

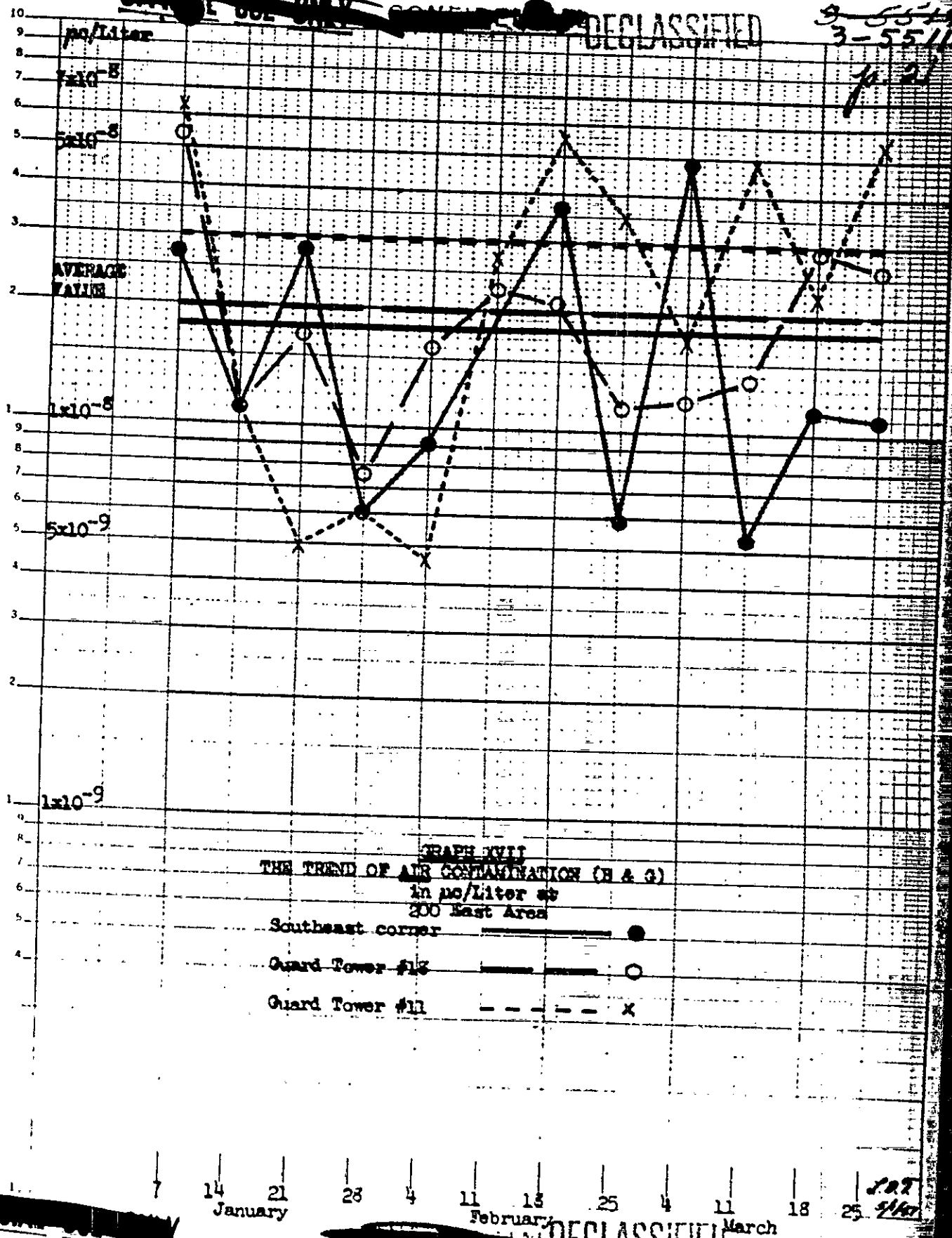
Inlet to pond

Northwest corner of pond

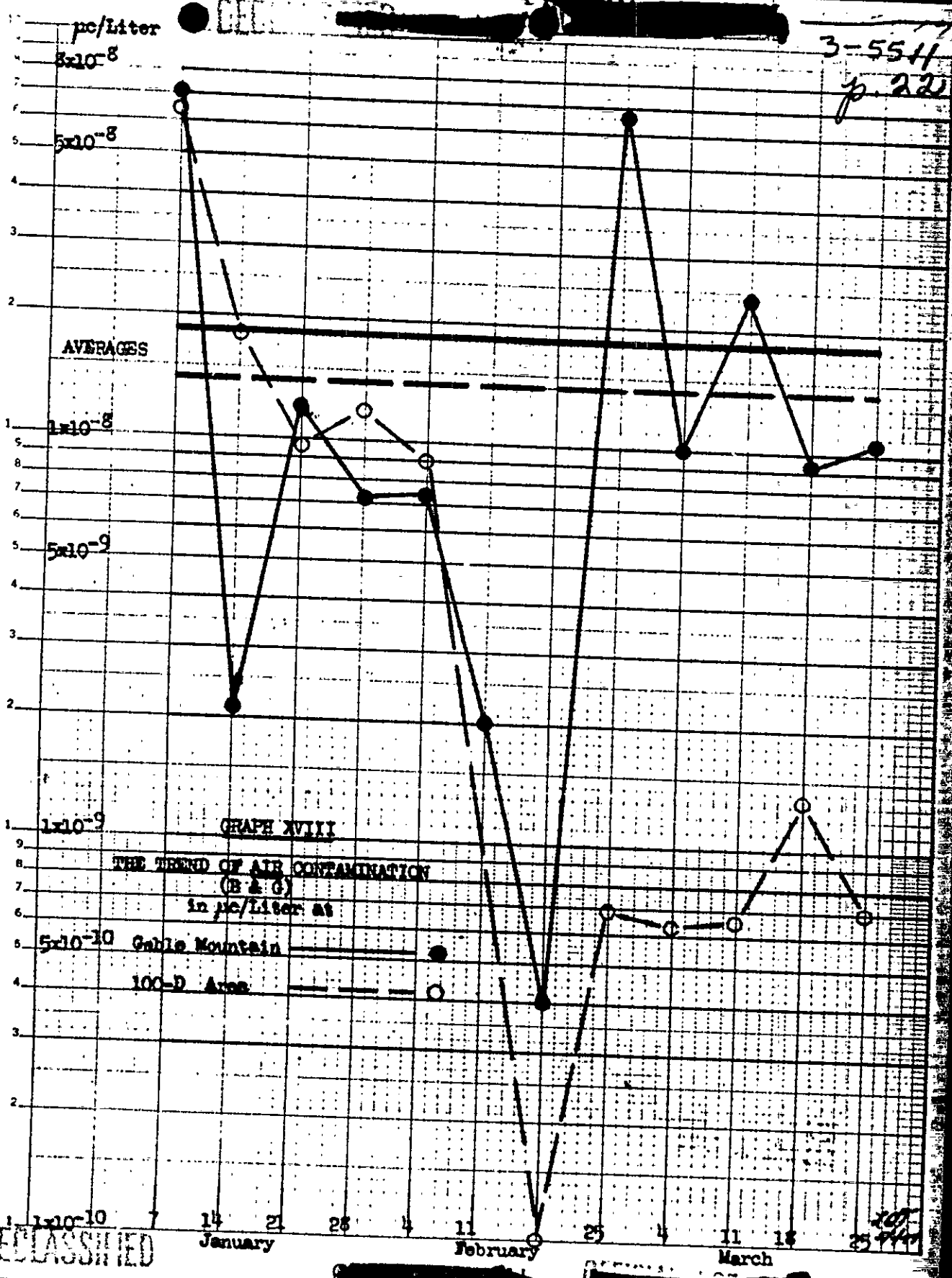
January 7 14 21 28 4 11 18 25 31
February 7 14 21 28 4 11 18 25 31
March 7 14 21 28 4 11 18 25 31

