N68311.000925
NAVSTA LONG BEACH
SSIC #5090.3

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE PROGRAM OFFICE
SOUTHWEST DIVISION, NAVAL FACILITIES ENGINEERING COMMAND
1420 KETTNER BOULEVARD, SUITE 507
SAN DIEGO, CALIFORNIA 92101-2404

11011
Ser 56LB.AL/ 0000582
FEB 27 1997

From: Commander, Southwest Division, Naval Facilities Engineering Command
To: Distribution

Subj: INSTALLATION RESTORATION SITE 7 (WEST BASIN), NAVAL STATION LONG BEACH, LONG BEACH, CALIFORNIA

Encl: (1) Preliminary Results of Additional Analyses for IR Site 7
(2) Minutes of 13 February 1997 Teleconference
(3) Responses to Comments on Draft Remedial Investigation Report for IR Site 7

1. Pursuant to the 13 February 1997 teleconference, enclosures (1) through (3) list the following preliminary results of the additional analyses being conducted for site 7:

- Clusters by variable group (metals, PAHs, PCBs, DDTs, Sulfides, toxicity, and benthic indices)
- Summary statistics
- ANOVA and post-ANOVA statistical testing results
- Matrix of "hit" determinations by station based on zones.
- Graphs of individual analyte concentrations, toxocity data, benthic community data, and physical data sorted by West Basin stations, Reference UPL, Reference UCL, Reference Maximum, ER-L, and ER-M.

2. These additional analyses were performed in support of the Remedial Investigation being conducted for Site 7, in response to the joint Agency comments of 5 August 1996, and as further elaborated on at the 13 February 1997 project status teleconference. This information is being transmitted to you for discussion at the 1 April 1997 technical workshop in Norwalk.

3. In addition to these documents, minutes of the 13 February 1997 teleconference are enclosed. Additional copies of BIN responses to comments were mailed on 20 February 1977 to the Agencies and Trustees under separate cover, as requested at the 13 February 1997 teleconference.

4. Please do not hesitate to contact Omer Kadaster at (562) 807-2178 if additional information is required.

Alan K. Lee

ALAN K. LEE
By direction

Subj: INSTALLATION RESTORATION SITE 7 (WEST BASIN), NAVAL STATION LONG BEACH, LONG BEACH, CALIFORNIA

Distribution:
Mike Radecki, Southwest Division (4 copies)
Chris Leadon, Southwest Division (1 copy)
Anna Ulaszewski, Long Beach Naval Shipyard (1 copy)
Alavaro Gutierrez, Cal-EPA/DTSC (1 copy)
John Christopher, Cal-EPA/DTSC (1 copy)
Martin Hausladen, USEPA-IX (1 copy)
Laurie J. Sullivan, NOAA (1 copy)
Carol Roberts, US Fish & Wildlife (1 copy)
Patricia Velez, California Fish & Game (1 copy)
Hugh Marley, RWQCB (1 copy)

Subj: INSTALLATION RESTORATION SITE 7 (WEST BASIN), NAVAL STATION LONG BEACH, LONG BEACH, CALIFORNIA

Distribution:
Mike Radecki, Southwest Division (4 copies)
Chris Leadon, Southwest Division (1 copy)
Anna Ulaszewski, Long Beach Naval Shipyard (1 copy)
Alavaro Gutierrez, Cal-EPA/DTSC (1 copy)
John Christopher, Cal-EPA/DTSC (1 copy)
Martin Hausladen, USEPA-IX (1 copy)
Laurie J. Sullivan, NOAA (1 copy)
Carol Roberts, US Fish & Wildlife (1 copy)
Patricia Velez, California Fish & Game (1 copy)
Hugh Marley, RWQCB (1 copy)

Blind copy to:
5600/5601
540
56SD.AL
Chron file

Writer: Alan Lee, 56SD.AL, 532-2004 x27
Typist: Norm Lilley, 5640.NL, 2/27/97

njl c:/temp/lee_ste7.doc

925

BECHTEL NATIONAL INC.

CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N-68711-92-D-4670 **Document Control No.** CTO-0026/0446

File Code: 0218.3

TO: Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Selby, Code 57CS.RS
Building 127, Room 110
1220 Pacific Highway
San Diego, CA. 92132-5187

DATE: 27 February 1997
CTO #: 0026
LOCATION: LBNC, Long Beach, CA

FROM: _____ Program / Project Manager

_____ Operations Manager

DESCRIPTION: Transmittal of : Preliminary Results of Additional Analyses; Minutes of 13 February 1997 Teleconference; and, Additional Copies of Responses to Comments, Installation Restoration Site 7 (West Basin) , Naval Station Long Beach, Long Beach, California

TYPE: Contract Deliverable (Cost) _____ CTO Deliverable (Technical) _____ Other: X

VERSION: N/A (e.g., Draft, Draft Final, Final, etc.) REVISION No: N/A

ADMIN RECORD: (PM to Identify) Yes [X] No [ ] U.S. EPA Category _____ Confidential _____

SCHEDULED DELIVERY DATE: 04 Mar 1997 ACTUAL DELIVERY DATE: MAR 04 1997

NUMBER OF COPIES SUBMITTED: 1o/5c/5e

COPIES TO (Include Name, Navy Mail Code, and No. of Copies):

SWDIV:	BECHTEL:	OTHER (Distribution done by Bechtel):
J. Rogers - 5723.JR (1c/1e)	J.W. Kluesener (1c/1e)	Anna Ulaszewski, LBNSY (1 copy)
C. Leadon - 5721.CL (1c/1e)	K.K. Kapur (1c/1e)	Alvaro Gutierrez, Cal-EPA/DTSC (1 copy)
M. Radecki - 56MC.MR (1c/1e)	O. Kadaster (1c/1e)	John Christopher, Cal-EPA/DTSC (1 copy)
A. Lee - 56LB.AL (1c/1e)	Bong Kown (1c/1e)	Martin Hausladen, USEPA-IX (1 copy)
K. Ostrowski - 56LB.KO (1c/1e)	Noriko Kawamoto (1c/1e)	Laurie J. Sullivan, NOAA (1 copy)
	San Diego PDCC (1c/1e)	Carol Roberts, US Fish & Wildlife (1 copy)
	C. PHILLIPS (1C/3E)	Patricia Velez, Cal Fish & Game (1 copy)
		Hugh Marley, RWQCB-LA (1 copy)

Date/Time Received: MAR 4 6 39 AM '97 BRAC OFFICE

CLEAN II Program
Bechtel Job No. 22214
Contract No. N68711-92-D-4670
File Code: 0218.3

IN REPLY REFERENCE: CTO-0026/0446

27 February 1997

Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Selby, Code 57CS.RS
Building 127, Room 110
1220 Pacific Highway
San Diego, CA 92132-5187

Subject: Transmittal of Preliminary Results of Additional Analyses, Minutes of 13 February 1997 Teleconference, and Additional Copies of Responses to Comments
Installation Restoration Site 7 (West Basin), Naval Station Long Beach
Long Beach, California

Dear Mr. Selby:

Enclosed please find five (5) copies of preliminary results of additional analyses performed in support of the Remedial Investigation (RI) being conducted at the Installation Restoration Site 7 (West Basin), Naval Station Long Beach, Long Beach, California as well as five copies of the Minutes of the 13 February 1997 teleconference. These two documents are being transmitted to individual Agencies and Trustees (DTSC, USEPA, USFWS, NOAA and CDFG) for discussion at a technical workshop scheduled for 01 April 1997. Also, additional copies of responses to comments are being forwarded to the Agencies and Trustees as recently requested by them. The responses to comments had already been forwarded to you on 15 January 1997 and therefore were not included in this transmittal.

If you have any questions and/or comments, please feel free to contact Omer Kadaster at (562) 807-2178.

Very truly yours,

K.K. Kapur
Project Manager

Enclosures

N68311.000925
NAVSTA LONG BEACH
SSIC NO. 5090.3

ENCLOSURE 1
PRELIMINARY RESULTS OF ADDITIONAL ANALYSES

DATED 27 FEBRUARY 1997

Exploring Definitions of Sediment Evaluation Zones (SEZs) - Submittal 3

This submittal is the third in a series of exploratory data evaluations in partial response to Problem 4 of the joint Agency/Trustee memorandum of 5 August 1996, and pursuant to a request by the Agencies/Trustees during the 13 February 1997 teleconference. During the teleconference, BNI proposed an alternative to defining SEZs based on separate clustering of data by chemical and biological group. The following paragraphs describe the thought process behind the proposal. The dendrograms and tables of summary statistics contained in this submittal are to be used as supporting data documentation. In addition, BNI discusses the use of the proposed variable group zones with regard to building an evaluation matrix and defining overall West Basin SEZs.

Cluster analysis is being used in these evaluations as the primary tool to develop SEZs for purposes of differentiating patterns among the 34 West Basin stations (pier stations are excluded), and statistical comparisons between non-pier West Basin and reference data. The results of each cluster analysis are presented in dendrograms showing groups of stations according to a Bray-Curtis dissimilarity index shown on the horizontal axis as "Distances". Prior to all of the cluster analyses presented in this submittal, data were transformed by the overall mean value (i.e., D_{ij} = [result of variable j at station i] ÷ [mean result of variable j over all stations]). Echinoderm development data were transformed by first adding 1 and then dividing by mean development over all stations. Pier and reference station data were not included in any of the cluster analyses.

Clusters 50 and 54 were previously provided to the Agencies/Trustees in the second cluster diagram submittal. They are presented again in Submittal 3 in order to more completely outline BNI's thought process in defining SEZs. Cluster 50 is the dendrogram resulting from a cluster analysis of physical parameters only (TOC, total fines, and sulfides). Based on this dendrogram, the non-pier West Basin stations appear to group similarly to the depositional areas of the CLEAN I Work Plan. Cluster 54 is the dendrogram resulting from a cluster analysis of physical and chemical parameters. Based on the Cluster 54 dendrogram, the non-pier West Basin stations appear to group similarly to the SEZs presented in the Draft RI Report. However, the station groupings of Cluster 54 are not similar to Cluster 50. It was thought that chemical patterns would follow physical patterns in the West Basin; this was the premise behind the development of the CLEAN I depositional areas. Upon further inspection of the cluster groupings (or SEZs) resulting from Cluster 54, it was noticed that data variance was high (as predicted by the coefficient of variation [CV]) within each SEZ for most of the analytes (see the attached table of summary statistics).

BNI then combined various biological parameters with chemistry and physical data in an attempt to define SEZs based on all three data types collected from the West Basin. The results of these cluster analyses are presented as dendrograms in Clusters A, B, C, D, and E. While these clusters group stations in what at first appears to be meaningful patterns

(e.g., stations along the seawall are grouped together, and stations near the Shipyard are grouped together), the distances along the x-axis where the branching off of dissimilar stations occurs is relatively high as compared to clustering of only physical, chemical/physical, or biological data (see Clusters 50, 54, and 1 through 41 [1st cluster submittal] for comparison). This discovery prompted further inspection of the data as grouped into SEZs per Clusters A through E. It was noted that variance was high (>>30%) within each zone for each data parameter. Data variance was also high (>30%) within each SEZ as defined by Cluster 54 for most of the analytes (see preceding paragraph). The high variance within each data set as grouped by Clusters 54 and A through E was not consistent with one of the purposes for defining SEZs: providing West Basin sample replication in order to conduct statistical comparisons with reference data. The higher the variance within each data group, the less likely differences between the groups can be statistically detected (e.g., via analysis of variance [ANOVA]), and thus statistical analysis becomes less meaningful.

Due to the undesirably high data variance within SEZs as defined by clustering combined physical, chemical, and biological data, BNI explored an alternate method, wherein data were clustered by chemical and biological groups and used the results of these clusters to define separate SEZs for each chemical and biological group. Accordingly, data were grouped into nine categories (metals, PAHs, PCBs, DDTs, sulfides, echinoderm survival and development, amphipod survival and reburial, polychaete survival, and benthic community total abundance and number of species [taxa]) and then used in the cluster analyses. The dendrograms resulting from these cluster analyses are presented in this submittal package along with the respective tables of summary statistics for each analyte by SEZ. A solid line has been drawn on each dendrogram showing the cutoff where zones were defined by BNI. These cutoffs were defined using best professional judgment. The tables of summary statistics show that the CVs have decreased within data groups (i.e., variance has decreased). Please note that BNI is still exploring various means of inputting data into the cluster analysis (e.g., normalizing data prior to the clustering procedure), and the SEZs described in this submittal are not meant to be considered final.

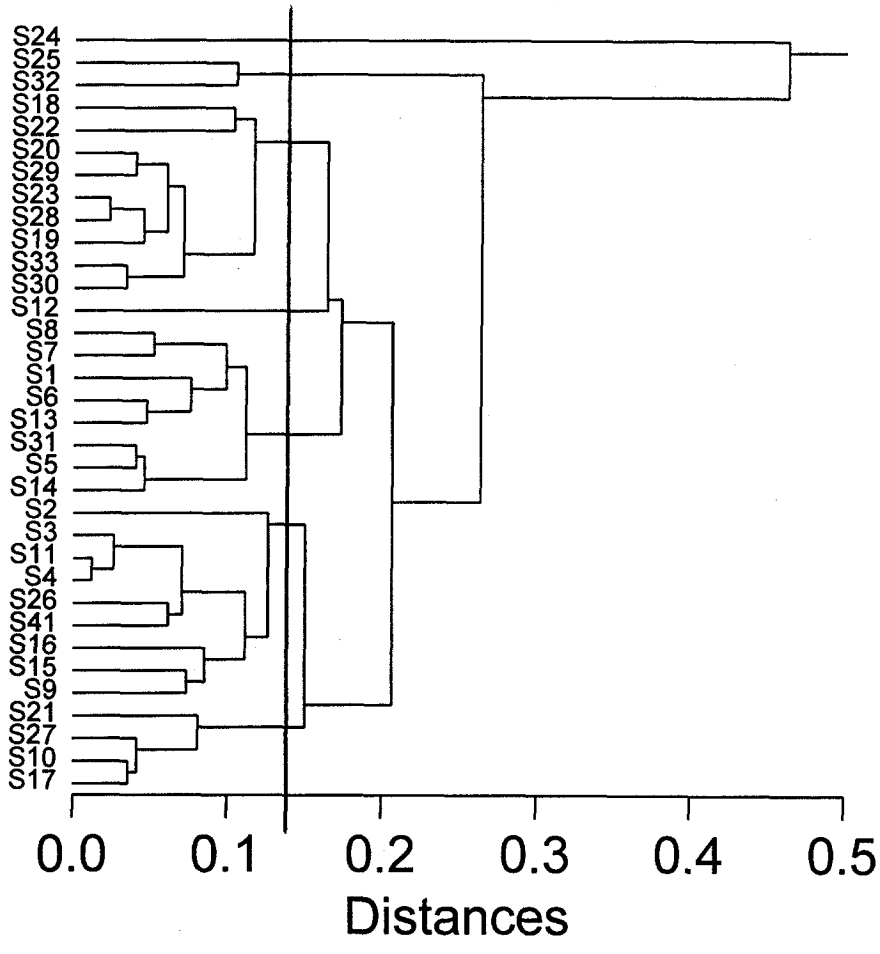
As the next step in defining overall West Basin SEZs, preliminary statistical analyses between West Basin SEZs and reference data were conducted. The results of these analyses are also presented in this submittal. Data were first appropriately transformed (chemistry and benthic community data were log transformed and bioassay data were arcsine transformed) and then analyzed using one-way ANOVAs followed by Tukey pairwise comparison of means using SYSTAT®. Please note that these are preliminary statistical comparisons with reference, and are not meant to represent final results.

After statistical differences from reference were determined, a matrix of "hit" designations for each station was constructed. This matrix table is shown in this submittal package titled "ANOVA Results with Reference n=4". All stations within a group zone that were statistically significantly higher in concentration or lower in

biological measurement from reference are designated as a "hit" ("H" in the table) for the specific analyte tested. The matrix of station "hits" was then used to complete a preliminary evaluation matrix, also included in this submittal, and define overall SEZs for the West Basin. The SEZs will be assigned "AOPC" or "non-AOPC" status based on the criteria established at the onset of this RI (please refer to Tables 3-1 and 4-50 of the Risk Assessment Work Plan and Draft RI Report, respectively). Following this task, those SEZs identified as an AOPC in the evaluation matrix will be evaluated in the ecological risk assessment (ERA) segment of the RI. After completion of the ERA, a final evaluation matrix will be presented designating the SEZs as "AOC" or "no further action".

Cluster Tree

Cluster 50: TOC, Total Fines, and Sulfides



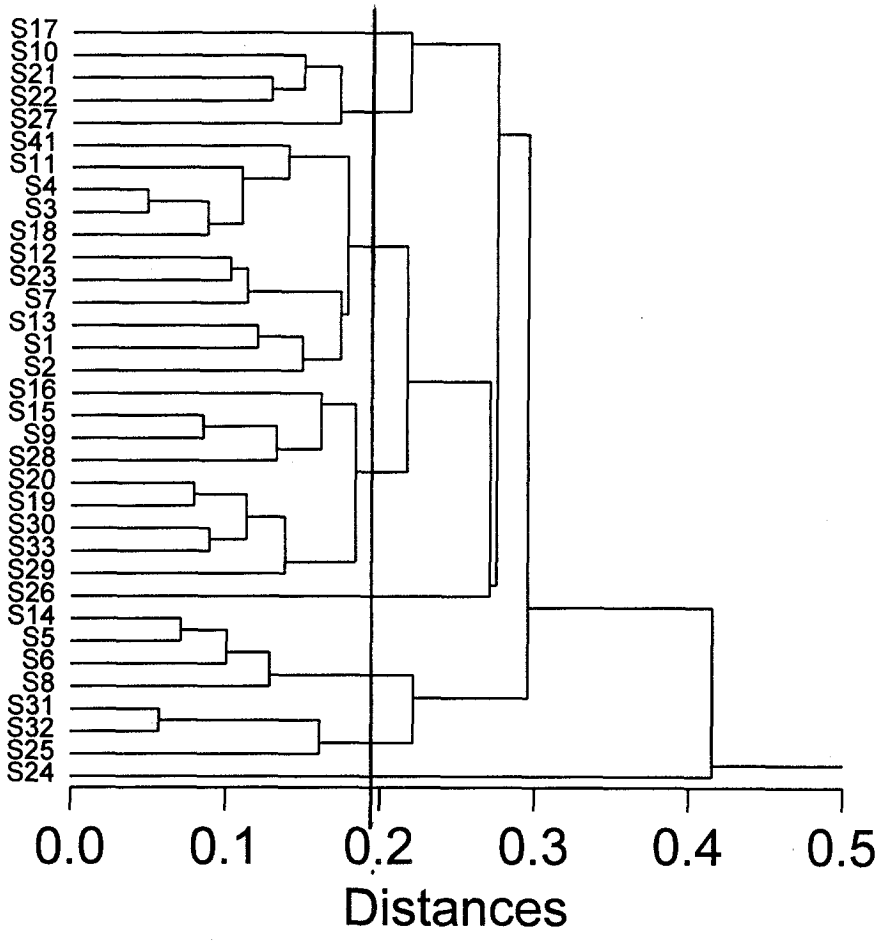
TOC,Fines,Sulfide

STATION ID	SULFIDE	TOC	T_FINES
Cluster 50 Zone 1			
18	110	0.41	83
22	140	0.71	93
20	160	0.7	76
29	150	0.64	70
23	87	0.72	70
28	50	0.71	68
19	33	0.6	68
33	31	0.58	76
30	44	0.52	73
Minimum	31	0.41	68
Maximum	160	0.72	93
Mean	89.4	0.6	75.2
Standard Dev.	52.3	0.1	8.2
CV	58.4	17.0	10.9
Cluster 50 Zone 2			
8	98	0.65	44
7	18	0.67	42
1	17	0.79	53
6	47	0.61	51
13	5.8	0.6	56
31	15	0.49	47
5	14	0.42	45
14	24	0.46	42
Minimum	5.8	0.42	42
Maximum	98	0.79	56
Mean	29.9	0.6	47.5
Standard Dev.	30.1	0.1	5.3
CV	100.7	21.0	11.1
Cluster 50 Zone 3			
2	18	1.1	52
3	31	1.2	71
11	35	1.3	70
4	1.1	1.3	71
26	98	1.3	84
41	120	1.1	77
16	190	0.89	78
15	7.2	0.92	84
9	25	0.92	65
Minimum	1.1	0.89	52
Maximum	190	1.3	84
Mean	58.4	1.1	72.4
Standard Dev.	63.9	0.2	10.0
CV	109.4	15.4	13.8

STATION ID	SULFIDE	TOC	T_FINES
Cluster 50 Zone 4			
21	60	1.5	92
27	240	1.7	91
10	270	1.8	82
17	140	1.8	87
Minimum	60	1.5	82
Maximum	270	1.8	92
Mean	177.5	1.7	88.0
Standard Dev.	96.0	0.1	4.5
CV	54.1	8.3	5.2
24	11	0.069	3.9
25	54	0.56	30
32	41	0.44	24
12	400	0.63	62

Cluster Tree

Cluster 54: Chemicals > 50% Detected, TOC, and Total Fines

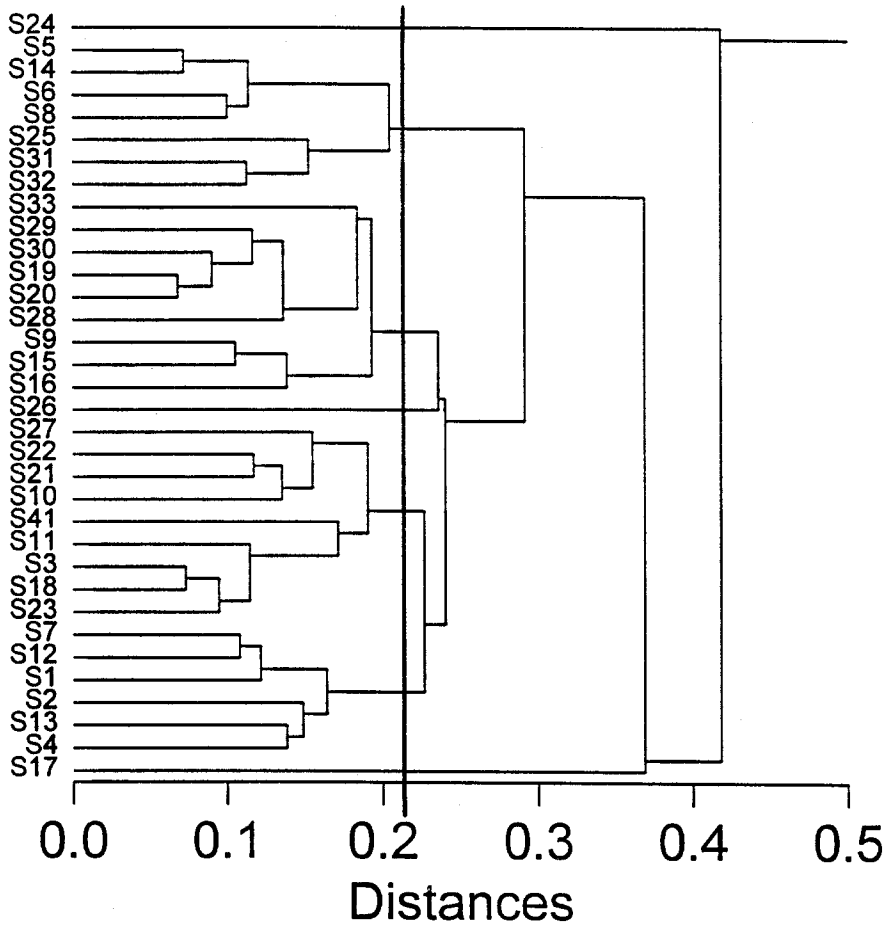


STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster 54 Zone 1																									
10	20	88	12	200	540	500	340	660	0.68	0.32	1.8	54	390	210	160	360	77	0.57	32	540	340	3.4	270	82	250
21	11	92	16	280	440	510	300	550	0.69	1	1.5	67	550	220	320	300	78	0.74	37	230	350	3	60	92	300
22	16	130	17	130	300	410	150	300	1	0.91	0.71	71	280	210	76	150	89	0.48	41	410	150	3.5	140	93	300
27	12	100	13		48	48		72	0.72	0.48	1.7	65	48	220	24		75	0.87	34	430	48	3.4	240	91	240
Minimum	11	88	12	130	48	48	150	72	0.68	0.32	0.71	54	48	210	24	150	75	0.48	32	230	48	3	60	82	240
Maximum	20	130	17	280	540	510	340	660	1	1	1.8	71	550	220	320	360	89	0.87	41	540	350	3.5	270	93	300
Mean	14.8	102.5	14.5	203.3	332.0	367.0	263.3	395.5	0.8	0.7	1.4	64.3	317.0	215.0	145.0	270.0	79.8	0.7	36.0	402.5	222.0	3.3	177.5	89.5	272.5
Standard Dev.	4.1	19.0	2.4	75.1	213.4	217.4	100.2	263.1	0.2	0.3	0.5	7.3	210.8	5.8	129.4	108.2	6.3	0.2	3.9	128.4	148.1	0.2	96.0	5.1	32.0
Coefficient of Var.	27.9	18.5	16.4	36.9	64.3	59.2	38.0	66.5	19.8	48.6	34.6	11.3	66.5	2.7	89.3	40.1	7.9	26.2	10.9	31.9	66.7	6.7	54.1	5.7	11.7
Cluster 54 Zone 2																									
41	20	110	11	140	340	440	160	400	0.6	0.72	1.1	44	220	120	140	160	74	1.1	20	220	140	2.4	120	77	220
11	0.45	57	12	92	310	370	200	370	0.55	0.35	1.3	42	150	120	92	200	62	0.7	22	310	110	2.2	35	70	200
4	10	72	12	10	220	320	10	250	0.54	0.41	1.3	39	10	120	10	10	52	0.72	27	250	10	2.7	1.1	71	170
3	7.1	67	12	59	200	240	120	310	0.59	0.45	1.2	39	79	130		120	51	0.85	24	240		2.6	31	71	170
18	7.9	57	11	120	240	260	220	320	0.61	0.51	0.41	43	220	110	120	220	49	0.57	26	200	120	2.4	110	83	170
12	7.1	36	8	36	110	150	91	180	0.55	0.27	0.63	33		69	55	91	38	0.38	22	110	55	2	400	62	130
23	7	61	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	81	130	140	38	0.31	22	160	140	2.2	87	70	140
7	9.2	31	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	73	81	130	37	0.41	16	150	65	2.3	18	42	110
13	16	50	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	150	10	10	58	0.68	22	370	10	2.3	5.8	56	160
1	13	34	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	110	28	71	39	0.62	21	170	43	2	17	53	150
2	6.9	46	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	130	16	32	45	0.59	16	290	32	2.6	18	52	160
Minimum	0.45	31	6.8	10	64	96	10	80	0.32	0.16	0.41	29	10	69	10	10	37	0.31	16	110	10	2	1.1	42	110
Maximum	20	110	12	140	340	440	220	400	0.61	0.72	1.3	44	230	150	140	220	74	1.1	27	370	140	2.7	400	83	220
Mean	9.5	56.5	9.6	63.3	193.1	237.8	116.1	250.9	0.5	0.4	0.9	37.5	119.4	110.3	68.2	107.6	49.4	0.6	21.6	224.5	72.5	2.3	76.6	64.3	161.8
Standard Dev.	5.2	22.3	2.0	46.3	82.8	104.0	63.4	100.5	0.1	0.2	0.3	5.0	87.1	25.7	51.3	72.1	11.8	0.2	3.5	77.5	51.1	0.2	115.2	12.3	30.6
Coefficient of Var.	55.0	39.5	21.2	73.2	42.9	43.7	54.6	40.1	16.3	42.5	35.2	13.3	72.9	23.3	75.2	67.0	23.9	35.6	16.0	34.5	70.4	10.0	150.3	19.2	18.9
Cluster 54 Zone 3																									
16	42	60	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	92	10	10	46	0.54	26	150	10	2.6	190	78	160
15	20	43	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	88	10	10	45	0.51	25	120	10	2.5	7.2	84	160
9	8.4	46	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	96	18	36	48	0.59	25	150	18	2.3	25	65	160
28	7	54	12	10	36	36	10	36	0.54	0.41	0.71	39	36	110	18	10	43	0.34	27	140	18	5.2	50	68	160
20	4.9	37	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	76	40	40	41	0.31	25	75	40	2.5	160	76	150
19	4.5	38	10	45	87	45	45	120	0.52	0.37	0.6	37	45	68	45	45	37	0.31	23	56	45	2.1	33	68	130
30	5.9	33	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	52	16	10	31	0.23	21	51	33	2	44	73	120
33	4.8	41	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	50	10	10	28	0.26	26	31	10	2.2	31	76	110
29	0.45	43	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	52	10	10	30	0.13	24	10	10	1.9	150	70	110
Minimum	0.45	33	4.8	10	10	10	10	10	0.49	0.24	0.52	33	10	50	10	10	28	0.13	21	10	10	1.9	7.2	65	110
Maximum	42	60	12	45	100	100	45	120	0.69	0.42	0.92	42	85	110	45	45	48	0.59	27	150	45	5.2	190	84	160
Mean	10.9	43.9	8.8	18.1	44.7	42.0	20.1	52.7	0.6	0.4	0.7	38.0	32.4	76.0	19.7	20.1	38.8	0.4	24.7	87.0	21.6	2.6	76.7	73.1	140.0
Standard Dev.	12.8	8.5	2.0	14.1	32.2	29.8	15.3	36.8	0.1	0.1	0.2	3.7	25.9	21.9	13.5	15.3	7.5	0.2	1.8	54.0	14.1	1.0	69.3	6.0	22.4
Coefficient of Var.	118.0	19.3	22.4	78.0	72.0	70.9	76.2	69.9	12.3	16.4	21.4	9.8	79.9	28.9	68.4	76.2	19.5	43.4	7.3	62.0	65.2	38.9	90.4	8.2	16.0

STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster 54 Zone 4																									
14	0.4	17	6	32	95	130	63	140	0.32	0.14	0.46	25	63	47	10	63	21	0.21	17	63	10	1.6	24	42	85
5	1.9	13	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	54		75	21	0.22	13	67		1.3	14	45	94
6	0.4	21	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	67	30	46	26	0.23	18	110	30	1.5	47	51	110
8	4.1	25	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	54	33	49	43	0.34	16	97	33	1.3	98	44	110
Minimum	0.4	13	4.6	10	82	98	46	130	0.3	0.14	0.42	22	49	47	10	46	21	0.21	13	63	10	1.3	14	42	85
Maximum	4.1	25	6	60	120	150	75	180	0.33	0.24	0.65	27	100	67	33	75	43	0.34	18	110	33	1.6	98	51	110
Mean	1.7	19.0	5.3	37.0	99.3	132.0	58.3	157.5	0.3	0.2	0.5	25.0	75.8	55.5	24.3	58.3	27.8	0.3	16.0	84.3	24.3	1.4	45.8	45.5	99.8
Standard Dev.	1.7	5.2	0.6	21.3	15.8	24.5	13.4	26.3	0.0	0.0	0.1	2.2	23.8	8.3	12.5	13.4	10.4	0.1	2.2	22.9	12.5	0.2	37.5	3.9	12.4
Coefficient of Var.	102.9	27.2	10.9	57.6	15.9	18.6	23.0	16.7	4.8	25.9	21.0	8.6	31.4	15.0	51.4	23.0	37.6	24.2	13.5	27.2	51.4	10.5	81.9	8.5	12.4
Cluster 54 Zone 5																									
31	3.8	31	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	30	10	10	19	0.13	16	10	10	1.4	15	47	68
32	3	27	5	10	10	10	10	10	0.31	0.13	0.44	22	10	27	10	10	17	0.11	16	10	10	1.4	41	24	63
25	0.35	18	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	30	35	35	16	0.11	16	5	35	1.3	54	30	73
Minimum	0.35	18	1.6	10	10	10	10	10	0.28	0.13	0.44	21	10	27	10	10	16	0.11	16	5	10	1.3	15	24	63
Maximum	3.8	31	5.2	35	35	35	35	35	0.31	0.26	0.56	22	35	30	35	35	19	0.13	16	10	35	1.4	54	47	73
Mean	2.4	25.3	3.9	18.3	18.3	18.3	18.3	18.3	0.3	0.2	0.5	21.7	18.3	29.0	18.3	18.3	17.3	0.1	16.0	8.3	18.3	1.4	36.7	33.7	68.0
Standard Dev.	1.8	6.7	2.0	14.4	14.4	14.4	14.4	14.4	0.0	0.1	0.1	0.6	14.4	1.7	14.4	14.4	1.5	0.0	0.0	2.9	14.4	0.1	19.9	11.9	5.0
Coefficient of Var.	75.8	26.3	51.4	78.7	78.7	78.7	78.7	78.7	5.8	40.9	12.1	2.7	78.7	6.0	78.7	78.7	8.8	9.9	0.0	34.6	78.7	4.2	54.2	35.4	7.4
24	0.35	6	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	13	5	5	5.2	0.015	7.8	5	5	0.35	11	3.9	33
17	33	180	19	150	500	680	380	480	0.75	1	1.8	88	380	530	150	400	180	1.8	35	880	180	3.8	140	87	480
26	9.8	65	13	38	96	130	58	120	0.77	0.46	1.3	48	58	120	38	58	56	0.48	33	130	38	19	98	84	190

Cluster Tree

Cluster A: Chemistry (>50%), Physical, Echinoderm Development, Amphipod Survival, and Polychaete Growth

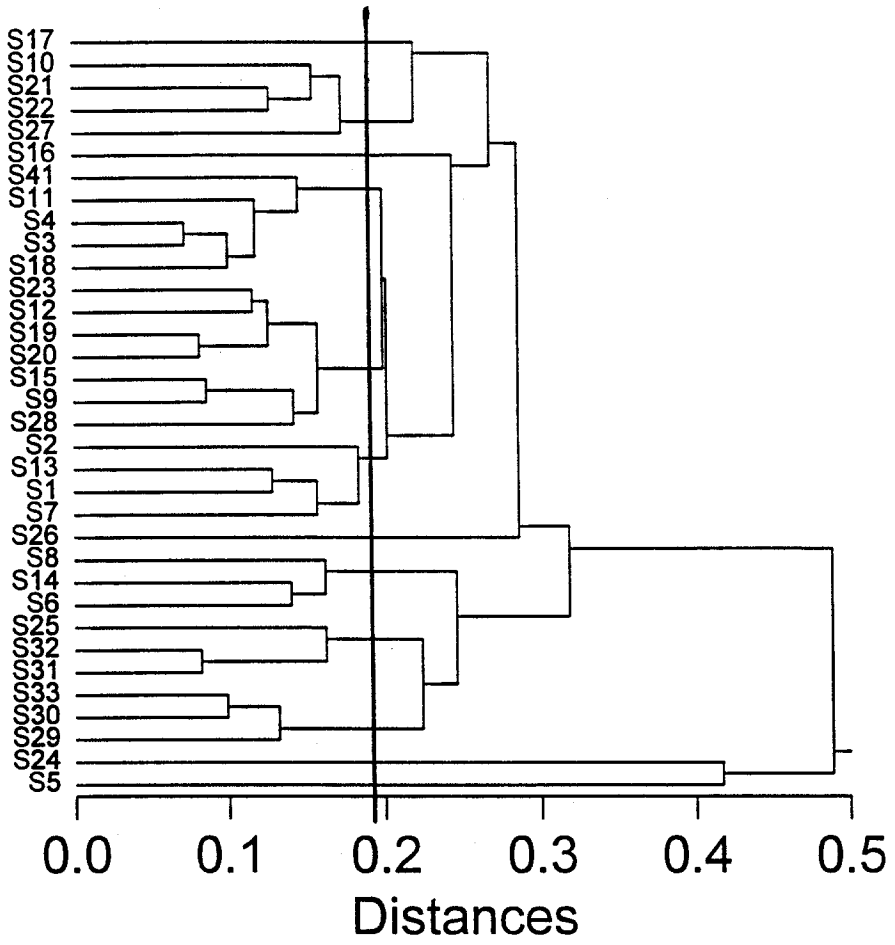


STATION ID	DDD	DDE	AMPH_SUR	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	ECH_DEV	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	POLY_GR	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster A Zone 1																												
5	1.9	13	87	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	54	7		75	21	0.22	13	67	0.132		1.3	14	45	94
14	0.4	17	96.3	6	32	95	130	63	140	0.32	0.14	0.46	25	63	47	0	10	63	21	0.21	17	63	0.123	10	1.6	24	42	85
6	0.4	21	87	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	67	0	30	46	26	0.23	18	110	0.098	30	1.5	47	51	110
8	4.1	25	87	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	54	0.7	33	49	43	0.34	16	97	0.104	33	1.3	98	44	110
25	0.35	18	93	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	30	0	35	35	16	0.11	16	5	0.101	35	1.3	54	30	73
31	3.8	31	86	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	30	0	10	10	19	0.13	16	10	0.094	10	1.4	15	47	68
32	3	27	91	5	10	10	10	10	10	0.31	0.13	0.44	22	10	27	40.3	10	10	17	0.11	16	10	0.11	10	1.4	41	24	63
Minimum	0.35	13	86	1.6	10	10	10	10	10	0.28	0.13	0.42	21	10	27	0	10	10	16	0.11	13	5	0.094	10	1.3	14	24	63
Maximum	4.1	31	96.3	6	60	120	150	75	180	0.33	0.26	0.65	27	100	67	40.3	35	75	43	0.34	18	110	0.132	35	1.6	98	51	110
Mean	2.0	21.7	89.6	4.7	29.0	64.6	83.3	41.1	97.9	0.3	0.2	0.5	23.6	51.1	44.1	6.9	21.3	41.1	23.3	0.2	16.0	51.7	0.1	21.3	1.4	41.9	40.4	86.1
Standard Dev.	1.7	6.3	3.9	1.4	19.9	45.4	63.7	24.8	77.1	0.0	0.1	0.1	2.4	36.0	15.4	15.0	12.5	24.8	9.3	0.1	1.5	43.7	0.0	12.5	0.1	29.3	9.7	19.3
Coefficient of Var.	83.2	29.0	4.4	30.5	68.6	70.4	76.5	60.3	78.8	5.2	29.8	17.2	10.1	70.3	34.8	218.3	58.7	60.3	39.9	43.2	9.5	84.6	12.8	58.7	8.2	69.9	24.1	22.4
Cluster A Zone 2																												
33	4.8	41	83	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	50	0.5	10	10	28	0.26	26	31	0.104	10	2.2	31	76	110
29	0.45	43	83	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	52	96.3	10	10	30	0.13	24	10	0.092	10	1.9	150	70	110
30	5.9	33	83.5	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	52	93.3	16	10	31	0.23	21	51	0.067	33	2	44	73	120
19	4.5	38	89	10	45	87	45	45	120	0.52	0.37	0.6	37	45	68	86.7	45	45	37	0.31	23	56	0.088	45	2.1	33	68	130
20	4.9	37	87	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	76	92.3	40	40	41	0.31	25	75	0.077	40	2.5	160	76	150
28	7	54	90	12	10	36	36	10	36	0.54	0.41	0.71	39	36	110	94.3	18	10	43	0.34	27	140	0.066	18	5.2	50	68	160
9	8.4	46	88	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	96	11	18	36	48	0.59	25	150	0.095	18	2.3	25	65	160
15	20	43	93	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	88	57	10	10	45	0.51	25	120	0.089	10	2.5	7.2	84	160
16	42	60	91	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	92	67.7	10	10	46	0.54	26	150	0.093	10	2.6	190	78	160
Minimum	0.45	33	83	4.8	10	10	10	10	10	0.49	0.24	0.52	33	10	50	0.5	10	10	28	0.13	21	10	0.066	10	1.9	7.2	65	110
Maximum	42	60	93	12	45	100	100	45	120	0.69	0.42	0.92	42	85	110	96.3	45	45	48	0.59	27	150	0.104	45	5.2	190	84	160
Mean	10.9	43.9	87.5	8.8	18.1	44.7	42.0	20.1	52.7	0.6	0.4	0.7	38.0	32.4	76.0	66.6	19.7	20.1	38.8	0.4	24.7	87.0	0.1	21.6	2.6	76.7	73.1	140.0
Standard Dev.	12.8	8.5	3.7	2.0	14.1	32.2	29.8	15.3	36.8	0.1	0.1	0.2	3.7	25.9	21.9	37.0	13.5	15.3	7.5	0.2	1.8	54.0	0.0	14.1	1.0	69.3	6.0	22.4
Coefficient of Var.	118.0	19.3	4.2	22.4	78.0	72.0	70.9	76.2	69.9	12.3	16.4	21.4	9.8	79.9	28.9	55.7	68.4	76.2	19.5	43.4	7.3	62.0	15.1	65.2	38.9	90.4	8.2	16.0
Cluster A Zone 3																												
27	12	100	81	13		48	48		72	0.72	0.48	1.7	65	48	220	93.7	24		75	0.87	34	430	0.076	48	3.4	240	91	240
22	16	130	90	17	130	300	410	150	300	1	0.91	0.71	71	280	210	89.3	76	150	89	0.48	41	410	0.085	150	3.5	140	93	300
21	11	92	85	16	280	440	510	300	550	0.69	1	1.5	67	550	220	92.3	320	300	78	0.74	37	230	0.066	350	3	60	92	300
10	20	88	91	12	200	540	500	340	660	0.68	0.32	1.8	54	390	210	89.7	160	360	77	0.57	32	540	0.101	340	3.4	270	82	250
41	20	110	57	11	140	340	440	160	400	0.6	0.72	1.1	44	220	120	51.3	140	160	74	1.1	20	220	0.077	140	2.4	120	77	220
11	0.45	57	98.8	12	92	310	370	200	370	0.55	0.35	1.3	42	150	120	87.3	92	200	62	0.7	22	310	0.106	110	2.2	35	70	200
3	7.1	67	93	12	59	200	240	120	310	0.59	0.45	1.2	39	79	130	84		120	51	0.85	24	240	0.075		2.6	31	71	170
18	7.9	57	92	11	120	240	260	220	320	0.61	0.51	0.41	43	220	110	86.7	120	220	49	0.57	26	200	0.097	120	2.4	110	83	170
23	7	61	95	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	81	93.3	130	140	38	0.31	22	160	0.093	140	2.2	87	70	140
Minimum	0.45	57	57	8.5	59	48	48	120	72	0.54	0.32	0.41	39	48	81	51.3	24	120	38	0.31	20	160	0.066	48	2.2	31	70	140
Maximum	20	130	98.8	17	280	540	510	340	660	1	1	1.8	71	550	220	93.7	320	360	89	1.1	41	540	0.106	350	3.5	270	93	300
Mean	11.3	84.7	87.0	12.5	141.4	288.7	333.1	203.8	363.6	0.7	0.6	1.2	51.7	240.8	157.9	85.3	132.8	206.3	65.9	0.7	28.7	304.4	0.1	174.8	2.8	121.4	81.0	221.1
Standard Dev.	6.5	26.0	12.4	2.6	69.1	145.5	152.5	79.3	167.0	0.1	0.3	0.5	12.8	154.9	55.9	13.1	86.8	84.3	16.8	0.2	7.5	128.0	0.0	109.7	0.5	84.6	9.5	56.9
Coefficient of Var.	57.8	30.7	14.3	20.8	48.9	50.4	45.8	38.9	45.9	21.1	44.3	40.9	24.8	64.3	35.4	15.4	65.4	40.9	25.5	34.3	26.3	42.0	15.9	62.8	19.3	69.6	11.8	25.7

STATION ID	DDD	DDE	AMPH_SUR	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	ECH_DEV	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	POLY_GR	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster A Zone 4																												
7	9.2	31	87	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	73	0	81	130	37	0.41	16	150	0.103	65	2.3	18	42	110
12	7.1	36	88	8	36	110	150	91	180	0.55	0.27	0.63	33		69	0.3	55	91	38	0.38	22	110	0.095	55	2	400	62	130
1	13	34	85	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	110	1	28	71	39	0.62	21	170	0.134	43	2	17	53	150
2	6.9	46	91	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	130	0	16	32	45	0.59	16	290	0.116	32	2.6	18	52	160
13	16	50	92.5	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	150	0.3	10	10	58	0.68	22	370	0.087	10	2.3	5.8	56	160
4	10	72	90	12	10	220	320	10	250	0.54	0.41	1.3	39	10	120	0	10	10	52	0.72	27	250	0.068	10	2.7	1.1	71	170
Minimum	6.9	31	85	6.8	10	64	96	10	80	0.32	0.16	0.6	29	10	69	0	10	10	37	0.38	16	110	0.068	10	2	1.1	42	110
Maximum	16	72	92.5	12	65	220	320	130	260	0.55	0.46	1.3	39	150	150	1	81	130	58	0.72	27	370	0.134	65	2.7	400	71	170
Mean	10.4	44.8	88.9	8.6	29.2	142.3	181.0	72.8	178.3	0.5	0.3	0.8	34.2	59.0	108.7	0.3	33.3	57.3	44.8	0.6	20.7	223.3	0.1	35.8	2.3	76.7	56.0	146.7
Standard Dev.	3.5	15.2	2.8	1.9	21.5	55.6	76.9	41.5	68.2	0.1	0.1	0.3	4.0	61.2	32.1	0.4	28.8	48.4	8.6	0.1	4.2	97.7	0.0	22.9	0.3	158.6	9.8	22.5
Coefficient of Var.	34.2	33.9	3.1	22.7	73.8	39.0	42.5	57.0	38.3	17.9	40.6	33.8	11.8	103.7	29.5	145.6	86.5	84.5	19.1	24.8	20.2	43.7	22.9	63.9	12.6	206.9	17.5	15.3
17	33	180	88	19	150	500	680	380	480	0.75	1	1.8	88	380	530	0	150	400	180	1.8	35	880	0.067	180	3.8	140	87	480
24	0.35	6	92	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	13	0	5	5	5.2	0.015	7.8	5	0.134	5	0.35	11	3.9	33
26	9.8	65	90	13	38	96	130	58	120	0.77	0.46	1.3	48	58	120	91.3	38	58	56	0.48	33	130	0.089	38	19	98	84	190

Cluster Tree

Cluster B: Chemistry (>50%), Physical, and Polychaete, Crustacean, and Molluscan Abundance