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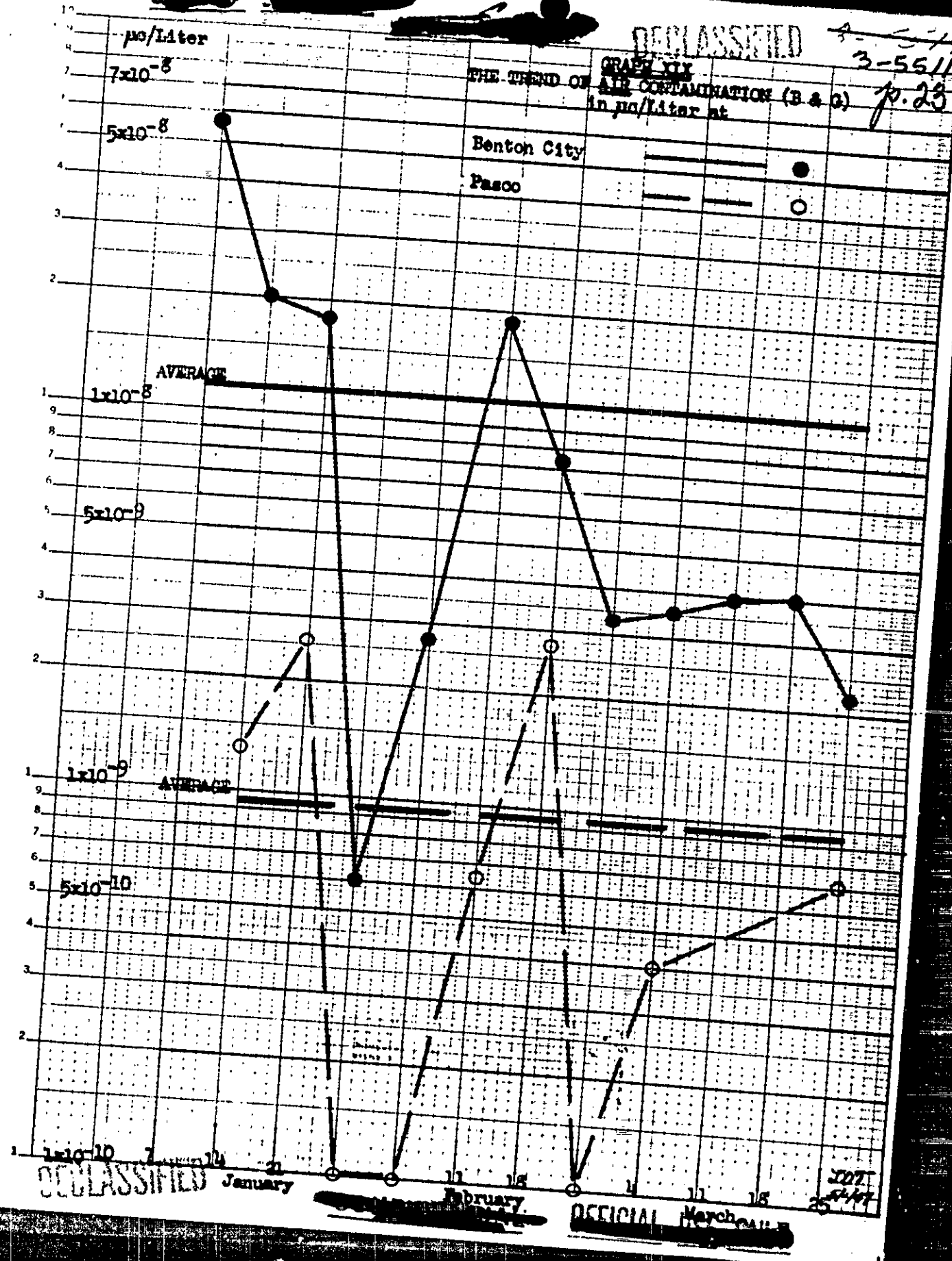
REUPPEL & EASER CO., N.Y. P.O. 35071
Normal Operating Time: 10 to 10:30 p.m. 5 days a week
5000 HOURS

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GRAPH XIX
THE TREND OF AIR CONTAMINATION (B & C)
in $\mu\text{g/Liter}$ at

Benton City
Pasco



ESSEL & ESSER CO., INC., NO. 3507
Semi-Logarithmic, 10 to the 10th, 10 times as great,
10 to the 10th, 10 times as great.

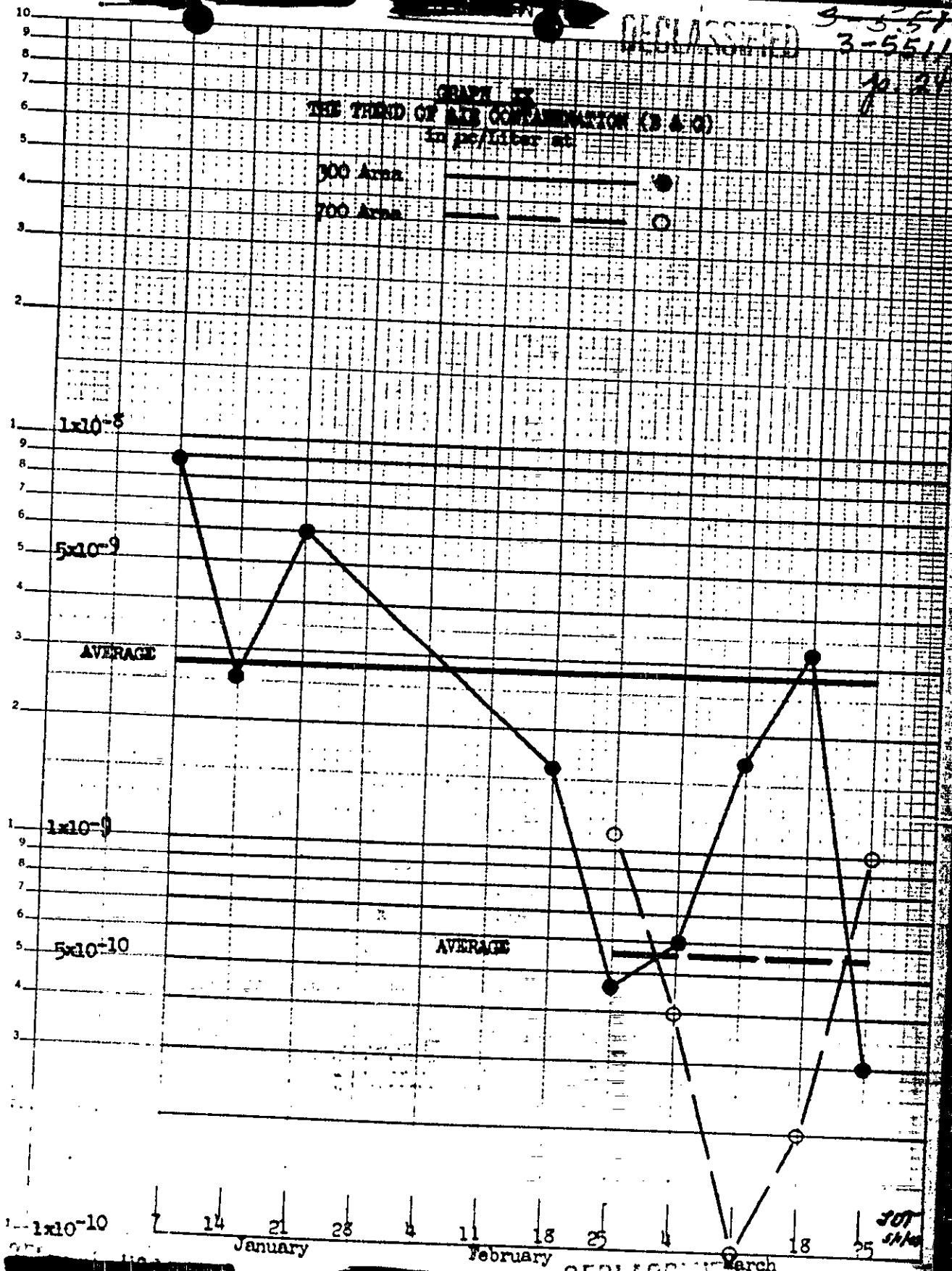
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GRAPH BY
THE THIRD OF AIR CONTAMINATION (B & C)
in pc/liter at