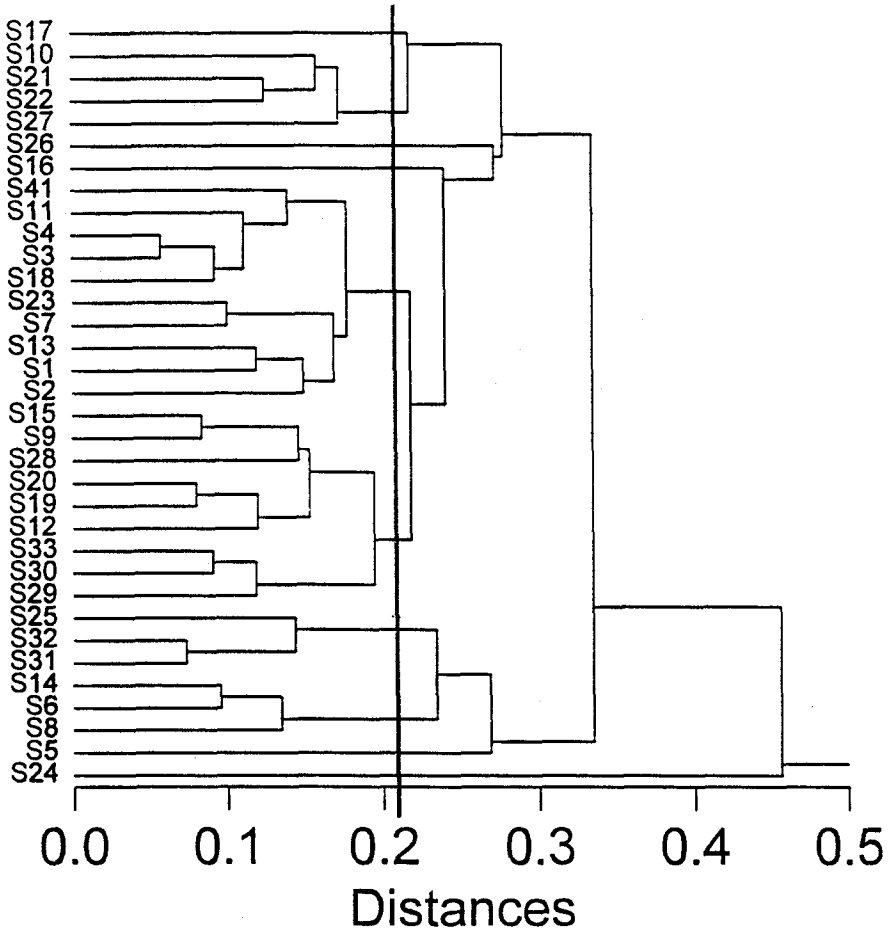


STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	CRUS_AB	FLUORAN	INDENO	T_PB	T_HG	MOLL_AB	T_NI	PCB_1260	POLY_AB	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster B Zone 1																												
10	20	88	12	200	540	500	340	660	0.68	0.32	1.8	54	390	210	0	160	360	77	0.57	1	32	540	23	340	3.4	270	82	250
21	11	92	16	280	440	510	300	550	0.69	1	1.5	67	550	220	5	320	300	78	0.74	6	37	230	71	350	3	60	92	300
22	16	130	17	130	300	410	150	300	1	0.91	0.71	71	280	210	4	76	150	89	0.48	7	41	410	81	150	3.5	140	93	300
27	12	100	13		48	48		72	0.72	0.48	1.7	65	48	220	3	24		75	0.87	5	34	430	64	48	3.4	240	91	240
Minimum	11	88	12	130	48	48	150	72	0.68	0.32	0.71	54	48	210	0	24	150	75	0.48	1	32	230	23	48	3	60	82	240
Maximum	20	130	17	280	540	510	340	660	1	1	1.8	71	550	220	5	320	360	89	0.87	7	41	540	81	350	3.5	270	93	300
Mean	14.8	102.5	14.5	203.3	332.0	367.0	263.3	395.5	0.8	0.7	1.4	64.3	317.0	215.0	3.0	145.0	270.0	79.8	0.7	4.8	36.0	402.5	59.8	222.0	3.3	177.5	89.5	272.5
Standard Dev.	4.1	19.0	2.4	75.1	213.4	217.4	100.2	263.1	0.2	0.3	0.5	7.3	210.8	5.8	2.2	129.4	108.2	6.3	0.2	2.6	3.9	128.4	25.5	148.1	0.2	96.0	5.1	32.0
Coefficient of Var.	27.9	18.5	16.4	36.9	64.3	59.2	38.0	66.5	19.8	48.6	34.6	11.3	66.5	2.7	72.0	89.3	40.1	7.9	26.2	55.4	10.9	31.9	42.6	66.7	6.7	54.1	5.7	11.7
Cluster B Zone 2																												
41	20	110	11	140	340	440	160	400	0.6	0.72	1.1	44	220	120	11	140	160	74	1.1	7	20	220	61	140	2.4	120	77	220
11	0.45	57	12	92	310	370	200	370	0.55	0.35	1.3	42	150	120	1	92	200	62	0.7	5	22	310	44	110	2.2	35	70	200
4	10	72	12	10	220	320	10	250	0.54	0.41	1.3	39	10	120	27	10	10	52	0.72	5	27	250	155	10	2.7	1.1	71	170
3	7.1	67	12	59	200	240	120	310	0.59	0.45	1.2	39	79	130	5		120	51	0.85	16	24	240	50		2.6	31	71	170
18	7.9	57	11	120	240	260	220	320	0.61	0.51	0.41	43	220	110	0	120	220	49	0.57	4	26	200	46	120	2.4	110	83	170
Minimum	0.45	57	11	10	200	240	10	250	0.54	0.35	0.41	39	10	110	0	10	10	49	0.57	4	20	200	44	10	2.2	1.1	70	170
Maximum	20	110	12	140	340	440	220	400	0.61	0.72	1.3	44	220	130	27	140	220	74	1.1	16	27	310	155	140	2.7	120	83	220
Mean	9.1	72.6	11.6	84.2	262.0	326.0	142.0	330.0	0.6	0.5	1.1	41.4	135.8	120.0	8.8	90.5	142.0	57.6	0.8	7.4	23.8	244.0	71.2	95.0	2.5	59.4	74.4	186.0
Standard Dev.	7.1	21.9	0.5	51.5	60.2	81.7	83.2	57.9	0.0	0.1	0.4	2.3	91.4	7.1	11.1	57.2	83.2	10.5	0.2	4.9	2.9	41.6	47.3	58.0	0.2	52.5	5.5	23.0
Coefficient of Var.	77.8	30.2	4.7	61.1	23.0	25.1	58.6	17.5	5.4	29.1	35.2	5.6	67.3	5.9	125.6	63.2	58.6	18.2	25.5	66.6	12.0	17.0	66.4	61.1	7.9	88.4	7.5	12.4
Cluster B Zone 3																												
23	7	61	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	81	5	130	140	38	0.31	9	22	160	91	140	2.2	87	70	140
12	7.1	36	8	36	110	150	91	180	0.55	0.27	0.63	33		69	0	55	91	38	0.38	2	22	110	11	55	2	400	62	130
19	4.5	38	10	45	87	45	45	120	0.52	0.37	0.6	37	45	68	4	45	45	37	0.31	1	23	56	36	45	2.1	33	68	130
20	4.9	37	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	76	6	40	40	41	0.31	4	25	75	44	40	2.5	160	76	150
15	20	43	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	88	1	10	10	45	0.51	0	25	120	11	10	2.5	7.2	84	160
9	8.4	46	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	96	1	18	36	48	0.59	2	25	150	14	18	2.3	25	65	160
28	7	54	12	10	36	36	10	36	0.54	0.41	0.71	39	36	110	3	18	10	43	0.34	11	27	140	50	18	5.2	50	68	160
Minimum	4.5	36	7.8	10	36	36	10	36	0.52	0.27	0.6	33	10	68	0	10	10	37	0.31	0	22	56	11	10	2	7.2	62	130
Maximum	20	61	12	110	180	220	140	290	0.68	0.42	0.92	42	230	110	6	130	140	48	0.59	11	27	160	91	140	5.2	400	84	160
Mean	8.4	45.0	9.2	38.4	88.6	96.6	53.1	122.0	0.6	0.4	0.7	38.9	76.5	84.0	2.9	45.1	53.1	41.4	0.4	4.1	24.1	115.9	36.7	46.6	2.7	108.9	70.4	147.1
Standard Dev.	5.3	9.5	1.5	34.7	48.6	67.0	47.0	87.0	0.1	0.1	0.1	3.1	79.0	15.2	2.3	40.9	47.0	4.1	0.1	4.2	1.9	38.7	28.9	44.4	1.1	138.1	7.4	13.8
Coefficient of Var.	62.8	21.0	16.0	90.2	54.9	69.4	88.4	71.3	9.9	13.6	17.3	8.1	103.3	18.1	79.4	90.6	88.4	9.9	28.7	101.9	7.7	33.4	78.7	95.3	41.9	126.8	10.5	9.4
Cluster B Zone 4																												
2	6.9	46	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	130	15	16	32	45	0.59	18	16	290	184	32	2.6	18	52	160
13	16	50	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	150	32	10	10	58	0.68	14	22	370	66	10	2.3	5.8	56	160
1	13	34	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	110	49	28	71	39	0.62	15	21	170	106	43	2	17	53	150
7	9.2	31	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	73	23	81	130	37	0.41	9	16	150	73	65	2.3	18	42	110
Minimum	6.9	31	6.8	10	64	96	48	80	0.32	0.16	0.6	29	10	73	15	10	10	37	0.41	9	16	150	66	10	2	5.8	42	110
Maximum	16	50	9.7	65	180	200	130	260	0.49	0.46	1.1	39	150	150	49	81	130	58	0.68	18	22	370	184	65	2.6	18	56	160
Mean	11.3	40.3	7.9	32.3	131.0	154.0	84.0	160.0	0.4	0.3	0.8	33.3	71.3	115.8	29.8	33.8	60.8	44.8	0.6	14.0	18.8	245.0	107.3	37.5	2.3	14.7	50.8	145.0
Standard Dev.	4.0	9.2	1.3	24.9	51.2	46.0	35.8	74.8	0.1	0.1	0.2	4.2	63.2	32.8	14.6	32.4	52.6	9.5	0.1	3.7	3.2	103.8	54.1	22.9	0.2	6.0	6.1	23.8
Coefficient of Var.	35.8	22.8	16.3	77.3	39.1	29.9	42.7	46.8	17.7	49.9	28.0	12.6	88.6	28.4	49.0	95.9	86.6	21.2	20.2	26.7	17.1	42.4	50.4	61.1	10.6	40.5	12.0	16.4

STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	CRUS_AB	FLUORAN	INDENO	T_PB	T_HG	MOLL_AB	T_NI	PCB_1260	POLY_AB	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster B Zone 5																												
8	4.1	25	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	54	4	33	49	43	0.34	13	16	97	66	33	1.3	98	44	110
14	0.4	17	6	32	95	130	63	140	0.32	0.14	0.46	25	63	47	18	10	63	21	0.21	8	17	63	110	10	1.6	24	42	85
6	0.4	21	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	67	70	30	46	26	0.23	12	18	110	88	30	1.5	47	51	110
Minimum	0.4	17	4.6	10	82	98	46	130	0.3	0.14	0.46	25	49	47	4	10	46	21	0.21	8	16	63	66	10	1.3	24	42	85
Maximum	4.1	25	6	46	120	150	63	180	0.33	0.24	0.65	27	91	67	70	33	63	43	0.34	13	18	110	110	33	1.6	98	51	110
Mean	1.6	21.0	5.3	29.3	99.0	126.0	52.7	150.0	0.3	0.2	0.6	26.0	67.7	56.0	30.7	24.3	52.7	30.0	0.3	11.0	17.0	90.0	88.0	24.3	1.5	56.3	45.7	101.7
Standard Dev.	2.1	4.0	0.7	18.1	19.3	26.2	9.1	26.5	0.0	0.1	0.1	1.0	21.4	10.1	34.8	12.5	9.1	11.5	0.1	2.6	1.0	24.3	22.0	12.5	0.2	37.9	4.7	14.4
Coefficient of Var.	130.8	19.0	13.3	61.9	19.5	20.8	17.2	17.6	4.8	26.1	17.5	3.8	31.6	18.1	113.4	51.4	17.2	38.4	26.9	24.1	5.9	27.0	25.0	51.4	10.4	67.2	10.3	14.2
Cluster B Zone 6																												
25	0.35	18	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	30	29	35	35	16	0.11	15	16	5	159	35	1.3	54	30	73
32	3	27	5	10	10	10	10	10	0.31	0.13	0.44	22	10	27	20	10	10	17	0.11	17	16	10	109	10	1.4	41	24	63
31	3.8	31	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	30	35	10	10	19	0.13	14	16	10	73	10	1.4	15	47	68
Minimum	0.35	18	1.6	10	10	10	10	10	0.28	0.13	0.44	21	10	27	20	10	10	16	0.11	14	16	5	73	10	1.3	15	24	63
Maximum	3.8	31	5.2	35	35	35	35	35	0.31	0.26	0.56	22	35	30	35	35	35	19	0.13	17	16	10	159	35	1.4	54	47	73
Mean	2.4	25.3	3.9	18.3	18.3	18.3	18.3	18.3	0.3	0.2	0.5	21.7	18.3	29.0	28.0	18.3	18.3	17.3	0.1	15.3	16.0	8.3	113.7	18.3	1.4	36.7	33.7	68.0
Standard Dev.	1.8	6.7	2.0	14.4	14.4	14.4	14.4	14.4	0.0	0.1	0.1	0.6	14.4	1.7	7.5	14.4	14.4	1.5	0.0	1.5	0.0	2.9	43.2	14.4	0.1	19.9	11.9	5.0
Coefficient of Var.	75.8	26.3	51.4	78.7	78.7	78.7	78.7	78.7	5.8	40.9	12.1	2.7	78.7	6.0	27.0	78.7	78.7	8.8	9.9	10.0	0.0	34.6	38.0	78.7	4.2	54.2	35.4	7.4
Cluster B Zone 7																												
33	4.8	41	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	50	32	10	10	28	0.26	31	26	31	75	10	2.2	31	76	110
30	5.9	33	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	52	36	16	10	31	0.23	10	21	51	86	33	2	44	73	120
29	0.45	43	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	52	28	10	10	30	0.13	1	24	10	57	10	1.9	150	70	110
Minimum	0.45	33	4.8	10	10	10	10	10	0.49	0.24	0.52	33	10	50	28	10	10	28	0.13	1	21	10	57	10	1.9	31	70	110
Maximum	5.9	43	8.8	10	33	33	10	37	0.69	0.33	0.64	35	33	52	36	16	10	31	0.26	31	26	51	86	33	2.2	150	76	120
Mean	3.7	39.0	7.2	10.0	20.7	20.7	10.0	26.7	0.6	0.3	0.6	33.7	17.7	51.3	32.0	12.0	10.0	29.7	0.2	14.0	23.7	30.7	72.7	17.7	2.0	75.0	73.0	113.3
Standard Dev.	2.9	5.3	2.1	0.0	11.6	11.6	0.0	14.6	0.1	0.0	0.1	1.2	13.3	1.2	4.0	3.5	0.0	1.5	0.1	15.4	2.5	20.5	14.6	13.3	0.2	65.3	3.0	5.8
Coefficient of Var.	77.5	13.6	29.3	0.0	56.1	56.1	0.0	54.6	17.5	15.8	10.3	3.4	75.2	2.2	12.5	28.9	0.0	5.1	32.9	110.0	10.6	66.9	20.1	75.2	7.5	87.0	4.1	5.1
24	0.35	6	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	13	16	5	5	5.2	0.015	5	7.8	5	137	5	0.35	11	3.9	33
5	1.9	13	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	54	211		75	21	0.22	24	13	67	1614		1.3	14	45	94
17	33	180	19	150	500	680	380	480	0.75	1	1.8	88	380	530	19	150	400	180	1.8	7	35	880	105	180	3.8	140	87	480
16	42	60	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	92	2	10	10	46	0.54	2	26	150	52	10	2.6	190	78	160
26	9.8	65	13	38	96	130	58	120	0.77	0.46	1.3	48	58	120	23	38	58	56	0.48	10	33	130	45	38	19	98	84	190

Cluster Tree

Cluster C: Chemistry (>50%), Physical, Total Abundance, and Total Taxa

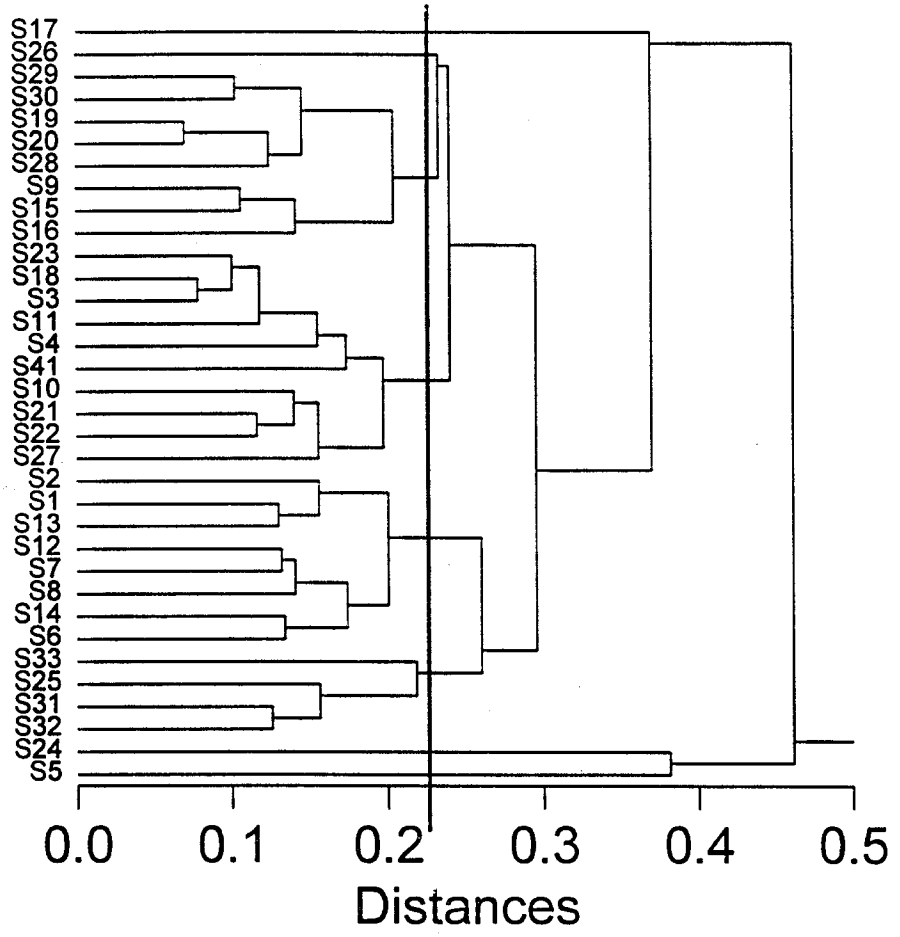


STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	COM_NUM	COM_CNT	T_CU	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster C Zone 1																											
10	20	88	12	200	540	500	340	660	0.68	0.32	1.8	54	390	8	24	210	160	360	77	0.57	32	540	340	3.4	270	82	250
21	11	92	16	280	440	510	300	550	0.69	1	1.5	67	550	29	85	220	320	300	78	0.74	37	230	350	3	60	92	300
22	16	130	17	130	300	410	150	300	1	0.91	0.71	71	280	30	95	210	76	150	89	0.48	41	410	150	3.5	140	93	300
27	12	100	13		48	48		72	0.72	0.48	1.7	65	48	29	76	220	24		75	0.87	34	430	48	3.4	240	91	240
Minimum	11	88	12	130	48	48	150	72	0.68	0.32	0.71	54	48	8	24	210	24	150	75	0.48	32	230	48	3	60	82	240
Maximum	20	130	17	280	540	510	340	660	1	1	1.8	71	550	30	95	220	320	360	89	0.87	41	540	350	3.5	270	93	300
Mean	14.8	102.5	14.5	203.3	332.0	367.0	263.3	395.5	0.8	0.7	1.4	64.3	317.0	24.0	70.0	215.0	145.0	270.0	79.8	0.7	36.0	402.5	222.0	3.3	177.5	89.5	272.5
Standard Dev.	4.1	19.0	2.4	75.1	213.4	217.4	100.2	263.1	0.2	0.3	0.5	7.3	210.8	10.7	31.6	5.8	129.4	108.2	6.3	0.2	3.9	128.4	148.1	0.2	96.0	5.1	32.0
Coefficient of Var.	27.9	18.5	16.4	36.9	64.3	59.2	38.0	66.5	19.8	48.6	34.6	11.3	66.5	44.5	45.2	2.7	89.3	40.1	7.9	26.2	10.9	31.9	66.7	6.7	54.1	5.7	11.7
Cluster C Zone 2																											
41	20	110	11	140	340	440	160	400	0.6	0.72	1.1	44	220	26	109	120	140	160	74	1.1	20	220	140	2.4	120	77	220
11	0.45	57	12	92	310	370	200	370	0.55	0.35	1.3	42	150	21	57	120	92	200	62	0.7	22	310	110	2.2	35	70	200
4	10	72	12	10	220	320	10	250	0.54	0.41	1.3	39	10	32	192	120	10	10	52	0.72	27	250	10	2.7	1.1	71	170
3	7.1	67	12	59	200	240	120	310	0.59	0.45	1.2	39	79	24	73	130		120	51	0.85	24	240		2.6	31	71	170
18	7.9	57	11	120	240	260	220	320	0.61	0.51	0.41	43	220	20	52	110	120	220	49	0.57	26	200	120	2.4	110	83	170
23	7	61	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	33	113	81	130	140	38	0.31	22	160	140	2.2	87	70	140
7	9.2	31	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	31	106	73	81	130	37	0.41	16	150	65	2.3	18	42	110
13	16	50	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	36	114	150	10	10	58	0.68	22	370	10	2.3	5.8	56	160
1	13	34	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	32	172	110	28	71	39	0.62	21	170	43	2	17	53	150
2	6.9	46	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	42	228	130	16	32	45	0.59	16	290	32	2.6	18	52	160
Minimum	0.45	31	6.8	10	64	96	10	80	0.32	0.16	0.41	29	10	20	52	73	10	10	37	0.31	16	150	10	2	1.1	42	110
Maximum	20	110	12	140	340	440	220	400	0.61	0.72	1.3	44	230	42	228	150	140	220	74	1.1	27	370	140	2.7	120	83	220
Mean	9.8	58.5	9.8	66.0	201.4	246.6	118.6	258.0	0.5	0.4	0.9	38.0	119.4	29.7	121.6	114.4	69.7	109.3	50.5	0.7	21.6	236.0	74.4	2.4	44.3	64.5	165.0
Standard Dev.	5.5	22.4	2.1	47.9	82.3	105.2	66.3	103.0	0.1	0.2	0.3	5.0	87.1	6.9	58.4	22.9	54.2	75.8	11.8	0.2	3.7	71.2	53.8	0.2	44.2	13.0	30.3
Coefficient of Var.	55.9	38.2	21.2	72.5	40.9	42.7	55.9	39.9	17.2	42.5	34.7	13.2	72.9	23.3	48.1	20.0	77.8	69.3	23.3	33.6	16.9	30.2	72.2	9.1	99.9	20.1	18.3
Cluster C Zone 3																											
15	20	43	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	9	14	88	10	10	45	0.51	25	120	10	2.5	7.2	84	160
9	8.4	46	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	9	17	96	18	36	48	0.59	25	150	18	2.3	25	65	160
28	7	54	12	10	36	36	10	36	0.54	0.41	0.71	39	36	27	69	110	18	10	43	0.34	27	140	18	5.2	50	68	160
20	4.9	37	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	22	56	76	40	40	41	0.31	25	75	40	2.5	160	76	150
19	4.5	38	10	45	87	45	45	120	0.52	0.37	0.6	37	45	18	42	68	45	45	37	0.31	23	56	45	2.1	33	68	130
12	7.1	36	8	36	110	150	91	180	0.55	0.27	0.63	33		10	15	69	55	91	38	0.38	22	110	55	2	400	62	130
33	4.8	41	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	49	162	50	10	10	28	0.26	26	31	10	2.2	31	76	110
30	5.9	33	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	39	137	52	16	10	31	0.23	21	51	33	2	44	73	120
29	0.45	43	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	38	91	52	10	10	30	0.13	24	10	10	1.9	150	70	110
Minimum	0.45	33	4.8	10	10	10	10	10	0.49	0.24	0.52	33	10	9	14	50	10	10	28	0.13	21	10	10	1.9	7.2	62	110
Maximum	20	54	12	45	110	150	91	180	0.69	0.42	0.92	42	85	49	162	110	55	91	48	0.59	27	150	55	5.2	400	84	160
Mean	7.0	41.2	8.6	21.0	55.8	57.6	29.1	71.6	0.6	0.3	0.7	37.0	35.3	24.6	67.0	73.4	24.7	29.1	37.9	0.3	24.2	82.6	26.6	2.5	100.0	71.3	136.7
Standard Dev.	5.4	6.3	1.9	14.9	35.8	44.1	27.6	52.5	0.1	0.1	0.1	3.7	26.2	14.7	53.9	21.2	17.2	27.6	7.0	0.1	1.9	49.6	17.1	1.0	125.1	6.7	21.2
Coefficient of Var.	76.6	15.2	22.6	71.0	64.1	76.6	94.7	73.3	12.4	18.5	20.6	10.0	74.3	60.0	80.5	28.8	69.9	94.7	18.6	41.3	7.9	60.1	64.4	40.7	125.1	9.4	15.5

STATION ID	DDD	DDE	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	COM_NUM	COM_CNT	T_CU	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster C Zone 4																											
25	0.35	18	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	51	213	30	35	35	16	0.11	16	5	35	1.3	54	30	73
32	3	27	5	10	10	10	10	10	0.31	0.13	0.44	22	10	58	183	27	10	10	17	0.11	16	10	10	1.4	41	24	63
31	3.8	31	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	46	133	30	10	10	19	0.13	16	10	10	1.4	15	47	68
Minimum	0.35	18	1.6	10	10	10	10	10	0.28	0.13	0.44	21	10	46	133	27	10	10	16	0.11	16	5	10	1.3	15	24	63
Maximum	3.8	31	5.2	35	35	35	35	35	0.31	0.26	0.56	22	35	58	213	30	35	35	19	0.13	16	10	35	1.4	54	47	73
Mean	2.4	25.3	3.9	18.3	18.3	18.3	18.3	18.3	0.3	0.2	0.5	21.7	18.3	51.7	176.3	29.0	18.3	18.3	17.3	0.1	16.0	8.3	18.3	1.4	36.7	33.7	68.0
Standard Dev.	1.8	6.7	2.0	14.4	14.4	14.4	14.4	14.4	0.0	0.1	0.1	0.6	14.4	6.0	40.4	1.7	14.4	14.4	1.5	0.0	0.0	2.9	14.4	0.1	19.9	11.9	5.0
Coefficient of Var.	75.8	26.3	51.4	78.7	78.7	78.7	78.7	78.7	5.8	40.9	12.1	2.7	78.7	11.7	22.9	6.0	78.7	78.7	8.8	9.9	0.0	34.6	78.7	4.2	54.2	35.4	7.4
Cluster C Zone 5																											
14	0.4	17	6	32	95	130	63	140	0.32	0.14	0.46	25	63	34	139	47	10	63	21	0.21	17	63	10	1.6	24	42	85
6	0.4	21	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	36	174	67	30	46	26	0.23	18	110	30	1.5	47	51	110
8	4.1	25	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	25	84	54	33	49	43	0.34	16	97	33	1.3	98	44	110
Minimum	0.4	17	4.6	10	82	98	46	130	0.3	0.14	0.46	25	49	25	84	47	10	46	21	0.21	16	63	10	1.3	24	42	85
Maximum	4.1	25	6	46	120	150	63	180	0.33	0.24	0.65	27	91	36	174	67	33	63	43	0.34	18	110	33	1.6	98	51	110
Mean	1.6	21.0	5.3	29.3	99.0	126.0	52.7	150.0	0.3	0.2	0.6	26.0	67.7	31.7	132.3	56.0	24.3	52.7	30.0	0.3	17.0	90.0	24.3	1.5	56.3	45.7	101.7
Standard Dev.	2.1	4.0	0.7	18.1	19.3	26.2	9.1	26.5	0.0	0.1	0.1	1.0	21.4	5.9	45.4	10.1	12.5	9.1	11.5	0.1	1.0	24.3	12.5	0.2	37.9	4.7	14.4
Coefficient of Var.	130.8	19.0	13.3	61.9	19.5	20.8	17.2	17.6	4.8	26.1	17.5	3.8	31.6	18.5	34.3	18.1	51.4	17.2	38.4	26.9	5.9	27.0	51.4	10.4	67.2	10.3	14.2
5	1.9	13	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	56	1856	54		75	21	0.22	13	67		1.3	14	45	94
24	0.35	6	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	42	175	13	5	5	5.2	0.015	7.8	5	5	0.35	11	3.9	33
17	33	180	19	150	500	680	380	480	0.75	1	1.8	88	380	37	137	530	150	400	180	1.8	35	880	180	3.8	140	87	480
26	9.8	65	13	38	96	130	58	120	0.77	0.46	1.3	48	58	23	79	120	38	58	56	0.48	33	130	38	19	98	84	190
16	42	60	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	21	60	92	10	10	46	0.54	26	150	10	2.6	190	78	160

Cluster Tree

Cluster D: Chemistry (>50%), Physical, Ech. Dev., Amph. Surv., Poly. Growth, Poly. Abun., Crus. Abun., and Moll. Abun.

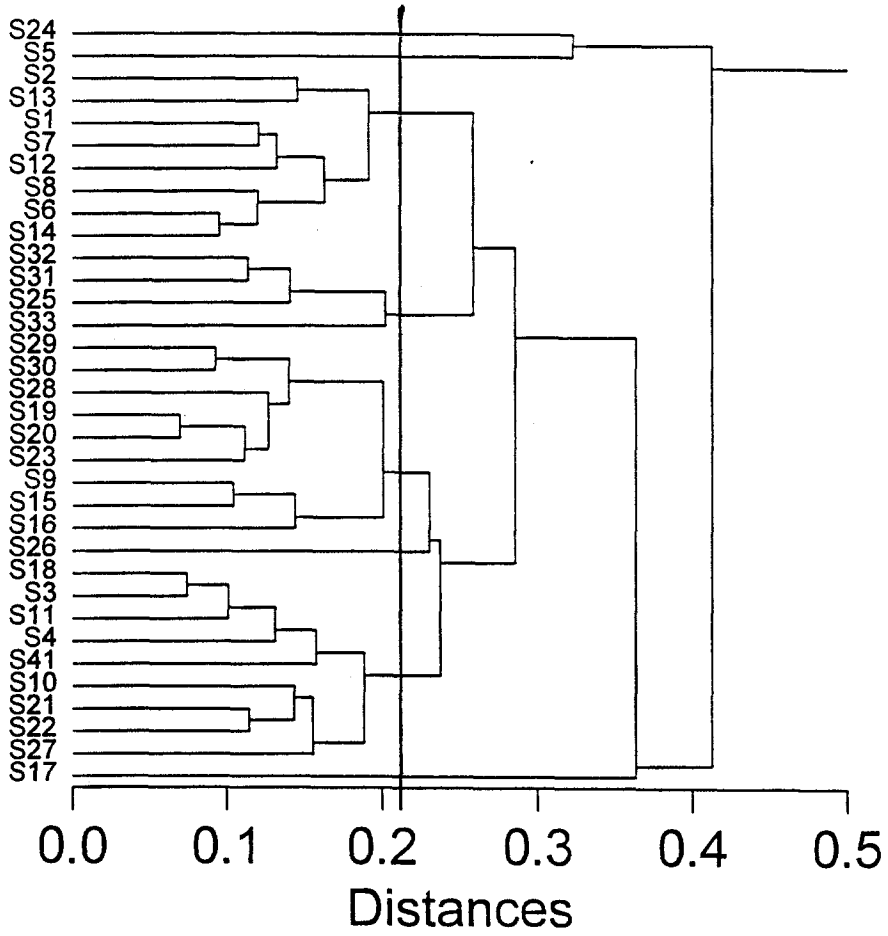


STATION ID	DDD	DDE	AMPH_SUP	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	CRUS_AB	ECR_DEV	FLUORAN	INDENO	T_PB	T_HG	MOLL_AB	T_NI	PCB_1260	POLY_GR	POLY_AB	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster D Zone 1																															
29	0.45	43	83	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	52	28	96.3	10	10	30	0.13	1	24	10	0.092	57	10	1.9	150	70	110
30	5.9	33	83.5	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	52	36	93.3	16	10	31	0.23	10	21	51	0.067	86	33	2	44	73	120
19	4.5	38	89	10	45	87	45	45	120	0.52	0.37	0.6	37	45	68	4	86.7	45	45	37	0.31	1	23	56	0.088	36	45	2.1	33	68	130
20	4.9	37	87	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	76	6	92.3	40	40	41	0.31	4	25	75	0.077	44	40	2.5	160	76	150
28	7	54	90	12	10	36	36	10	36	0.54	0.41	0.71	39	36	110	3	94.3	18	10	43	0.34	11	27	140	0.066	50	18	5.2	50	68	160
9	8.4	46	88	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	96	1	11	18	36	48	0.59	2	25	150	0.095	14	18	2.3	25	65	160
15	20	43	93	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	88	1	57	10	10	45	0.51	0	25	120	0.089	11	10	2.5	7.2	84	160
16	42	60	91	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	92	2	67.7	10	10	46	0.54	2	26	150	0.093	52	10	2.6	190	78	160
Minimum	0.45	33	83	4.8	10	10	10	10	10	0.49	0.3	0.52	33	10	52	1	11	10	10	30	0.13	0	21	10	0.066	11	10	1.9	7.2	65	110
Maximum	42	60	93	12	45	100	100	45	120	0.68	0.42	0.92	42	85	110	36	96.3	45	45	48	0.59	11	27	150	0.095	86	45	5.2	190	84	160
Mean	11.6	44.3	88.1	8.8	19.1	49.0	46.0	21.4	58.0	0.6	0.4	0.7	38.4	35.3	79.3	10.1	74.8	20.9	21.4	40.1	0.4	3.9	24.5	94.0	0.1	43.8	23.0	2.6	82.4	72.8	143.8
Standard Dev.	13.5	9.0	3.5	2.1	14.7	31.5	29.1	15.9	35.4	0.1	0.0	0.2	3.8	26.2	21.0	13.8	29.4	13.9	15.9	6.8	0.2	4.3	1.9	53.1	0.0	24.2	14.3	1.1	71.8	6.3	20.7
Coefficient of Var.	116.1	20.3	4.0	24.0	77.1	64.2	63.3	74.3	61.1	10.5	11.5	21.0	9.8	74.3	26.5	136.0	39.4	66.4	74.3	17.0	43.6	109.9	7.6	56.5	14.1	55.2	62.1	40.4	87.1	8.7	14.4
Cluster D Zone 2																															
23	7	61	95	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	81	5	93.3	130	140	38	0.31	9	22	160	0.093	91	140	2.2	87	70	140
18	7.9	57	92	11	120	240	260	220	320	0.61	0.51	0.41	43	220	110	0	86.7	120	220	49	0.57	4	26	200	0.097	46	120	2.4	110	83	170
3	7.1	67	93	12	59	200	240	120	310	0.59	0.45	1.2	39	79	130	5	84		120	51	0.85	16	24	240	0.075	50		2.6	31	71	170
11	0.45	57	98.8	12	92	310	370	200	370	0.55	0.35	1.3	42	150	120	1	87.3	92	200	62	0.7	5	22	310	0.106	44	110	2.2	35	70	200
4	10	72	90	12	10	220	320	10	250	0.54	0.41	1.3	39	10	120	27	0	10	10	52	0.72	5	27	250	0.068	155	10	2.7	1.1	71	170
41	20	110	57	11	140	340	440	160	400	0.6	0.72	1.1	44	220	120	11	51.3	140	160	74	1.1	7	20	220	0.077	61	140	2.4	120	77	220
10	20	88	91	12	200	540	500	340	660	0.68	0.32	1.8	54	390	210	0	89.7	160	360	77	0.57	1	32	540	0.101	23	340	3.4	270	82	250
21	11	92	85	16	280	440	510	300	550	0.69	1	1.5	67	550	220	5	92.3	320	300	78	0.74	6	37	230	0.066	71	350	3	60	92	300
22	16	130	90	17	130	300	410	150	300	1	0.91	0.71	71	280	210	4	89.3	76	150	89	0.48	7	41	410	0.085	81	150	3.5	140	93	300
27	12	100	81	13		48	48		72	0.72	0.48	1.7	65	48	220	3	93.7	24		75	0.87	5	34	430	0.076	64	48	3.4	240	91	240
Minimum	0.45	57	57	8.5	10	48	48	10	72	0.54	0.32	0.41	39	10	81	0	0	10	10	38	0.31	1	20	160	0.066	23	10	2.2	1.1	70	140
Maximum	20	130	98.8	17	280	540	510	340	660	1	1	1.8	71	550	220	27	93.7	320	360	89	1.1	16	41	540	0.106	155	350	3.5	270	93	300
Mean	11.1	83.4	87.3	12.5	126.8	281.8	331.8	182.2	352.2	0.7	0.6	1.2	50.4	217.7	154.1	6.1	76.8	119.1	184.4	64.5	0.7	6.5	28.5	299.0	0.1	68.6	156.4	2.8	109.4	80.0	216.0
Standard Dev.	6.2	24.8	11.7	2.5	78.1	138.8	143.8	98.3	161.5	0.1	0.2	0.4	12.7	163.3	54.1	8.0	29.7	90.9	102.5	16.4	0.2	4.0	7.1	121.9	0.0	36.1	116.4	0.5	88.3	9.5	56.0
Coefficient of Var.	55.2	29.8	13.4	19.7	61.6	49.3	43.3	54.0	45.9	21.2	43.9	38.3	25.3	75.0	35.1	131.5	38.7	76.3	55.6	25.5	32.2	60.8	25.0	40.8	16.7	52.7	74.4	18.3	80.8	11.9	25.9
Cluster D Zone 3																															
2	6.9	46	91	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	130	15	0	16	32	45	0.59	18	16	290	0.116	184	32	2.6	18	52	160
1	13	34	85	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	110	49	1	28	71	39	0.62	15	21	170	0.134	106	43	2	17	53	150
13	16	50	92.5	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	150	32	0.3	10	10	58	0.68	14	22	370	0.087	66	10	2.3	5.8	56	160
12	7.1	36	88	8	36	110	150	91	180	0.55	0.27	0.63	33		69	0	0.3	55	91	38	0.38	2	22	110	0.095	11	55	2	400	62	130
7	9.2	31	87	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	73	23	0	81	130	37	0.41	9	16	150	0.103	73	65	2.3	18	42	110
8	4.1	25	87	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	54	4	0.7	33	49	43	0.34	13	16	97	0.104	66	33	1.3	98	44	110
14	0.4	17	96.3	6	32	95	130	63	140	0.32	0.14	0.46	25	63	47	18	0	10	63	21	0.21	8	17	63	0.123	110	10	1.6	24	42	85
6	0.4	21	87	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	67	70	0	30	46	26	0.23	12	18	110	0.098	88	30	1.5	47	51	110
Minimum	0.4	17	85	4.6	10	64	96	46	80	0.3	0.14	0.46	25	10	47	0	0	10	10	21	0.21	2	16	63	0.087	11	10	1.3	5.8	42	85
Maximum	16	50	96.3	9.7	65	180	200	130	260	0.55	0.46	1.1	39	150	150	70	1	81	130	58	0.68	18	22	370	0.134	184	65	2.6	400	62	160
Mean	7.1	32.5	89.2	6.9	31.6	116.4	143.0	73.1	158.8	0.4	0.2	0.7	30.5	69.7	87.5	26.4	0.3	32.9	61.5	38.4	0.4	11.4	18.5	170.0	0.1	88.0	34.8	2.0	78.5	50.3	126.9
Standard Dev.	5.6	11.6	3.7	1.6	19.1	38.5	36.1	29.4	51.9	0.1	0.1	0.2	4.7	46.4	37.7	23.5	0.4	24.4	37.0	11.4	0.2	5.0	2.7	106.1	0.0	49.5	19.5	0.5	133.1	7.1	27.6
Coefficient of Var.	78.1	35.5	4.2	23.8	60.5	33.1	25.3	40.3	32.7	23.9	40.9	27.5	15.3	66.5	43.1	89.0	132.0	74.2	60.1	29.7	41.3	43.6	14.7	62.4	14.6	56.2	56.0	23.1	169.7	14.2	21.8

STATION ID	DDD	DDE	AMPH_SUR	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	T_CU	CRUS_AB	ECH_DEV	FLUORAN	INDENO	T_PB	T_HG	MOLL_AB	T_NI	PCB_1260	POLY_GR	POLY_AB	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster D Zone 4																															
[illegible]	4.8	41	83	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	50	32	0.5	10	10	28	0.26	31	26	31	0.104	75	10	2.2	31	76	110
[illegible]	0.35	18	93	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	30	29	0	35	35	16	0.11	15	16	5	0.101	159	35	1.3	54	30	73
31	3.8	31	86	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	30	35	0	10	10	19	0.13	14	16	10	0.094	73	10	1.4	15	47	68
32	3	27	91	5	10	10	10	10	10	0.31	0.13	0.44	22	10	27	20	40.3	10	10	17	0.11	17	16	10	0.11	109	10	1.4	41	24	63
Minimum	0.35	18	83	1.6	10	10	10	10	10	0.28	0.13	0.44	21	10	27	20	0	10	10	16	0.11	14	16	5	0.094	73	10	1.3	15	24	63
Maximum	4.8	41	93	8.8	35	35	35	35	35	0.69	0.26	0.58	35	35	50	35	40.3	35	35	28	0.26	31	26	31	0.11	159	35	2.2	54	76	110
Mean	3.0	29.3	88.3	5.2	16.3	16.3	16.3	16.3	16.3	0.4	0.2	0.5	25.0	16.3	34.3	29.0	10.2	16.3	16.3	20.0	0.2	19.3	18.5	14.0	0.1	104.0	16.3	1.6	35.3	44.3	78.5
Standard Dev.	1.9	9.5	4.6	2.9	12.5	12.5	12.5	12.5	12.5	0.2	0.1	0.1	6.7	12.5	10.6	6.5	20.1	12.5	12.5	5.5	0.1	7.9	5.0	11.6	0.0	40.2	12.5	0.4	16.5	23.3	21.4
Coefficient of Var.	63.8	32.6	5.2	57.1	76.9	76.9	76.9	76.9	76.9	49.2	34.8	12.5	26.7	76.9	30.9	22.3	196.7	76.9	76.9	27.4	47.4	41.2	27.0	82.7	6.5	38.7	76.9	26.6	46.7	52.7	27.3
24	0.35	6	92	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	13	16	0	5	5	5.2	0.015	5	7.8	5	0.134	137	5	0.35	11	3.9	33
5	1.9	13	87	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	54	211	7		75	21	0.22	24	13	67	0.132	1614		1.3	14	45	94
17	33	180	88	19	150	500	680	380	480	0.75	1	1.8	88	380	530	19	0	150	400	180	1.8	7	35	880	0.067	105	180	3.8	140	87	480
26	9.8	65	90	13	38	96	130	58	120	0.77	0.46	1.3	48	58	120	23	91.3	38	58	56	0.48	10	33	130	0.089	45	38	19	98	84	190

Cluster Tree

Cluster E: Chemistry (>50%), Physical, Ech. Dev., Amph. Surv., Poly. Growth, Total Abund., and Total Taxa

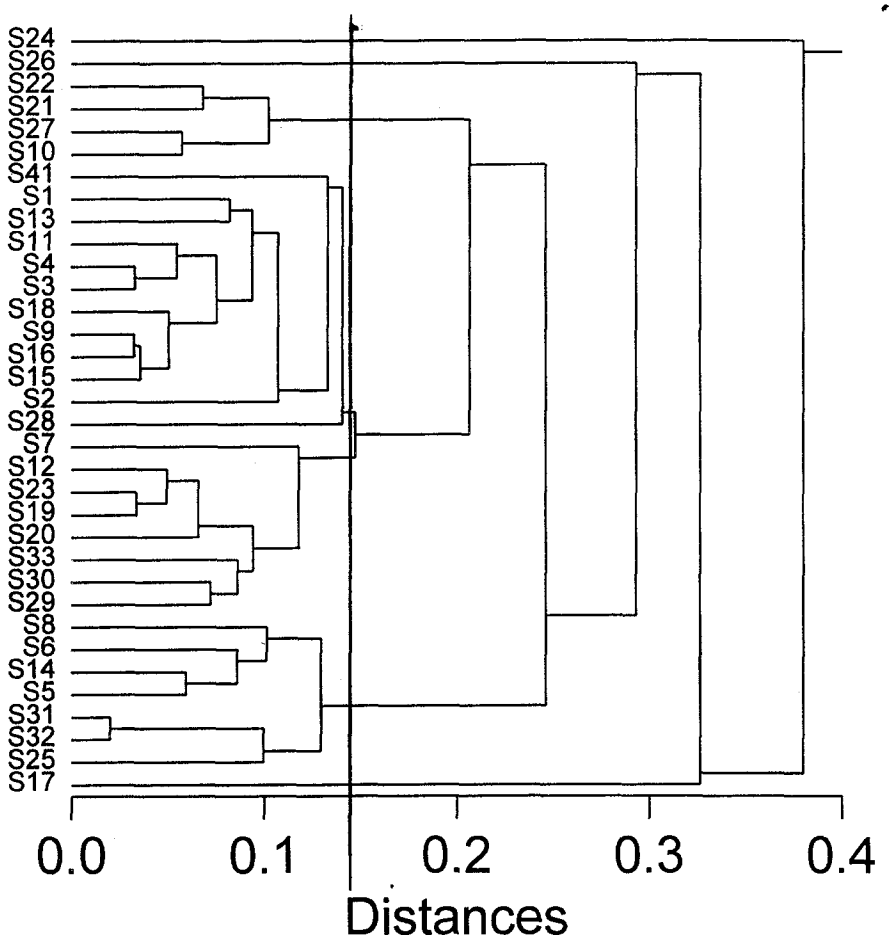


STATION ID	DDD	DDE	AMPH_SUR	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	COM_NUM	COM_CNT	T_CU	ECH_DEV	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	POLY_GR	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster E Zone 1																														
2	6.9	46	91	7.2	16	64	96	48	80	0.32	0.46	1.1	32	32	42	228	130	0	16	32	45	0.59	16	290	0.116	32	2.6	18	52	160
13	16	50	92.5	7.8	10	160	200	93	160	0.47	0.2	0.6	39	10	36	114	150	0.3	10	10	58	0.68	22	370	0.087	10	2.3	5.8	56	160
1	13	34	85	9.7	38	120	140	65	140	0.44	0.25	0.79	33	93	32	172	110	1	28	71	39	0.62	21	170	0.134	43	2	17	53	150
7	9.2	31	87	6.8	65	180	180	130	260	0.49	0.16	0.67	29	150	31	106	73	0	81	130	37	0.41	16	150	0.103	65	2.3	18	42	110
12	7.1	36	88	8	36	110	150	91	180	0.55	0.27	0.63	33		10	15	69	0.3	55	91	38	0.38	22	110	0.095	55	2	400	62	130
8	4.1	25	87	5.2	10	82	98	49	130	0.33	0.21	0.65	26	49	25	84	54	0.7	33	49	43	0.34	16	97	0.104	33	1.3	98	44	110
6	0.4	21	87	4.6	46	120	150	46	180	0.3	0.24	0.61	27	91	36	174	67	0	30	46	26	0.23	18	110	0.098	30	1.5	47	51	110
14	0.4	17	96.3	6	32	95	130	63	140	0.32	0.14	0.46	25	63	34	139	47	0	10	63	21	0.21	17	63	0.123	10	1.6	24	42	85
Minimum	0.4	17	85	4.6	10	64	96	46	80	0.3	0.14	0.46	25	10	10	15	47	0	10	10	21	0.21	16	63	0.087	10	1.3	5.8	42	85
Maximum	16	50	96.3	9.7	65	180	200	130	260	0.55	0.46	1.1	39	150	42	228	150	1	81	130	58	0.68	22	370	0.134	65	2.6	400	62	160
Mean	7.1	32.5	89.2	6.9	31.6	116.4	143.0	73.1	158.8	0.4	0.2	0.7	30.5	69.7	30.8	129.0	87.5	0.3	32.9	61.5	38.4	0.4	18.5	170.0	0.1	34.8	2.0	78.5	50.3	126.9
Standard Dev.	5.6	11.6	3.7	1.6	19.1	38.5	36.1	29.4	51.9	0.1	0.1	0.2	4.7	46.4	9.7	65.0	37.7	0.4	24.4	37.0	11.4	0.2	2.7	106.1	0.0	19.5	0.5	133.1	7.1	27.6
Coefficient of Var.	78.1	35.5	4.2	23.8	60.5	33.1	25.3	40.3	32.7	23.9	40.9	27.5	15.3	66.5	31.5	50.4	43.1	132.0	74.2	60.1	29.7	41.3	14.7	62.4	14.6	56.0	23.1	169.7	14.2	21.8
Cluster E Zone 2																														
32	3	27	91	5	10	10	10	10	10	0.31	0.13	0.44	22	10	58	183	27	40.3	10	10	17	0.11	16	10	0.11	10	1.4	41	24	63
31	3.8	31	86	5.2	10	10	10	10	10	0.31	0.14	0.49	22	10	46	133	30	0	10	10	19	0.13	16	10	0.094	10	1.4	15	47	68
25	0.35	18	93	1.6	35	35	35	35	35	0.28	0.26	0.56	21	35	51	213	30	0	35	35	16	0.11	16	5	0.101	35	1.3	54	30	73
33	4.8	41	83	8.8	10	10	10	10	10	0.69	0.24	0.58	35	10	49	162	50	0.5	10	10	28	0.26	26	31	0.104	10	2.2	31	76	110
Minimum	0.35	18	83	1.6	10	10	10	10	10	0.28	0.13	0.44	21	10	46	133	27	0	10	10	16	0.11	16	5	0.094	10	1.3	15	24	63
Maximum	4.8	41	93	8.8	35	35	35	35	35	0.69	0.26	0.58	35	35	58	213	50	40.3	35	35	28	0.26	26	31	0.11	35	2.2	54	76	110
Mean	3.0	29.3	88.3	5.2	16.3	16.3	16.3	16.3	16.3	0.4	0.2	0.5	25.0	16.3	51.0	172.8	34.3	10.2	16.3	16.3	20.0	0.2	18.5	14.0	0.1	16.3	1.6	35.3	44.3	78.5
Standard Dev.	1.9	9.5	4.6	2.9	12.5	12.5	12.5	12.5	12.5	0.2	0.1	0.1	6.7	12.5	5.1	33.8	10.6	20.1	12.5	12.5	5.5	0.1	5.0	11.6	0.0	12.5	0.4	16.5	23.3	21.4
Coefficient of Var.	63.8	32.6	5.2	57.1	76.9	76.9	76.9	76.9	76.9	49.2	34.8	12.5	26.7	76.9	10.0	19.5	30.9	196.7	76.9	76.9	27.4	47.4	27.0	82.7	6.5	76.9	26.6	46.7	52.7	27.3
Cluster E Zone 3																														
29	0.45	43	83	4.8	10	19	19	10	37	0.56	0.33	0.64	33	10	38	91	52	96.3	10	10	30	0.13	24	10	0.092	10	1.9	150	70	110
30	5.9	33	83.5	7.9	10	33	33	10	33	0.49	0.3	0.52	33	33	39	137	52	93.3	16	10	31	0.23	21	51	0.067	33	2	44	73	120
28	7	54	90	12	10	36	36	10	36	0.54	0.41	0.71	39	36	27	69	110	94.3	18	10	43	0.34	27	140	0.066	18	5.2	50	68	160
19	4.5	38	89	10	45	87	45	45	120	0.52	0.37	0.6	37	45	18	42	68	86.7	45	45	37	0.31	23	56	0.088	45	2.1	33	68	130
20	4.9	37	87	8.5	40	100	100	40	85	0.68	0.42	0.7	42	85	22	56	76	92.3	40	40	41	0.31	25	75	0.077	40	2.5	160	76	150
23	7	61	95	8.5	110	180	220	140	290	0.54	0.36	0.72	40	230	33	113	81	93.3	130	140	38	0.31	22	160	0.093	140	2.2	87	70	140
9	8.4	46	88	9.4	18	53	53	36	71	0.53	0.36	0.92	39	53	9	17	96	11	18	36	48	0.59	25	150	0.095	18	2.3	25	65	160
15	20	43	93	7.8	10	54	72	10	72	0.54	0.4	0.92	42	10	9	14	88	57	10	10	45	0.51	25	120	0.089	10	2.5	7.2	84	160
16	42	60	91	9.8	10	10	10	10	10	0.6	0.34	0.89	42	10	21	60	92	67.7	10	10	46	0.54	26	150	0.093	10	2.6	190	78	160
Minimum	0.45	33	83	4.8	10	10	10	10	10	0.49	0.3	0.52	33	10	9	14	52	11	10	10	30	0.13	21	10	0.066	10	1.9	7.2	65	110
Maximum	42	61	95	12	110	180	220	140	290	0.68	0.42	0.92	42	230	39	137	110	96.3	130	140	48	0.59	27	160	0.095	140	5.2	190	84	160
Mean	11.1	46.1	88.8	8.7	29.2	63.6	65.3	34.6	83.8	0.6	0.4	0.7	38.6	56.9	24.0	66.6	79.4	76.9	33.0	34.6	39.9	0.4	24.2	101.3	0.1	36.0	2.6	82.9	72.4	143.3
Standard Dev.	12.7	10.1	4.0	2.0	33.3	52.7	64.1	42.2	84.1	0.1	0.0	0.1	3.6	69.4	11.2	41.4	19.7	28.2	38.6	42.2	6.4	0.2	1.9	54.4	0.0	41.2	1.0	67.2	6.0	19.4
Coefficient of Var.	114.4	21.9	4.5	22.5	113.9	82.9	98.1	122.2	100.4	9.9	10.8	19.7	9.3	122.0	46.8	62.2	24.7	36.7	117.0	122.2	16.1	41.9	7.9	53.7	13.6	114.5	38.9	81.0	8.2	13.5