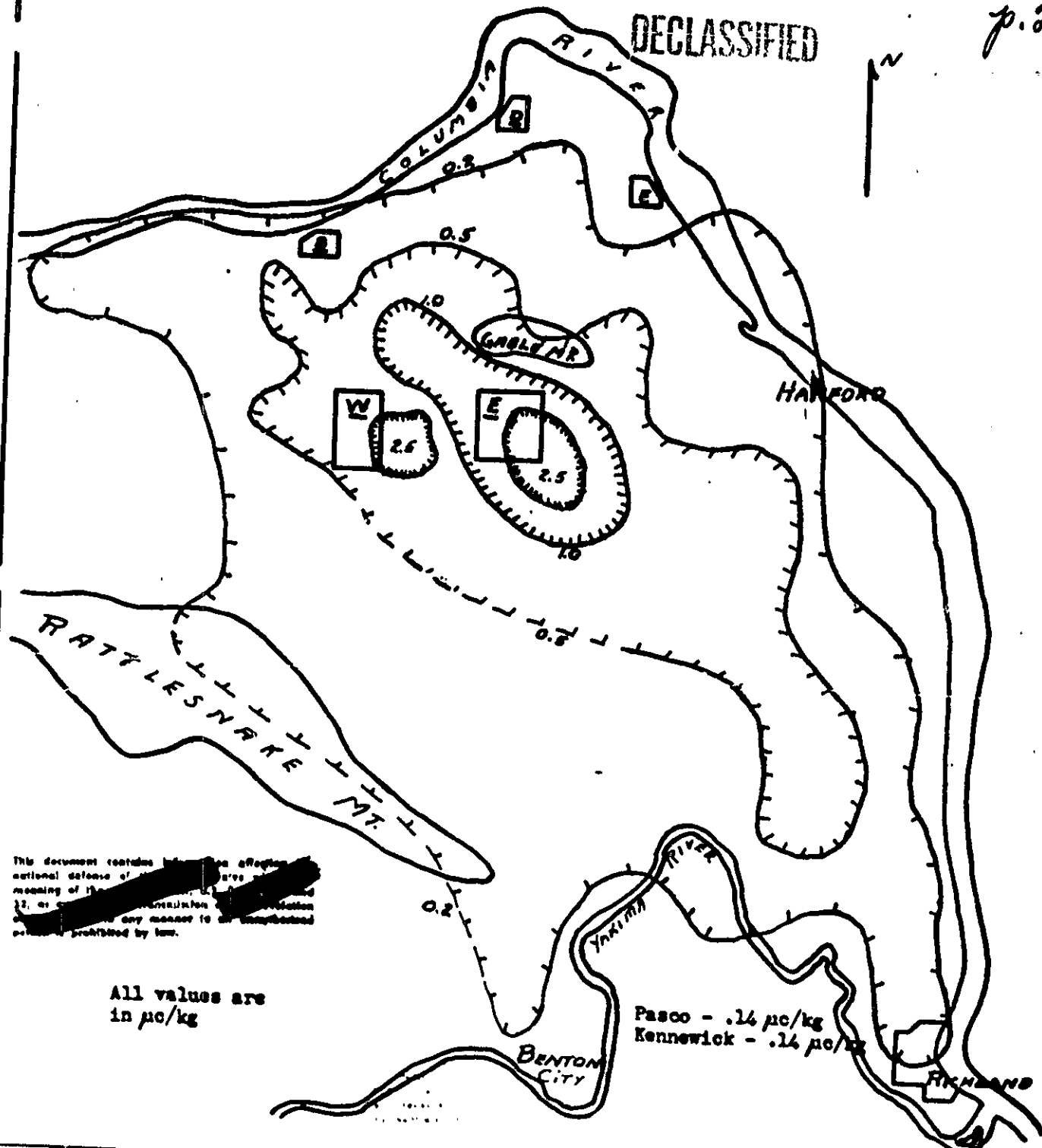


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All values are
in $\mu\text{C}/\text{kg}$

Pasco - .14 $\mu\text{C}/\text{kg}$
Kennewick - .14 $\mu\text{C}/\text{kg}$

HANFORD ENGINEER WORKS		APPROVED	DATE 5-1-47	DRAWN BY L. D. T.
Average Vegetation Contamination Isodose Map for Period Jan. 1 to March 25, 1947			CHECKED	BLDG. NO.
			DWG. NO.	