STATION ID	DDD	DDE	AMPH_SUR	T_AS	BAA	BAP	BBF	BGHIP	BKF	T_BE	T_CD	TOC	T_CR	CHRYSENE	COM_NUM	COM_CNT	T_CU	ECH_DEV	FLUORAN	INDENO	T_PB	T_HG	T_NI	PCB_1260	POLY_GR	PYRENE	T_AG	SULFIDE	T_FINES	T_ZN
Cluster E Zone 4																														
18	7.9	57	92	11	120	240	260	220	320	0.61	0.51	0.41	43	220	20	52	110	86.7	120	220	49	0.57	26	200	0.097	120	2.4	110	83	170
3	7.1	67	93	12	59	200	240	120	310	0.59	0.45	1.2	39	79	24	73	130	84		120	51	0.85	24	240	0.075		2.6	31	71	170
11	0.45	57	98.8	12	92	310	370	200	370	0.55	0.35	1.3	42	150	21	57	120	87.3	92	200	62	0.7	22	310	0.106	110	2.2	35	70	200
4	10	72	90	12	10	220	320	10	250	0.54	0.41	1.3	39	10	32	192	120	0	10	10	52	0.72	27	250	0.068	10	2.7	1.1	71	170
41	20	110	57	11	140	340	440	160	400	0.6	0.72	1.1	44	220	26	109	120	51.3	140	160	74	1.1	20	220	0.077	140	2.4	120	77	220
10	20	88	91	12	200	540	500	340	660	0.68	0.32	1.8	54	390	8	24	210	89.7	160	360	77	0.57	32	540	0.101	340	3.4	270	82	250
21	11	92	85	16	280	440	510	300	550	0.69	1	1.5	67	550	29	85	220	92.3	320	300	78	0.74	37	230	0.066	350	3	60	92	300
22	16	130	90	17	130	300	410	150	300	1	0.91	0.71	71	280	30	95	210	89.3	76	150	89	0.48	41	410	0.085	150	3.5	140	93	300
27	12	100	81	13		48	48		72	0.72	0.48	1.7	65	48	29	76	220	93.7	24		75	0.87	34	430	0.076	48	3.4	240	91	240
Minimum	0.45	57	57	11	10	48	48	10	72	0.54	0.32	0.41	39	10	8	24	110	0	10	10	49	0.48	20	200	0.066	10	2.2	1.1	70	170
Maximum	20	130	98.8	17	280	540	510	340	660	1	1	1.8	71	550	32	192	220	93.7	320	360	89	1.1	41	540	0.106	350	3.5	270	93	300
Mean	11.6	85.9	86.4	12.9	128.9	293.1	344.2	187.5	359.1	0.7	0.6	1.2	51.6	216.3	24.3	84.8	162.2	74.9	117.8	190.0	67.4	0.7	29.2	314.4	0.1	158.5	2.8	111.9	81.1	224.4
Standard Dev.	6.3	25.0	12.1	2.1	83.2	142.3	146.7	103.8	169.8	0.1	0.2	0.4	12.9	173.1	7.4	47.4	50.4	30.9	97.1	108.1	14.3	0.2	7.2	118.4	0.0	124.3	0.5	93.3	9.4	52.2
Coefficient of Var.	54.7	29.1	14.0	16.7	64.6	48.5	42.6	55.3	47.3	21.1	43.1	36.4	25.1	80.0	30.3	55.9	31.1	41.2	82.5	56.9	21.3	25.8	24.5	37.7	17.5	78.4	17.4	83.4	11.6	23.3
17	33	180	88	19	150	500	680	380	480	0.75	1	1.8	88	380	37	137	530	0	150	400	180	1.8	35	880	0.067	180	3.8	140	87	480
24	0.35	6	92	4.6	5	5	5	5	5	0.13	0.078	0.069	9.8	5	42	175	13	0	5	5	5.2	0.015	7.8	5	0.134	5	0.35	11	3.9	33
5	1.9	13	87	5.4	60	100	150	75	180	0.3	0.15	0.42	22	100	56	1856	54	7		75	21	0.22	13	67	0.132		1.3	14	45	94
26	9.8	65	90	13	38	96	130	58	120	0.77	0.46	1.3	48	58	23	79	120	91.3	38	58	56	0.48	33	130	0.089	38	19	98	84	190

Cluster Tree

Metals



STATION ID	T_AS	T_BE	T_CD	T_CR	T_CU	T_PB	T_HG	T_NI	T_AG	T_ZN
Metals Zone 1										
22	17	1	0.91	71	210	89	0.48	41	3.5	300
21	16	0.69	1	67	220	78	0.74	37	3	300
27	13	0.72	0.48	65	220	75	0.87	34	3.4	240
10	12	0.68	0.32	54	210	77	0.57	32	3.4	250
Minimum	12	0.68	0.32	54	210	75	0.48	32	3	240
Maximum	17	1	1	71	220	89	0.87	41	3.5	300
Mean	14.5	0.8	0.7	64.3	215.0	79.8	0.7	36.0	3.3	272.5
Standard Dev.	2.4	0.2	0.3	7.3	5.8	6.3	0.2	3.9	0.2	32.0
CV	16.4	19.8	48.6	11.3	2.7	7.9	26.2	10.9	6.7	11.7
Metals Zone 2										
41	11	0.6	0.72	44	120	74	1.1	20	2.4	220
18	11	0.61	0.51	43	110	49	0.57	26	2.4	170
15	7.8	0.54	0.4	42	88	45	0.51	25	2.5	160
16	9.8	0.6	0.34	42	92	46	0.54	26	2.6	160
9	9.4	0.53	0.36	39	96	48	0.59	25	2.3	160
11	12	0.55	0.35	42	120	62	0.7	22	2.2	200
4	12	0.54	0.41	39	120	52	0.72	27	2.7	170
3	12	0.59	0.45	39	130	51	0.85	24	2.6	170
13	7.8	0.47	0.2	39	150	58	0.68	22	2.3	160
1	9.7	0.44	0.25	33	110	39	0.62	21	2	150
2	7.2	0.32	0.46	32	130	45	0.59	16	2.6	160
28	12	0.54	0.41	39	110	43	0.34	27	5.2	160
Minimum	7.2	0.32	0.2	32	88	39	0.34	16	2	150
Maximum	12	0.61	0.72	44	150	74	1.1	27	5.2	220
Mean	10.1	0.5	0.4	39.4	114.7	51.0	0.7	23.4	2.7	170.0
Standard Dev.	1.8	0.1	0.1	3.7	17.7	9.6	0.2	3.3	0.8	20.0
CV	17.8	15.8	32.5	9.4	15.4	18.9	29.0	14.2	31.2	11.8
Metals Zone 3										
7	6.8	0.49	0.16	29	73	37	0.41	16	2.3	110
12	8	0.55	0.27	33	69	38	0.38	22	2	130
19	10	0.52	0.37	37	68	37	0.31	23	2.1	130
23	8.5	0.54	0.36	40	81	38	0.31	22	2.2	140
20	8.5	0.68	0.42	42	76	41	0.31	25	2.5	150
33	8.8	0.69	0.24	35	50	28	0.26	26	2.2	110
30	7.9	0.49	0.3	33	52	31	0.23	21	2	120
29	4.8	0.56	0.33	33	52	30	0.13	24	1.9	110
Minimum	4.8	0.49	0.16	29	50	28	0.13	16	1.9	110
Maximum	10	0.69	0.42	42	81	41	0.41	26	2.5	150
Mean	7.9	0.6	0.3	35.3	65.1	35.0	0.3	22.4	2.2	125.0
Standard Dev.	1.5	0.1	0.1	4.2	12.1	4.7	0.1	3.1	0.2	15.1
CV	19.6	13.9	26.9	12.0	18.6	13.3	30.0	13.7	9.0	12.1

STATION ID	T_AS	T_BE	T_CD	T_CR	T_CU	T_PB	T_HG	T_NI	T_AG	T_ZN
Metals Zone 4										
8	5.2	0.33	0.21	26	54	43	0.34	16	1.3	110
6	4.6	0.3	0.24	27	67	26	0.23	18	1.5	110
5	5.4	0.3	0.15	22	54	21	0.22	13	1.3	94
14	6	0.32	0.14	25	47	21	0.21	17	1.6	85
31	5.2	0.31	0.14	22	30	19	0.13	16	1.4	68
32	5	0.31	0.13	22	27	17	0.11	16	1.4	63
25	1.6	0.28	0.26	21	30	16	0.11	16	1.3	73
Minimum	1.6	0.28	0.13	21	27	16	0.11	13	1.3	63
Maximum	6	0.33	0.26	27	67	43	0.34	18	1.6	110
Mean	4.7	0.3	0.2	23.6	44.1	23.3	0.2	16.0	1.4	86.1
Standard Dev.	1.4	0.0	0.1	2.4	15.4	9.3	0.1	1.5	0.1	19.3
CV	30.5	5.2	29.8	10.1	34.8	39.9	43.2	9.5	8.2	22.4
17	19	0.75	1	88	530	180	1.8	35	3.8	480
26	13	0.77	0.46	48	120	56	0.48	33	19	190
24	4.6	0.13	0.078	9.8	13	5.2	0.015	7.8	0.35	33

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPENDENT T_AS2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_AS2   N: 35   Multiple R: 0.826   Squared multiple R: 0.682


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_AS2

   CONSTANT                    0.946

   MET_ZONE$   A               0.240

   MET_ZONE$   B               0.095

   MET_ZONE$   C              -0.003

   MET_ZONE$   D              -0.206


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.702     4        0.176      16.080       0.000

Error                      0.327    30        0.011

-------------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE      N
  MET_ZONE$   =A                 1.186        0.052      4
  MET_ZONE$   =B                 1.041        0.030     12
  MET_ZONE$   =C                 0.943        0.037      8
  MET_ZONE$   =D                 0.740        0.039      7
      ZONE$   =R                 0.820        0.052      4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
  5  R
Using least squares means.
Post Hoc test of T_AS2
-------------------------------------------------------------------------------

Using model MSE of 0.011 with 30 DF.
Matrix of pairwise mean differences:

                    1          2          3          4          5
          1       0.0
          2    -0.145        0.0
          3    -0.243     -0.098        0.0
          4    -0.447     -0.302     -0.204        0.0
          5    -0.367     -0.222     -0.124      0.080        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                    1          2          3          4          5
          1     1.000
          2     0.142      1.000
          3     0.006      0.266      1.000
          4     0.000      0.000      0.006      1.000
          5     0.000      0.008      0.321      0.740      1.000
-------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_BE2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_BE2   N: 35   Multiple R: 0.776   Squared multiple R: 0.603


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            T_BE2

   CONSTANT                  0.175

   MET_ZONE$   A             0.072

   MET_ZONE$   B             0.008

   MET_ZONE$   C             0.019

   MET_ZONE$   D            -0.059


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.055     4        0.014      11.377       0.000

Error                      0.037    30        0.001

-------------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE       N
  MET_ZONE$   =A                 0.247        0.017       4
  MET_ZONE$   =B                 0.183        0.010      12
  MET_ZONE$   =C                 0.194        0.012       8
  MET_ZONE$   =D                 0.116        0.013       7
  MET_ZONE$   =R                 0.134        0.017       4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
     R
Using least squares means.
Post Hoc test of T_BE2
--------------------------------------------------------------------------------

Using model MSE of 0.001 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.064        0.0
            3      -0.053      0.011        0.0
            4      -0.131     -0.067     -0.078        0.0
            5      -0.113     -0.049     -0.060      0.018        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.026      1.000
            3       0.118      0.961      1.000
            4       0.000      0.003      0.001      1.000
            5       0.001      0.134      0.063      0.922      1.000
--------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_CD2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_CD2   N: 35   Multiple R: 0.741   Squared multiple R: 0.549


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_CD2

   CONSTANT                    0.150

   MET_ZONE$   A               0.068

     T_ZONE$   B              -0.004

   MET_ZONE$   C              -0.035

   MET_ZONE$   D              -0.078


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.075     4        0.019       9.140       0.000

Error                      0.062    30        0.002

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE       N
  MET_ZONE$   =A                   0.218       0.023       4
  MET_ZONE$   =B                   0.146       0.013      12
  MET_ZONE$   =C                   0.115       0.016       8
  MET_ZONE$   =D                   0.072       0.017       7
  MET_ZONE$   =R                   0.198       0.023       4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
  5  R
Using least squares means.
Post Hoc test of T_CD2
--------------------------------------------------------------------------------

Using model MSE of 0.002 with 30 DF.
Matrix of pairwise mean differences:

                    1          2          3          4          5
          1       0.0
          2    -0.072        0.0
          3    -0.103     -0.031        0.0
          4    -0.146     -0.074     -0.043        0.0
          5    -0.021      0.052      0.082      0.126        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                    1          2          3          4          5
          1     1.000
          2     0.069      1.000
          3     0.007      0.580      1.000
          4     0.000      0.014      0.370      1.000
          5     0.966      0.306      0.044      0.001      1.000
--------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_CR2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_CR2   N: 35   Multiple R: 0.898   Squared multiple R: 0.806


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            T_CR2

   CONSTANT                  1.558

   MET_ZONE$   A             0.255

   MET_ZONE$   B             0.047

   MET_ZONE$   C            -0.001

   MET_ZONE$   D            -0.169


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.555    4        0.139      31.248       0.000

Error                      0.133   30        0.004

-------------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE      N
  MET_ZONE$   =A                  1.812       0.033      4
  MET_ZONE$   =B                  1.605       0.019     12
  MET_ZONE$   =C                  1.557       0.024      8
  MET_ZONE$   =D                  1.389       0.025      7
  MET_ZONE$   =R                  1.426       0.033      4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
     R
Using least squares means.
Post Hoc test of T_CR2
-------------------------------------------------------------------------------

Using model MSE of 0.004 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.208        0.0
            3      -0.256     -0.048        0.0
            4      -0.424     -0.216     -0.168        0.0
            5      -0.386     -0.179     -0.131      0.037        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.000      1.000
            3       0.000      0.521      1.000
            4       0.000      0.000      0.000      1.000
            5       0.000      0.001      0.025      0.896      1.000
-------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPENDENT T_CU2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_CU2    N: 35    Multiple R: 0.930    Squared multiple R: 0.865


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_CU2

   CONSTANT                    1.858

   MET_ZONE$    A              0.476

     T_ZONE$    B              0.200

   MET_ZONE$    C             -0.045

   MET_ZONE$    D             -0.226


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  2.403     4        0.601      48.123       0.000

Error                      0.374    30        0.012

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE       N
  MET_ZONE$    =A                 2.334        0.056       4
  MET_ZONE$    =B                 2.059        0.032      12
  MET_ZONE$    =C                 1.814        0.040       8
  MET_ZONE$    =D                 1.632        0.042       7
      ZONE$    =R                 1.453        0.056       4
--    ---------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
     C
     D
  5  R
Using least squares means.
Post Hoc test of T_CU2
-------------------------------------------------------------------------------

Using model MSE of 0.012 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.276        0.0
            3      -0.521     -0.245        0.0
            4      -0.702     -0.426     -0.182        0.0
            5      -0.881     -0.605     -0.361     -0.179        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.002      1.000
            3       0.000      0.000      1.000
            4       0.000      0.000      0.029      1.000
            5       0.000      0.000      0.000      0.105      1.000
-------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_PB2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_PB2    N: 35    Multiple R: 0.806    Squared multiple R: 0.650


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_PB2

   CONSTANT                    1.615

   MET_ZONE$    A              0.291

     T_ZONE$    B              0.095

   MET_ZONE$    C             -0.062

   MET_ZONE$    D             -0.251


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.939     4        0.235      13.943       0.000

Error                      0.505    30        0.017

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  MET_ZONE$    =A                  1.906       0.065       4
  MET_ZONE$    =B                  1.710       0.037      12
  MET_ZONE$    =C                  1.553       0.046       8
  MET_ZONE$    =D                  1.364       0.049       7
  MET_ZONE$    =R                  1.542       0.065       4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  ~  C
     D
  ⌣  R
Using least squares means.
Post Hoc test of T_PB2
```

Using model MSE of 0.017 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	-0.196	0.0			
3	-0.353	-0.157	0.0		
4	-0.542	-0.346	-0.189	0.0	
5	-0.364	-0.168	-0.011	0.178	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.092	1.000			
3	0.001	0.087	1.000		
4	0.000	0.000	0.060	1.000	
5	0.004	0.193	1.000	0.210	1.000

>

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_HG2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_HG2   N: 35   Multiple R: 0.880   Squared multiple R: 0.774


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_HG2

   CONSTANT                    0.136

   MET_ZONE$   A               0.084

     T_ZONE$   B               0.079

   MET_ZONE$   C              -0.025

   MET_ZONE$   D              -0.060


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.155     4        0.039      25.736       0.000

Error                      0.045    30        0.002

-------------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE      N
  MET_ZONE$   =A                 0.220       0.019      4
  MET_ZONE$   =B                 0.215       0.011     12
  MET_ZONE$   =C                 0.111       0.014      8
  MET_ZONE$   =D                 0.076       0.015      7
  ' ZONE$   =R                   0.058       0.019      4
--  -----------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
  5  R
Using least squares means.
Post Hoc test of T_HG2
```

Using model MSE of 0.002 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	-0.004	0.0			
3	-0.109	-0.105	0.0		
4	-0.144	-0.140	-0.035	0.0	
5	-0.162	-0.157	-0.053	-0.018	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	1.000	1.000			
3	0.001	0.000	1.000		
4	0.000	0.000	0.429	1.000	
5	0.000	0.000	0.202	0.948	1.000

>

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_NI2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_NI2   N: 35   Multiple R: 0.810   Squared multiple R: 0.656


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            T_NI2

   CONSTANT                  1.353

   MET_ZONE$   A             0.213

   MET_ZONE$   B             0.031

   MET_ZONE$   C             0.012

   MET_ZONE$   D            -0.124


                      Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.371     4        0.093      14.303       0.000

Error                      0.195    30        0.006

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  MET_ZONE$   =A                    1.566       0.040       4
  MET_ZONE$   =B                    1.384       0.023      12
  MET_ZONE$   =C                    1.365       0.028       8
  MET_ZONE$   =D                    1.229       0.030       7
  MET_ZONE$   =R                    1.222       0.040       4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
     C
     D
     R
Using least squares means.
Post Hoc test of T_NI2
-----------------------------------------------------------------------------

Using model MSE of 0.006 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.183        0.0
            3      -0.201     -0.019        0.0
            4      -0.338     -0.155     -0.136        0.0
            5      -0.345     -0.162     -0.144     -0.007        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.004      1.000
            3       0.003      0.986      1.000
            4       0.000      0.003      0.021      1.000
            5       0.000      0.012      0.049      1.000      1.000
-----------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_AG2 / TUKEY

>ESTIMATE
```

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_AG2 N: 35 Multiple R: 0.841 Squared multiple R: 0.707

Estimates of effects $B = (X'X)^{-1} X'Y$

		T_AG2
CONSTANT		0.491
MET_ZONE$	A	0.144
MET_ZONE$	B	0.063
MET_ZONE$	C	0.006
MET_ZONE$	D	-0.112

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
MET_ZONE$	0.259	4	0.065	18.133	0.000
Error	0.107	30	0.004		

Least squares means.

		LS Mean	SE	N
MET_ZONE$	=A	0.636	0.030	4
MET_ZONE$	=B	0.555	0.017	12
MET_ZONE$	=C	0.498	0.021	8
MET_ZONE$	=D	0.380	0.023	7
MET_ZONE$	=R	0.390	0.030	4

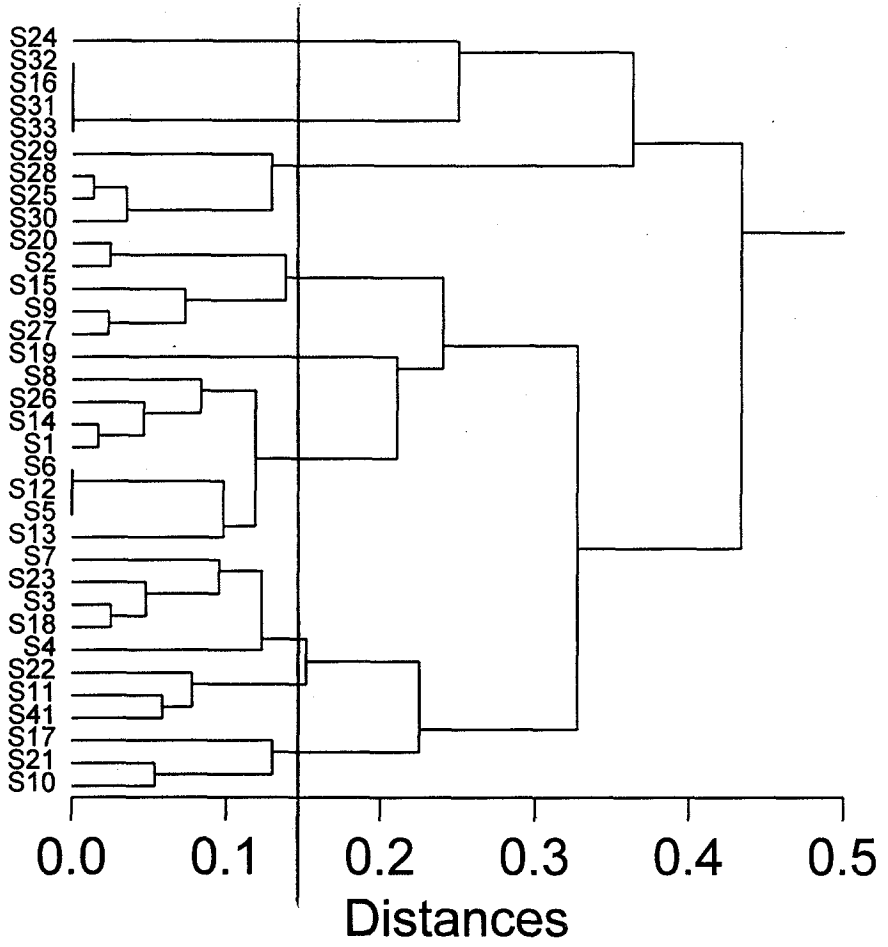
```
COL/
ROW MET_ZONE$
  1  A
  2  B
  3  C
     D
  5  R
Using least squares means.
Post Hoc test of T_AG2
-------------------------------------------------------------------------------

Using model MSE of 0.004 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.081        0.0
            3      -0.138     -0.057        0.0
            4      -0.256     -0.175     -0.118        0.0
            5      -0.246     -0.165     -0.108      0.010        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.159      1.000
            3       0.006      0.250      1.000
            4       0.000      0.000      0.005      1.000
            5       0.000      0.000      0.045      0.999      1.000
-------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY MET_ZONE$

>DEPEND T_ZN2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
MET_ZONE$ (5 levels)
   A, B, C, D, R
3 case(s) deleted due to missing data.

Dep Var: T_ZN2   N: 35   Multiple R: 0.893   Squared multiple R: 0.798


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_ZN2

   CONSTANT                    2.125

   MET_ZONE$   A               0.310

   MET_ZONE$   B               0.105

   MET_ZONE$   C              -0.028

   MET_ZONE$   D              -0.194


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

MET_ZONE$                  0.935     4        0.234      29.560       0.000

Error                      0.237    30        0.008

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE      N
  MET_ZONE$   =A                   2.435       0.044      4
  MET_ZONE$   =B                   2.231       0.026     12
  MET_ZONE$   =C                   2.098       0.031      8
  MET_ZONE$   =D                   1.931       0.034      7
  MET_ZONE$   =R                   1.932       0.044      4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW MET_ZONE$
  1  A
  2  B
     C
     D
     R
Using least squares means.
Post Hoc test of T_ZN2
-------------------------------------------------------------------------------

Using model MSE of 0.008 with 30 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.204        0.0
            3      -0.337     -0.133        0.0
            4      -0.504     -0.300     -0.167        0.0
            5      -0.503     -0.298     -0.166      0.001        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.003      1.000
            3       0.000      0.021      1.000
            4       0.000      0.000      0.009      1.000
            5       0.000      0.000      0.036      1.000      1.000
-------------------------------------------------------------------------------


>
```

Cluster Tree

PAHs and SVOCs



STATION ID	BAP	BBF	BKF	CHRYSENE	FLUORAN	PYRENE	T_PAH	T_HPAH	T_BENZOF	BIS2ETH
PAH Zone 1										
32	10	10	10	10	10	10	0	0	0	50
16	10	10	10	10	10	10	0	0	0	50
31	10	10	10	10	10	10	0	0	0	50
33	10	10	10	10	10	10	0	0	0	50
Minimum	10	10	10	10	10	10	0	0	0	50
Maximum	10	10	10	10	10	10	0	0	0	50
Mean	10.0	10.0	10.0	10.0	10.0	10.0	0.0	0.0	0.0	50.0
Standard Dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAH Zone 2										
29	19	19	37	10	10	10	75	75	56	50
28	36	36	36	36	18	18	180	180	72	50
25	35	35	35	35	35	35	0	0	0	250
30	33	33	33	33	16	33	181	181	66	50
Minimum	19	19	33	10	10	10	0	0	0	50
Maximum	36	36	37	36	35	35	181	181	72	250
Mean	30.8	30.8	35.3	28.5	19.8	24.0	109.0	109.0	48.5	100.0
Standard Dev.	7.9	7.9	1.7	12.4	10.7	12.0	88.1	88.1	33.0	100.0
CV	25.8	25.8	4.8	43.5	54.3	50.1	80.8	80.8	68.0	100.0
PAH Zone 3										
20	100	100	85	85	40	40	370	370	185	300
2	64	96	80	32	16	32	448	416	176	50
15	54	72	72	10	10	10	198	198	144	50
9	53	53	71	53	18	18	374	356	124	
27	48	48	72	48	24	48	312	288	120	
Minimum	48	48	71	10	10	10	198	198	120	50
Maximum	100	100	85	85	40	48	448	416	185	300
Mean	63.8	73.8	76.0	45.6	21.6	29.6	340.4	325.6	149.8	133.3
Standard Dev.	21.1	23.9	6.2	27.7	11.4	15.6	93.1	84.8	29.6	144.3
CV	33.0	32.4	8.2	60.7	52.9	52.6	27.3	26.0	19.8	108.3

STATION ID	BAP	BBF	BKF	CHRYSENE	FLUORAN	PYRENE	T_PAH	T_HPAH	T_BENZOF	BIS2ETH
PAH Zone 4										
8	82	98	130	49	33	33	572	523	228	50
26	96	130	120	58	38	38	653	653	250	50
14	95	130	140	63	10	10	666	602	270	50
1	120	140	140	93	28	43	838	738	280	50
6	120	150	180	91	30	30	830	739	330	50
12	110	150	180		55	55	858	768	330	
5	100	150	180	100			875	740	330	
13	160	200	160	10	10	10	613	613	360	50
Minimum	82	98	120	10	10	10	572	523	228	50
Maximum	160	200	180	100	55	55	875	768	360	50
Mean	110.4	143.5	153.8	66.3	29.1	31.3	738.1	672.0	297.3	50.0
Standard Dev.	23.9	28.7	24.5	31.6	15.8	16.6	123.8	87.5	46.6	0.0
CV	21.7	20.0	15.9	47.7	54.2	53.1	16.8	13.0	15.7	0.0
PAH Zone 5										
7	180	180	260	150	81	65	1370	1241	440	
23	180	220	290	230	130	140	1580	1580	510	300
3	200	240	310	79			1226	1128	550	
18	240	260	320	220	120	120	1960	1960	580	350
4	220	320	250	10	10	10	790	790	570	50
Minimum	180	180	250	10	10	10	790	790	440	50
Maximum	240	320	320	230	130	140	1960	1960	580	350
Mean	204.0	244.0	286.0	137.8	85.3	83.8	1385.2	1339.8	530.0	233.3
Standard Dev.	26.1	51.8	30.5	93.8	54.4	58.5	432.5	447.0	57.0	160.7
CV	12.8	21.2	10.7	68.1	63.9	69.9	31.2	33.4	10.8	68.9

STATION ID	BAP	BBF	BKF	CHRYSENE	FLUORAN	PYRENE	T_PAH	T_HPAH	T_BENZOF	BIS2ETH
PAH Zone 6										
22	300	410	300	280	76	150	2073	1946	710	250
11	310	370	370	150	92	110	2077	1894	740	
41	340	440	400	220	140	140	2400	2220	840	50
Minimum	300	370	300	150	76	110	2073	1894	710	50
Maximum	340	440	400	280	140	150	2400	2220	840	250
Mean	316.7	406.7	356.7	216.7	102.7	133.3	2183.3	2020.0	763.3	150.0
Standard Dev.	20.8	35.1	51.3	65.1	33.3	20.8	187.6	175.1	68.1	141.4
CV	6.6	8.6	14.4	30.0	32.4	15.6	8.6	8.7	8.9	94.3
PAH Zone 7										
17	500	680	480	380	150	180	3300	3300	1160	450
21	440	510	550	550	320	350	3940	3600	1060	400
10	540	500	660	390	160	340	3828	3490	1160	
Minimum	440	500	480	380	150	180	3300	3300	1060	400
Maximum	540	680	660	550	320	350	3940	3600	1160	450
Mean	493.3	563.3	563.3	440.0	210.0	290.0	3689.3	3463.3	1126.7	425.0
Standard Dev.	50.3	101.2	90.7	95.4	95.4	95.4	341.8	151.8	57.7	35.4
CV	10.2	18.0	16.1	21.7	45.4	32.9	9.3	4.4	5.1	8.3
24	5	5	5	5	5	5	0	0	0	45
19	87	45	120	45	45	45	207	207	120	300

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND BAP2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: BAP2    N: 36    Multiple R: 0.982    Squared multiple R: 0.964


                                  -1
Estimates of effects  B = (X'X)   X'Y


                              BAP2

   CONSTANT                    1.872

   PAH_ZONE$   A              -0.831

   PAH_ZONE$   B              -0.383

   PAH_ZONE$   C              -0.076

   PAH_ZONE$   D               0.166

   PAH_ZONE$   E               0.437

   PAH_ZONE$   F               0.629

   PAH_ZONE$   G               0.820


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 10.073     7        1.439     106.774       0.000

Error                      0.377    28        0.013

-------------------------------------------------------------------------------

Le   squares means.
                                LS Mean          SE       N
  PAH_ZONE$   =A                  1.041       0.058       4
  PAH_ZONE$   =B                  1.489       0.058       4
  PAH_ZONE$   =C                  1.796       0.052       5
```

PAH_ZONE$	=D	2.039	0.041	8
PAH_ZONE$	=E	2.309	0.052	5
PAH_ZONE$	=F	2.501	0.067	3
PAH_ZONE$	=G	2.692	0.067	3
PAH_ZONE$	=R	1.111	0.058	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R

Using least squares means.
Post Hoc test of BAP2

Using model MSE of 0.013 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.448	0.0			
3	0.755	0.307	0.0		
4	0.997	0.550	0.243	0.0	
5	1.268	0.820	0.513	0.270	0.0
6	1.460	1.012	0.705	0.463	0.192
7	1.651	1.203	0.896	0.654	0.383
8	0.069	-0.379	-0.685	-0.928	-1.198

	6	7	8
6	0.0		
7	0.191	0.0	
8	-1.391	-1.582	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.010	1.000		
4	0.000	0.000	0.020	1.000	
5	0.000	0.000	0.000	0.007	1.000
6	0.000	0.000	0.000	0.000	0.344
7	0.000	0.000	0.000	0.000	0.002
8	0.989	0.002	0.000	0.000	0.000

	6	7	8
6	1.000		
7	0.489	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND BBF2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: BBF2    N: 36    Multiple R: 0.982    Squared multiple R: 0.964


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              BBF2

   CONSTANT                    1.923

   PAH_ZONE$   A              -0.882

    H_ZONE$    B              -0.434

   PAH_ZONE$   C              -0.068

   PAH_ZONE$   D               0.229

   PAH_ZONE$   E               0.458

   PAH_ZONE$   F               0.686

   PAH_ZONE$   G               0.824


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 11.445     7        1.635     107.544       0.000

Error                      0.426    28        0.015

-------------------------------------------------------------------------------

Le     squares means.
                                 LS Mean          SE       N
  PAH_ZONE$    =A                 1.041        0.062       4
  PAH_ZONE$    =B                 1.489        0.062       4
  PAH_ZONE$    =C                 1.855        0.055       5
```

PAH_ZONE$	=D	2.152	0.044	8
PAH_ZONE$	=E	2.381	0.055	5
PAH_ZONE$	=F	2.609	0.071	3
PAH_ZONE$	=G	2.747	0.071	3
PAH_ZONE$	=R	1.111	0.062	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of BBF2

Using model MSE of 0.015 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.448	0.0			
3	0.814	0.366	0.0		
4	1.111	0.663	0.297	0.0	
5	1.340	0.892	0.526	0.229	0.0
6	1.568	1.120	0.754	0.457	0.228
7	1.706	1.258	0.892	0.595	0.366
8	0.069	-0.379	-0.745	-1.042	-1.271

	6	7	8
6	0.0		
7	0.138	0.0	
8	-1.499	-1.636	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.003	1.000		
4	0.000	0.000	0.005	1.000	
5	0.000	0.000	0.000	0.051	1.000
6	0.000	0.000	0.000	0.000	0.224
7	0.000	0.000	0.000	0.000	0.007
8	0.992	0.004	0.000	0.000	0.000

	6	7	8
6	1.000		
7	0.863	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND BKF2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: BKF2    N: 36    Multiple R: 0.989    Squared multiple R: 0.978


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              BKF2

   CONSTANT                    1.942

   PAH_ZONE$    A             -0.901

     H_ZONE$    B             -0.383

   PAH_ZONE$    C             -0.057

   PAH_ZONE$    D              0.243

   PAH_ZONE$    E              0.514

   PAH_ZONE$    F              0.608

   PAH_ZONE$    G              0.806


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 11.462     7        1.637     174.428       0.000

Error                      0.263    28        0.009

-------------------------------------------------------------------------------

Le    squares means.
                                 LS Mean          SE       N
  PAH_ZONE$    =A                 1.041        0.048       4
  PAH_ZONE$    =B                 1.559        0.048       4
  PAH_ZONE$    =C                 1.885        0.043       5
```

PAH_ZONE$	=D	2.185	0.034	8
PAH_ZONE$	=E	2.456	0.043	5
PAH_ZONE$	=F	2.550	0.056	3
PAH_ZONE$	=G	2.748	0.056	3
PAH_ZONE$	=R	1.111	0.048	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of BKF2

Using model MSE of 0.009 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.518	0.0			
3	0.844	0.326	0.0		
4	1.143	0.626	0.299	0.0	
5	1.415	0.897	0.571	0.271	0.0
6	1.509	0.991	0.665	0.366	0.094
7	1.706	1.189	0.862	0.563	0.292
8	0.069	-0.448	-0.775	-1.074	-1.345

	6	7	8
6	0.0		
7	0.197	0.0	
8	-1.440	-1.637	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.001	1.000		
4	0.000	0.000	0.000	1.000	
5	0.000	0.000	0.000	0.001	1.000
6	0.000	0.000	0.000	0.000	0.878
7	0.000	0.000	0.000	0.000	0.006
8	0.969	0.000	0.000	0.000	0.000

	6	7	8
6	1.000		
7	0.238	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND CHRYSEN / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
3 case(s) deleted due to missing data.

Dep Var: CHRYSEN   N: 35   Multiple R: 0.857   Squared multiple R: 0.734


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            CHRYSEN

   CONSTANT                   1.730

   PAH_ZONE$   A             -0.689

     H_ZONE$   B             -0.306

   PAH_ZONE$   C             -0.147

   PAH_ZONE$   D              0.021

   PAH_ZONE$   E              0.236

   PAH_ZONE$   F              0.594

   PAH_ZONE$   G              0.908


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                  7.675     7        1.096      10.670       0.000

Error                      2.774    27        0.103

-------------------------------------------------------------------------------

Le    squares means.
                                  LS Mean          SE       N
  PAH_ZONE$    =A                  1.041        0.160       4
  PAH_ZONE$    =B                  1.424        0.160       4
  PAH_ZONE$    =C                  1.583        0.143       5
```

PAH_ZONE$	=D	1.751	0.121	7
PAH_ZONE$	=E	1.966	0.143	5
PAH_ZONE$	=F	2.324	0.185	3
PAH_ZONE$	=G	2.638	0.185	3
PAH_ZONE$	=R	1.111	0.160	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R

Using least squares means.
Post Hoc test of CHRYSEN

Using model MSE of 0.103 with 27 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.383	0.0			
3	0.542	0.159	0.0		
4	0.710	0.327	0.168	0.0	
5	0.925	0.542	0.383	0.215	0.0
6	1.283	0.900	0.741	0.573	0.358
7	1.597	1.214	1.055	0.887	0.672
8	0.069	-0.314	-0.473	-0.641	-0.856
	6	7	8		
6	0.0				
7	0.314	0.0			
8	-1.213	-1.527	0.0		

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.694	1.000			
3	0.229	0.995	1.000		
4	0.028	0.731	0.984	1.000	
5	0.004	0.230	0.570	0.940	1.000
6	0.000	0.020	0.065	0.203	0.786
7	0.000	0.001	0.003	0.009	0.119
8	1.000	0.857	0.384	0.061	0.010
	6	7	8		
6	1.000				
7	0.925	1.000			
8	0.001	0.000	1.000		

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND FLUORAN2 / TUKEY

>ESTIMATE
```

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
A, B, C, D, E, F, G, R
4 case(s) deleted due to missing data.

Dep Var: FLUORAN2 N: 34 Multiple R: 0.852 Squared multiple R: 0.727

Estimates of effects $B = (X'X)^{-1} X'Y$

		FLUORAN2
CONSTANT		1.531
PAH_ZONE$	A	-0.489
PAH_ZONE$	B	-0.254
PAH_ZONE$	C	-0.218
PAH_ZONE$	D	-0.115
PAH_ZONE$	E	0.258
PAH_ZONE$	F	0.471
PAH_ZONE$	G	0.767

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
PAH_ZONE$	4.852	7	0.693	9.878	0.000
Error	1.824	26	0.070		

Least squares means.

		LS Mean	SE	N
PAH_ZONE$	=A	1.041	0.132	4
PAH_ZONE$	=B	1.277	0.132	4
PAH_ZONE$	=C	1.312	0.118	5

PAH_ZONE$	=D	1.415	0.100	7
PAH_ZONE$	=E	1.789	0.132	4
PAH_ZONE$	=F	2.001	0.153	3
PAH_ZONE$	=G	2.297	0.153	3
PAH_ZONE$	=R	1.111	0.132	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R

Using least squares means.
Post Hoc test of FLUORAN2

Using model MSE of 0.070 with 26 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.235	0.0			
3	0.271	0.036	0.0		
4	0.374	0.139	0.103	0.0	
5	0.747	0.512	0.477	0.373	0.0
6	0.960	0.725	0.689	0.586	0.213
7	1.256	1.021	0.985	0.882	0.509
8	0.069	-0.166	-0.202	-0.305	-0.678
	6	7	8		
6	0.0				
7	0.296	0.0			
8	-0.891	-1.187	0.0		

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.906	1.000			
3	0.788	1.000	1.000		
4	0.356	0.989	0.997	1.000	
5	0.010	0.157	0.173	0.357	1.000
6	0.001	0.026	0.027	0.060	0.961
7	0.000	0.001	0.001	0.001	0.234
8	1.000	0.985	0.943	0.604	0.024
	6	7	8		
6	1.000				
7	0.863	1.000			
8	0.004	0.000	1.000		

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND PYRENE2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
4 case(s) deleted due to missing data.

Dep Var: PYRENE2    N: 34    Multiple R: 0.842    Squared multiple R: 0.710


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              PYRENE2

   CONSTANT                     1.610

   PAH_ZONE$   A               -0.568

     H_ZONE$   B               -0.258

   PAH_ZONE$   C               -0.181

   PAH_ZONE$   D               -0.169

   PAH_ZONE$   E                0.163

   PAH_ZONE$   F                0.515

   PAH_ZONE$   G                0.835


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                  5.251     7        0.750       9.078       0.000

Error                      2.148    26        0.083

-------------------------------------------------------------------------------

Le     squares means.
                                 LS Mean          SE       N
  PAH_ZONE$    =A                 1.041        0.144       4
  PAH_ZONE$    =B                 1.352        0.144       4
  PAH_ZONE$    =C                 1.428        0.129       5
```

PAH_ZONE$	=D	1.441	0.109	7
PAH_ZONE$	=E	1.773	0.144	4
PAH_ZONE$	=F	2.125	0.166	3
PAH_ZONE$	=G	2.445	0.166	3
PAH_ZONE$	=R	1.272	0.144	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of PYRENE2

Using model MSE of 0.083 with 26 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.311	0.0			
3	0.387	0.076	0.0		
4	0.400	0.089	0.013	0.0	
5	0.732	0.421	0.345	0.332	0.0
6	1.083	0.773	0.696	0.683	0.351
7	1.404	1.093	1.017	1.004	0.672
8	0.231	-0.080	-0.156	-0.169	-0.501

	6	7	8
6	0.0		
7	0.321	0.0	
8	-0.852	-1.173	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.786	1.000			
3	0.497	1.000	1.000		
4	0.373	1.000	1.000	1.000	
5	0.025	0.457	0.633	0.599	1.000
6	0.001	0.030	0.047	0.035	0.746
7	0.000	0.001	0.001	0.001	0.082
8	0.942	1.000	0.991	0.979	0.254

	6	7	8
6	1.000		
7	0.864	1.000	
8	0.013	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND TBENZOF / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: TBENZOF   N: 36   Multiple R: 0.931   Squared multiple R: 0.867


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              TBENZOF

   CONSTANT                     1.933

   PAH_ZONE$   A               -1.933

    \H_ZONE$   B               -0.571

   PAH_ZONE$   C                0.239

   PAH_ZONE$   D                0.537

   PAH_ZONE$   E                0.790

   PAH_ZONE$   F                0.950

   PAH_ZONE$   G                1.119


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 33.514     7        4.788      26.184       0.000

Error                      5.120    28        0.183

-------------------------------------------------------------------------------

Le     squares means.
                                LS Mean          SE       N
  PAH_ZONE$    =A                0.000        0.214       4
  PAH_ZONE$    =B                1.361        0.214       4
  PAH_ZONE$    =C                2.172        0.191       5
```

PAH_ZONE$	=D	2.470	0.151	8
PAH_ZONE$	=E	2.723	0.191	5
PAH_ZONE$	=F	2.882	0.247	3
PAH_ZONE$	=G	3.052	0.247	3
PAH_ZONE$	=R	0.801	0.214	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of TBENZOF

Using model MSE of 0.183 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	1.361	0.0			
3	2.172	0.810	0.0		
4	2.470	1.108	0.298	0.0	
5	2.723	1.362	0.551	0.253	0.0
6	2.882	1.521	0.710	0.412	0.159
7	3.052	1.690	0.880	0.582	0.329
8	0.801	-0.560	-1.371	-1.669	-1.922

	6	7	8
6	0.0		
7	0.170	0.0	
8	-2.081	-2.251	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.002	1.000			
3	0.000	0.129	1.000		
4	0.000	0.005	0.918	1.000	
5	0.000	0.001	0.476	0.964	1.000
6	0.000	0.002	0.341	0.838	1.000
7	0.000	0.000	0.131	0.493	0.961
8	0.181	0.592	0.001	0.000	0.000

	6	7	8
6	1.000		
7	1.000	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND T_HPAH2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: T_HPAH2    N: 36    Multiple R: 0.925    Squared multiple R: 0.856


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_HPAH2

   CONSTANT                     2.285

   PAH_ZONE$   A               -2.285

     H_ZONE$   B               -0.685

   PAH_ZONE$   C                0.216

   PAH_ZONE$   D                0.540

   PAH_ZONE$   E                0.823

   PAH_ZONE$   F                1.020

   PAH_ZONE$   G                1.255


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 39.640     7       5.663      23.868       0.000

Error                      6.643    28       0.237

-------------------------------------------------------------------------------

Le    squares means.
                                 LS Mean          SE      N
  PAH_ZONE$   =A                   0.0          0.244      4
  PAH_ZONE$   =B                   1.600        0.244      4
  PAH_ZONE$   =C                   2.500        0.218      5
```

PAH_ZONE$	=D	2.825	0.172	8
PAH_ZONE$	=E	3.107	0.218	5
PAH_ZONE$	=F	3.305	0.281	3
PAH_ZONE$	=G	3.539	0.281	3
PAH_ZONE$	=R	1.402	0.244	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of T_HPAH2

Using model MSE of 0.237 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	1.600	0.0			
3	2.500	0.901	0.0		
4	2.825	1.225	0.324	0.0	
5	3.107	1.508	0.607	0.283	0.0
6	3.305	1.705	0.804	0.480	0.197
7	3.539	1.940	1.039	0.715	0.432
8	1.402	-0.198	-1.098	-1.423	-1.705

	6	7	8
6	0.0		
7	0.235	0.0	
8	-1.903	-2.137	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.002	1.000			
3	0.000	0.147	1.000		
4	0.000	0.007	0.935	1.000	
5	0.000	0.002	0.518	0.968	1.000
6	0.000	0.002	0.349	0.824	0.999
7	0.000	0.000	0.106	0.400	0.921
8	0.007	0.999	0.041	0.001	0.000

	6	7	8
6	1.000		
7	0.999	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND T_PAH2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
   A, B, C, D, E, F, G, R
2 case(s) deleted due to missing data.

Dep Var: T_PAH2    N: 36    Multiple R: 0.927    Squared multiple R: 0.859


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_PAH2

   CONSTANT                    2.301

   PAH_ZONE$    A             -2.301

    \H_ZONE$    B             -0.702

   PAH_ZONE$    C              0.217

   PAH_ZONE$    D              0.562

   PAH_ZONE$    E              0.822

   PAH_ZONE$    F              1.037

   PAH_ZONE$    G              1.265


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PAH_ZONE$                 40.522     7        5.789      24.318       0.000

Error                      6.665    28        0.238

-------------------------------------------------------------------------------

Le     squares means.
                                 LS Mean          SE       N
  PAH_ZONE$    =A                 0.000        0.244       4
  PAH_ZONE$    =B                 1.600        0.244       4
  PAH_ZONE$    =C                 2.518        0.218       5
```

PAH_ZONE$	=D	2.863	0.172	8
PAH_ZONE$	=E	3.123	0.218	5
PAH_ZONE$	=F	3.338	0.282	3
PAH_ZONE$	=G	3.566	0.282	3
PAH_ZONE$	=R	1.402	0.244	4

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of T_PAH2

Using model MSE of 0.238 with 28 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	1.600	0.0			
3	2.518	0.918	0.0		
4	2.863	1.264	0.345	0.0	
5	3.123	1.523	0.605	0.260	0.0
6	3.338	1.739	0.820	0.475	0.215
7	3.566	1.966	1.048	0.703	0.443
8	1.402	-0.198	-1.116	-1.461	-1.721

	6	7	8
6	0.0		
7	0.227	0.0	
8	-1.936	-2.164	0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.002	1.000			
3	0.000	0.134	1.000		
4	0.000	0.005	0.912	1.000	
5	0.000	0.002	0.524	0.980	1.000
6	0.000	0.002	0.327	0.832	0.999
7	0.000	0.000	0.102	0.423	0.912
8	0.007	0.999	0.036	0.001	0.000

	6	7	8
6	1.000		
7	0.999	1.000	
8	0.000	0.000	1.000

```
>ANOVA

>CATEGORY PAH_ZONE$

>DEPEND BIS2ETH2 / TUKEY

>ESTIMATE
```

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PAH_ZONE$ (8 levels)
A, B, C, D, E, F, G, R
10 case(s) deleted due to missing data.

Dep Var: BIS2ETH2 N: 28 Multiple R: 0.697 Squared multiple R: 0.486

Estimates of effects $B = (X'X)^{-1} X'Y$

		BIS2ETH2
CONSTANT		2.010
PAH_ZONE$	A	-0.302
PAH_ZONE$	B	-0.129
PAH_ZONE$	C	-0.109
PAH_ZONE$	D	-0.302
PAH_ZONE$	E	0.234
PAH_ZONE$	F	0.044
PAH_ZONE$	G	0.619

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
PAH_ZONE$	1.812	7	0.259	2.702	0.038
Error	1.915	20	0.096		

Least squares means.

	LS Mean	SE	N
PAH_ZONE$ =A	1.708	0.155	4
PAH_ZONE$ =B	1.881	0.155	4
PAH_ZONE$ =C	1.900	0.155	4

PAH_ZONE$	=D	1.708	0.126	6
PAH_ZONE$	=E	2.244	0.179	3
PAH_ZONE$	=F	2.054	0.219	2
PAH_ZONE$	=G	2.629	0.219	2
PAH_ZONE$	=R	1.954	0.179	3

COL/
ROW PAH_ZONE$
1 A
2 B
3 C
4 D
5 E
6 F
7 G
8 R
Using least squares means.
Post Hoc test of BIS2ETH2

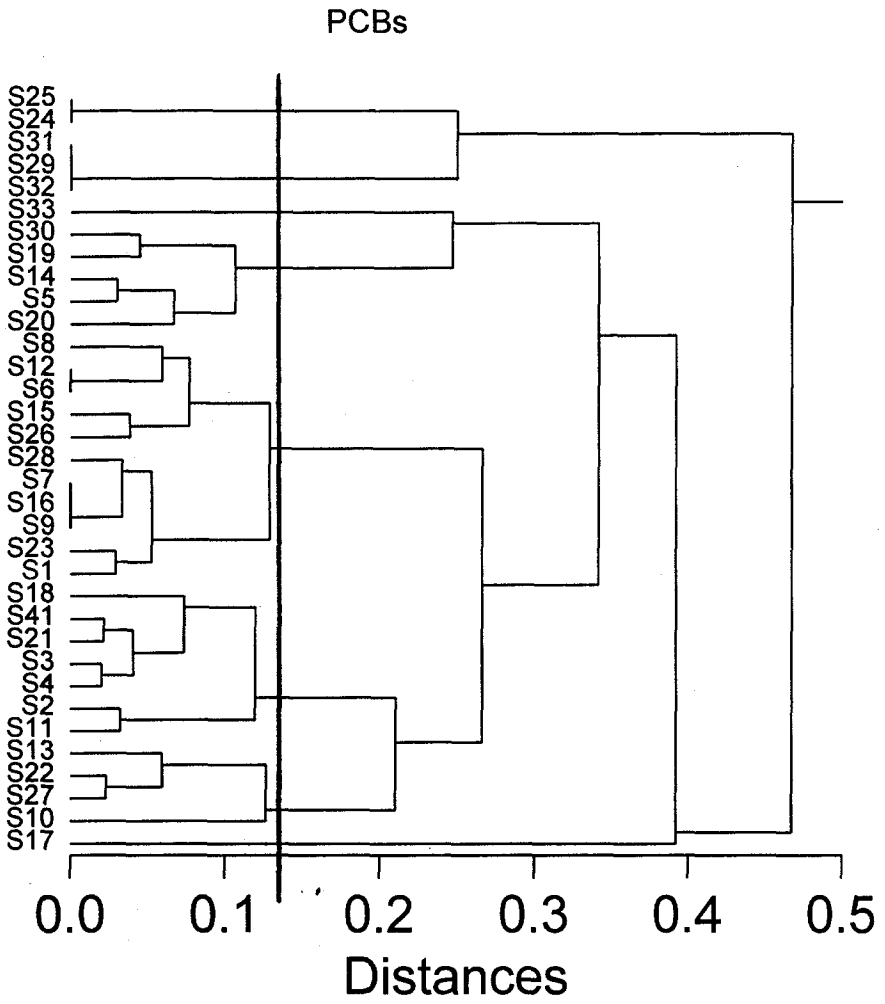
Using model MSE of 0.096 with 20 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.173	0.0			
3	0.193	0.020	0.0		
4	0.000	-0.173	-0.193	0.0	
5	0.536	0.363	0.343	0.536	0.0
6	0.346	0.173	0.153	0.346	-0.190
7	0.921	0.748	0.728	0.921	0.385
8	0.247	0.074	0.054	0.247	-0.289
	6	7	8		
6	0.0				
7	0.575	0.0			
8	-0.099	-0.674	0.0		

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.992	1.000			
3	0.985	1.000	1.000		
4	1.000	0.986	0.974	1.000	
5	0.356	0.780	0.822	0.271	1.000
6	0.892	0.998	0.999	0.860	0.997
7	0.044	0.153	0.174	0.028	0.863
8	0.961	1.000	1.000	0.943	0.938
	6	7	8		
6	1.000				
7	0.592	1.000			
8	1.000	0.299	1.000		

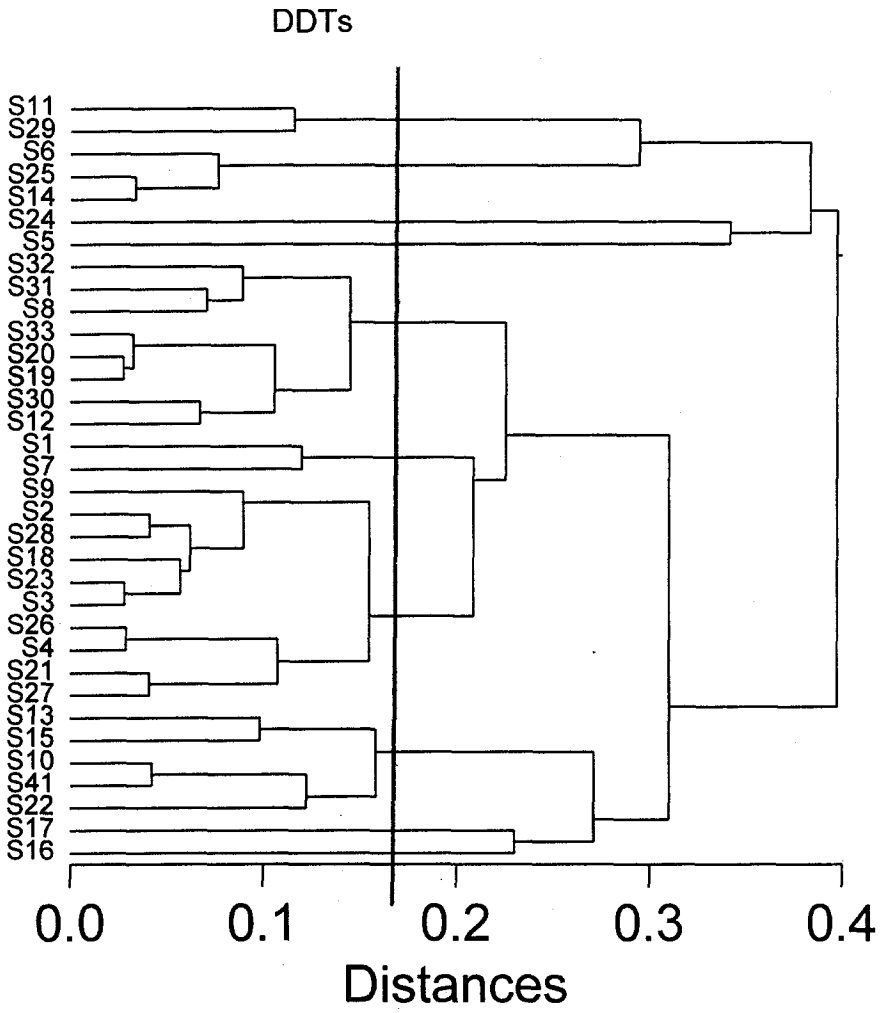
Cluster Tree



STATION ID	PCB_1260
PCB Zone 1	
31	10
29	10
32	10
Minimum	10
Maximum	10
Mean	10.0
Standard Dev.	0.0
CV	0.0
PCB Zone 2	
30	51
19	56
14	63
5	67
20	75
Minimum	51
Maximum	75
Mean	62.4
Standard Dev.	9.4
CV	15.0
PCB Zone 3	
8	97
12	110
6	110
15	120
26	130
28	140
7	150
16	150
9	150
23	160
1	170
Minimum	97
Maximum	170
Mean	135.2
Standard Dev.	23.4
CV	17.3

STATION ID	PCB_1260
PCB Zone 4	
18	200
41	220
21	230
3	240
4	250
2	290
11	310
Minimum	200
Maximum	310
Mean	248.6
Standard Dev.	38.9
CV	15.7
PCB Zone 5	
13	370
22	410
27	430
10	540
Minimum	370
Maximum	540
Mean	437.5
Standard Dev.	72.7
CV	16.6
25	5
24	5
33	31
17	880

Cluster Tree



STATION ID	DDD	DDE	T_DDT
DDTs Zone 1			
6	0.4	21	21
25	0.35	18	18
14	0.4	17	17
Minimum	0.35	17	17
Maximum	0.4	21	21
Mean	0.4	18.7	18.7
Standard Dev.	0.0	2.1	2.1
CV	7.5	11.2	11.2
DDTs Zone 2			
32	3	27	30
31	3.8	31	34.8
8	4.1	25	29.1
33	4.8	41	45.8
20	4.9	37	41.9
19	4.5	38	42.5
30	5.9	33	38.9
12	7.1	36	43.1
Minimum	3	25	29.1
Maximum	7.1	41	45.8
Mean	4.8	33.5	38.3
Standard Dev.	1.3	5.6	6.3
CV	26.7	16.6	16.4
DDTs Zone 3			
9	8.4	46	54.4
2	6.9	46	52.9
28	7	54	61
18	7.9	57	64.9
23	7	61	68
3	7.1	67	74.1
26	9.8	65	74.8
4	10	72	82
21	11	92	103
27	12	100	112
Minimum	6.9	46	52.9
Maximum	12	100	112
Mean	8.7	66.0	74.7
Standard Dev.	1.9	18.0	19.6
CV	21.4	27.3	26.3

STATION ID	DDD	DDE	T_DDT
DDTs Zone 4			
13	16	50	66
15	20	43	63
10	20	88	108
41	20	110	130
22	16	130	146
Minimum	16	43	63
Maximum	20	130	146
Mean	18.4	84.2	102.6
Standard Dev.	2.2	37.6	37.3
CV	11.9	44.6	36.4
11	0.45	57	57
29	0.45	43	43
24	0.35	6	6
5	1.9	13	14.9
1	13	34	47
7	9.2	31	40.2
17	33	180	213
16	42	60	136

```
>ANOVA

>CATEGORY DDT_ZONE$

>Γ   ND DDD2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
DDT_ZONE$ (5 levels)
   A, B, C, D, R
8 case(s) deleted due to missing data.

Dep Var: DDD2   N: 30   Multiple R: 0.956   Squared multiple R: 0.915


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              DDD2

   CONSTANT                    0.838

   DDT_ZONE$   A              -0.697

    )T_ZONE$   B              -0.087

   DDT_ZONE$   C               0.142

   DDT_ZONE$   D               0.447


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

DDT_ZONE$                  2.781     4        0.695      67.029       0.000

Error                      0.259    25        0.010

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE      N
  DDT_ZONE$   =A                  0.141        0.059      3
  DDT_ZONE$   =B                  0.752        0.036      8
  DDT_ZONE$   =C                  0.980        0.032     10
  DDT_ZONE$   =D                  1.286        0.046      5
    T_ZONE$   =R                  1.032        0.051      4
   -------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW DDT_ZONE$
  1  A
  2  B
     C
     D
  5  R
Using least squares means.
Post Hoc test of DDD2
-----------------------------------------------------------------------------

Using model MSE of 0.010 with 25 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1           0.0
            2           0.611      0.0
            3           0.839      0.229      0.0
            4           1.145      0.534      0.305      0.0
            5           0.891      0.281      0.052     -0.253      0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1           1.000
            2           0.000      1.000
            3           0.000      0.001      1.000
            4           0.000      0.000      0.000      1.000
            5           0.000      0.001      0.907      0.008      1.000
-----------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY DDT_ZONE$

>F   ND DDE2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
DDT_ZONE$ (5 levels)
   A, B, C, D, R
8 case(s) deleted due to missing data.

Dep Var: DDE2    N: 30    Multiple R: 0.884    Squared multiple R: 0.781


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              DDE2

   CONSTANT                    1.690

   DDT_ZONE$   A              -0.398

    DT_ZONE$   B              -0.158

   DDT_ZONE$   C               0.122

   DDT_ZONE$   D               0.202


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

DDT_ZONE$                  1.227     4        0.307      22.270       0.000

Error                      0.344    25        0.014

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE       N
  DDT_ZONE$    =A                 1.292       0.068       3
  DDT_ZONE$    =B                 1.533       0.041       8
  DDT_ZONE$    =C                 1.813       0.037      10
  DDT_ZONE$    =D                 1.893       0.052       5
    T_ZONE$    =R                 1.922       0.059       4
   -------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

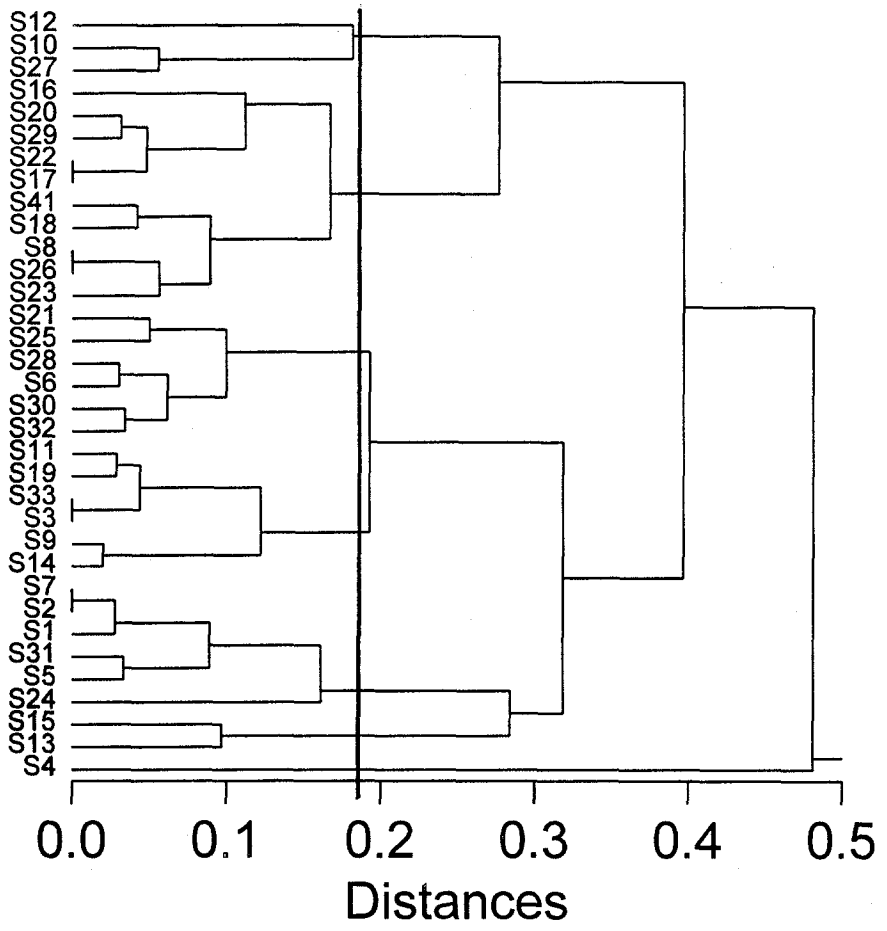
```
COL/
ROW DDT_ZONE$
  1  A
  2  B
     C
     D
  5  R
Using least squares means.
Post Hoc test of DDE2
-------------------------------------------------------------------------------

Using model MSE of 0.014 with 25 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1           0.0
            2           0.240      0.0
            3           0.521      0.280      0.0
            4           0.600      0.360      0.080      0.0
            5           0.629      0.389      0.109      0.029      0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1           1.000
            2           0.041      1.000
            3           0.000      0.000      1.000
            4           0.000      0.000      0.728      1.000
            5           0.000      0.000      0.531      0.996      1.000
-------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY DDT_ZONE$

>T   ND T_DDT2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
DDT_ZONE$ (5 levels)
   A, B, C, D, R
8 case(s) deleted due to missing data.

Dep Var: T_DDT2   N: 30   Multiple R: 0.919   Squared multiple R: 0.844


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              T_DDT2

   CONSTANT                     1.743

   DDT_ZONE$   A               -0.451

    )T_ZONE$   B               -0.154

   DDT_ZONE$   C                0.124

   DDT_ZONE$   D                0.248


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

DDT_ZONE$                  1.453     4        0.363      33.794       0.000

Error                      0.269    25        0.011

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE      N
  DDT_ZONE$   =A                   1.292       0.060      3
  DDT_ZONE$   =B                   1.589       0.037      8
  DDT_ZONE$   =C                   1.867       0.033     10
  DDT_ZONE$   =D                   1.991       0.046      5
    T_ZONE$   =R                   1.975       0.052      4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW DDT_ZONE$
  1  A
  2  B
     C
     D
  5  R
Using least squares means.
Post Hoc test of T_DDT2
-------------------------------------------------------------------------------

Using model MSE of 0.011 with 25 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2       0.297        0.0
            3       0.575      0.278        0.0
            4       0.699      0.402      0.124        0.0
            5       0.683      0.386      0.108     -0.016        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.002      1.000
            3       0.000      0.000      1.000
            4       0.000      0.000      0.219      1.000
            5       0.000      0.000      0.420      0.999      1.000
-------------------------------------------------------------------------------


>
```

Cluster Tree

Sulfides



STATION ID	SULFIDE
Sulfide Zone 1	
12	400
10	270
27	240
Minimum	240
Maximum	400
Mean	303.3
Standard Dev.	85.0
CV	28.0
Sulfide Zone 2	
16	190
20	160
29	150
22	140
17	140
41	120
18	110
8	98
26	98
23	87
Minimum	87
Maximum	190
Mean	129.3
Standard Dev.	32.5
CV	25.1
Sulfide Zone 3	
21	60
25	54
28	50
6	47
30	44
32	41
Minimum	41
Maximum	60
Mean	49.3
Standard Dev.	6.9
CV	14.0

STATION ID	SULFIDE
Sulfide Zone 4	
11	35
19	33
33	31
3	31
9	25
14	24
Minimum	24
Maximum	35
Mean	29.8
Standard Dev.	4.4
CV	14.8
Sulfide Zone 5	
7	18
2	18
1	17
31	15
5	14
24	11
Minimum	11
Maximum	18
Mean	15.5
Standard Dev.	2.7
CV	17.7
15	7.2
13	5.8
4	1.1

```
>ANOVA

>CATEGORY SUL_ZONE$

>DEPEND SULFIDE2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
SUL_ZONE$ (6 levels)
   A, B, C, D, E, R
3 case(s) deleted due to missing data.

Dep Var: SULFIDE2   N: 35   Multiple R: 0.900   Squared multiple R: 0.811


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              SULFIDE2

   CONSTANT                      1.843

   SUL_ZONE$   A                 0.630

     L_ZONE$   B                 0.260

   SUL_ZONE$   C                -0.144

   SUL_ZONE$   D                -0.357

   SUL_ZONE$   E                -0.631


                            Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

SUL_ZONE$                   5.328    5        1.066      24.853       0.000

Error                       1.243   29        0.043

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE      N
  SUL_ZONE$   =A                   2.473       0.120      3
  SUL_ZONE$   =B                   2.103       0.065     10
      ZONE$   =C                   1.698       0.085      6
     _ZONE$   =D                   1.485       0.085      6
  SUL_ZONE$   =E                   1.212       0.085      6
  SUL_ZONE$   =R                   2.084       0.104      4
-------------------------------------------------------------------------------
```

COL/
ROW SUL_ZONE$
A
B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of SULFIDE2

Using model MSE of 0.043 with 29 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	-0.370	0.0			
3	-0.774	-0.404	0.0		
4	-0.988	-0.618	-0.213	0.0	
5	-1.261	-0.891	-0.486	-0.273	0.0
6	-0.389	-0.019	0.385	0.599	0.872
	6				
6	0.0				

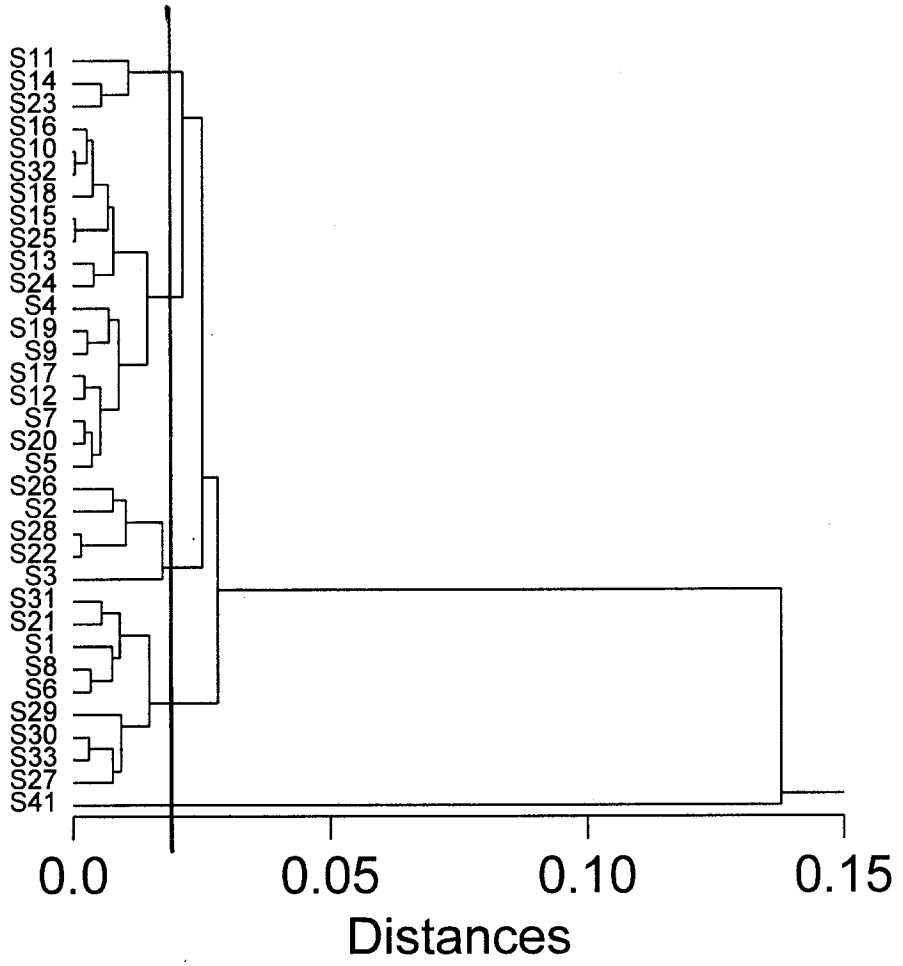
T ' HSD Multiple Comparisons.
M .x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.103	1.000			
3	0.000	0.009	1.000		
4	0.000	0.000	0.491	1.000	
5	0.000	0.000	0.004	0.233	1.000
6	0.170	1.000	0.072	0.001	0.000
	6				
6	1.000				

>

Cluster Tree

Amphipod Survival and Reburial



STATION ID	AMPH_SUR	AMPH_REB
Amphipod Zone 1		
11	98.8	98
14	96.3	97.4
23	95	96.6
Minimum	95	96.6
Maximum	98.8	98
Mean	96.7	97.3
Standard Dev.	1.9	0.7
CV	2.0	0.7
RPD	14.1	1.2
Amphipod Zone 2		
16	91	96.7
10	91	97.7
32	91	97.9
18	92	97.8
15	93	96.9
25	93	96.7
13	92.5	98.9
24	92	100
4	90	98.9
19	89	100
9	88	100
17	88	97.9
12	88	98.8
7	87	98.5
20	87	97.6
5	87	96.6
Minimum	87	96.6
Maximum	93	100
Mean	90.0	98.2
Standard Dev.	2.2	1.2
CV	2.5	1.2
RPD	6.1	2.0
Amphipod Zone 3		
26	90	94.5
2	91	92.6
28	90	90.4
22	90	89.8
3	93	88.2
Minimum	90	88.2
Maximum	93	94.5
Mean	90.8	91.1
Standard Dev.	1.3	2.5
CV	1.4	2.7
RPD	7.1	5.3

STATION ID	AMPH_SUR	AMPH_REB
Amphipod Zone 4		
1	85	92
21	85	94.1
27	81	95.1
29	83	92.8
30	83.5	95.8
31	86	95.1
33	83	95.2
6	87	93.3
8	87	92
Minimum	81	92
Maximum	87	95.8
Mean	84.5	93.9
Standard Dev.	2.0	1.5
CV	2.4	1.6
RPD	0.3	2.4
41	57	77.9
Reference		
40018.1		93.1
40018.2	83	96.5
40018.3	88.3	96.4
40032.1	83	98.9
Mean	84.8	96.2

```
>ANOVA

>CATEGORY AMP_ZONE$

>DEPEND AMPHREB / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
AMP_ZONE$ (5 levels)
   A, B, C, D, R
1 case(s) deleted due to missing data.

Dep Var: AMPHREB   N: 37   Multiple R: 0.804   Squared multiple R: 0.646


                                  -1
Estimates of effects  B = (X'X)   X'Y


                              AMPHREB

   CONSTANT                     1.284

   AMP_ZONE$   A                0.056

     P_ZONE$   B                0.117

   AMP_ZONE$   C               -0.135

   AMP_ZONE$   D               -0.061


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

AMP_ZONE$                  0.335     4        0.084      14.593       0.000

Error                      0.184    32        0.006

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE      N
  AMP_ZONE$   =A                   1.341       0.044      3
  AMP_ZONE$   =B                   1.402       0.019     16
  AMP_ZONE$   =C                   1.149       0.034      5
  AMP_ZONE$   =D                   1.223       0.025      9
      ZONE$   =R                   1.307       0.038      4
--   ----------------------------------------------------------------------

-------------------------------------------------------------------------------
```

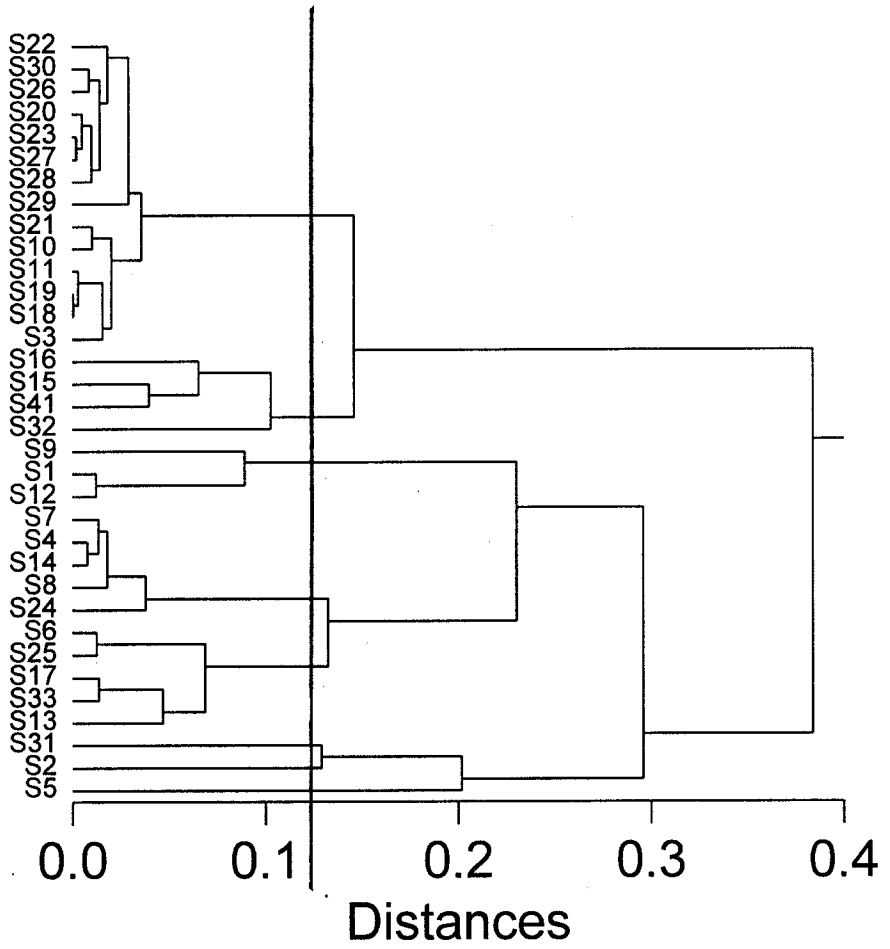
```
COL/
ROW AMP_ZONE$
  1  A
  2  B
  ^  C
     D
  ⌣  R
Using least squares means.
Post Hoc test of AMPHREB
--------------------------------------------------------------------------------

Using model MSE of 0.006 with 32 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1           0.0
            2           0.061      0.0
            3          -0.192     -0.252      0.0
            4          -0.118     -0.179      0.074      0.0
            5          -0.034     -0.095      0.158      0.084      0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1           1.000
            2           0.706      1.000
            3           0.012      0.000      1.000
            4           0.161      0.000      0.421      1.000
            5           0.976      0.190      0.031      0.369      1.000
--------------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY AMP_ZONE$

>DEPEND AMPHSUR / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
AMP_ZONE$ (5 levels)
   A, B, C, D, R
2 case(s) deleted due to missing data.

Dep Var: AMPHSUR   N: 36   Multiple R: 0.880   Squared multiple R: 0.774


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              AMPHSUR

   CONSTANT                     1.121

   AMP_ZONE$   A                0.201

     P_ZONE$   B                0.001

   AMP_ZONE$   C                0.019

   AMP_ZONE$   D               -0.113


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

AMP_ZONE$                  0.262     4        0.066      26.483       0.000

Error                      0.077    31        0.002

-------------------------------------------------------------------------------

Least squares means.
                                 LS Mean          SE      N
  AMP_ZONE$   =A                   1.322       0.029      3
  AMP_ZONE$   =B                   1.122       0.012     16
  AMP_ZONE$   =C                   1.139       0.022      5
  AMP_ZONE$   =D                   1.008       0.017      9
      ZONE$   =R                   1.013       0.029      3
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
```

```
COL/
ROW AMP_ZONE$
  1  A
  2  B
  3  C
     D
  5  R
Using least squares means.
Post Hoc test of AMPHSUR
--------------------------------------------------------------------------------

Using model MSE of 0.002 with 31 DF.
Matrix of pairwise mean differences:

                        1          2          3          4          5
            1         0.0
            2      -0.201        0.0
            3      -0.183      0.018        0.0
            4      -0.315     -0.114     -0.132        0.0
            5      -0.309     -0.108     -0.126      0.006        0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                        1          2          3          4          5
            1       1.000
            2       0.000      1.000
            3       0.000      0.956      1.000
            4       0.000      0.000      0.000      1.000
            5       0.000      0.013      0.013      1.000      1.000
--------------------------------------------------------------------------------


>
```

Cluster Tree

Echinoderm Survival and Development



STATION ID	ECH_DEV	ECH_SUR
Echinoderm Zone 1		
22	89.3	89
30	93.3	92.3
26	91.3	91.3
20	92.3	87
23	93.3	87.3
27	93.7	87.7
28	94.3	84.3
29	96.3	97.7
21	92.3	99.3
10	89.7	100
11	87.3	97.7
18	86.7	97
19	86.7	97.3
3	84	100
Minimum	84	84.3
Maximum	96.3	100
Mean	90.8	93.4
Standard Dev.	3.5	5.6
CV	3.9	6.0
RPD	11.1	12.7
Echinoderm Zone 2		
15	57	91.7
16	67.7	90
41	51.3	86.7
32	40.3	82.7
Minimum	40.3	82.7
Maximum	67.7	91.7
Mean	54.1	87.8
Standard Dev.	11.4	4.0
CV	21.1	4.5
RPD	33.8	5.9
Echinoderm Zone 3		
9	11	96
1	1	96
12	0.3	97
Minimum	0.3	96
Maximum	11	97
Mean	4.1	96.3
Standard Dev.	6.0	0.6
CV	146.0	0.6
RPD	95.0	16.2

STATION ID	ECH_DEV	ECH_SUR
Echinoderm Zone 4		
7	0	66.3
4	0	65
14	0	64
8	0.7	64.3
24	0	60.3
Minimum	0	60.3
Maximum	0.7	66.3
Mean	0.1	64.0
Standard Dev.	0.3	2.2
CV	223.6	3.5
RPD	99.8	22.8
Echinoderm Zone 5		
13	0.3	42.3
17	0	46.3
25	0	50.7
33	0.5	46
6	0	52
Minimum	0	42.3
Maximum	0.5	52
Mean	0.2	47.5
Standard Dev.	0.2	3.9
CV	143.9	8.2
RPD	99.8	42.7
31	0	25
2	0	33.7
5	7	32
Reference		
40018.1		97.7
40018.2	80.3	86.3
40018.3	83	70.5
40032.1		77
Mean	81.65	82.875

```
>ANOVA

>CATEGORY ECH_ZONE$

>DEPEND ECH_DEV2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
ECH_ZONE$ (6 levels)
   A, B, C, D, E, R
5 case(s) deleted due to missing data.

Dep Var: ECH_DEV2   N: 33   Multiple R: 0.991   Squared multiple R: 0.982


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            ECH_DEV2

   CONSTANT                    0.453

   ECH_ZONE$   A               0.691

   ECH_ZONE$   B               0.123

   ECH_ZONE$   C              -0.412

   ECH_ZONE$   D              -0.452

   ECH_ZONE$   E              -0.452


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

ECH_ZONE$                   8.917    5        1.783     303.051       0.000

Error                       0.159   27        0.006

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE      N
  ECH_ZONE$   =A                    1.145       0.021     14
  ECH_ZONE$   =B                    0.576       0.038      4
  ECH_ZONE$   =C                    0.041       0.044      3
  ECH_ZONE$   =D                    0.001       0.034      5
  ECH_ZONE$   =E                    0.002       0.034      5
  ECH_ZONE$   =R                    0.956       0.054      2
-------------------------------------------------------------------------------
```

COL/
ROW ECH_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of ECH_DEV2

Using model MSE of 0.006 with 27 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	-0.569	0.0			
3	-1.104	-0.535	0.0		
4	-1.143	-0.575	-0.040	0.0	
5	-1.143	-0.574	-0.039	0.000	0.0
6	-0.189	0.380	0.915	0.954	0.954
	6				
6	0.0				

T[illegible] HSD Multiple Comparisons.
M[illegible]x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.000	1.000		
4	0.000	0.000	0.979	1.000	
5	0.000	0.000	0.980	1.000	1.000
6	0.032	0.000	0.000	0.000	0.000
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY ECH_ZONE$

>DEPEND ECH_SUR2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
ECH_ZONE$ (6 levels)
   A, B, C, D, E, R
3 case(s) deleted due to missing data.

Dep Var: ECH_SUR2   N: 35   Multiple R: 0.897   Squared multiple R: 0.805


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            ECH_SUR2

   CONSTANT                    0.973

   ECH_ZONE$   A               0.283

   ECH_ZONE$   B               0.103

   ECH_ZONE$   C               0.327

   ECH_ZONE$   D              -0.278

   ECH_ZONE$   E              -0.478


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

ECH_ZONE$                  2.934     5        0.587      23.967       0.000

Error                      0.710    29        0.024

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE      N
  ECH_ZONE$   =A                    1.256       0.042     14
  ECH_ZONE$   =B                    1.076       0.078      4
      ZONE$   =C                    1.300       0.090      3
      ZONE$   =D                    0.695       0.070      5
  ECH_ZONE$   =E                    0.495       0.070      5
  ECH_ZONE$   =R                    1.015       0.078      4
-------------------------------------------------------------------------------
```

COL/
ROW ECH_ZONE$

	A
2	B
3	C
4	D
5	E
6	R

Using least squares means.
Post Hoc test of ECH_SUR2

Using model MSE of 0.024 with 29 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	-0.180	0.0			
3	0.044	0.224	0.0		
4	-0.561	-0.381	-0.605	0.0	
5	-0.761	-0.581	-0.805	-0.200	0.0
6	-0.241	-0.061	-0.285	0.320	0.520
	6				
6	0.0				

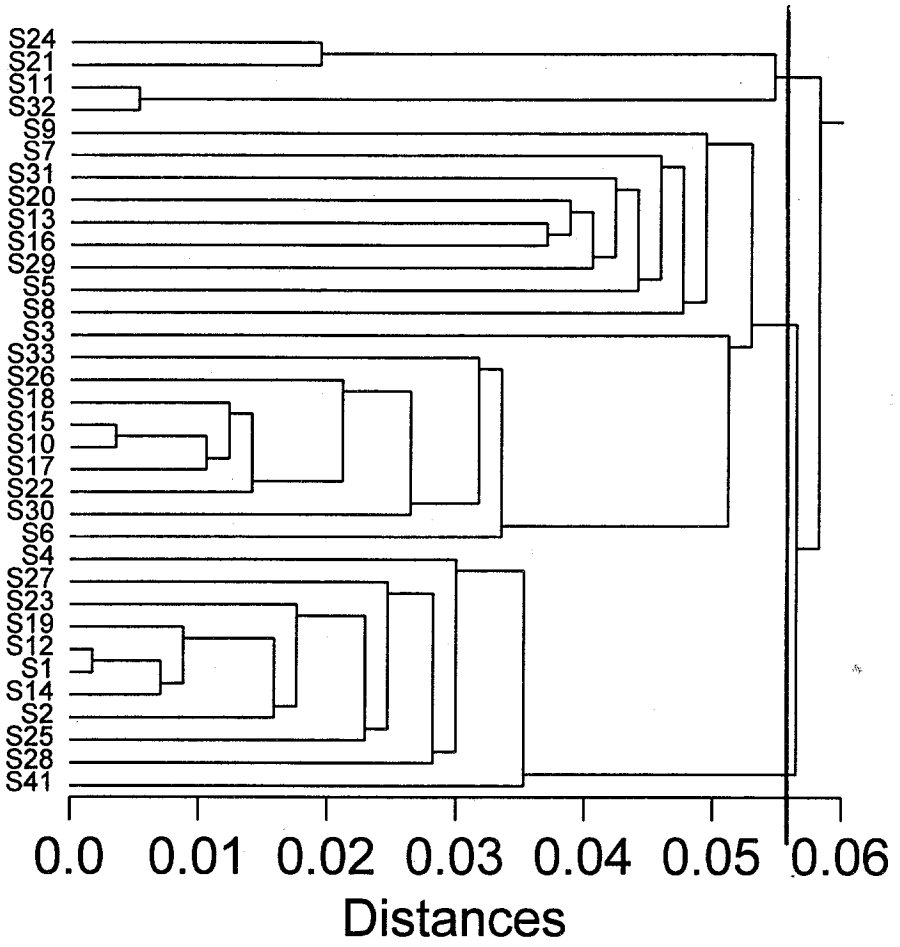
T HSD Multiple Comparisons.
Ma x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.351	1.000			
3	0.998	0.437	1.000		
4	0.000	0.012	0.000	1.000	
5	0.000	0.000	0.000	0.358	1.000
6	0.102	0.993	0.194	0.050	0.000
	6				
6	1.000				

>

Cluster Tree

Polychaete Survival



Polychaete Survival

STATION ID	POLY_SUR
Polychaete Zone 1	
24	84
21	84
11	88
32	88
Minimum	84
Maximum	88
Mean	86.0
Standard Dev.	2.3
CV	2.7
RPD	10.4
Polychaete Zone 2	
9	92
7	92
31	92
20	92
13	92
16	92
29	92
5	92
8	92
3	95
33	96
26	96
18	96
15	96
10	96
17	96
22	96
30	96
6	96
Minimum	92
Maximum	96
Mean	93.9
Standard Dev.	2.0
CV	2.1
RPD	2.1

Polychaete Survival

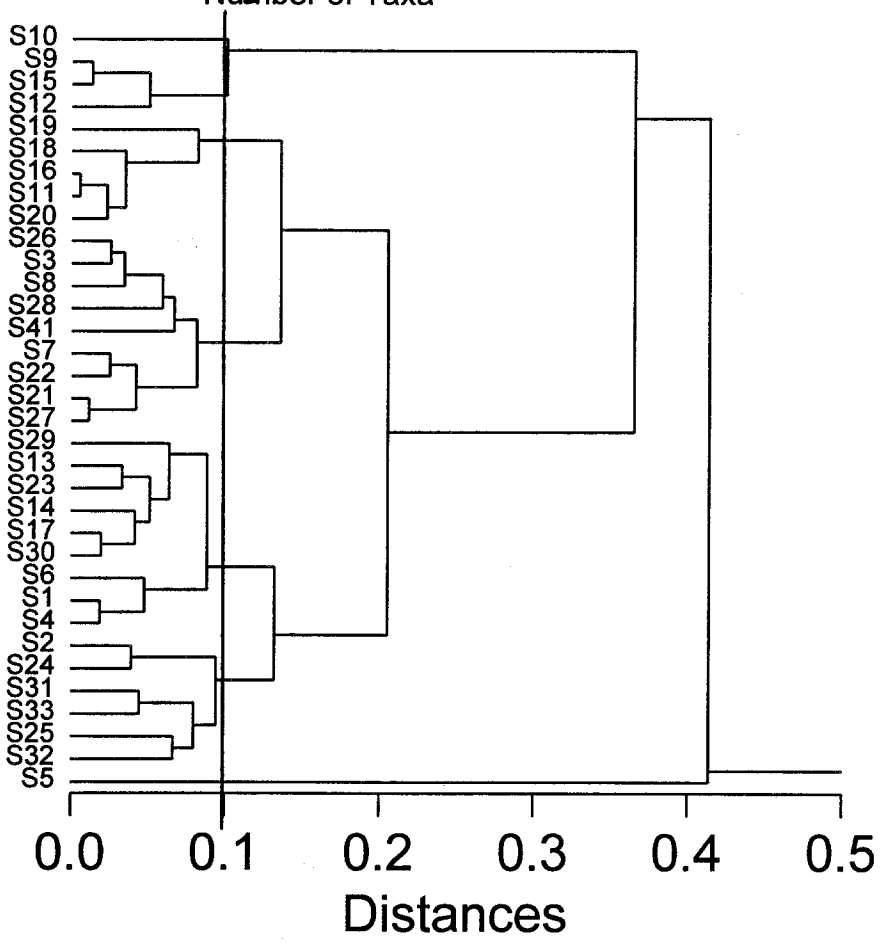
STATION ID	POLY_SUR
Polychaete Zone 3	
4	100
27	100
23	100
19	100
12	100
1	100
14	100
2	100
25	100
28	100
41	100
Minimum	100
Maximum	100
Mean	100.0
Standard Dev.	0.0
CV	0.0
RPD	4.2
Reference	
40018.1	96
40018.2	92
40018.3	100
40032.1	96
Mean	96.0

```
>ANOVA

>CATEGORY PSURV_ZONE$

>DEPEND POLYSUR / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
PSURV_ZONE$ (4 levels)
   A, B, C, R

Dep Var: POLYSUR   N: 38   Multiple R: 0.939   Squared multiple R: 0.881


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            POLYSUR

   CONSTANT                   1.291

   PSURV_ZONE$ A             -0.255

   PSURV_ZONE$ B             -0.062

   PSURV_ZONE$ C              0.280


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

PSURV_ZONE$                1.171    3        0.390      83.826       0.000

Error                      0.158   34        0.005

-------------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE       N
  PSURV_ZONE$ =A                  1.037       0.034       4
  PSURV_ZONE$ =B                  1.229       0.016      19
  PSURV_ZONE$ =C                  1.571       0.021      11
  PSURV_ZONE$ =R                  1.328       0.034       4
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------

CC
ROW PSURV_ZONE$
  1  A
  2  B
```

```
  3  C
  4  R
Using least squares means.
Post Hoc test of POLYSUR
-----------------------------------------------------------------------------

Using model MSE of 0.005 with 34 DF.
Matrix of pairwise mean differences:

                    1          2          3          4
          1         0.0
          2         0.192      0.0
          3         0.534      0.342      0.0
          4         0.292      0.099     -0.243      0.0

Tukey HSD Multiple Comparisons.
Matrix of pairwise comparison probabilities:

                    1          2          3          4
          1         1.000
          2         0.000      1.000
          3         0.000      0.000      1.000
          4         0.000      0.057      0.000      1.000
-----------------------------------------------------------------------------


>
```

Cluster Tree

Total Benthic Community Abundance and Number of Taxa



STATION ID	COM_NUM	COM_CNT	CRUS_NUM	CRUS_AB	ECH_NU	ECH_AB	MOLL_NU	MOLL_AB	POLY_AB	POLY_NU
Benthic Zone 1										
9	9	17	1	1	0	0	2	2	14	6
15	9	14	1	1	0	0	0	0	11	7
12	10	15	0	0	0	0	1	2	11	7
Minimum	9	14	0	0	0	0	0	0	11	6
Maximum	10	17	1	1	0	0	2	2	14	7
Mean	9.3	15.3	0.7	0.7	0.0	0.0	1.0	1.3	12.0	6.7
Standard Dev.	0.6	1.5	0.6	0.6	0.0	0.0	1.0	1.2	1.7	0.6
CV	6.2	10.0	86.6	86.6	0.0	0.0	100.0	86.6	14.4	8.7
Benthic Zone 2										
19	18	42	3	4	0	0	1	1	36	13
18	20	52	0	0	0	0	3	4	46	16
16	21	60	2	2	0	0	2	2	52	16
11	21	57	1	1	0	0	3	5	44	14
20	22	56	4	6	1	1	3	4	44	13
Minimum	18	42	0	0	0	0	1	1	36	13
Maximum	22	60	4	6	1	1	3	5	52	16
Mean	20.4	53.4	2.0	2.6	0.2	0.2	2.4	3.2	44.4	14.4
Standard Dev.	1.5	7.0	1.6	2.4	0.4	0.4	0.9	1.6	5.7	1.5
CV	7.4	13.1	79.1	92.6	223.6	223.6	37.3	51.3	12.9	10.5

STATION ID	COM_NUM	COM_CNT	CRUS_NUM	CRUS_AB	ECH_NU	ECH_AB	MOLL_NU	MOLL_AB	POLY_AB	POLY_NU
Benthic Zone 3										
26	23	79	2	23	1	1	4	10	45	16
3	24	73	4	5	0	0	6	16	50	12
8	25	84	4	4	0	0	8	13	66	12
28	27	69	3	3	0	0	7	11	50	14
41	26	109	4	11	0	0	4	7	61	15
7	31	106	6	23	0	0	6	9	73	18
22	30	95	4	4	1	2	7	7	81	17
21	29	85	3	5	0	0	5	6	71	19
27	29	76	3	3	0	0	5	5	64	18
Minimum	23	69	2	3	0	0	4	5	45	12
Maximum	31	109	6	23	1	2	8	16	81	19
Mean	27.1	86.2	3.7	9.0	0.2	0.3	5.8	9.3	62.3	15.7
Standard Dev.	2.8	14.2	1.1	8.3	0.4	0.7	1.4	3.6	12.0	2.6
CV	10.3	16.5	30.5	92.1	198.4	212.1	24.1	38.3	19.3	16.6
Benthic Zone 4										
29	38	91	7	28	2	4	1	1	57	27
13	36	114	7	32	0	0	6	14	66	22
23	33	113	3	5	0	0	5	9	91	21
14	34	139	7	18	0	0	5	8	110	21
17	37	137	7	19	0	0	4	7	105	23
30	39	137	8	36	0	0	5	10	86	22
6	36	174	8	70	0	0	8	12	88	17
1	32	172	12	49	0	0	7	15	106	11
4	32	192	7	27	0	0	5	5	155	18
Minimum	32	91	3	5	0	0	1	1	57	11
Maximum	39	192	12	70	2	4	8	15	155	27
Mean	35.2	141.0	7.3	31.6	0.2	0.4	5.1	9.0	96.0	20.2
Standard Dev.	2.6	33.0	2.3	19.0	0.7	1.3	2.0	4.4	28.4	4.5
CV	7.3	23.4	31.2	60.2	300.0	300.0	38.4	49.1	29.6	22.2

STATION ID	COM_NUM	COM_CNT	CRUS_NUM	CRUS_AB	ECH_NU	ECH_AB	MOLL_NU	MOLL_AB	POLY_AB	POLY_NU
Benthic Zone 5										
2	42	228	6	15	0	0	10	18	184	22
24	42	175	8	16	0	0	3	5	137	28
31	46	133	8	35	0	0	9	14	73	23
33	49	162	8	32	2	6	14	31	75	21
25	51	213	7	29	1	1	9	15	159	31
32	58	183	6	20	1	1	8	17	109	36
Minimum	42	133	6	15	0	0	3	5	73	21
Maximum	58	228	8	35	2	6	14	31	184	36
Mean	48.0	182.3	7.2	24.5	0.7	1.3	8.8	16.7	122.8	26.8
Standard Dev.	6.1	34.4	1.0	8.6	0.8	2.3	3.5	8.4	45.2	5.9
CV	12.7	18.9	13.7	35.1	122.5	175.4	40.1	50.4	36.8	22.0
10	8	24	0	0	0	0	1	1	23	7
5	56	1856	18	211	0	0	11	24	1614	22

```
>ANOVA

>CATEGORY BCA_ZONE$

>F   ND COM_NUM2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: COM_NUM2   N: 36   Multiple R: 0.952   Squared multiple R: 0.906


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              COM_NUM2

   CONSTANT                      1.429

   BCA_ZONE$   A                -0.415

     \_ZONE$   B                -0.100

   BCA_ZONE$   C                 0.018

   BCA_ZONE$   D                 0.129

   BCA_ZONE$   E                 0.258


                              Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  1.100     5        0.220      57.803       0.000

Error                      0.114    30        0.004

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  BCA_ZONE$   =A                    1.014       0.036       3
  BCA_ZONE$   =B                    1.330       0.028       5
      ZONE$   =C                    1.447       0.021       9
  L   ZONE$   =D                    1.558       0.021       9
  BCA_ZONE$   =E                    1.687       0.025       6
  BCA_ZONE$   =R                    1.539       0.031       4
-------------------------------------------------------------------------------
```

COL/
RO BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of COM_NUM2

Using model MSE of 0.004 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.316	0.0			
3	0.433	0.117	0.0		
4	0.544	0.228	0.111	0.0	
5	0.674	0.358	0.241	0.129	0.0
6	0.525	0.210	0.092	-0.019	-0.148
	6				
6	0.0				

T HSD Multiple Comparisons.
Ma x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.021	1.000		
4	0.000	0.000	0.008	1.000	
5	0.000	0.000	0.000	0.005	1.000
6	0.000	0.000	0.160	0.996	0.010
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>D[illegible]END CRUSNUM / TUKEY

>ESTIMATE
```

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: CRUSNUM N: 36 Multiple R: 0.850 Squared multiple R: 0.722

Estimates of effects $B = (X'X)^{-1} X'Y$

		CRUSNUM
CONSTANT		0.640
BCA_ZONE$	A	-0.439
BCA_ZONE$	B	-0.224
BCA_ZONE$	C	0.018
BCA_ZONE$	D	0.265
BCA_ZONE$	E	0.269

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
BCA_ZONE$	1.817	5	0.363	15.615	0.000
Error	0.698	30	0.023		

Least squares means.

		LS Mean	SE	N
BCA_ZONE$	=A	0.201	0.088	3
BCA_ZONE$	=B	0.416	0.068	5
[illegible]ZONE$	=C	0.658	0.051	9
[illegible]ZONE$	=D	0.904	0.051	9
BCA_ZONE$	=E	0.909	0.062	6
BCA_ZONE$	=R	0.751	0.076	4

COL/
R[illegible]CA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of CRUSNUM

Using model MSE of 0.023 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.215	0.0			
3	0.458	0.242	0.0		
4	0.704	0.489	0.246	0.0	
5	0.709	0.493	0.251	0.005	0.0
6	0.550	0.335	0.093	-0.154	-0.158
	6				
6	0.0				

T[illegible] HSD Multiple Comparisons.
Ma[illegible]x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.404	1.000			
3	0.001	0.077	1.000		
4	0.000	0.000	0.020	1.000	
5	0.000	0.000	0.042	1.000	1.000
6	0.001	0.029	0.911	0.558	0.599
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>   END ECH_NU2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: ECH_NU2   N: 36   Multiple R: 0.510   Squared multiple R: 0.260


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            ECH_NU2

   CONSTANT                   0.114

   BCA_ZONE$   A             -0.114

     A_ZONE$   B             -0.054

   BCA_ZONE$   C             -0.047

   BCA_ZONE$   D             -0.061

   BCA_ZONE$   E              0.066


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  0.308     5        0.062       2.108       0.092

Error                      0.877    30        0.029

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE      N
  BCA_ZONE$    =A                  0.000       0.099      3
  BCA_ZONE$    =B                  0.060       0.076      5
      ZONE$    =C                  0.067       0.057      9
  A_ZONE$      =D                  0.053       0.057      9
  BCA_ZONE$    =E                  0.180       0.070      6
  BCA_ZONE$    =R                  0.325       0.085      4
-------------------------------------------------------------------------------
```

COL/
RC RCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of ECH_NU2

Using model MSE of 0.029 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.060	0.0			
3	0.067	0.007	0.0		
4	0.053	-0.007	-0.014	0.0	
5	0.180	0.120	0.113	0.127	0.0
6	0.325	0.265	0.258	0.272	0.145
	6				
6	0.0				

T HSD Multiple Comparisons.
Ma x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.996	1.000			
3	0.991	1.000	1.000		
4	0.997	1.000	1.000	1.000	
5	0.674	0.854	0.807	0.722	1.000
6	0.159	0.221	0.152	0.116	0.773
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND POLY_NU2 / TUKEY

>ESTIMATE
```

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: POLY_NU2 N: 36 Multiple R: 0.863 Squared multiple R: 0.745

Estimates of effects $B = (X'X)^{-1} X'Y$

		POLY_NU2
CONSTANT		1.214
BCA_ZONE$	A	-0.330
BCA_ZONE$	B	-0.028
BCA_ZONE$	C	0.003
BCA_ZONE$	D	0.102
BCA_ZONE$	E	0.223

Analysis of Variance

Source	Sum-of-Squares	DF	Mean-Square	F-Ratio	P
BCA_ZONE$	0.682	5	0.136	17.515	0.000
Error	0.234	30	0.008		

Least squares means.

		LS Mean	SE	N
BCA_ZONE$	=A	0.884	0.051	3
BCA_ZONE$	=B	1.186	0.039	5
ZONE$	=C	1.217	0.029	9
ZONE$	=D	1.317	0.029	9
BCA_ZONE$	=E	1.437	0.036	6
BCA_ZONE$	=R	1.245	0.044	4

COL/
R[illegible] BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of POLY_NU2

Using model MSE of 0.008 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.302	0.0			
3	0.333	0.031	0.0		
4	0.433	0.131	0.100	0.0	
5	0.553	0.251	0.220	0.120	0.0
6	0.361	0.059	0.028	-0.071	-0.192
	6				
6	0.0				

T[illegible] HSD Multiple Comparisons.
M[illegible]x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.001	1.000			
3	0.000	0.988	1.000		
4	0.000	0.115	0.190	1.000	
5	0.000	0.001	0.001	0.133	1.000
6	0.000	0.914	0.994	0.756	0.023
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>D   END COM_CNT2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: COM_CNT2    N: 36    Multiple R: 0.943    Squared multiple R: 0.889


                                   -1
Estimates of effects  B = (X'X)  X'Y


                              COM_CNT2

   CONSTANT                      1.875

   BCA_ZONE$    A               -0.663

     \_ZONE$    B               -0.143

   BCA_ZONE$    C                0.061

   BCA_ZONE$    D                0.267

   BCA_ZONE$    E                0.382


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  2.768     5        0.554      47.815       0.000

Error                      0.347    30        0.012

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  BCA_ZONE$    =A                  1.212       0.062       3
  BCA_ZONE$    =B                  1.732       0.048       5
  !    ZONE$   =C                  1.936       0.036       9
  L   ZONE$    =D                  2.142       0.036       9
  BCA_ZONE$    =E                  2.257       0.044       6
  BCA_ZONE$    =R                  1.972       0.054       4
-------------------------------------------------------------------------------
```

COL/
RO[illegible] BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of COM_CNT2

Using model MSE of 0.012 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.521	0.0			
3	0.724	0.203	0.0		
4	0.930	0.409	0.206	0.0	
5	1.045	0.524	0.321	0.115	0.0
6	0.760	0.239	0.036	-0.170	-0.285
	6				
6	0.0				

T[illegible] HSD Multiple Comparisons.
Ma[illegible]x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.022	1.000		
4	0.000	0.000	0.004	1.000	
5	0.000	0.000	0.000	0.350	1.000
6	0.000	0.026	0.993	0.123	0.004
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND CRUS_AB2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: CRUS_AB2    N: 36    Multiple R: 0.832    Squared multiple R: 0.692


                                   -1
Estimates of effects  B = (X'X)  X'Y


                              CRUS_AB2

   CONSTANT                      0.903

   BCA_ZONE$    A               -0.702

   BCA_ZONE$    B               -0.439

   BCA_ZONE$    C               -0.014

   BCA_ZONE$    D                0.531

   BCA_ZONE$    E                0.482


                            Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  6.050     5        1.210      13.505       0.000

Error                      2.688    30        0.090

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  BCA_ZONE$    =A                  0.201        0.173       3
  BCA_ZONE$    =B                  0.464        0.134       5
  BCA_ZONE$    =C                  0.889        0.100       9
  BCA_ZONE$    =D                  1.434        0.100       9
  BCA_ZONE$    =E                  1.385        0.122       6
  BCA_ZONE$    =R                  1.046        0.150       4
-------------------------------------------------------------------------------
```

COL/
R' BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of CRUS_AB2

Using model MSE of 0.090 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.264	0.0			
3	0.688	0.424	0.0		
4	1.233	0.969	0.545	0.0	
5	1.184	0.920	0.496	-0.049	0.0
6	0.846	0.582	0.158	-0.387	-0.338
	6				
6	0.0				

T HSD Multiple Comparisons.
Ma ix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.830	1.000			
3	0.019	0.144	1.000		
4	0.000	0.000	0.007	1.000	
5	0.000	0.000	0.039	1.000	1.000
6	0.010	0.069	0.949	0.289	0.511
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND ECH_AB2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: ECH_AB2    N: 36    Multiple R: 0.552    Squared multiple R: 0.305


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              ECH_AB2

   CONSTANT                     0.164

   BCA_ZONE$    A              -0.164

   BCA_ZONE$    B              -0.104

   BCA_ZONE$    C              -0.078

   BCA_ZONE$    D              -0.087

   BCA_ZONE$    E               0.077


                          Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  0.792     5        0.158       2.635       0.043

Error                      1.803    30        0.060

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  BCA_ZONE$    =A                  0.000        0.142       3
  BCA_ZONE$    =B                  0.060        0.110       5
  BCA_ZONE$    =C                  0.086        0.082       9
  BCA_ZONE$    =D                  0.078        0.082       9
  BCA_ZONE$    =E                  0.241        0.100       6
  BCA_ZONE$    =R                  0.521        0.123       4
-------------------------------------------------------------------------------
```

COL/
RO' ⁻CA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of ECH_AB2

Using model MSE of 0.060 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.060	0.0			
3	0.086	0.026	0.0		
4	0.078	0.017	-0.009	0.0	
5	0.241	0.181	0.155	0.164	0.0
6	0.521	0.461	0.435	0.443	0.280
	6				
6	0.0				

Tu HSD Multiple Comparisons.
Ma x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.999	1.000			
3	0.995	1.000	1.000		
4	0.997	1.000	1.000	1.000	
5	0.732	0.824	0.835	0.801	1.000
6	0.088	0.085	0.061	0.054	0.500
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND MOLL_NU2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: MOLL_NU2   N: 36   Multiple R: 0.805   Squared multiple R: 0.647


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            MOLL_NU2

   CONSTANT                    0.715

   BCA_ZONE$   A              -0.456

   BCA_ZONE$   B              -0.198

   BCA_ZONE$   C               0.108

   BCA_ZONE$   D               0.042

   BCA_ZONE$   E               0.247


                         Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  1.506     5        0.301      11.010       0.000

Error                      0.821    30        0.027

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE       N
  BCA_ZONE$   =A                    0.259       0.095       3
  BCA_ZONE$   =B                    0.517       0.074       5
  BCA_ZONE$   =C                    0.823       0.055       9
  BCA_ZONE$   =D                    0.757       0.055       9
  BCA_ZONE$   =E                    0.962       0.068       6
  BCA_ZONE$   =R                    0.971       0.083       4
-------------------------------------------------------------------------------
```

COL/
P BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of MOLL_NU2

Using model MSE of 0.027 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.257	0.0			
3	0.563	0.306	0.0		
4	0.498	0.240	-0.066	0.0	
5	0.703	0.445	0.140	0.205	0.0
6	0.712	0.454	0.148	0.214	0.009
	6				
6	0.0				

T HSD Multiple Comparisons.
M ix of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.299	1.000			
3	0.000	0.026	1.000		
4	0.001	0.127	0.957	1.000	
5	0.000	0.001	0.604	0.205	1.000
6	0.000	0.004	0.673	0.290	1.000
	6				
6	1.000				

>

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND MOLL_AB2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: MOLL_AB2   N: 36   Multiple R: 0.788   Squared multiple R: 0.622


                                  -1
Estimates of effects  B = (X'X)  X'Y


                            MOLL_AB2

   CONSTANT                   0.888

   BCA_ZONE$   A             -0.570

   BCA_ZONE$   B             -0.297

   BCA_ZONE$   C              0.104

   BCA_ZONE$   D              0.054

   BCA_ZONE$   E              0.312


                        Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                  2.673    5        0.535       9.858       0.000

Error                      1.627   30        0.054

-------------------------------------------------------------------------

Least squares means.
                                LS Mean          SE      N
  BCA_ZONE$   =A                 0.318        0.134      3
  BCA_ZONE$   =B                 0.591        0.104      5
      ZONE$   =C                 0.992        0.078      9
      ZONE$   =D                 0.941        0.078      9
  BCA_ZONE$   =E                 1.200        0.095      6
  BCA_ZONE$   =R                 1.285        0.116      4
-------------------------------------------------------------------------
```

```
-----------------------------------------------------------------------------

COL/
ROW BCA_ZONE$
     A
  2  B
  3  C
  4  D
  5  E
  6  R
Using least squares means.
Post Hoc test of MOLL_AB2
-----------------------------------------------------------------------------

Using model MSE of 0.054 with 30 DF.
Matrix of pairwise mean differences:

                    1          2          3          4          5
          1         0.0
          2         0.273      0.0
          3         0.674      0.401      0.0
          4         0.623      0.350     -0.051      0.0
          5         0.882      0.609      0.208      0.258      0.0
          6         0.967      0.694      0.293      0.344      0.085
                    6
          6         0.0

Tu     HSD Multiple Comparisons.
Ma    x of pairwise comparison probabilities:

                    1          2          3          4          5
          1         1.000
          2         0.602      1.000
          3         0.002      0.045      1.000
          4         0.005      0.105      0.997      1.000
          5         0.000      0.002      0.547      0.312      1.000
          6         0.000      0.001      0.317      0.170      0.992
                    6
          6         1.000
-----------------------------------------------------------------------------


>
```

```
>ANOVA

>CATEGORY BCA_ZONE$

>DEPEND POLY_AB2 / TUKEY

>ESTIMATE

Effects coding used for categorical variables in model.

Categorical values encountered during processing are:
BCA_ZONE$ (6 levels)
   A, B, C, D, E, R
2 case(s) deleted due to missing data.

Dep Var: POLY_AB2   N: 36   Multiple R: 0.895   Squared multiple R: 0.801


                                  -1
Estimates of effects  B = (X'X)  X'Y


                              POLY_AB2

   CONSTANT                      1.708

   BCA_ZONE$   A                -0.597

   BCA_ZONE$   B                -0.054

   BCA_ZONE$   C                 0.086

   BCA_ZONE$   D                 0.262

   BCA_ZONE$   E                 0.359


                            Analysis of Variance

Source              Sum-of-Squares   DF  Mean-Square     F-Ratio       P

BCA_ZONE$                    2.304    5        0.461      24.137       0.000

Error                        0.573   30        0.019

-------------------------------------------------------------------------------

Least squares means.
                                  LS Mean          SE      N
  BCA_ZONE$   =A                    1.111       0.080      3
  BCA_ZONE$   =B                    1.654       0.062      5
  BCA_ZONE$   =C                    1.794       0.046      9
  BCA_ZONE$   =D                    1.971       0.046      9
  BCA_ZONE$   =E                    2.067       0.056      6
  BCA_ZONE$   =R                    1.652       0.069      4
-------------------------------------------------------------------------------
```

COL/
P BCA_ZONE$
A
2 B
3 C
4 D
5 E
6 R
Using least squares means.
Post Hoc test of POLY_AB2

Using model MSE of 0.019 with 30 DF.
Matrix of pairwise mean differences:

	1	2	3	4	5
1	0.0				
2	0.543	0.0			
3	0.683	0.140	0.0		
4	0.859	0.316	0.176	0.0	
5	0.956	0.413	0.273	0.097	0.0
6	0.540	-0.002	-0.142	-0.319	-0.415
	6				
6	0.0				

T HSD Multiple Comparisons.
M x of pairwise comparison probabilities:

	1	2	3	4	5
1	1.000				
2	0.000	1.000			
3	0.000	0.469	1.000		
4	0.000	0.004	0.104	1.000	
5	0.000	0.000	0.009	0.769	1.000
6	0.000	1.000	0.532	0.007	0.001
	6				
6	1.000				

>

PHYSICAL, CHEMICAL, TOXICITY, AND BENTHIC COMMUNITY DATA GRAPHS

The attached graphs illustrate West Basin station (not including piers) concentrations/values/ratios for physical, chemical, toxicity, and benthic community data. Reference summary statistical parameters are also included in these plots, as appropriate. Effects Range-Low (ER-L) and effects range-median (ER-M) values were included in the graphs whenever available.

The following assumptions/formats were used in plotting the data:

- The concentrations/values/ratios were plotted in increasing order for physical and chemical parameters.
- The concentrations/values/ratios were plotted in decreasing order for toxicity and benthic community parameters.
- Concentrations/values/ratios not detected in the West Basin were assumed to be zero.
- Rejected concentrations/values/ratios were assumed not to exist.
- Concentrations/values/ratios not detected at the Reference were assumed not to exist.
- Concentrations/values/ratios that were assumed not to exist were plotted on the right side of the graphs, following the detected values.

The parameters presented on the graphs include:

Station ID: Denotes the Station ID number, where sediment and benthic community samples were taken.

Ref-Min: Minimum concentration in the reference data set.

Ref-Max: Maximum concentration in the reference data set.

Ref-Mean: Arithmetic average of available data values at the reference for each compound.

95% Upper Confidence Limit: The 95% UCL of available data values for each compound using a 1-tail *t* statistic for reference stations (for chemical data)

$$95\% \text{ Upper Confidence Limit} = \text{mean} + t^* \sigma/(n^{(1/2)})$$

95% Lower Confidence Limit: The 95% LCL of available data values (n) for each compound using a 1-tail *t* statistic for reference stations (for toxicity and benthic community data)

$$95\% \text{ Lower Confidence Limit} = \text{mean} - t^* \sigma/(n^{(1/2)})$$

95% Upper Predictive Limit: The 95% UPL of available data values for each compound using a 1-tail *t* statistic for reference stations (for chemical data)

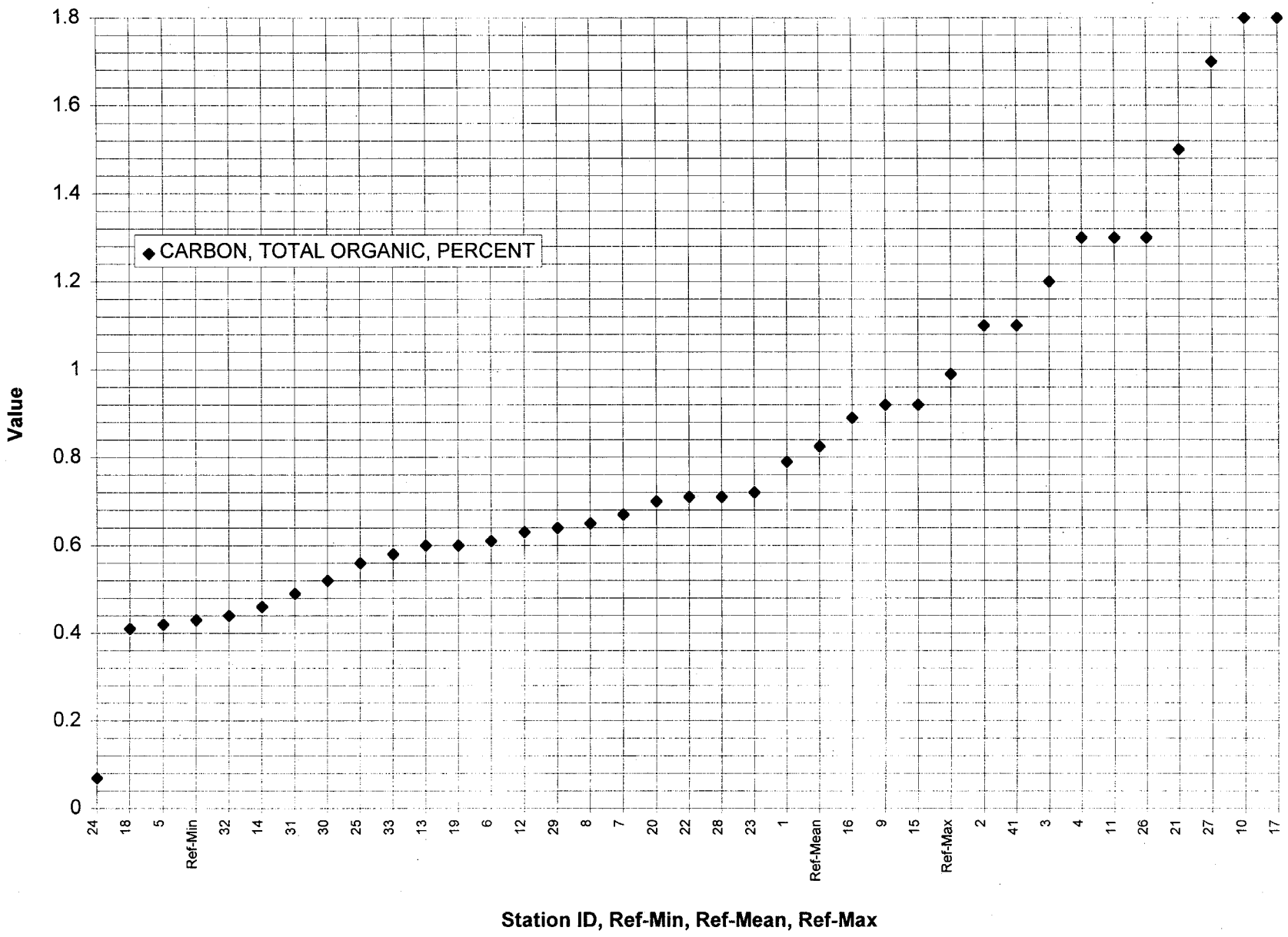
$$95\% \text{ Upper Predictive Limit} = \text{mean} + t^* \sigma(1+1/n)^{(1/2)}$$

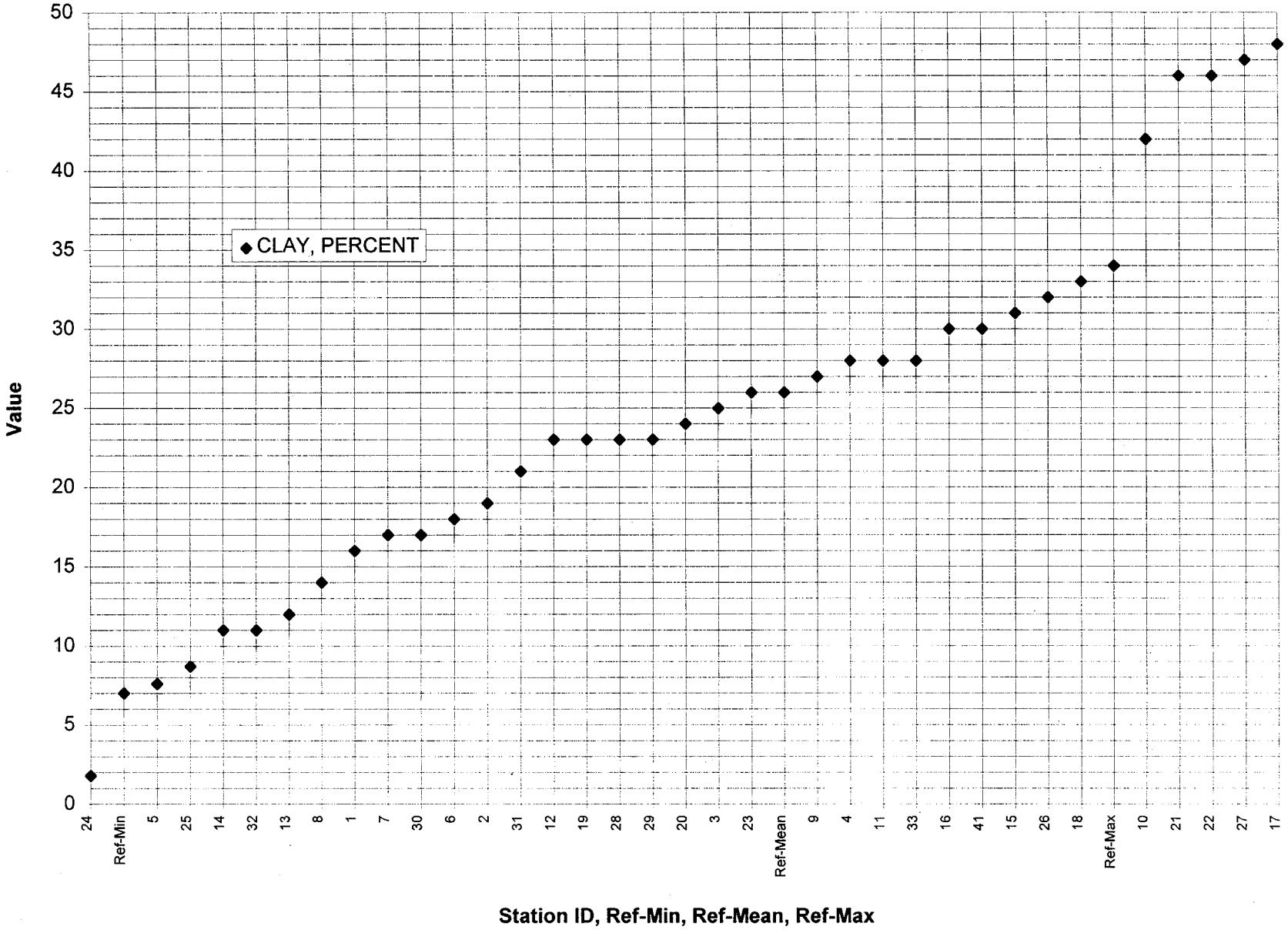
95% Lower Predictive Limit: The 95% LPL of available data values (n) for each compound using a 1-tail *t* statistic for reference stations (for toxicity and benthic community data)

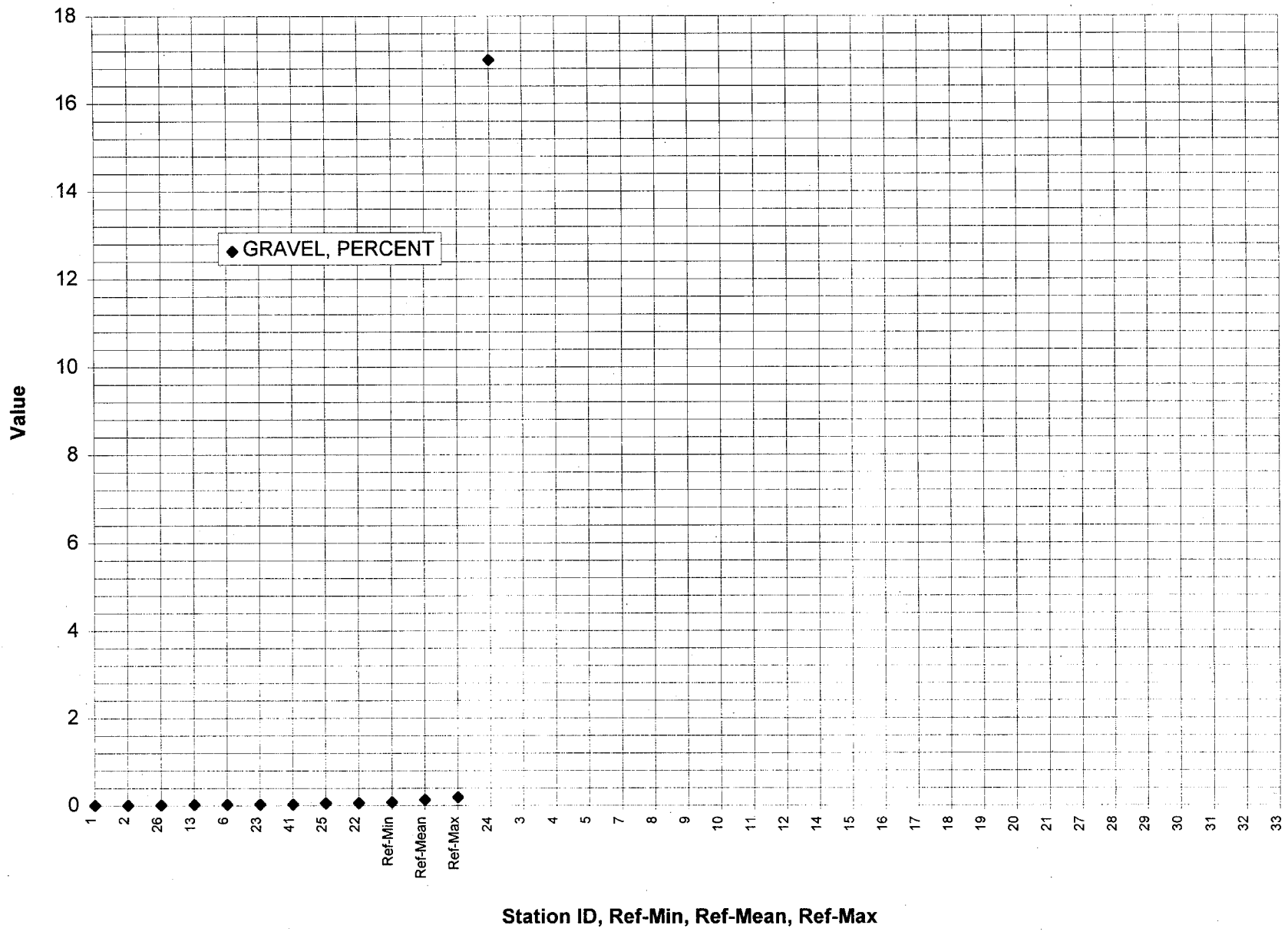
$$95\% \text{ Lower Predictive Limit} = \text{mean} - t^* \sigma(1+1/n)^{(1/2)}$$

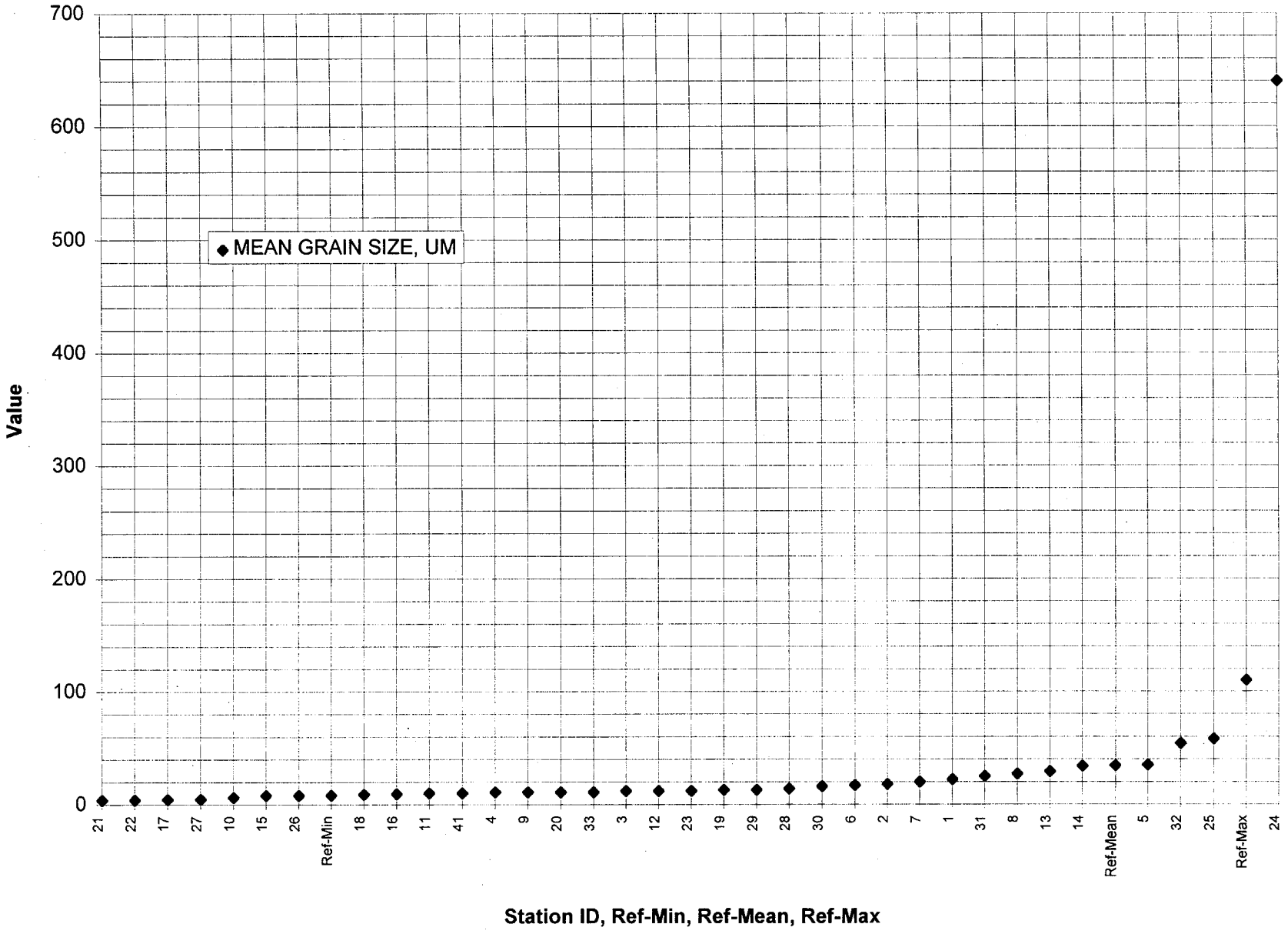
List of Analytes/Variables Plotted

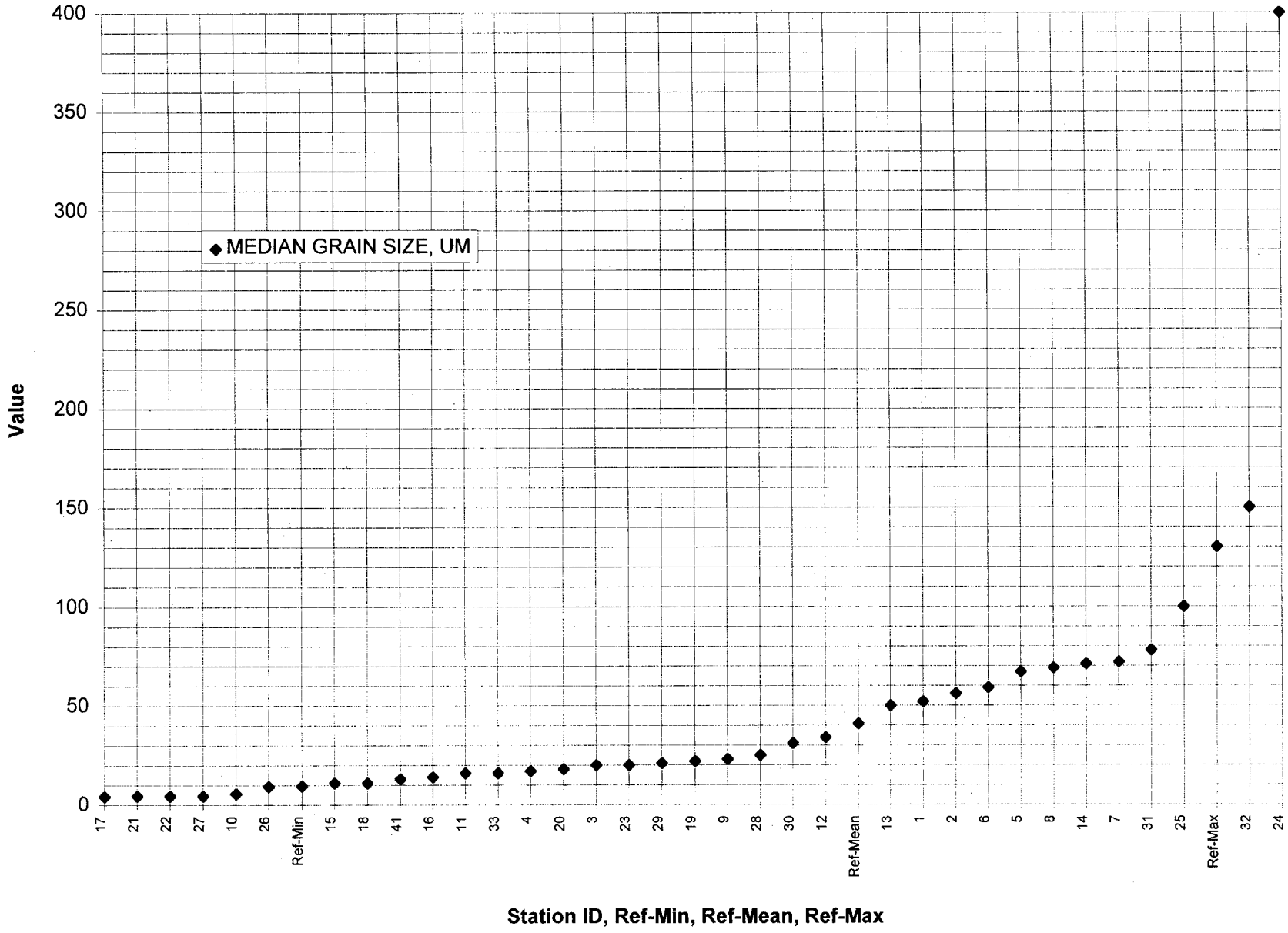
CARBON, TOTAL ORGANIC, PERCENT
CLAY, PERCENT
GRAVEL, PERCENT
MEAN GRAIN SIZE, UM
MEDIAN GRAIN SIZE, UM
SAND, PERCENT
SILT, PERCENT
TOTAL FINES, PERCENT
ARSENIC, TOTAL, MG/KG
BERYLLIUM, TOTAL, MG/KG
CADMIUM, TOTAL, MG/KG
CHROMIUM, TOTAL, MG/KG
COPPER, TOTAL, MG/KG
LEAD, TOTAL, MG/KG
MERCURY, TOTAL, MG/KG
NICKEL, TOTAL, MG/KG
SELENIUM, TOTAL, MG/KG
SILVER, TOTAL, MG/KG
ZINC, TOTAL, MG/KG
DIBUTYLTIN, UG/KG
MONOBUTYLTIN, UG/KG
BENZO(A)ANTHRACENE, UG/KG
BENZO(A)PYRENE, UG/KG
BENZO(B)FLUORANTHENE, UG/KG
BENZO(G,H,I)PERYLENE, UG/KG
BENZO(K)FLUORANTHENE, UG/KG
CHRYSENE, UG/KG
DIBENZO(A,H)ANTHRACENE, UG/KG
FLUORANTHENE, UG/KG
INDENO(1,2,3-CD)PYRENE, UG/KG
PYRENE, UG/KG
TOTAL BENZOFLUORANTHENES, UG/KG
TOTAL HPAH, UG/KG
ACENAPHTHENE, UG/KG
ACENAPHTHYLENE, UG/KG
ANTHRACENE, UG/KG
FLUORENE, UG/KG
METHYLNAPHTHALENES, UG/KG
PHENANTHRENE, UG/KG
TOTAL LPAH, UG/KG
TOTAL PAH, UG/KG
AROCLOR 1260, UG/KG
TOTAL PCB, UG/KG
ALDRIN, UG/KG
LINDANE (GAMMA-BHC), UG/KG
4,4'-DDD, UG/KG
4,4'-DDE, UG/KG
4,4'-DDT, UG/KG
TOTAL DDT, UG/KG
BIS(2-ETHYLHEXYL)PHTHALATE, UG/KG
DI-N-OCTYLPHTHALATE, UG/KG
PHENOL, UG/KG
ACID VOLATILE SULFIDE, UMOL/G
SULFIDE, TOTAL, MG/KG
CADMIUM, EXTRACTABLE-SEM/AVS,
COPPER, EXTRACTABLE-SEM/AVS,
LEAD, EXTRACTABLE-SEM/AVS,
MERCURY, EXTRACTABLE-SEM/AVS,
TOTAL SEM/AVS,
ZINC, EXTRACTABLE-SEM/AVS,
AMPHIPOD REBURIAL, PERCENT
AMPHIPOD SURVIVAL, PERCENT
ECHINODERM NORMAL DEVELOPMENT, PERCENT
ECHINODERM SURVIVAL, PERCENT
POLYCHAETE GROWTH, MG/D
POLYCHAETE SURVIVAL, PERCENT
Community Number of species,
Community Total abundance,
CRUSTACEANS Number of species,
CRUSTACEANS Total abundance,
ECHINODERMS Number of species,
ECHINODERMS Total abundance,
MOLLUSCS Number of species,
MOLLUSCS Total abundance,
OTHERS Number of species,
OTHERS Total abundance,
POLYCHAETES Number of species,
POLYCHAETES Total abundance,

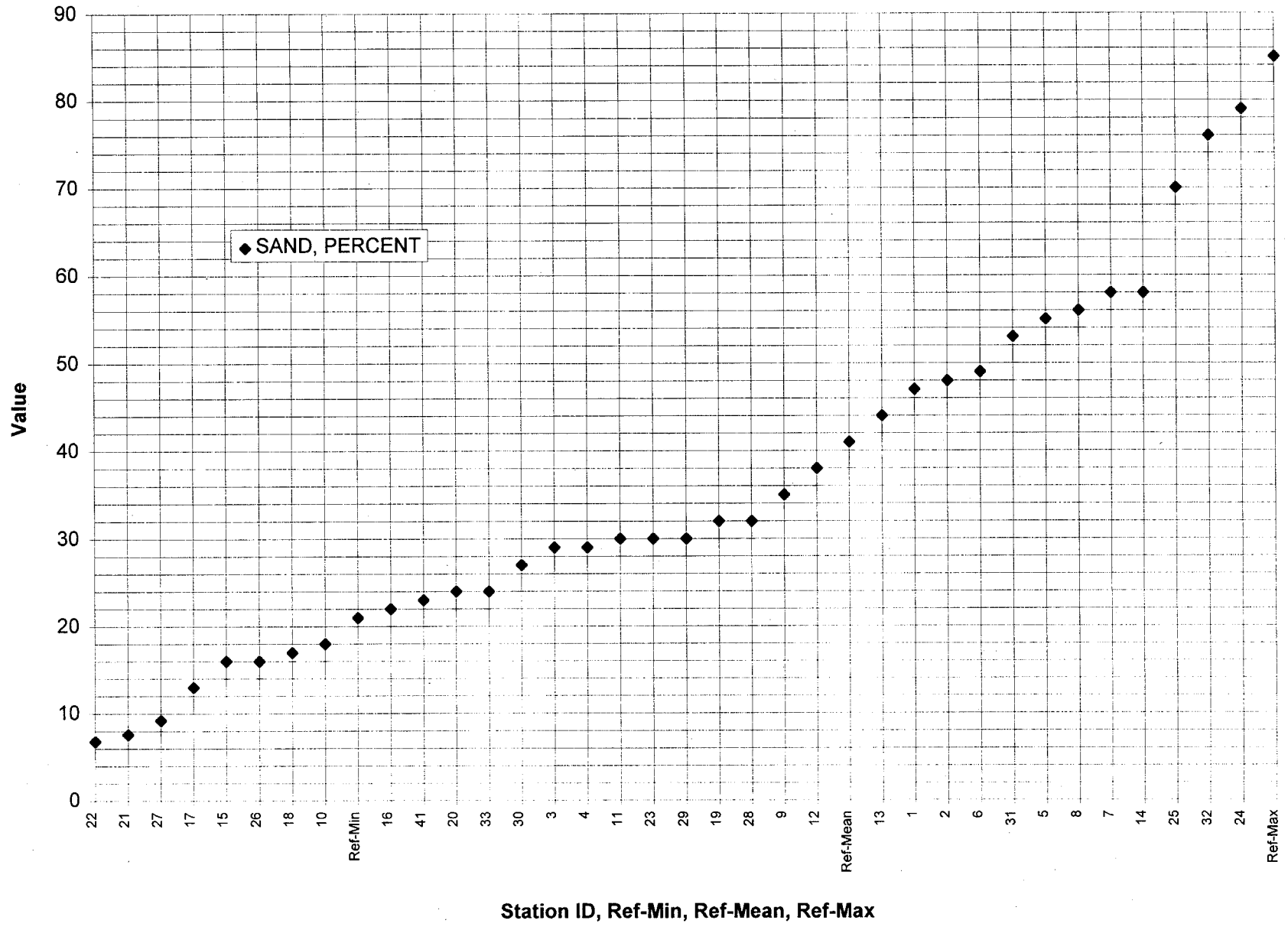

CARBON, TOTAL ORGANIC, PERCENT
Value
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
24
18
5
Ref-Min
32
14
31
30
25
33
13
19
6
12
29
8
7
20
22
28
23
1
Ref-Mean
16
9
15
Ref-Max
2
41
3
4
11
26
21
27
10
17
Station ID, Ref-Min, Ref-Mean, Ref-Max

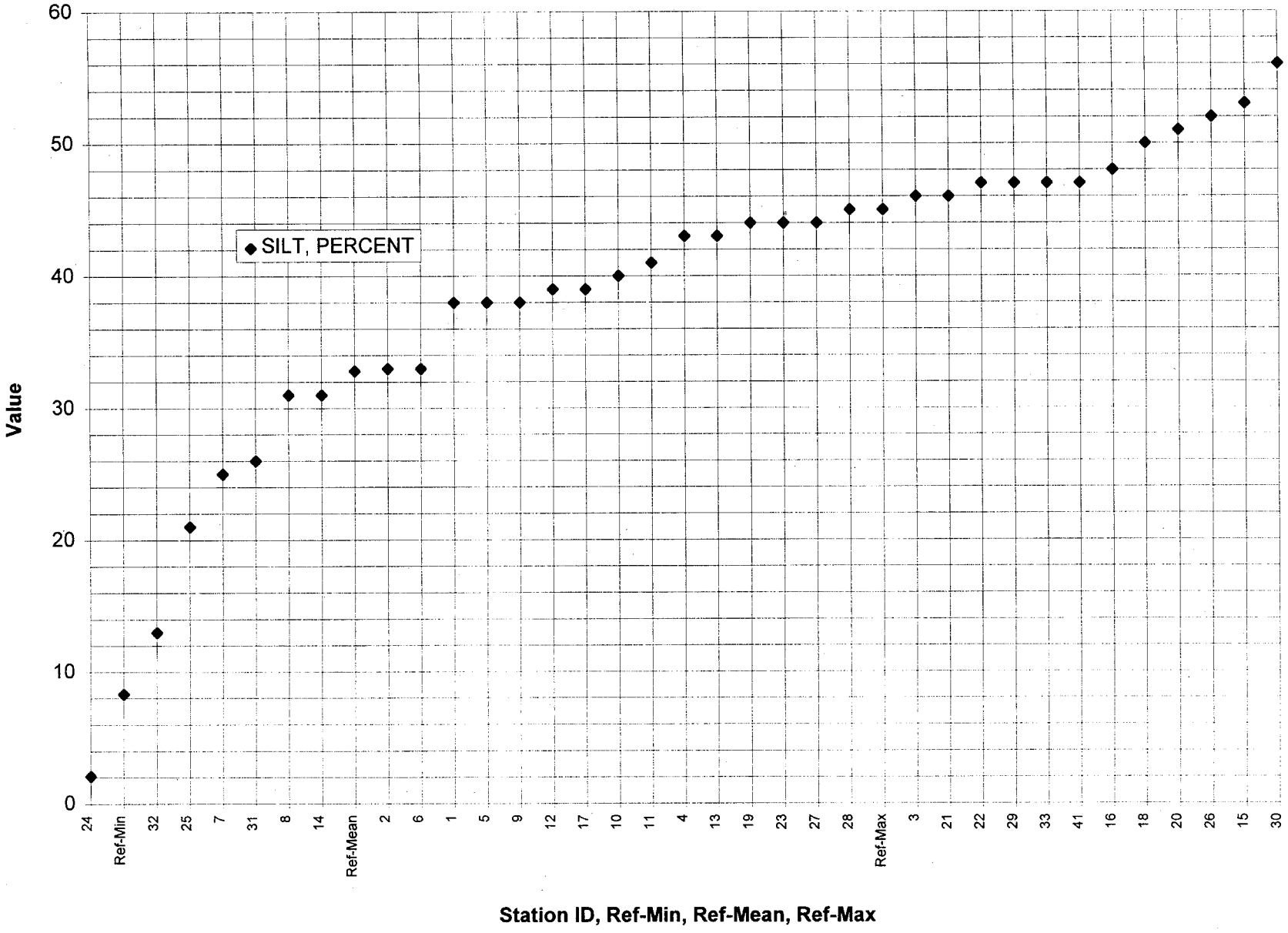

CLAY, PERCENT
Value
0
5
10
15
20
25
30
35
40
45
50
24
Ref-Min
5
25
14
32
13
8
1
7
30
6
2
31
12
19
28
29
20
3
23
Ref-Mean
9
4
11
33
16
41
15
26
18
Ref-Max
10
21
22
27
17
Station ID, Ref-Min, Ref-Mean, Ref-Max

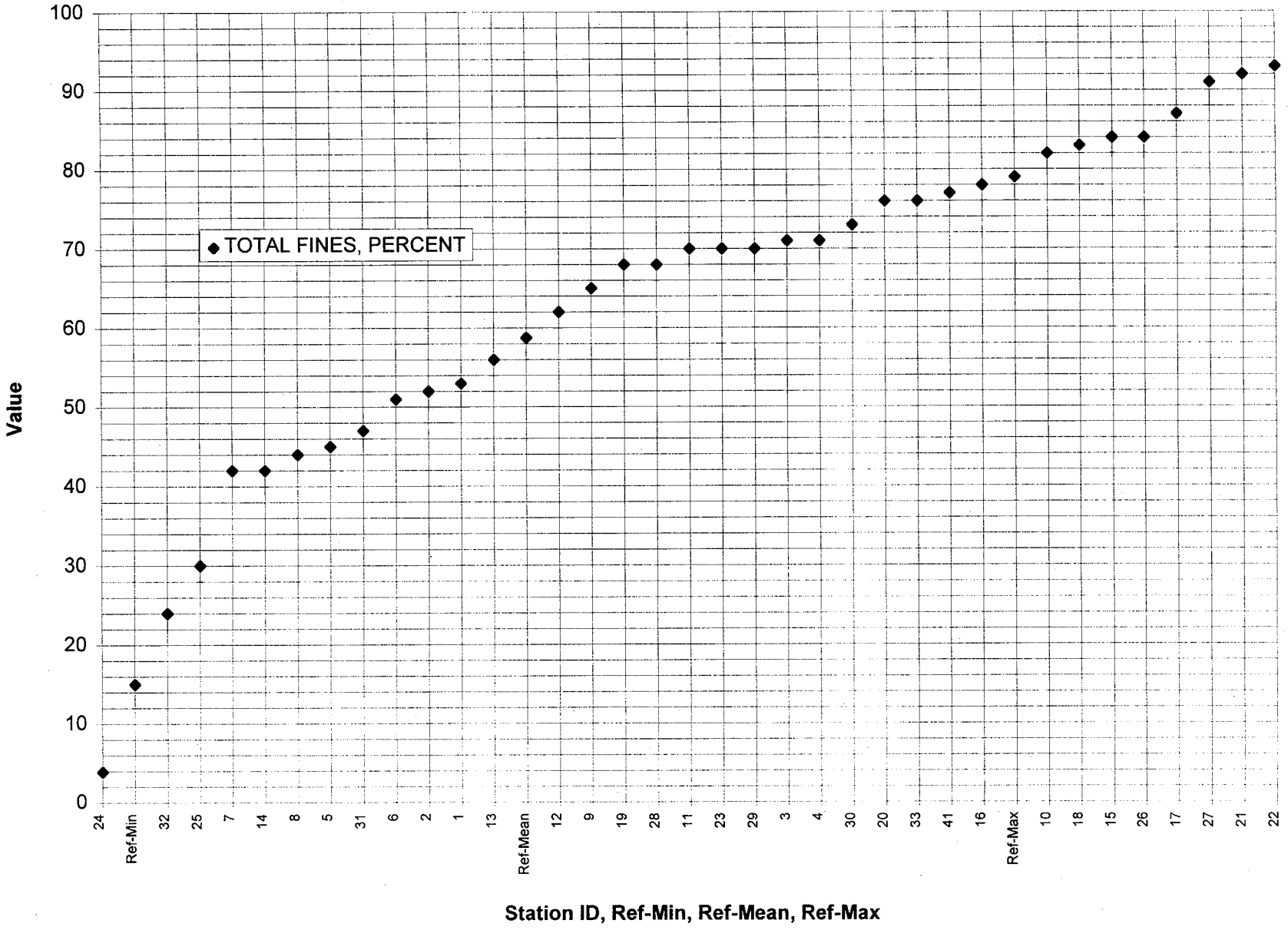

GRAVEL, PERCENT
Value
18
16
14
12
10
8
6
4
2
0
1
2
26
13
6
23
41
25
22
Ref-Min
Ref-Mean
Ref-Max
24
3
4
5
7
8
9
10
11
12
14
15
16
17
18
19
20
21
27
28
29
30
31
32
33
Station ID, Ref-Min, Ref-Mean, Ref-Max

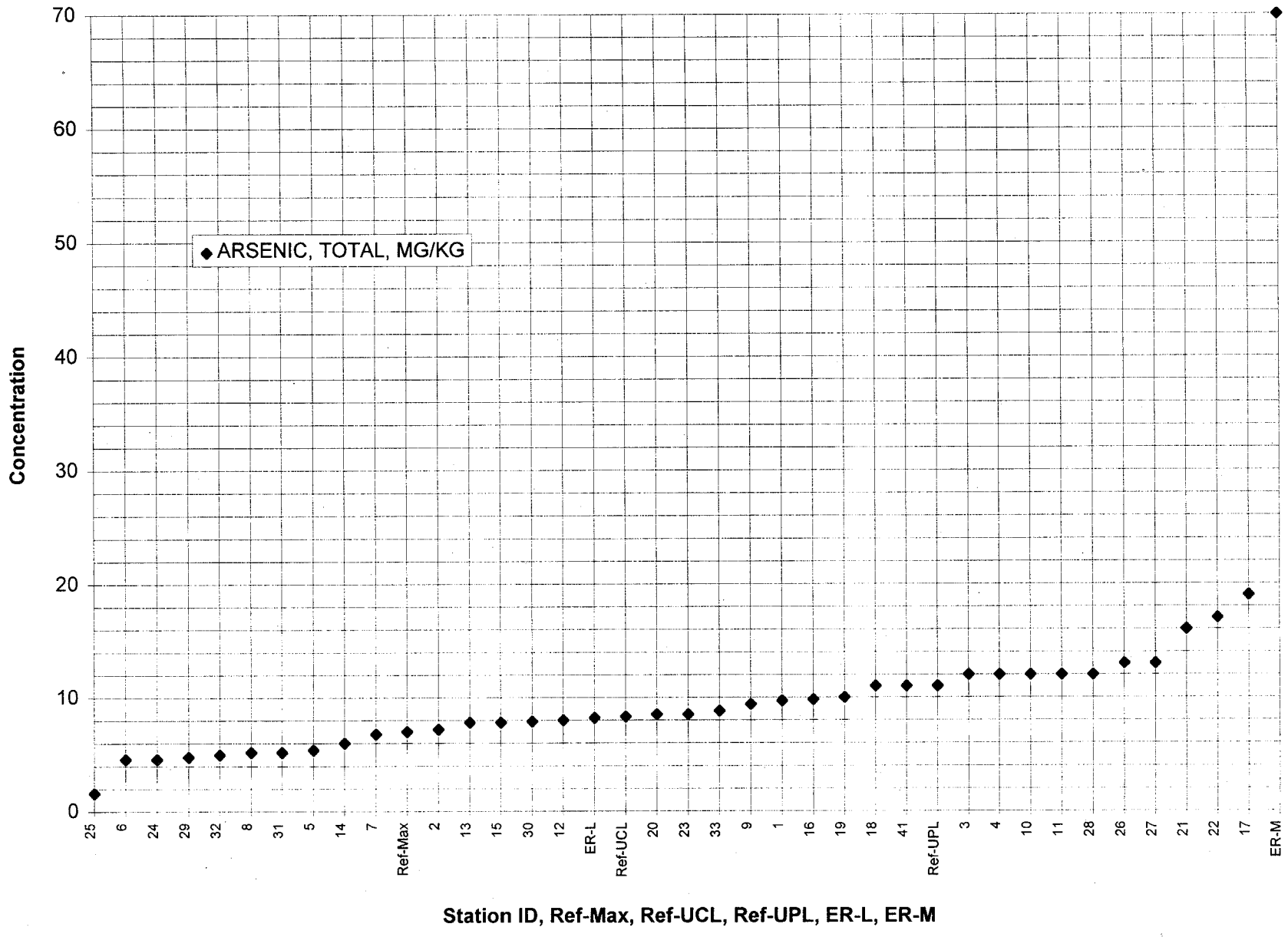

700
600
500
400
300
200
100
0
Value
MEAN GRAIN SIZE, UM
21
22
17
27
10
15
26
Ref-Min
18
16
11
41
4
9
20
33
3
12
23
19
29
28
30
6
2
7
1
31
8
13
14
Ref-Mean
5
32
25
Ref-Max
24
Station ID, Ref-Min, Ref-Mean, Ref-Max

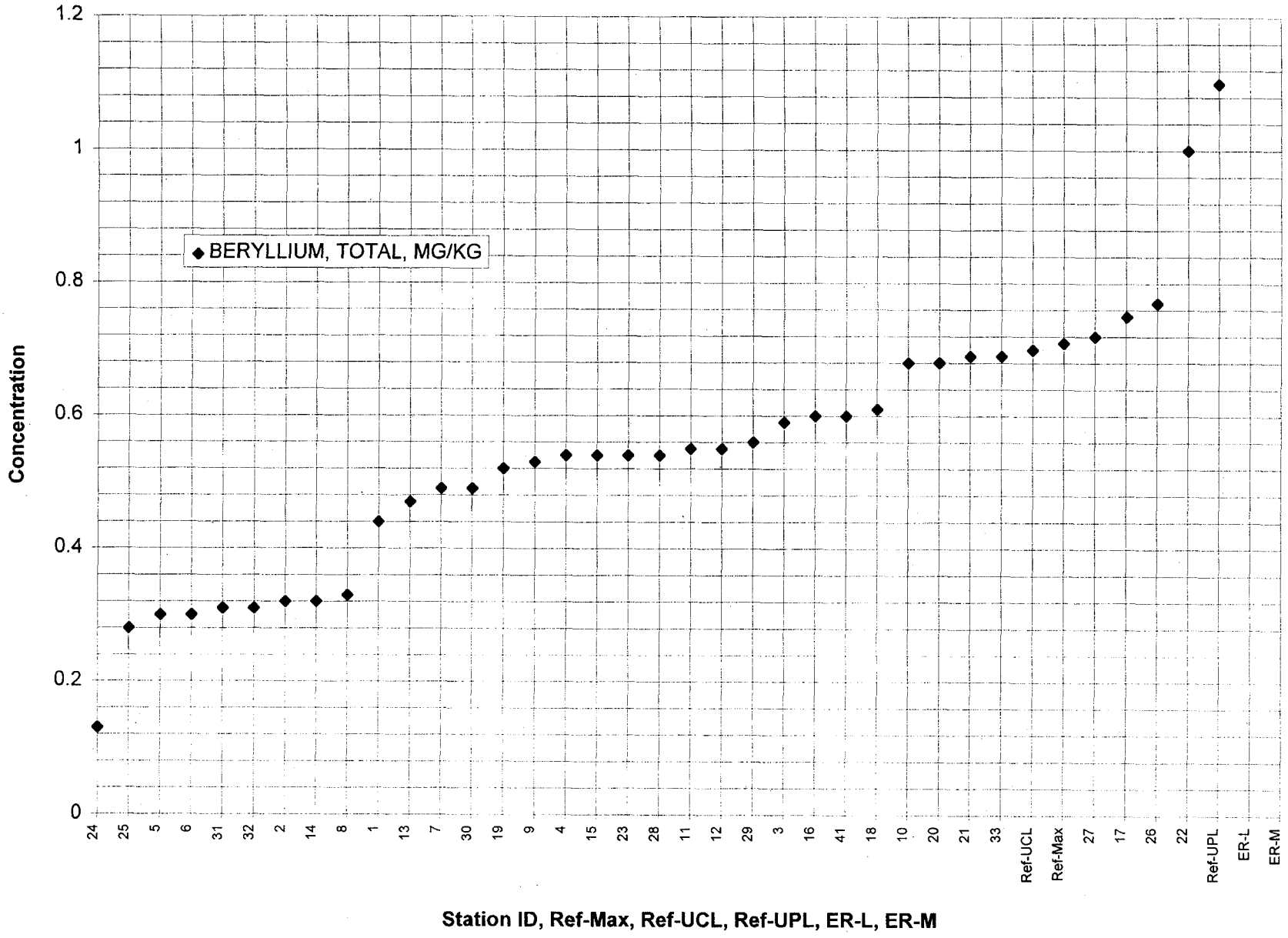

MEDIAN GRAIN SIZE, UM
Value
400
350
300
250
200
150
100
50
0
17
21
22
27
10
26
Ref-Min
15
18
41
16
11
33
4
20
3
23
29
19
9
28
30
12
Ref-Mean
13
1
2
6
5
8
14
7
31
25
Ref-Max
32
24
Station ID, Ref-Min, Ref-Mean, Ref-Max

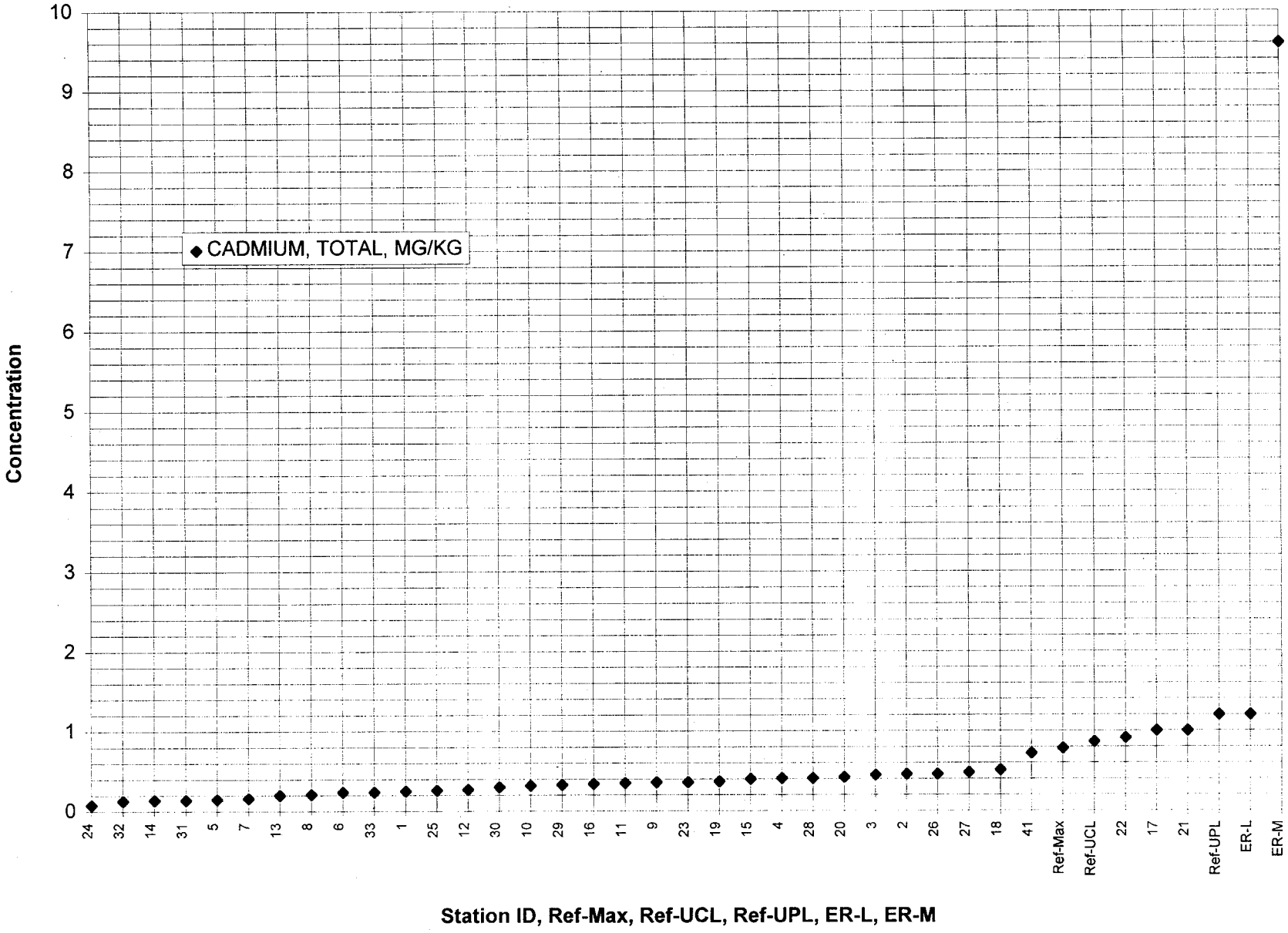

SAND, PERCENT
Value
0
10
20
30
40
50
60
70
80
90
22
21
27
17
15
26
18
10
Ref-Min
16
41
20
33
30
3
4
11
23
29
19
28
9
12
Ref-Mean
13
1
2
6
31
5
8
7
14
25
32
24
Ref-Max
Station ID, Ref-Min, Ref-Mean, Ref-Max

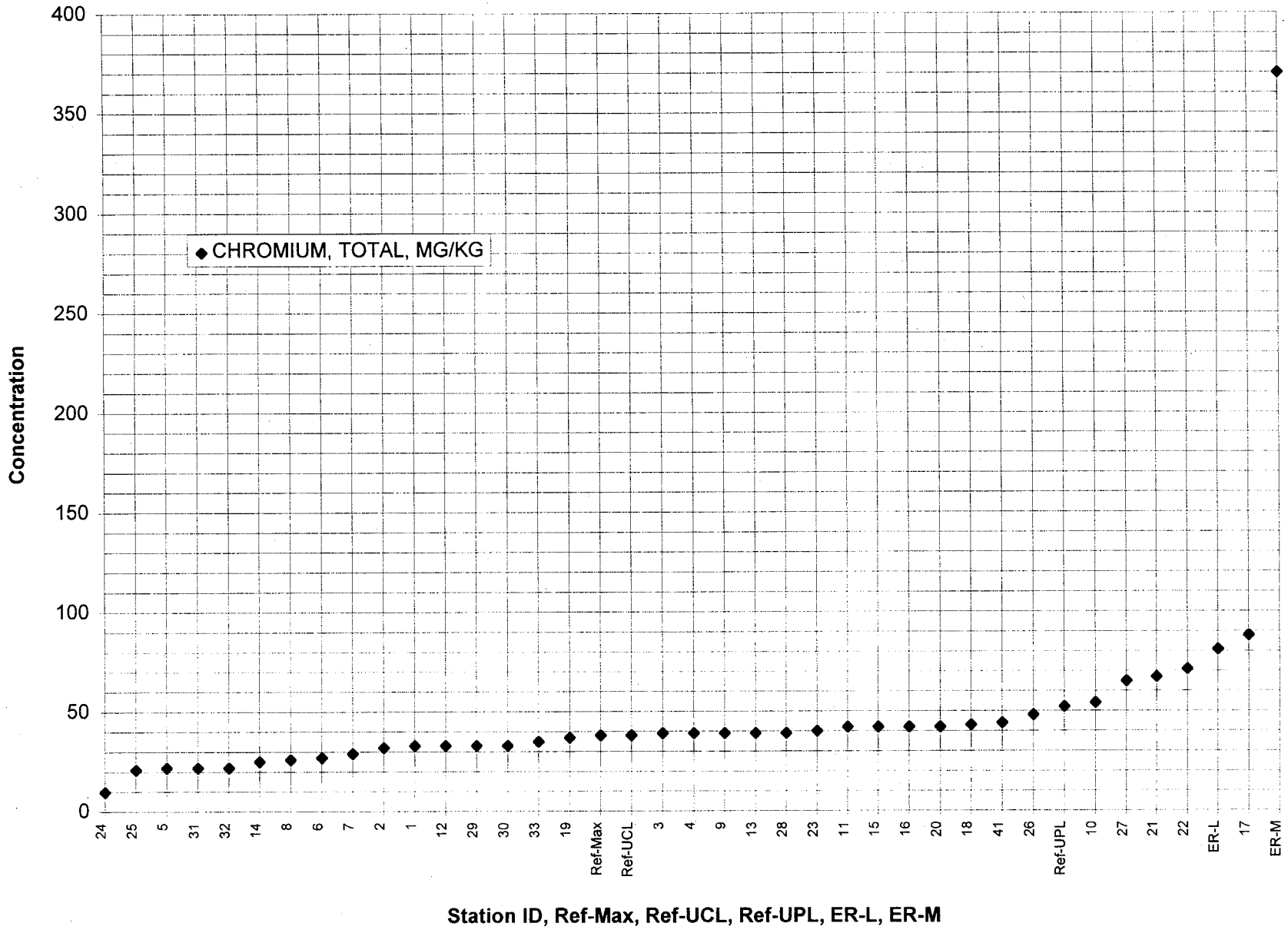

SILT, PERCENT
Value
60
50
40
30
20
10
0
24
Ref-Min
32
25
7
31
8
14
Ref-Mean
2
6
1
5
9
12
17
10
11
4
13
19
23
27
28
Ref-Max
3
21
22
29
33
41
16
18
20
26
15
30
Station ID, Ref-Min, Ref-Mean, Ref-Max

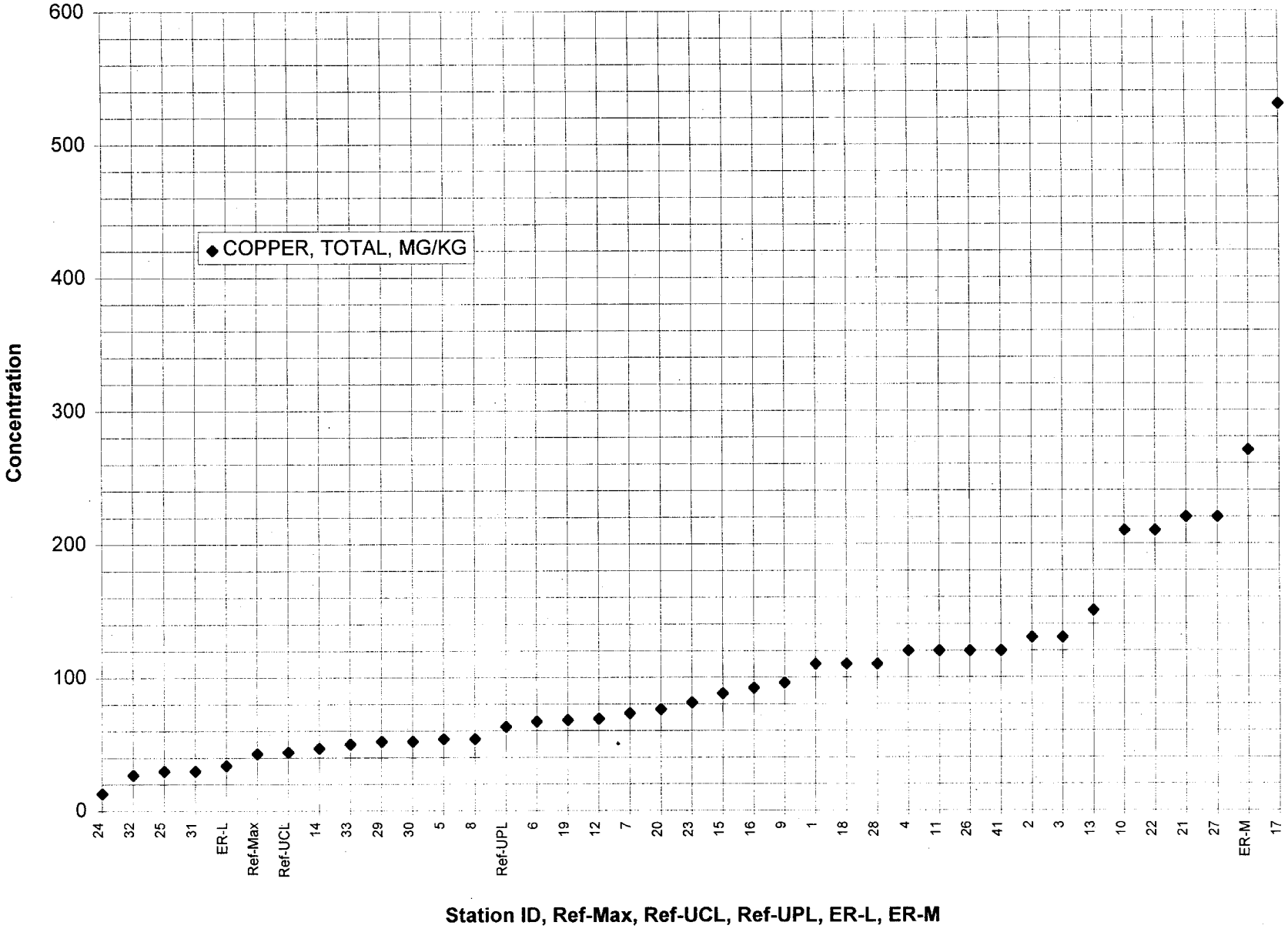

TOTAL FINES, PERCENT
Value
100
90
80
70
60
50
40
30
20
10
0
24
Ref-Min
32
25
7
14
8
5
31
6
2
1
13
Ref-Mean
12
9
19
28
11
23
29
3
4
30
20
33
41
16
Ref-Max
10
18
15
26
17
27
21
22
Station ID, Ref-Min, Ref-Mean, Ref-Max

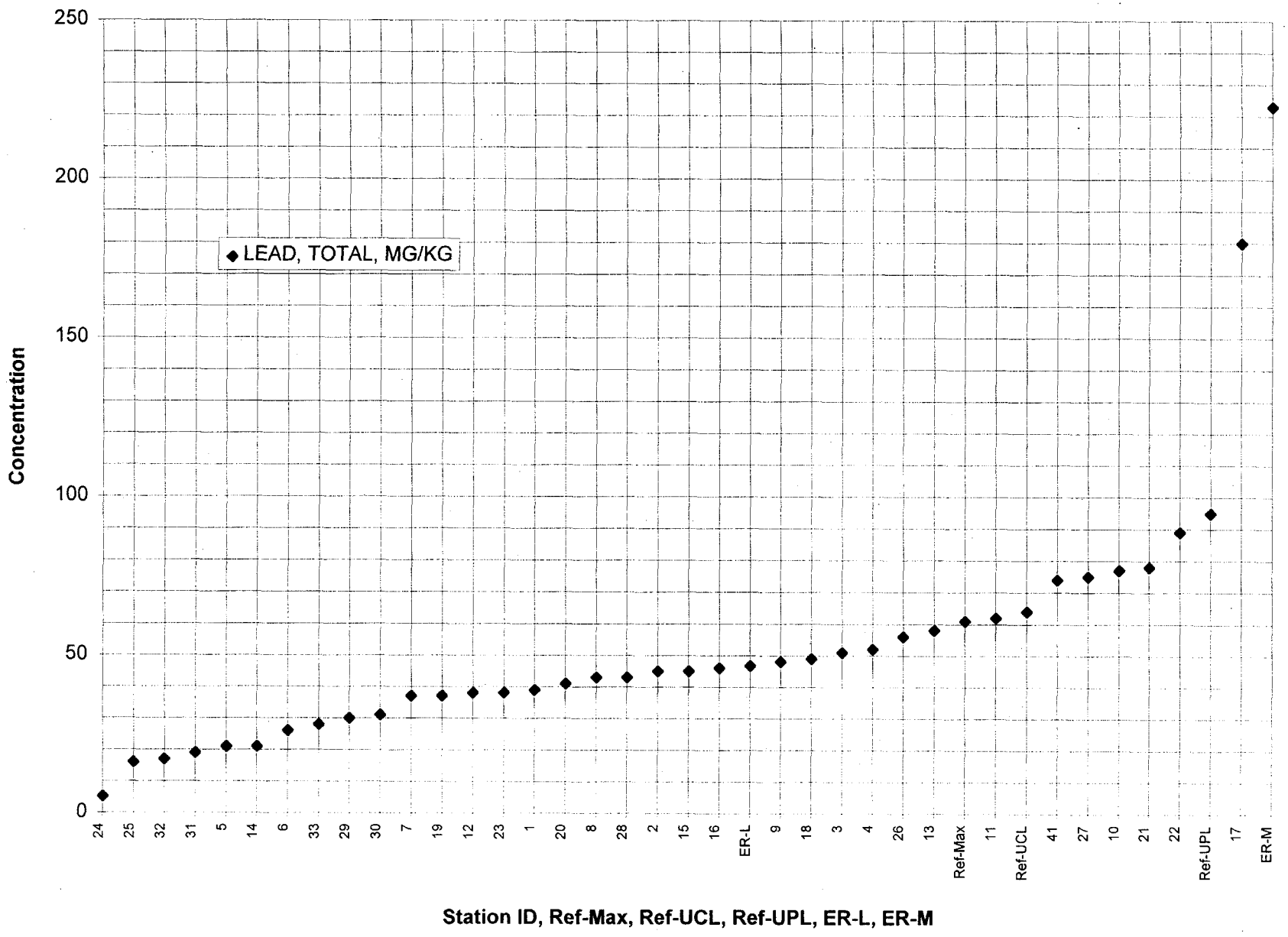

ARSENIC, TOTAL, MG/KG
Concentration
70
60
50
40
30
20
10
0
25
6
24
29
32
8
31
5
14
7
Ref-Max
2
13
15
30
12
ER-L
Ref-UCL
20
23
33
9
1
16
19
18
41
Ref-UPL
3
4
10
11
28
26
27
21
22
17
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

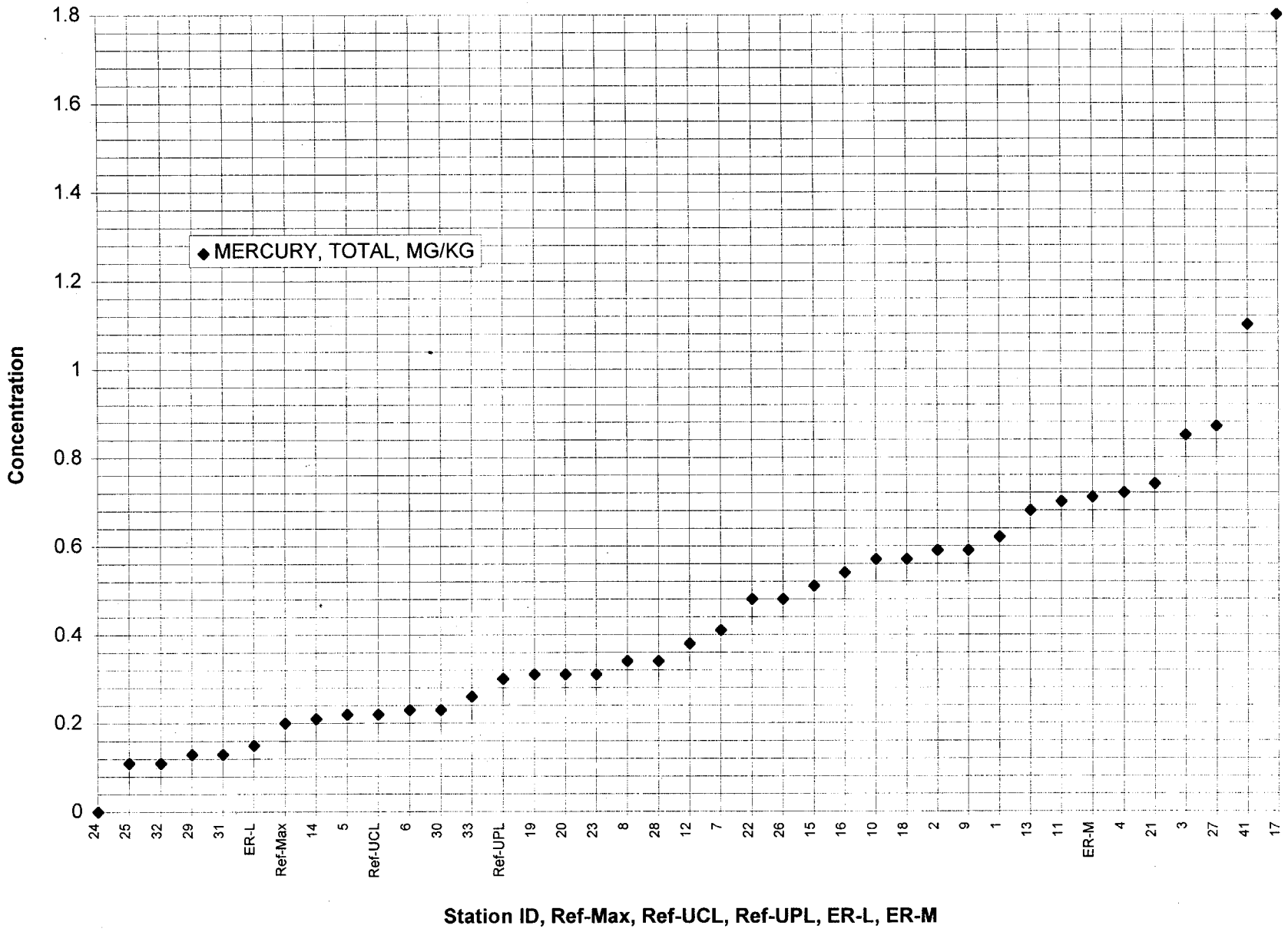

BERYLLIUM, TOTAL, MG/KG
Concentration
1.2
1
0.8
0.6
0.4
0.2
0
24
25
5
6
31
32
2
14
8
1
13
7
30
19
9
4
15
23
28
11
12
29
3
16
41
18
10
20
21
33
Ref-UCL
Ref-Max
27
17
26
22
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

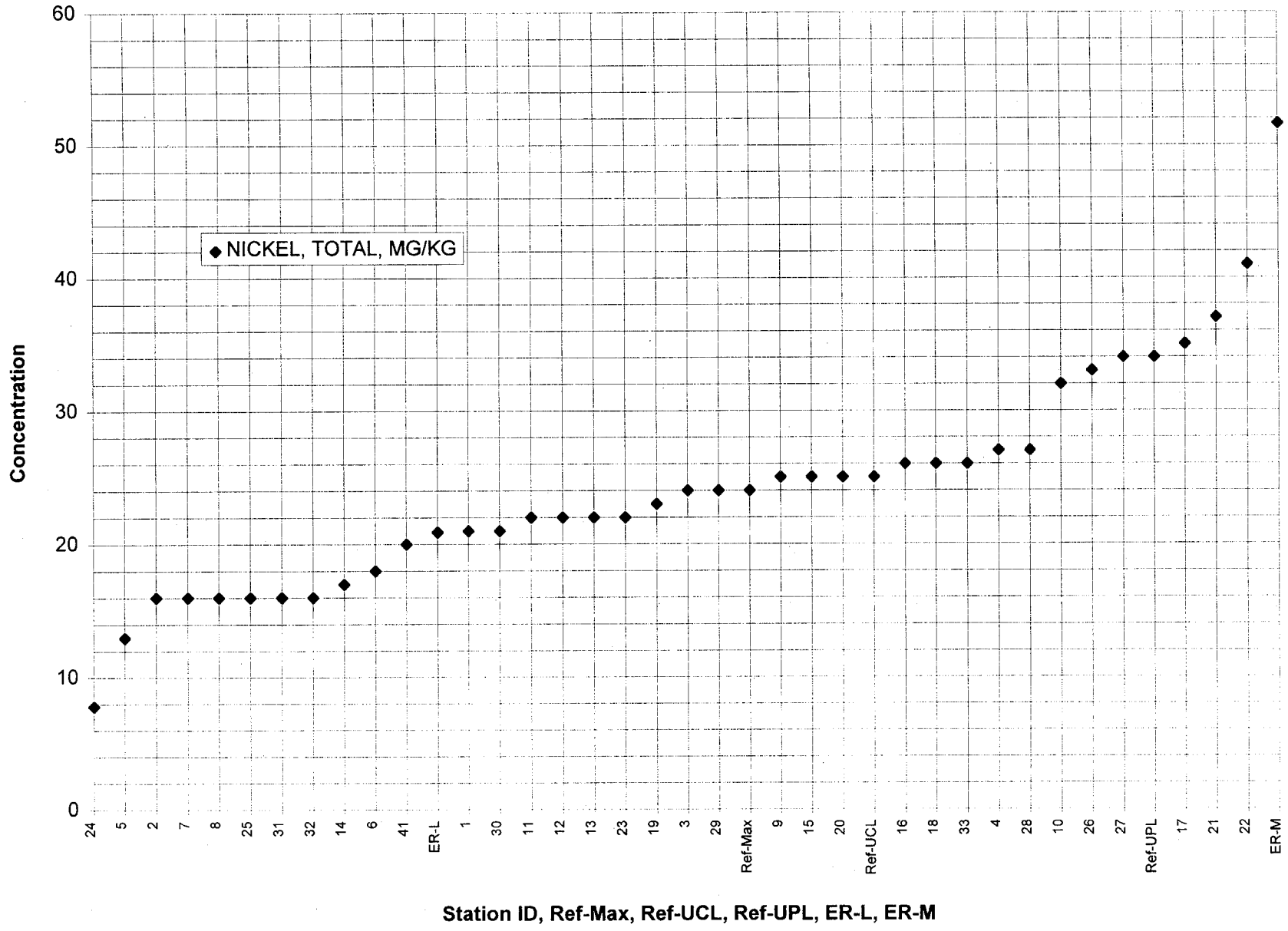

CADMIUM, TOTAL, MG/KG
Concentration
0
1
2
3
4
5
6
7
8
9
10
24
32
14
31
5
7
13
8
6
33
1
25
12
30
10
29
16
11
9
23
19
15
4
28
20
3
2
26
27
18
41
Ref-Max
Ref-UCL
22
17
21
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

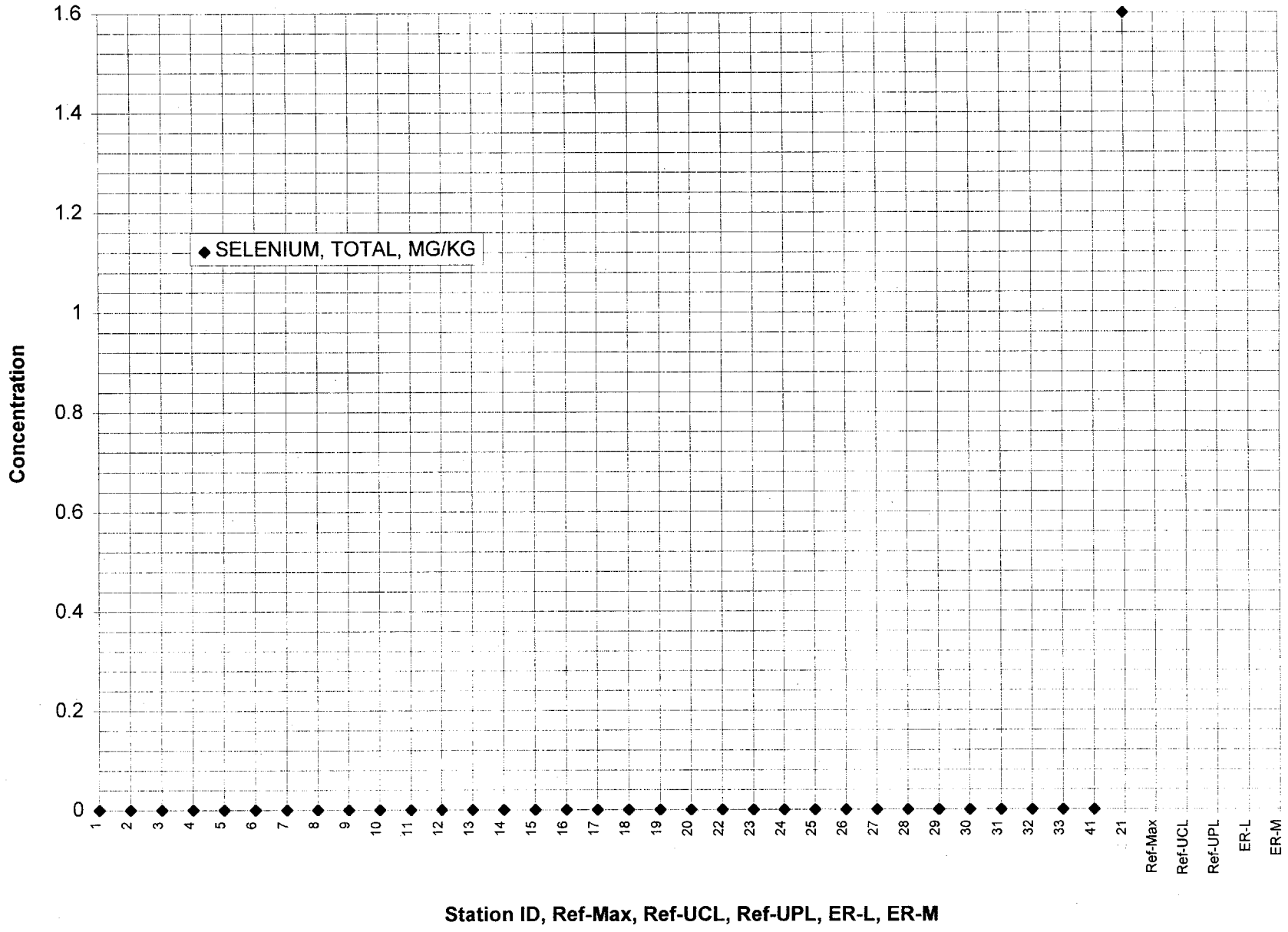

CHROMIUM, TOTAL, MG/KG
Concentration
400
350
300
250
200
150
100
50
0
24
25
5
31
32
14
8
6
7
2
1
12
29
30
33
19
Ref-Max
Ref-UCL
3
4
9
13
28
23
11
15
16
20
18
41
26
Ref-UPL
10
27
21
22
ER-L
17
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

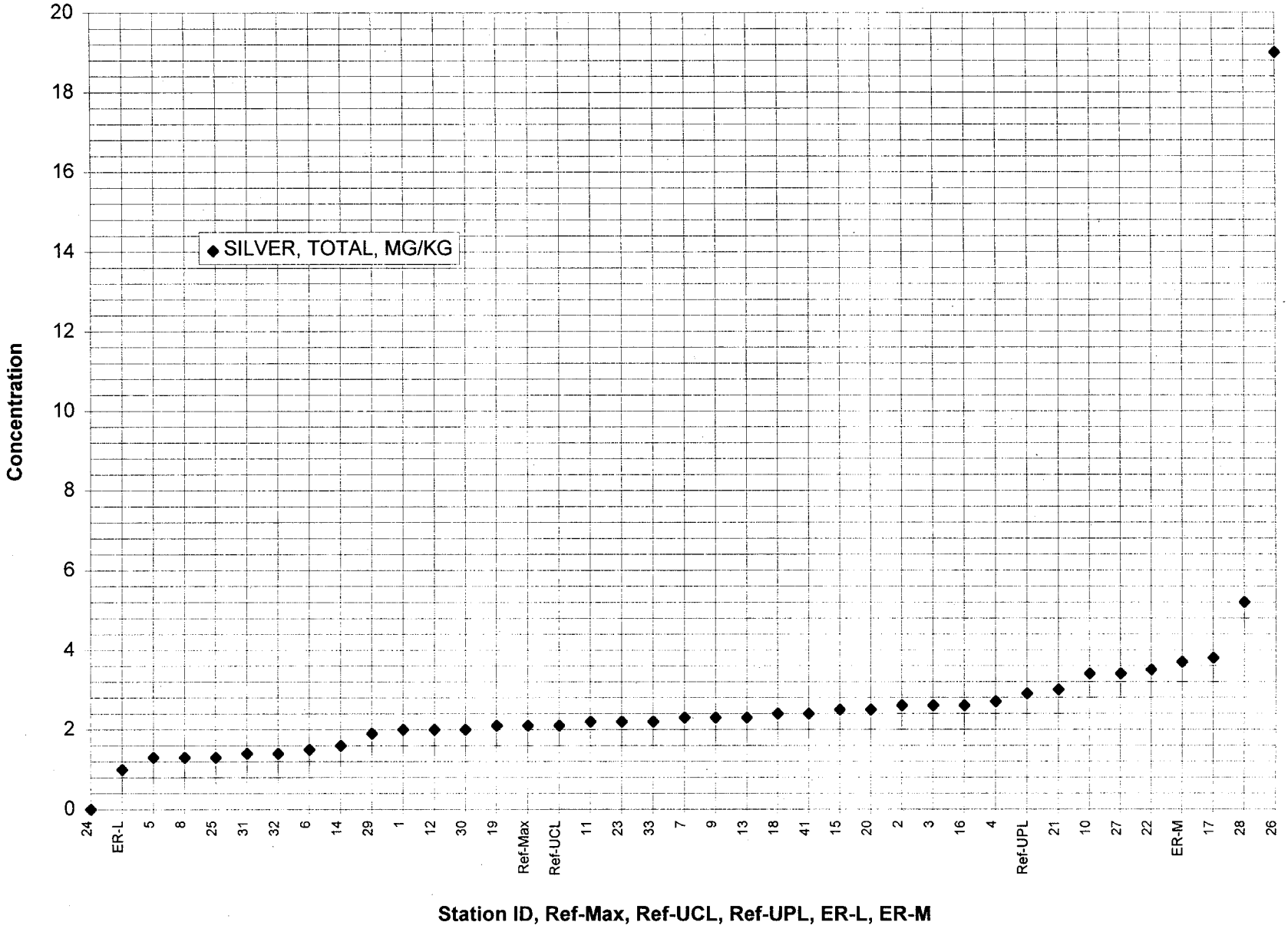

COPPER, TOTAL, MG/KG
Concentration
600
500
400
300
200
100
0
24
32
25
31
ER-L
Ref-Max
Ref-UCL
14
33
29
30
5
8
Ref-UPL
6
19
12
7
20
23
15
16
9
1
18
28
4
11
26
41
2
3
13
10
22
21
27
ER-M
17
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

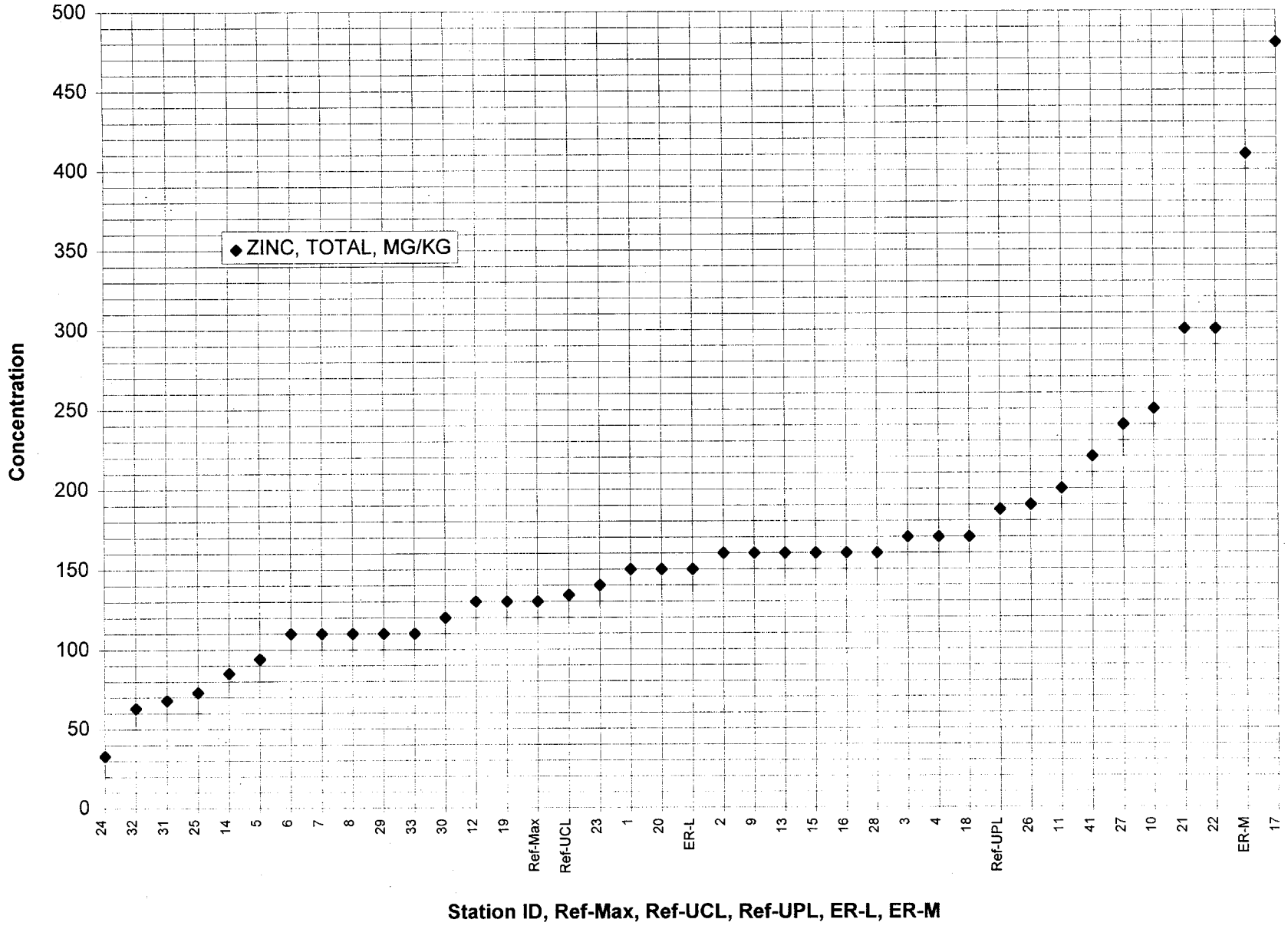

LEAD, TOTAL, MG/KG
Concentration
250
200
150
100
50
0
24
25
32
31
5
14
6
33
29
30
7
19
12
23
1
20
8
28
2
15
16
ER-L
9
18
3
4
26
13
Ref-Max
11
Ref-UCL
41
27
10
21
22
Ref-UPL
17
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

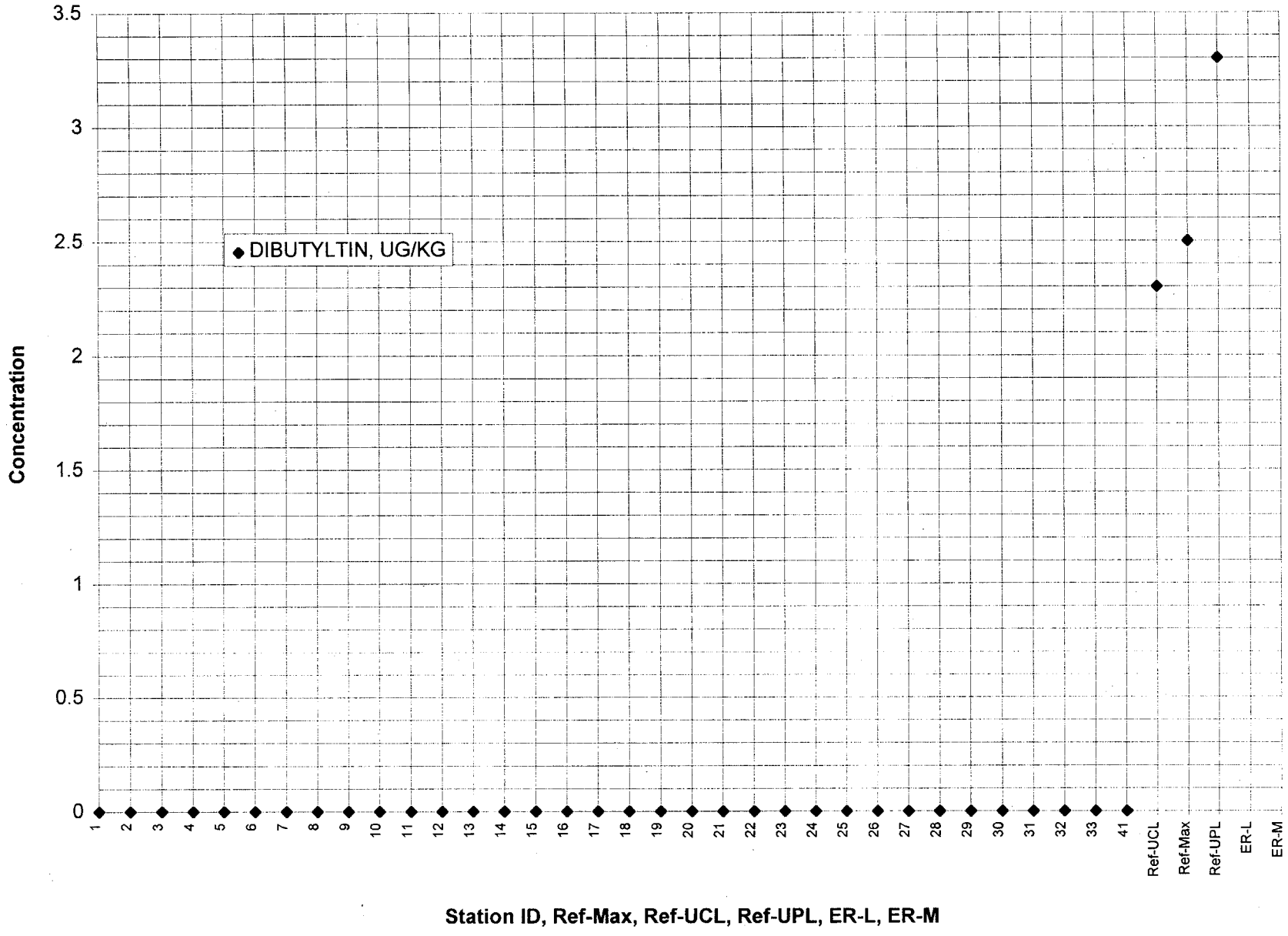

MERCURY, TOTAL, MG/KG
Concentration
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
24
25
32
29
31
ER-L
Ref-Max
14
5
Ref-UCL
6
30
33
Ref-UPL
19
20
23
8
28
12
7
22
26
15
16
10
18
2
9
1
13
11
ER-M
4
21
3
27
41
17
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

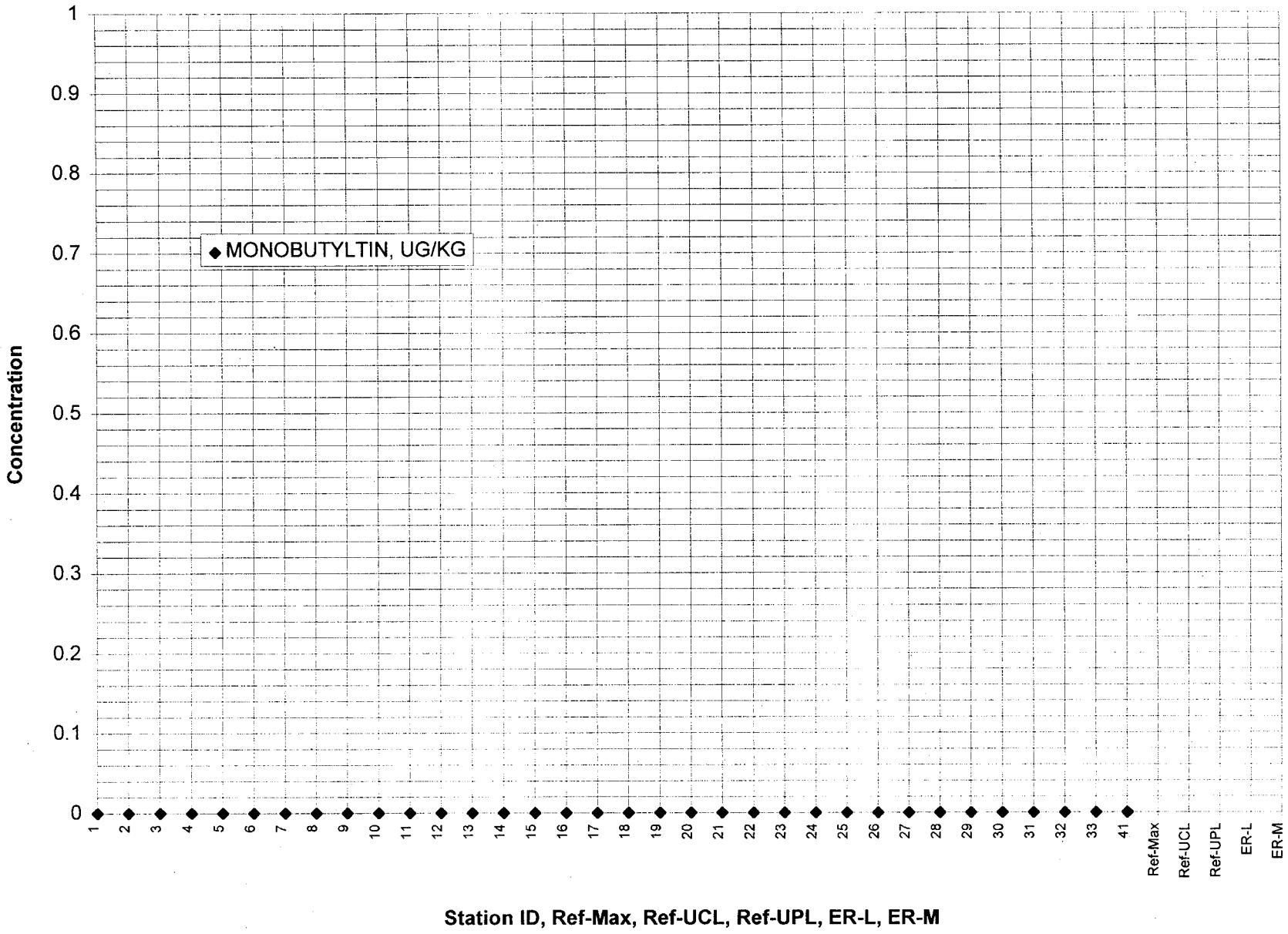

NICKEL, TOTAL, MG/KG
Concentration
0
10
20
30
40
50
60
24
5
2
7
8
25
31
32
14
6
41
ER-L
1
30
11
12
13
23
19
3
29
Ref-Max
9
15
20
Ref-UCL
16
18
33
4
28
10
26
27
Ref-UPL
17
21
22
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

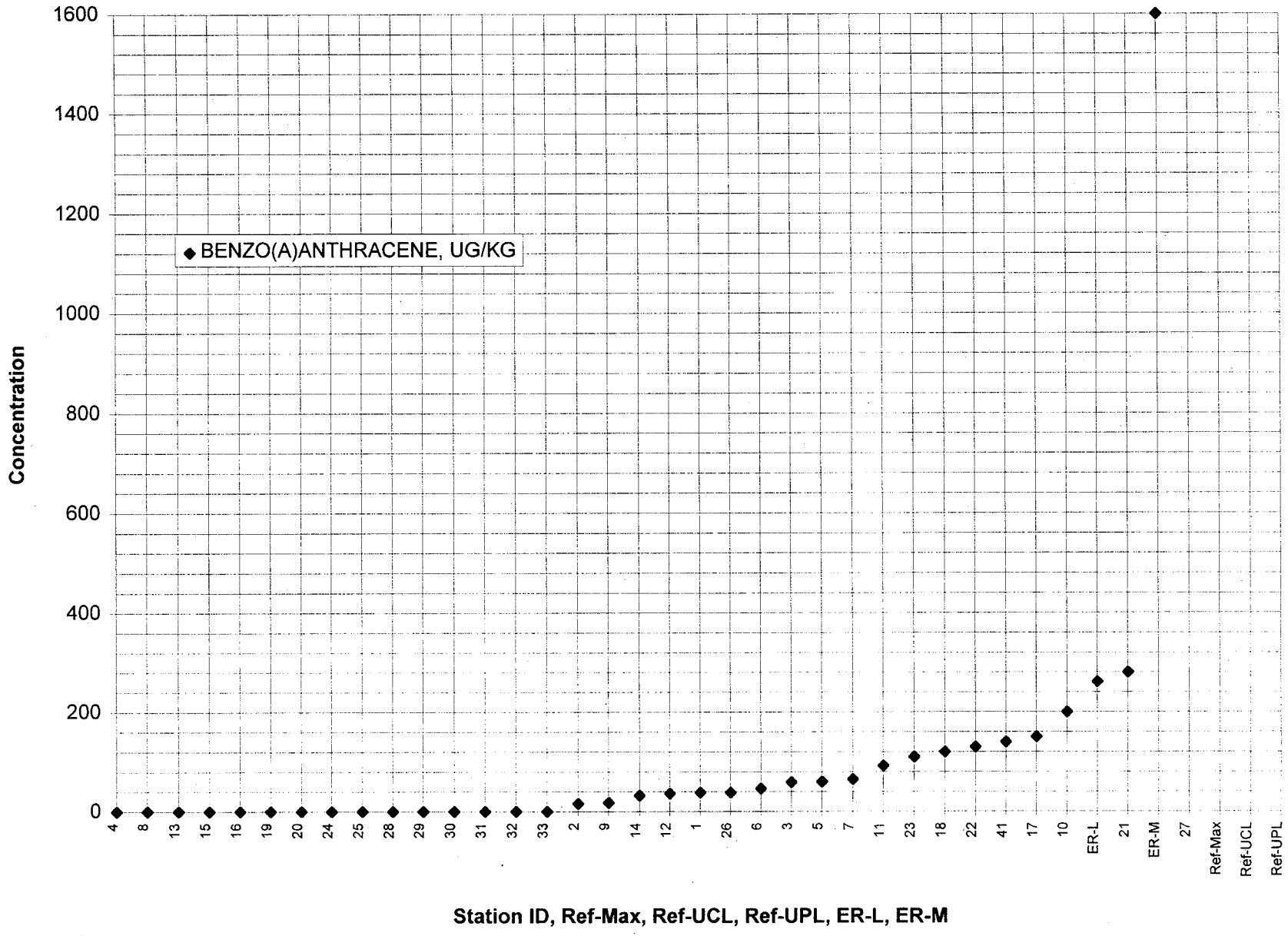

SELENIUM, TOTAL, MG/KG
Concentration
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
22
23
24
25
26
27
28
29
30
31
32
33
41
21
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

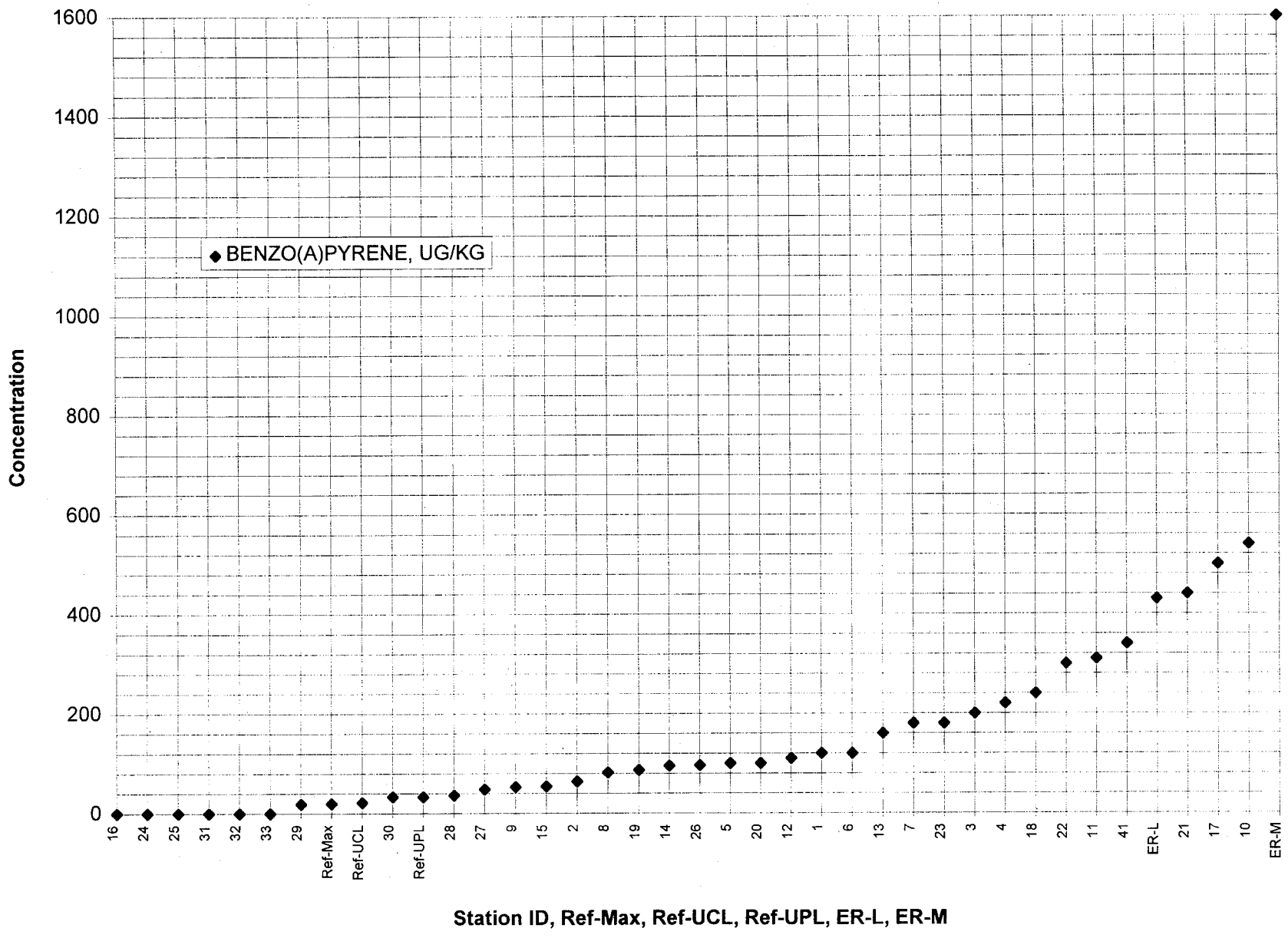

SILVER, TOTAL, MG/KG
Concentration
0
2
4
6
8
10
12
14
16
18
20
24
ER-L
5
8
25
31
32
6
14
29
1
12
30
19
Ref-Max
Ref-UCL
11
23
33
7
9
13
18
41
15
20
2
3
16
4
Ref-UPL
21
10
27
22
ER-M
17
28
26
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

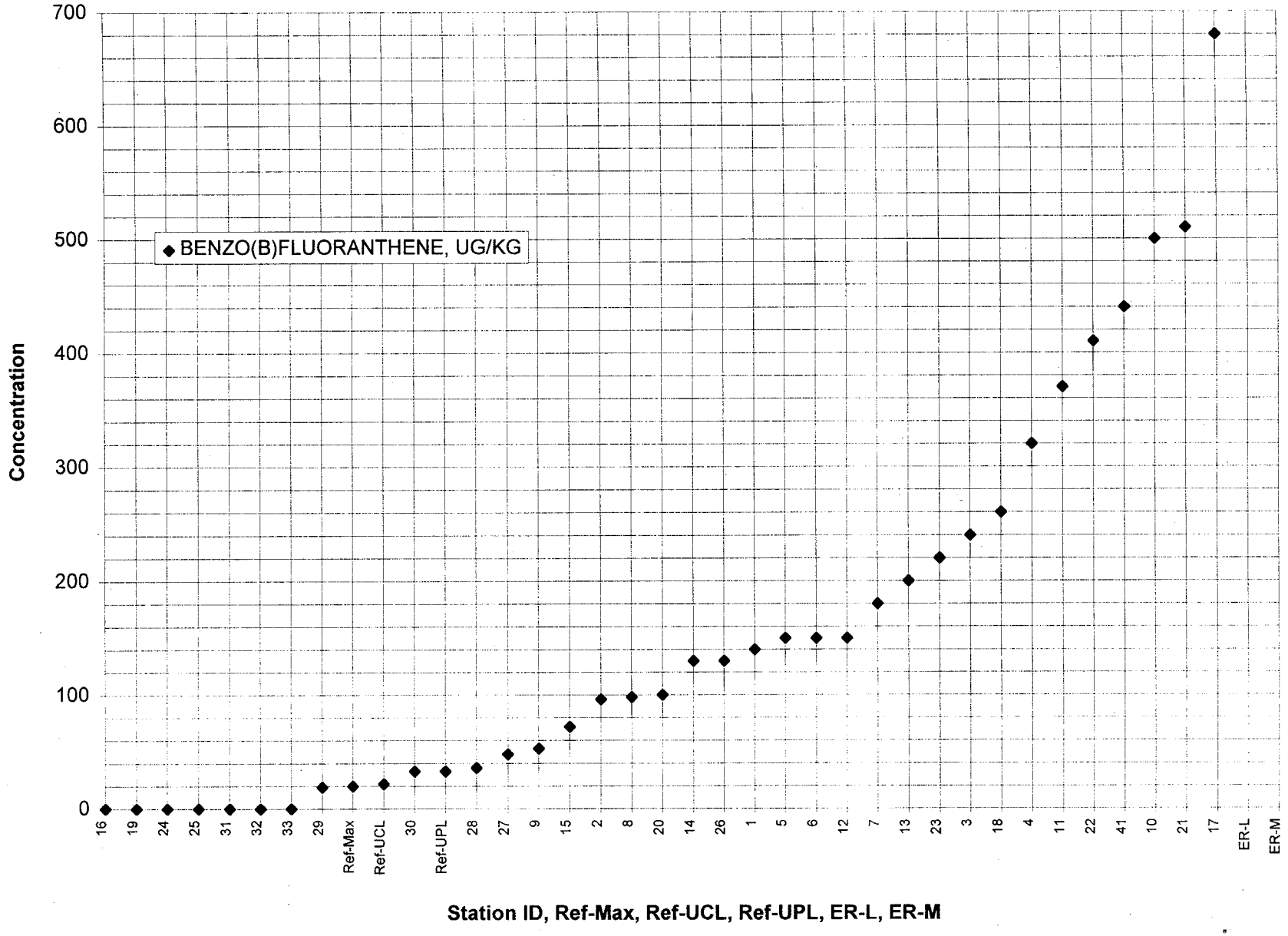

ZINC, TOTAL, MG/KG
Concentration
500
450
400
350
300
250
200
150
100
50
0
24
32
31
25
14
5
6
7
8
29
33
30
12
19
Ref-Max
Ref-UCL
23
1
20
ER-L
2
9
13
15
16
28
3
4
18
Ref-UPL
26
11
41
27
10
21
22
ER-M
17
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

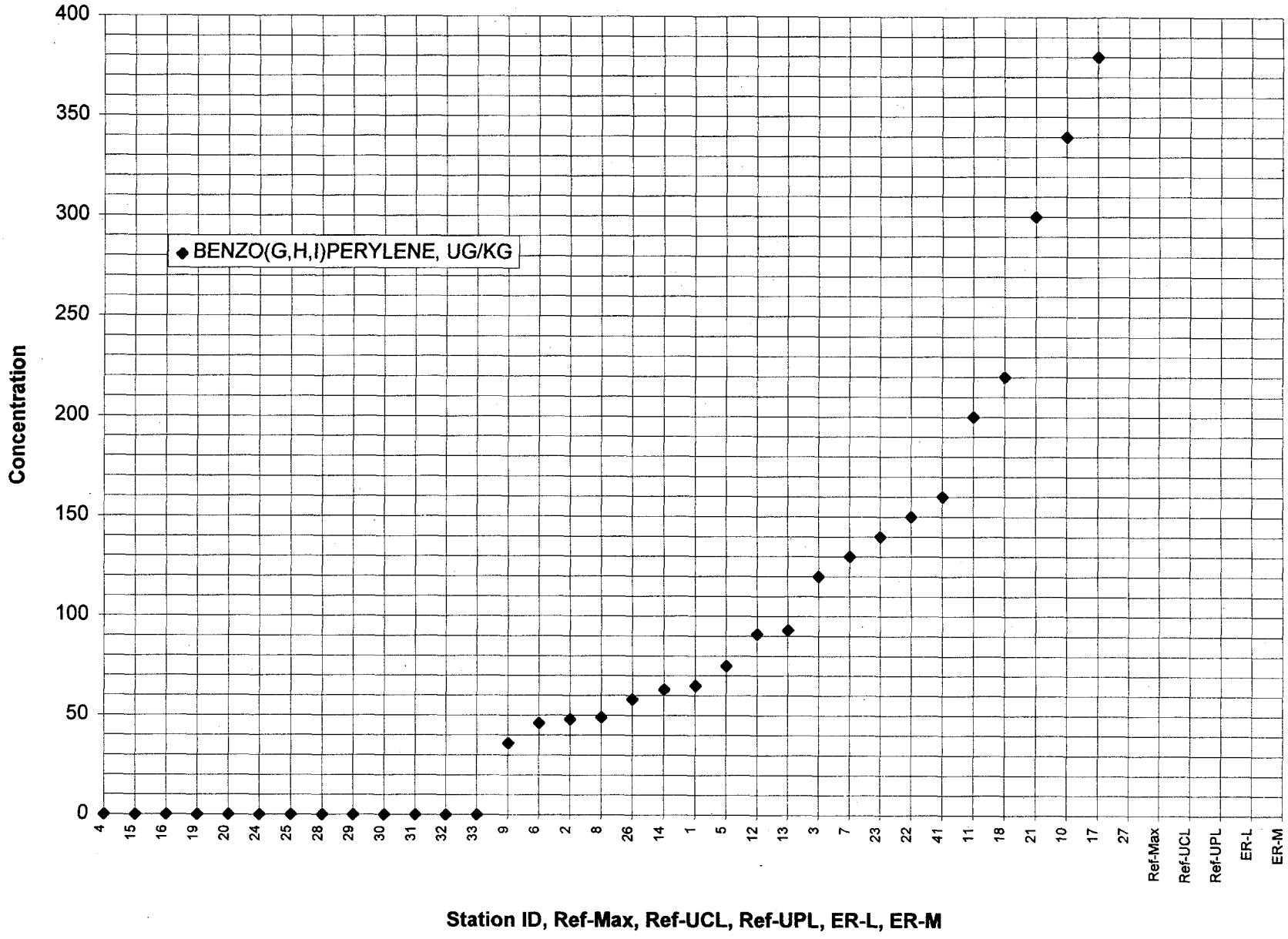

DIBUTYLTIN, UG/KG
Concentration
3.5
3
2.5
2
1.5
1
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
41
Ref-UCL
Ref-Max
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

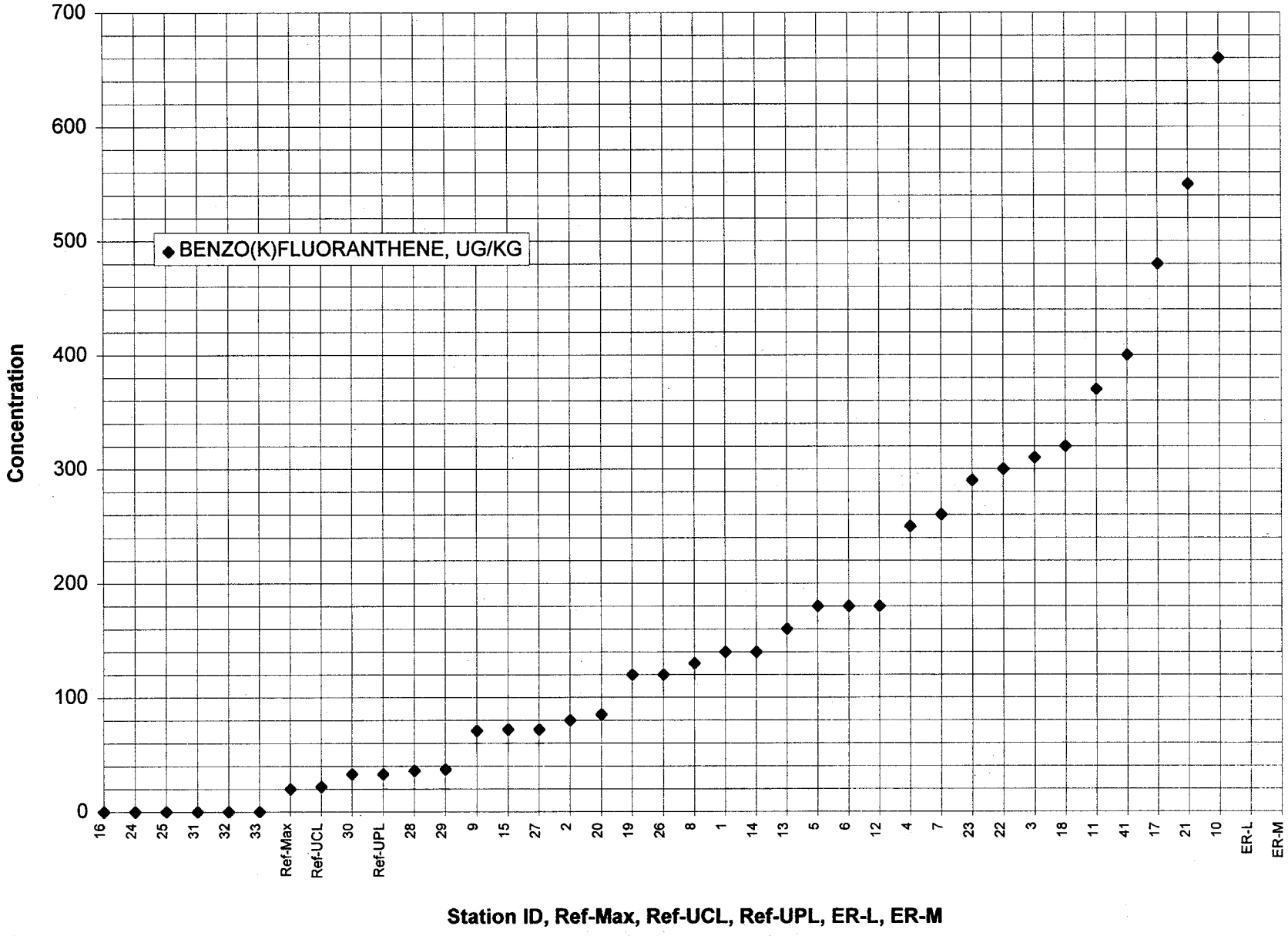

MONOBUTYLTIN, UG/KG
Concentration
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 41
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

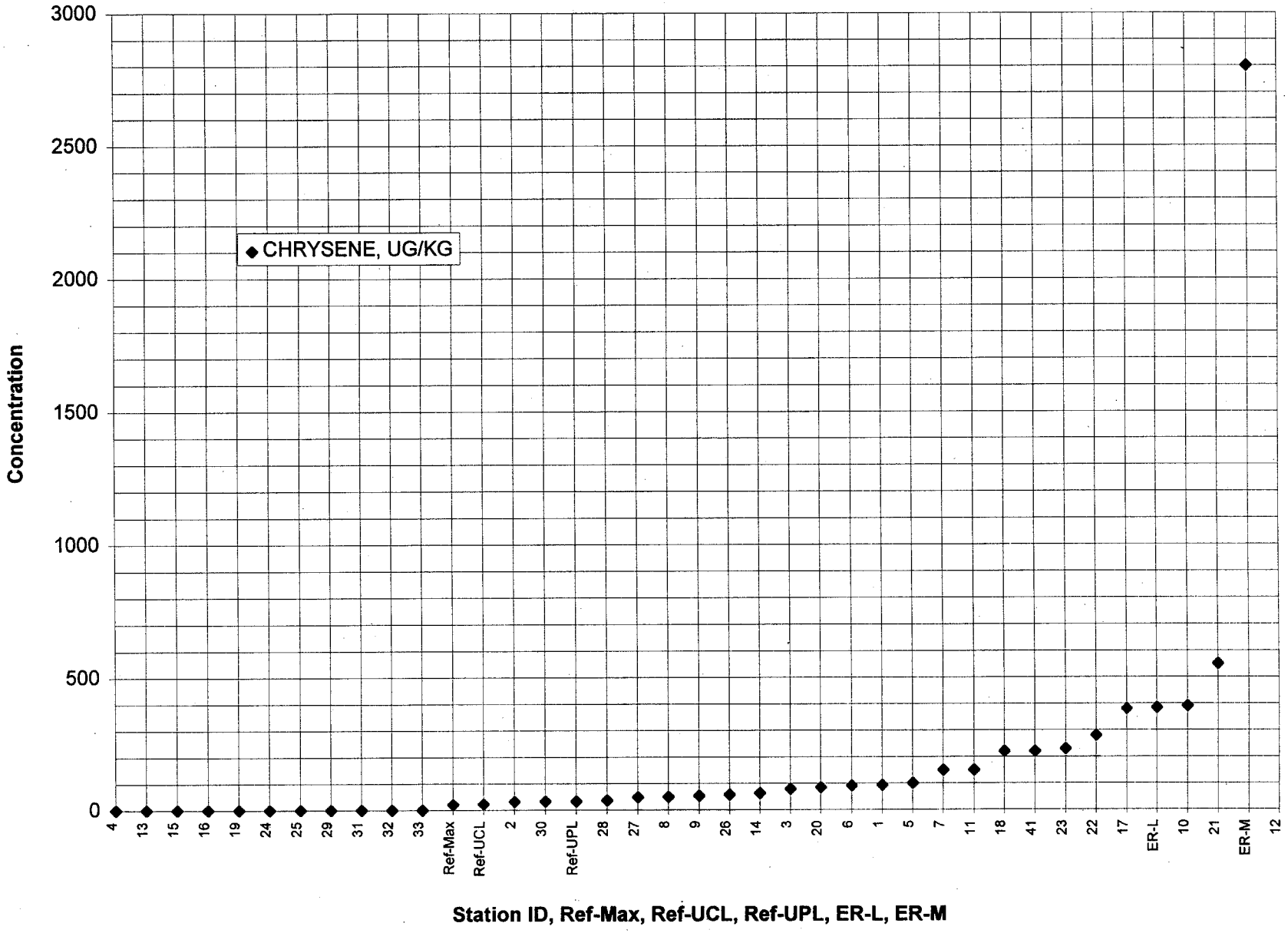

1600
1400
1200
1000
800
600
400
200
0
Concentration
BENZO(A)ANTHRACENE, UG/KG
4
8
13
15
16
19
20
24
25
28
29
30
31
32
33
2
9
14
12
1
26
6
3
5
7
11
23
18
22
41
17
10
ER-L
21
ER-M
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

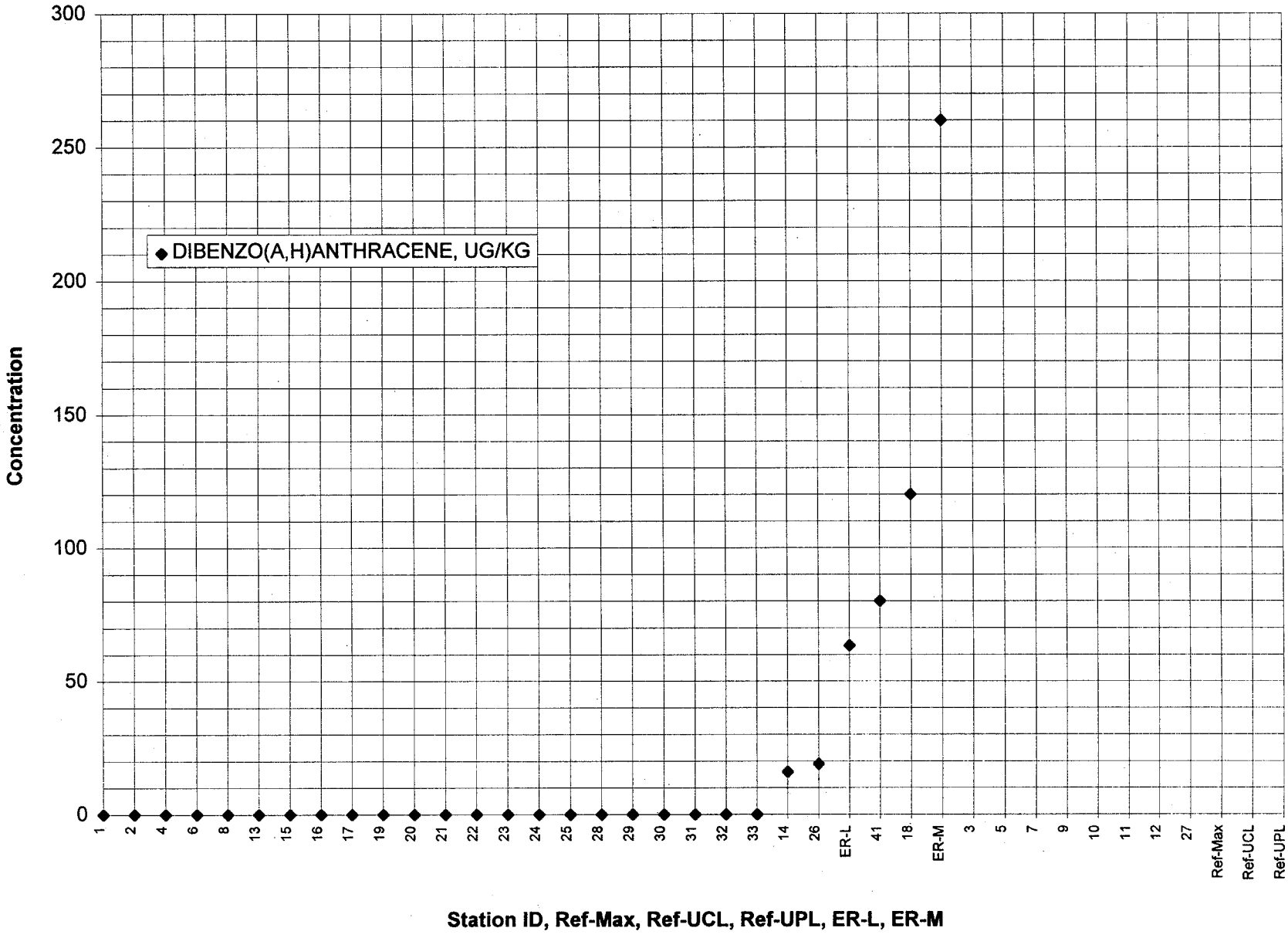

BENZO(A)PYRENE, UG/KG
Concentration
1600
1400
1200
1000
800
600
400
200
0
16
24
25
31
32
33
29
Ref-Max
Ref-UCL
30
Ref-UPL
28
27
9
15
2
8
19
14
26
5
20
12
1
6
13
7
23
3
4
18
22
11
41
ER-L
21
17
10
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

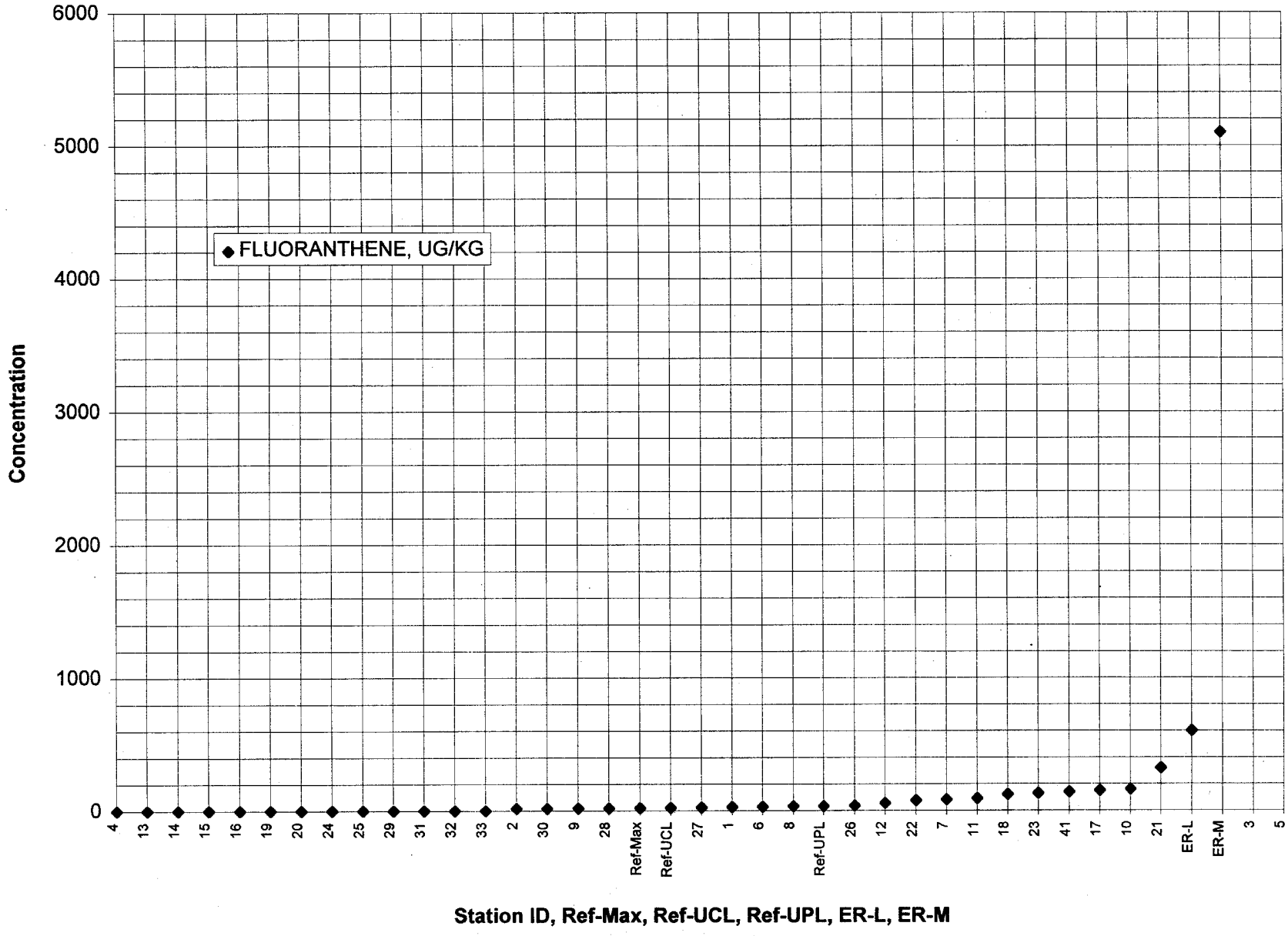

BENZO(B)FLUORANTHENE, UG/KG
Concentration
700
600
500
400
300
200
100
0
16
19
24
25
31
32
33
29
Ref-Max
Ref-UCL
30
Ref-UPL
28
27
9
15
2
8
20
14
26
1
5
6
12
7
13
23
3
18
4
11
22
41
10
21
17
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

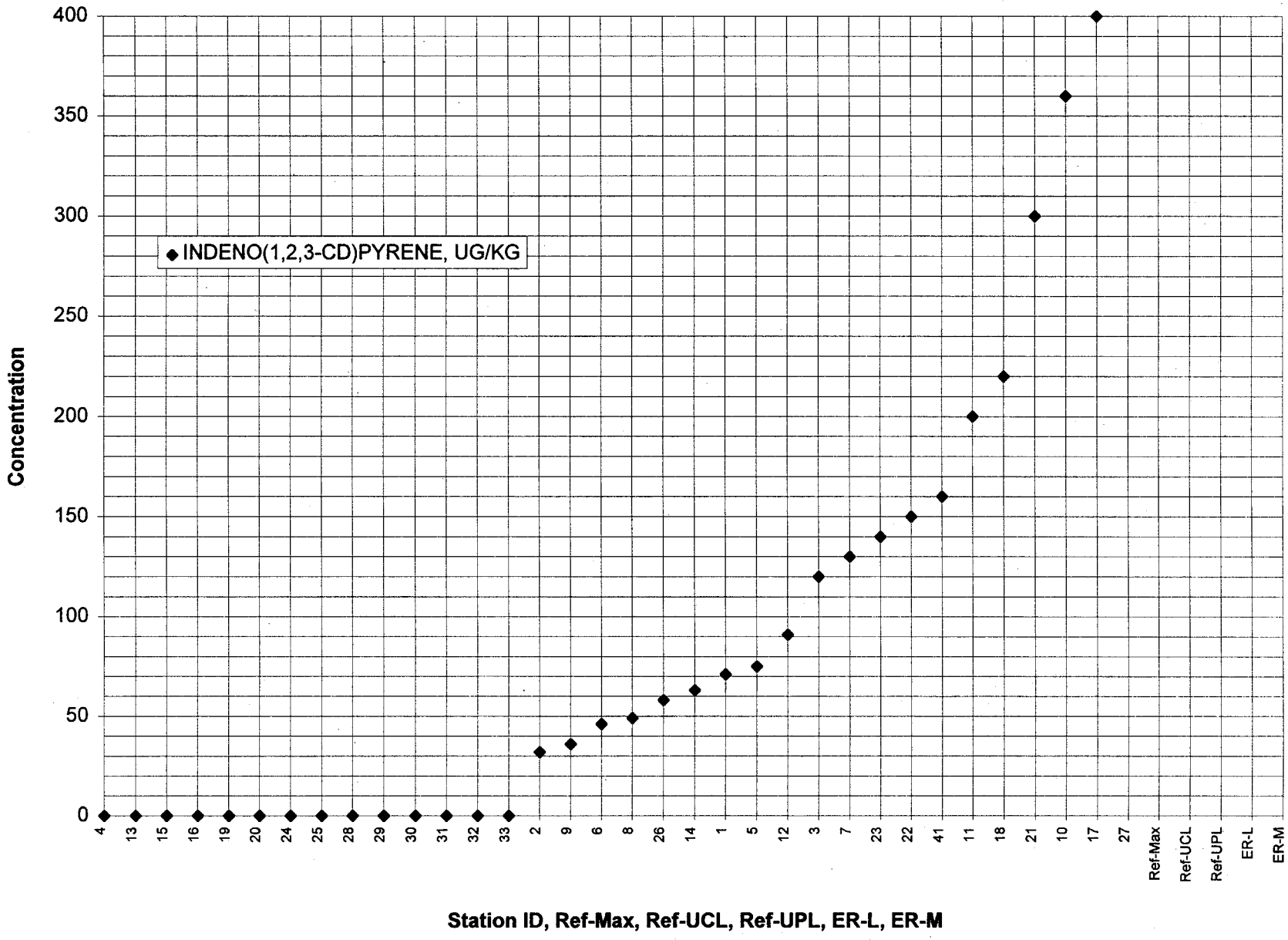

BENZO(G,H,I)PERYLENE, UG/KG
Concentration
400
350
300
250
200
150
100
50
0
4
15
16
19
20
24
25
28
29
30
31
32
33
9
6
2
8
26
14
1
5
12
13
3
7
23
22
41
11
18
21
10
17
27
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

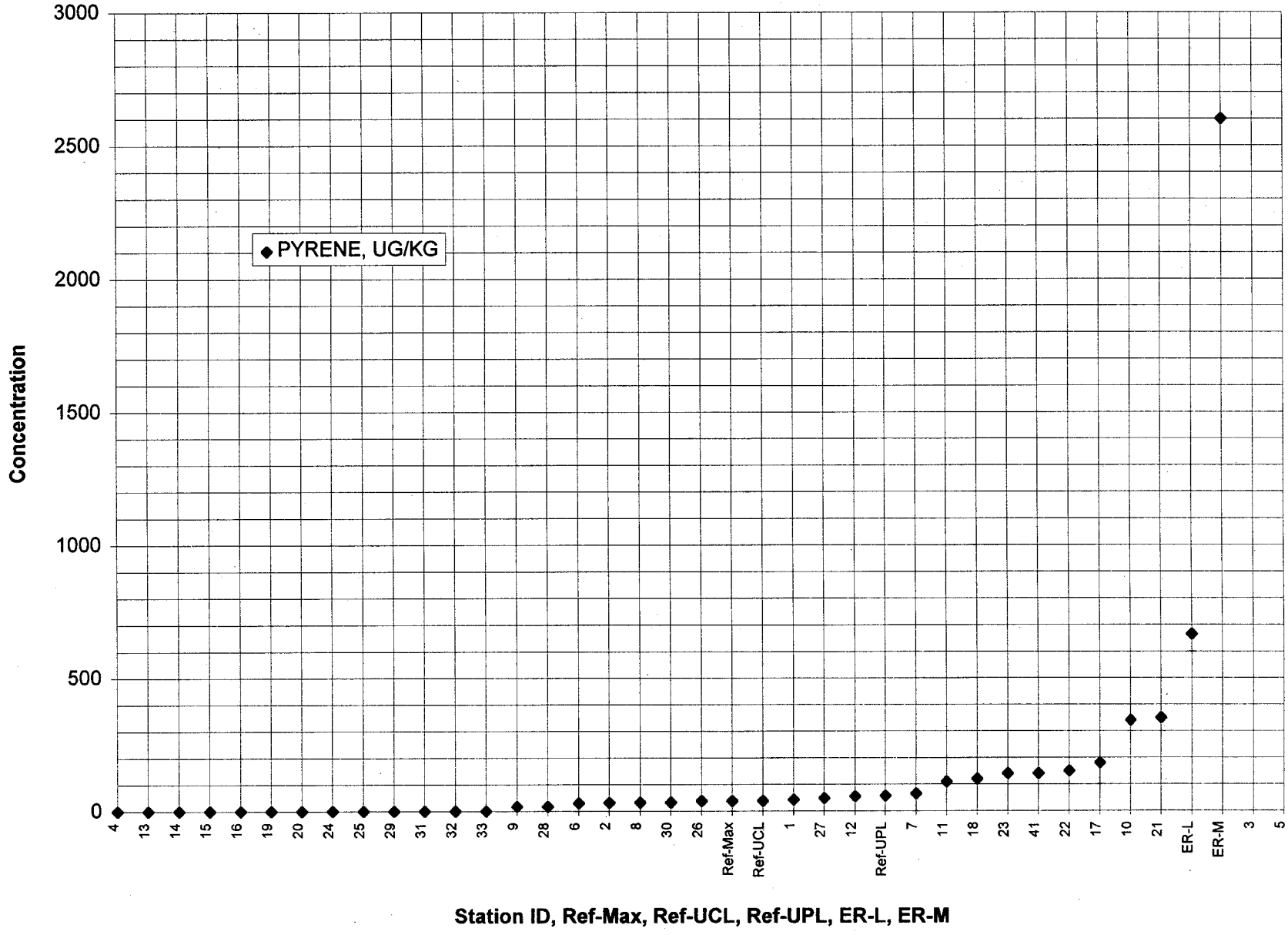

BENZO(K)FLUORANTHENE, UG/KG
Concentration
700
600
500
400
300
200
100
0
16
24
25
31
32
33
Ref-Max
Ref-UCL
30
Ref-UPL
28
29
9
15
27
2
20
19
26
8
1
14
13
5
6
12
4
7
23
22
3
18
11
41
17
21
10
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

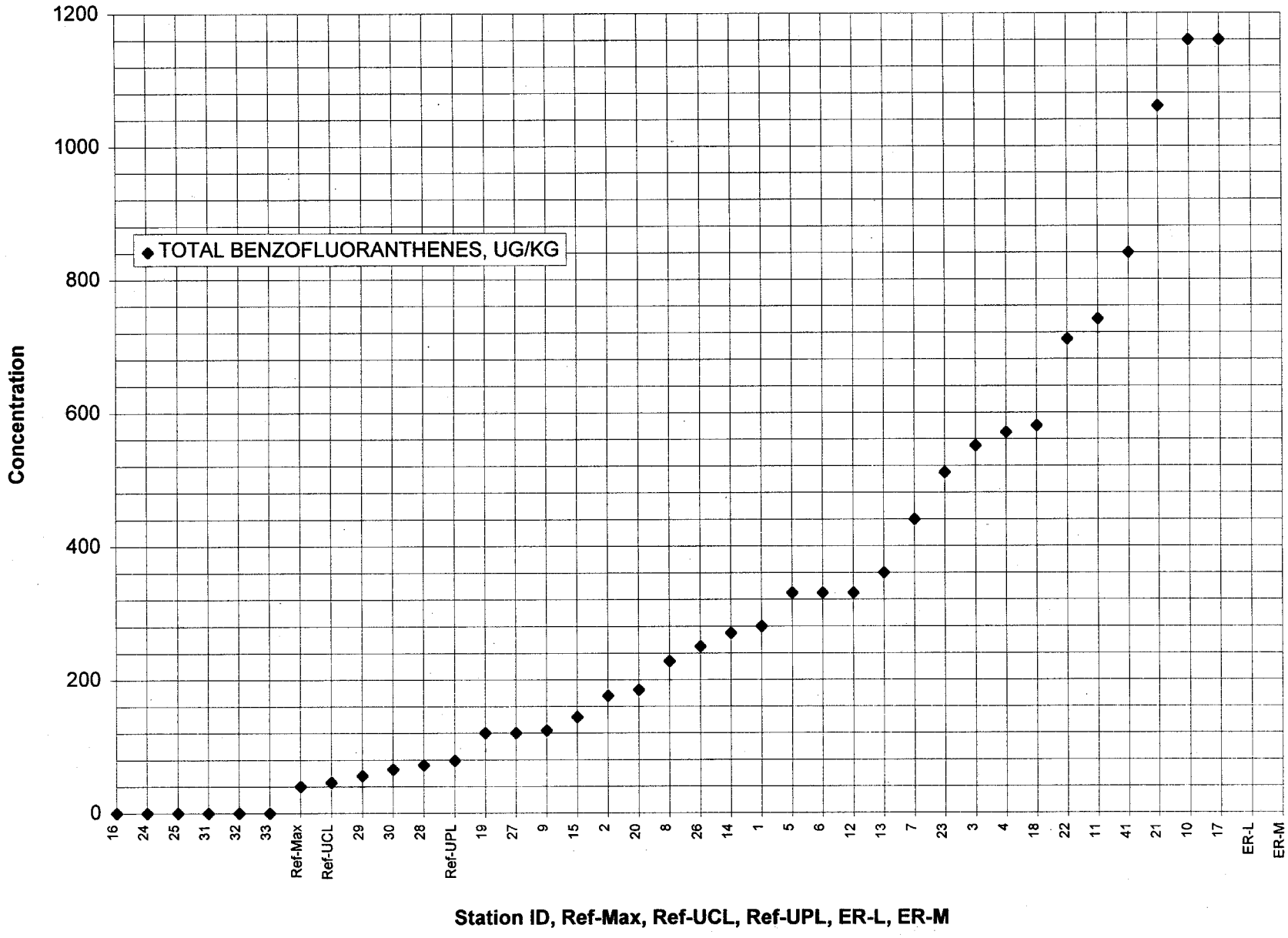

CHRYSENE, UG/KG
Concentration
3000
2500
2000
1500
1000
500
0
4
13
15
16
19
24
25
29
31
32
33
Ref-Max
Ref-UCL
2
30
Ref-UPL
28
27
8
9
26
14
3
20
6
1
5
7
11
18
41
23
22
17
ER-L
10
21
ER-M
12
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

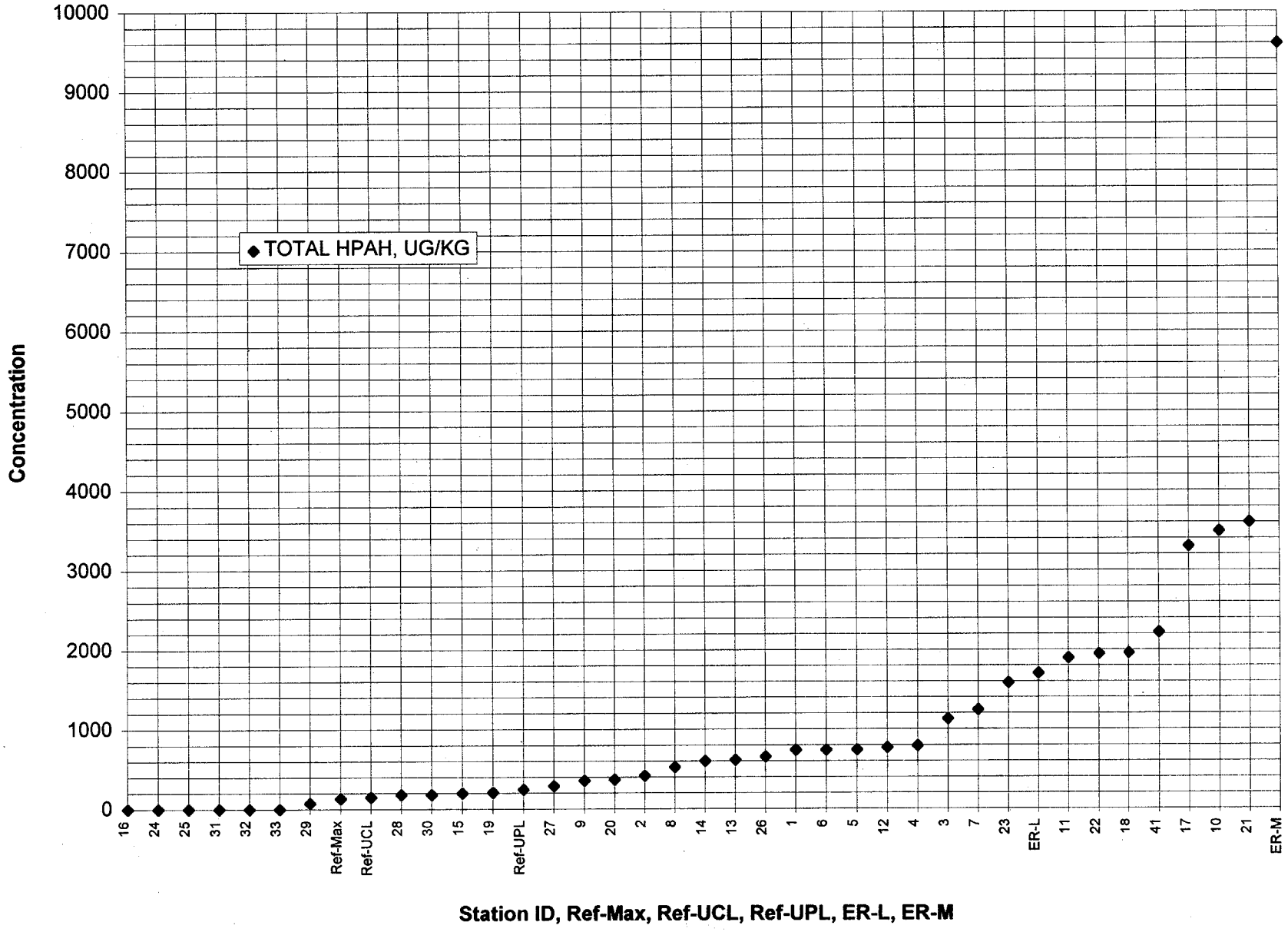

DIBENZO(A,H)ANTHRACENE, UG/KG
Concentration
300
250
200
150
100
50
0
1
2
4
6
8
13
15
16
17
19
20
21
22
23
24
25
28
29
30
31
32
33
14
26
ER-L
41
18
ER-M
3
5
7
9
10
11
12
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

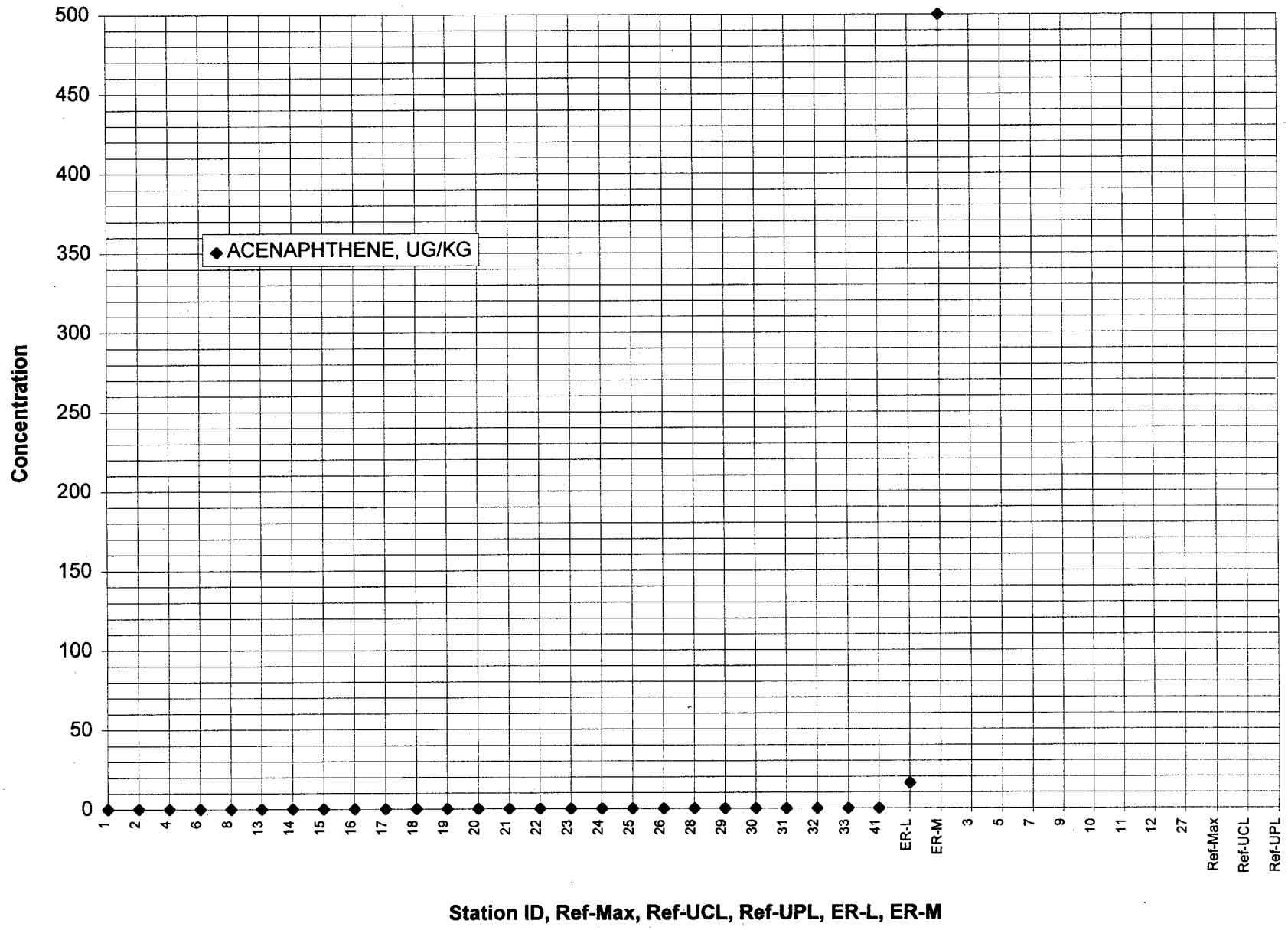

6000
5000
4000
3000
2000
1000
0
Concentration
FLUORANTHENE, UG/KG
4
13
14
15
16
19
20
24
25
29
31
32
33
2
30
9
28
Ref-Max
Ref-UCL
27
1
6
8
Ref-UPL
26
12
22
7
11
18
23
41
17
10
21
ER-L
ER-M
3
5
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

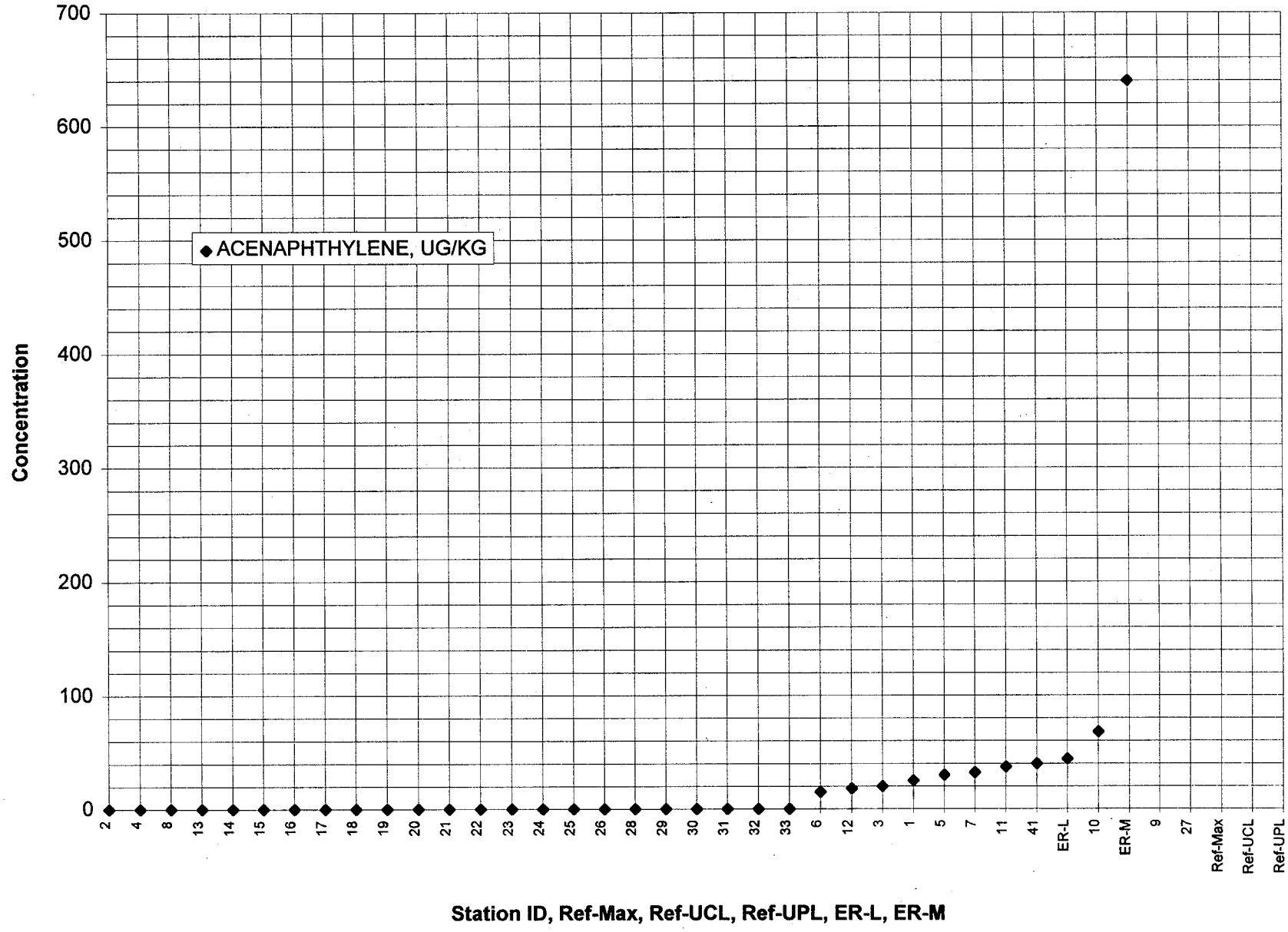

INDENO(1,2,3-CD)PYRENE, UG/KG
Concentration
400
350
300
250
200
150
100
50
0
4
13
15
16
19
20
24
25
28
29
30
31
32
33
2
9
6
8
26
14
1
5
12
3
7
23
22
41
11
18
21
10
17
27
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

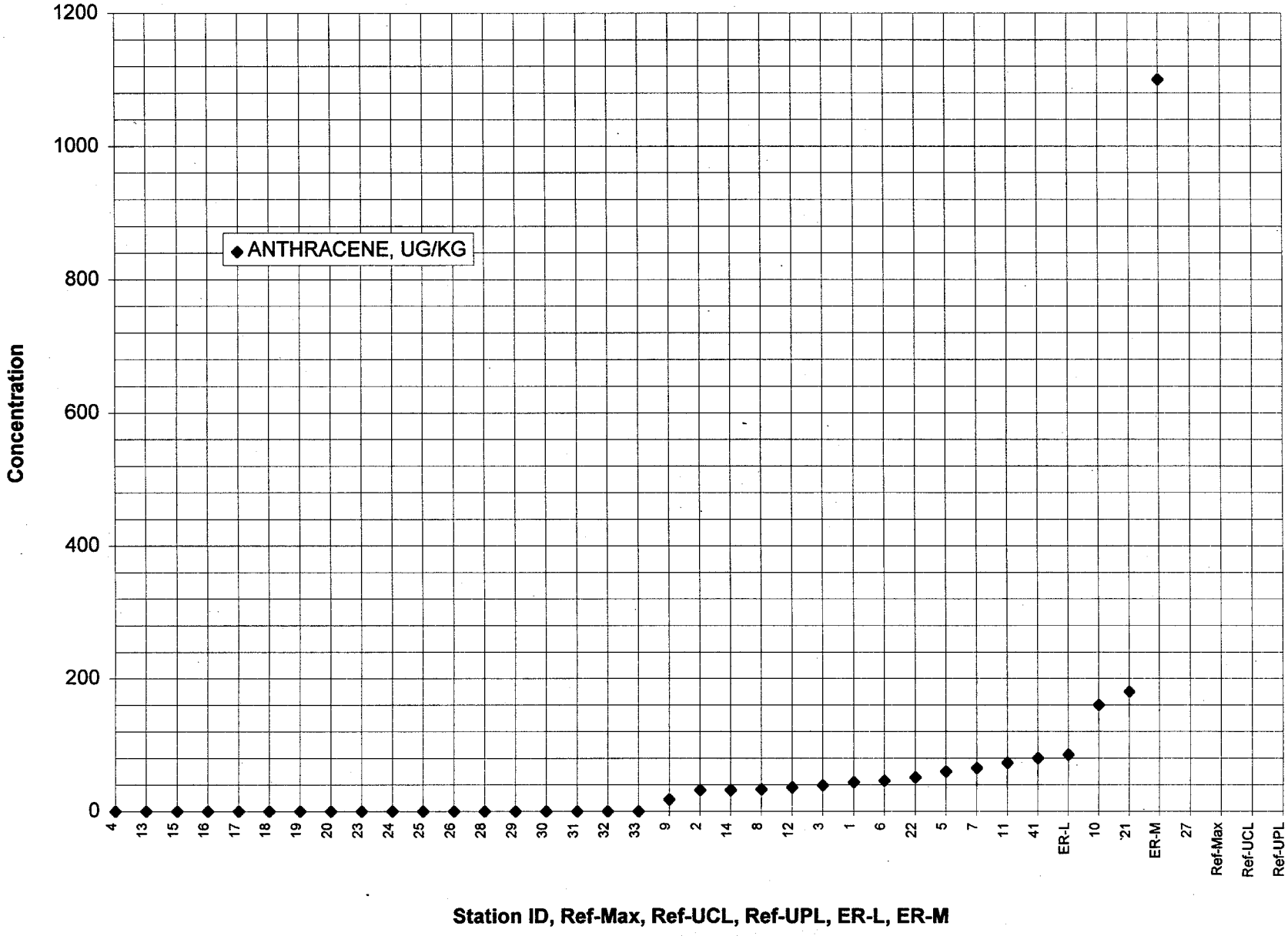

PYRENE, UG/KG
Concentration
3000
2500
2000
1500
1000
500
0
4
13
14
15
16
19
20
24
25
29
31
32
33
9
28
6
2
8
30
26
Ref-Max
Ref-UCL
1
27
12
Ref-UPL
7
11
18
23
41
22
17
10
21
ER-L
ER-M
3
5
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

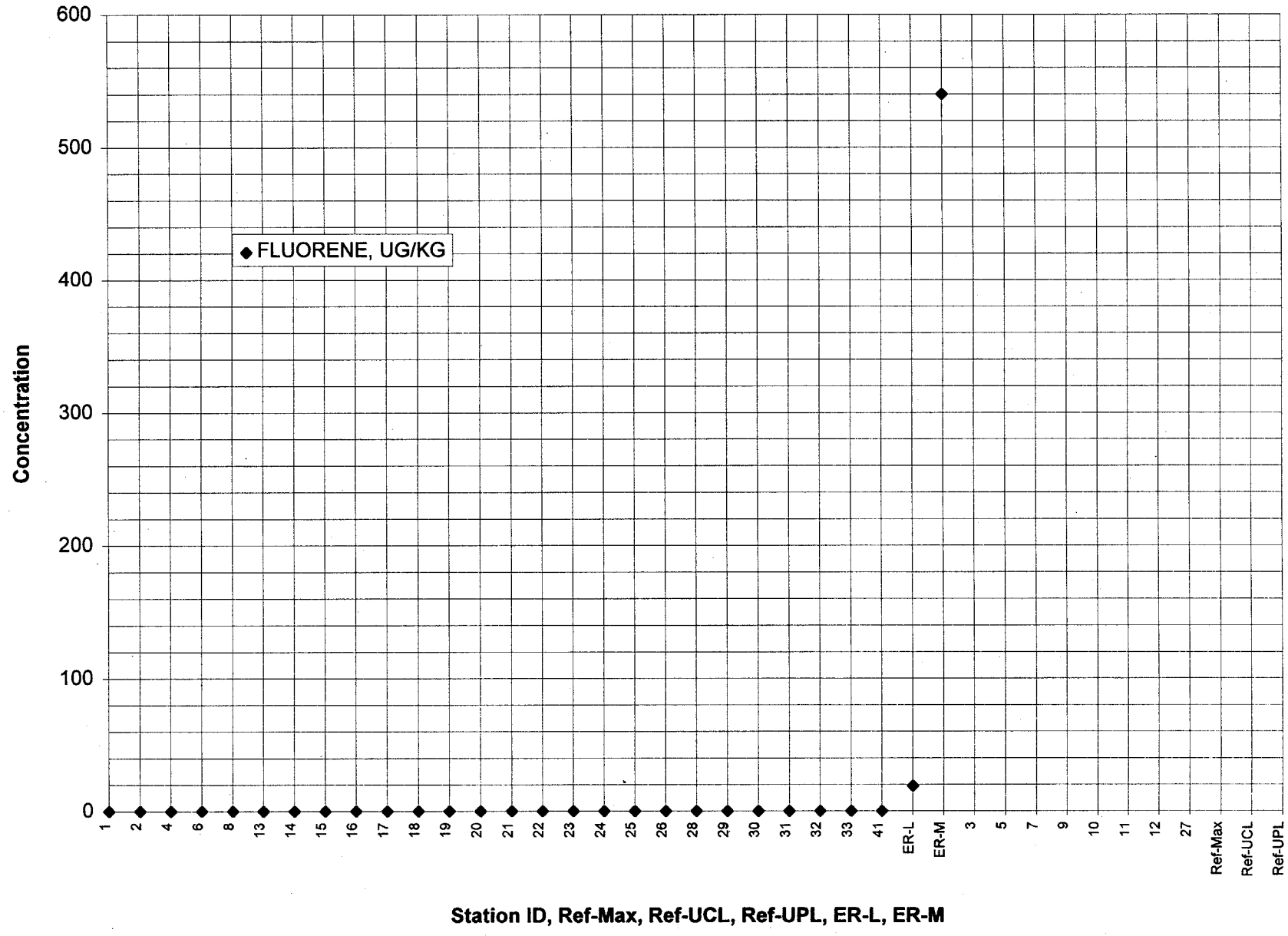

TOTAL BENZOFLUORANTHENES, UG/KG
Concentration
1200
1000
800
600
400
200
0
16
24
25
31
32
33
Ref-Max
Ref-UCL
29
30
28
Ref-UPL
19
27
9
15
2
20
8
26
14
1
5
6
12
13
7
23
3
4
18
22
11
41
21
10
17
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

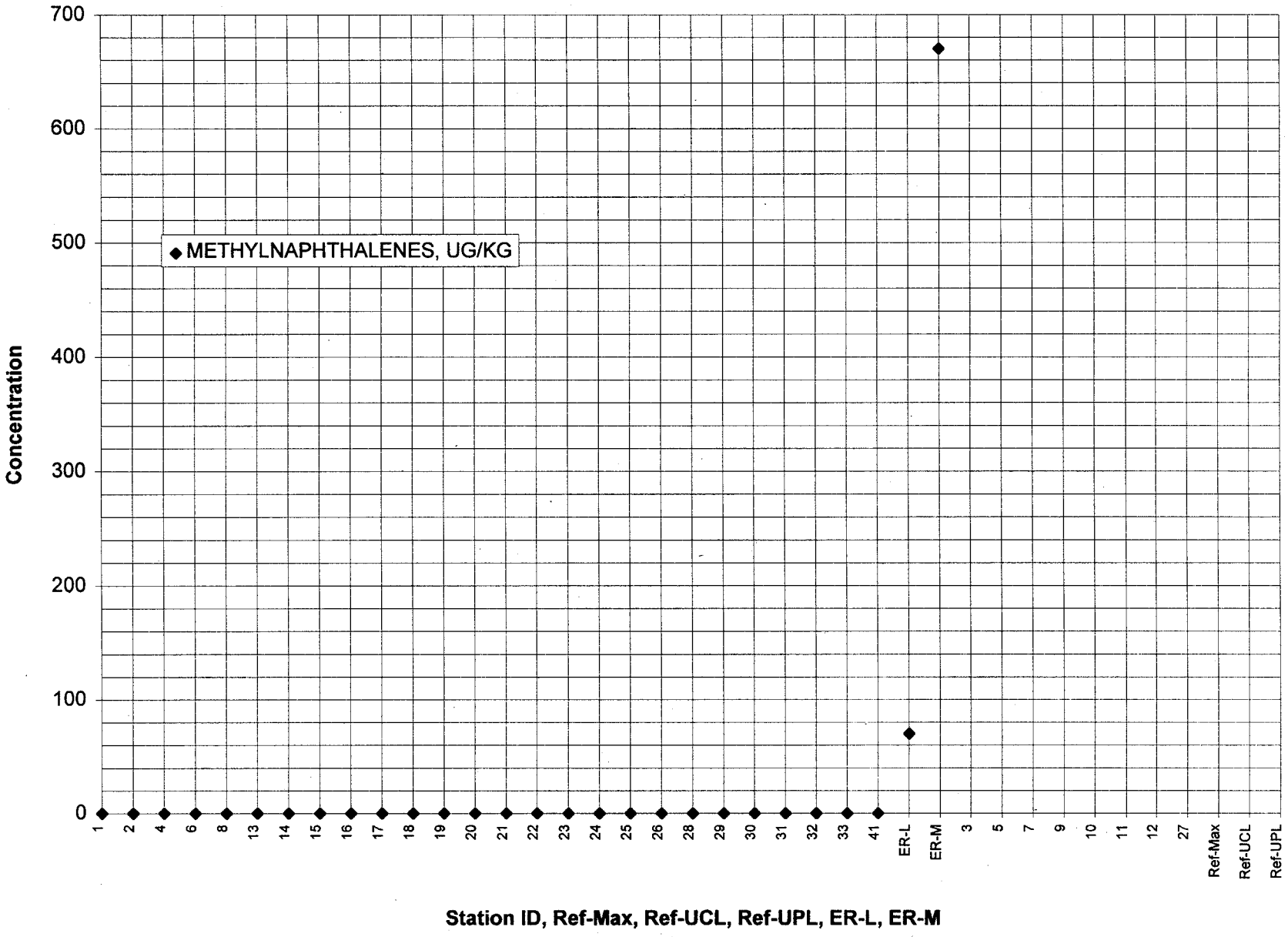

TOTAL HPAH, UG/KG
Concentration
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
16
24
25
31
32
33
29
Ref-Max
Ref-UCL
28
30
15
19
Ref-UPL
27
9
20
2
8
14
13
26
1
6
5
12
4
3
7
23
ER-L
11
22
18
41
17
10
21
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

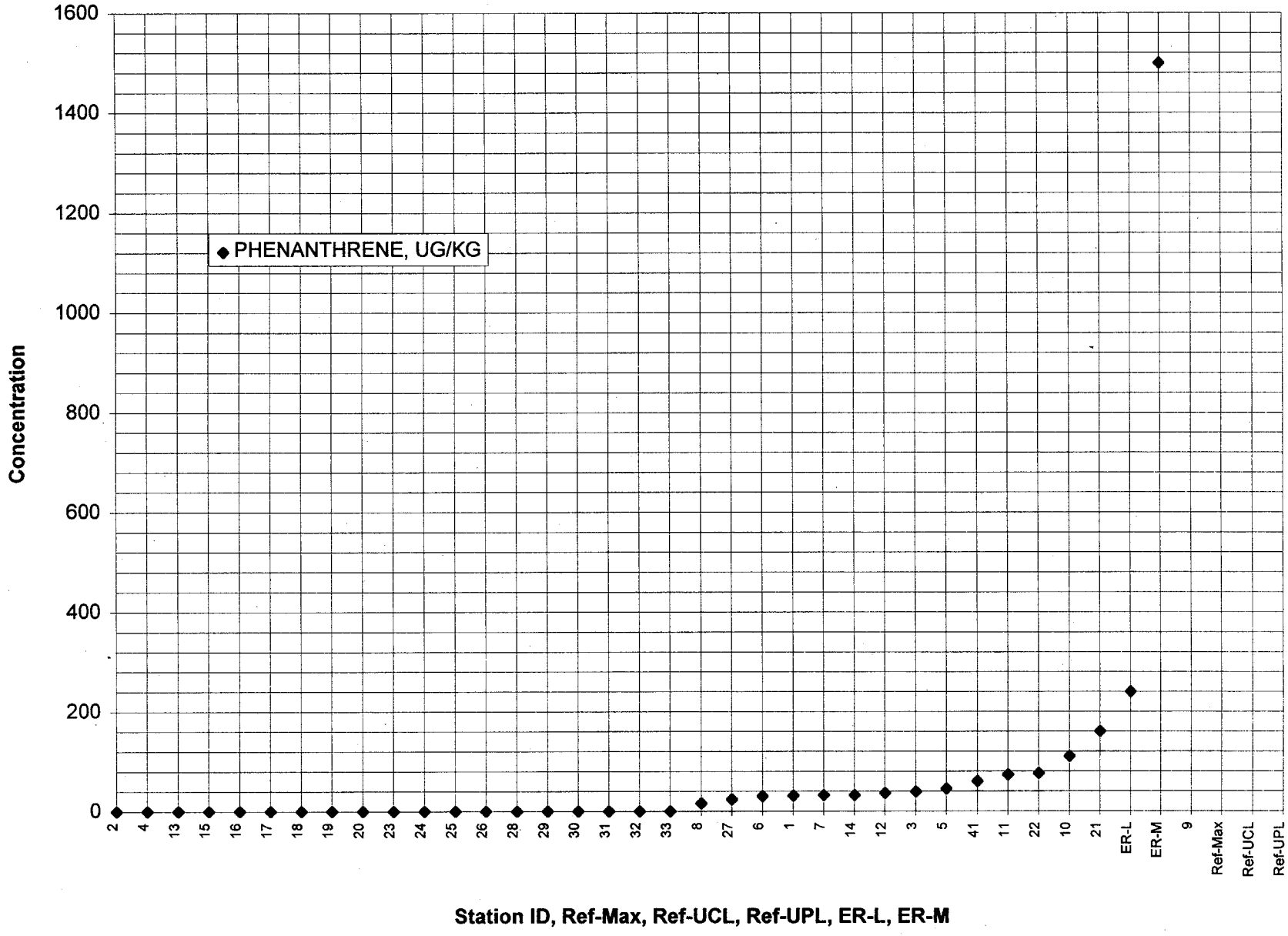

ACENAPHTHENE, UG/KG
Concentration
500
450
400
350
300
250
200
150
100
50
0
1
2
4
6
8
13
14
15
16
17
18
19
20
21
22
23
24
25
26
28
29
30
31
32
33
41
ER-L
ER-M
3
5
7
9
10
11
12
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

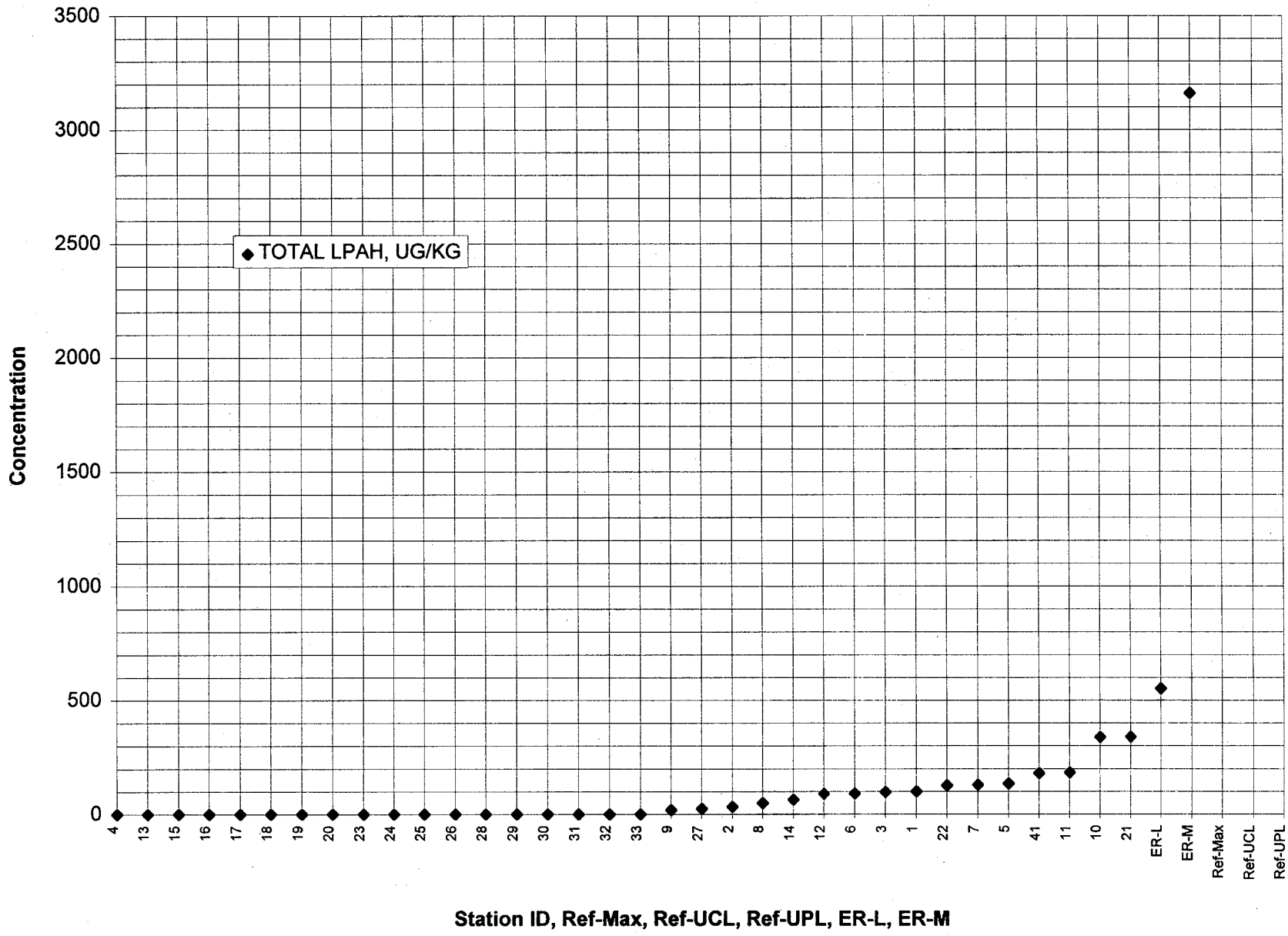

700
600
500
400
300
200
100
0
Concentration
ACENAPHTHYLENE, UG/KG
2
4
8
13
14
15
16
17
18
19
20
21
22
23
24
25
26
28
29
30
31
32
33
6
12
3
1
5
7
11
41
ER-L
10
ER-M
9
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

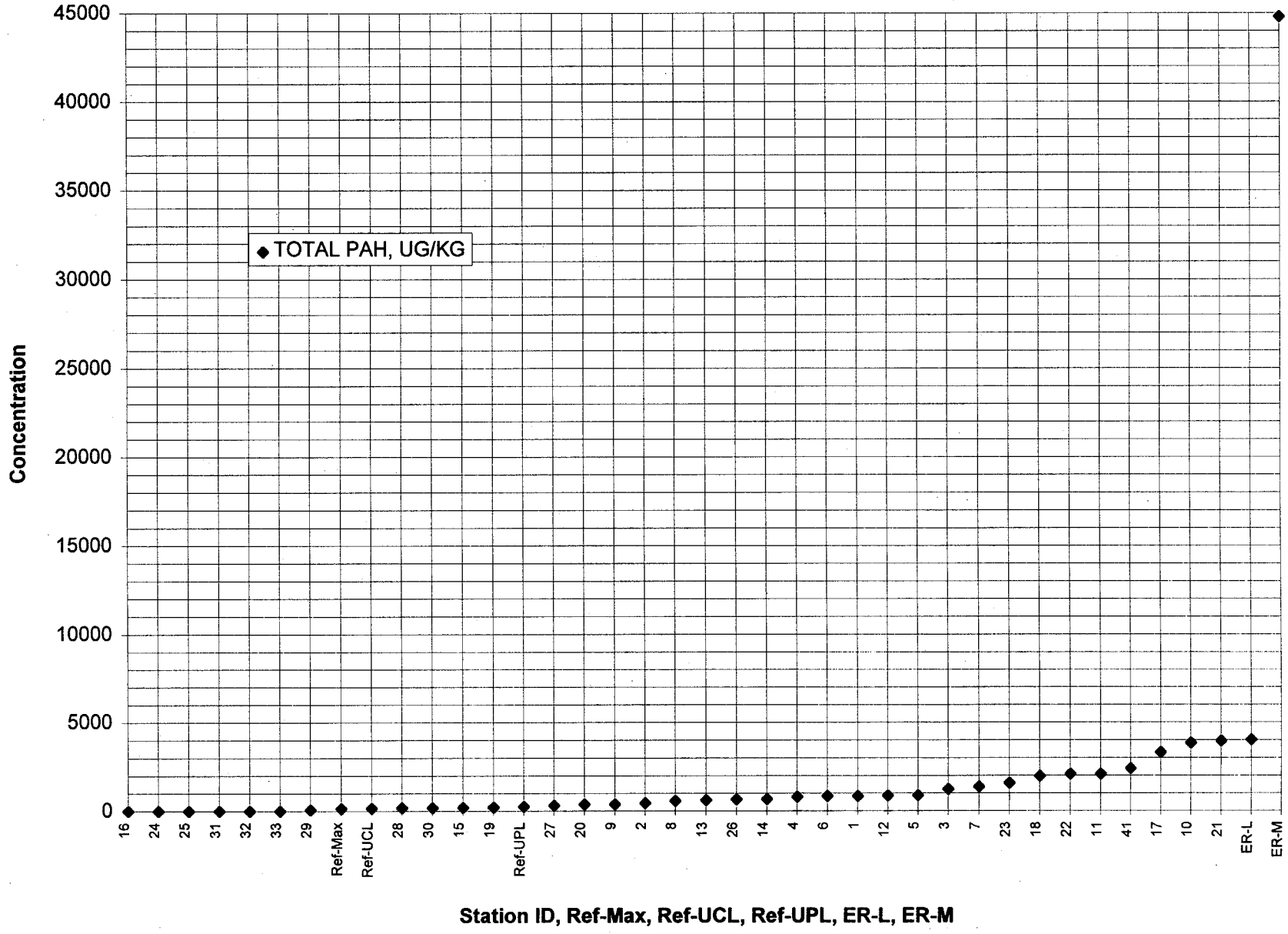

1200
1000
800
600
400
200
0
Concentration
ANTHRACENE, UG/KG
4
13
15
16
17
18
19
20
23
24
25
26
28
29
30
31
32
33
9
2
14
8
12
3
1
6
22
5
7
11
41
ER-L
10
21
ER-M
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

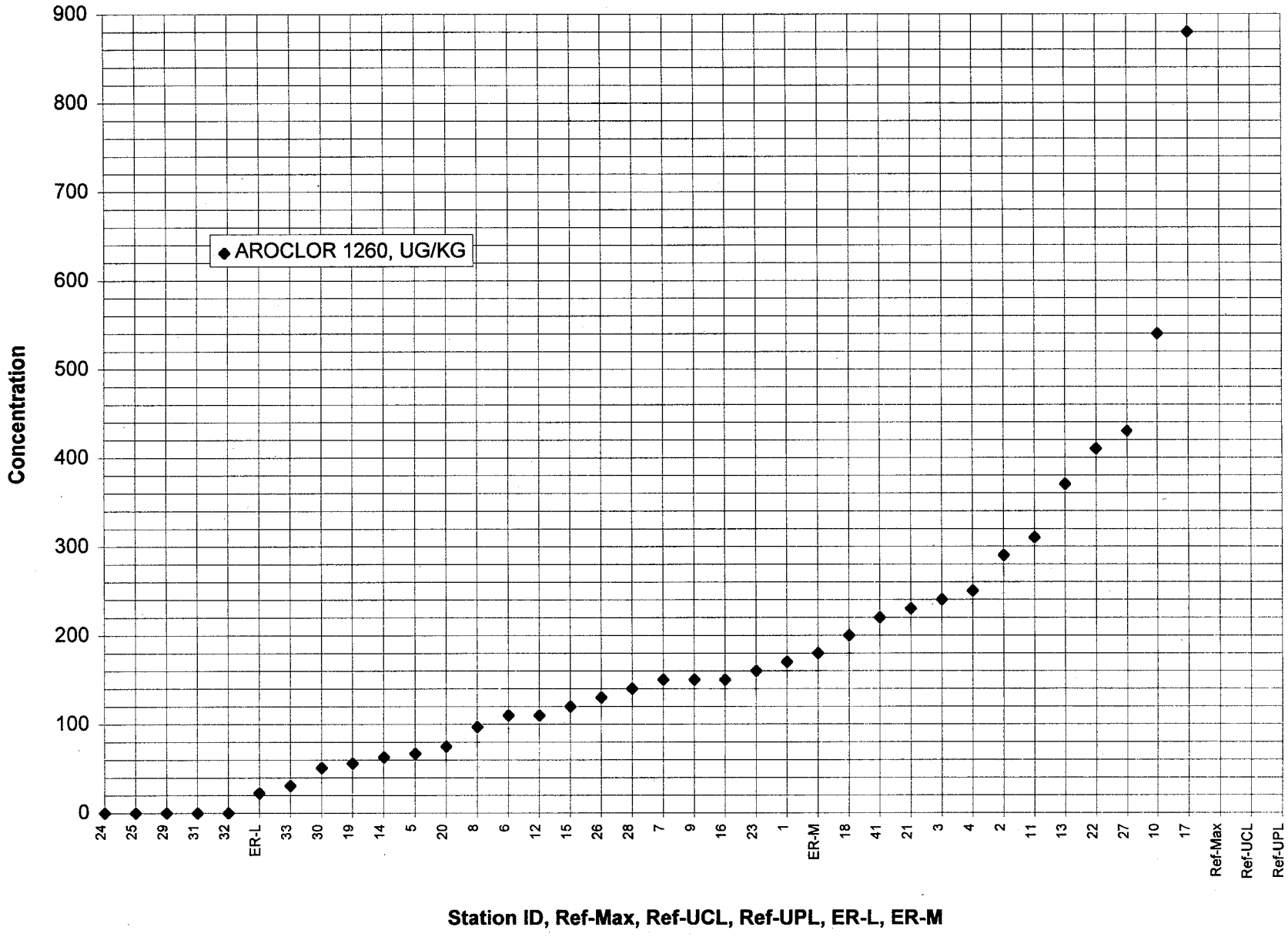

600
500
400
300
200
100
0
Concentration
FLUORENE, UG/KG
1
2
4
6
8
13
14
15
16
17
18
19
20
21
22
23
24
25
26
28
29
30
31
32
33
41
ER-L
ER-M
3
5
7
9
10
11
12
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

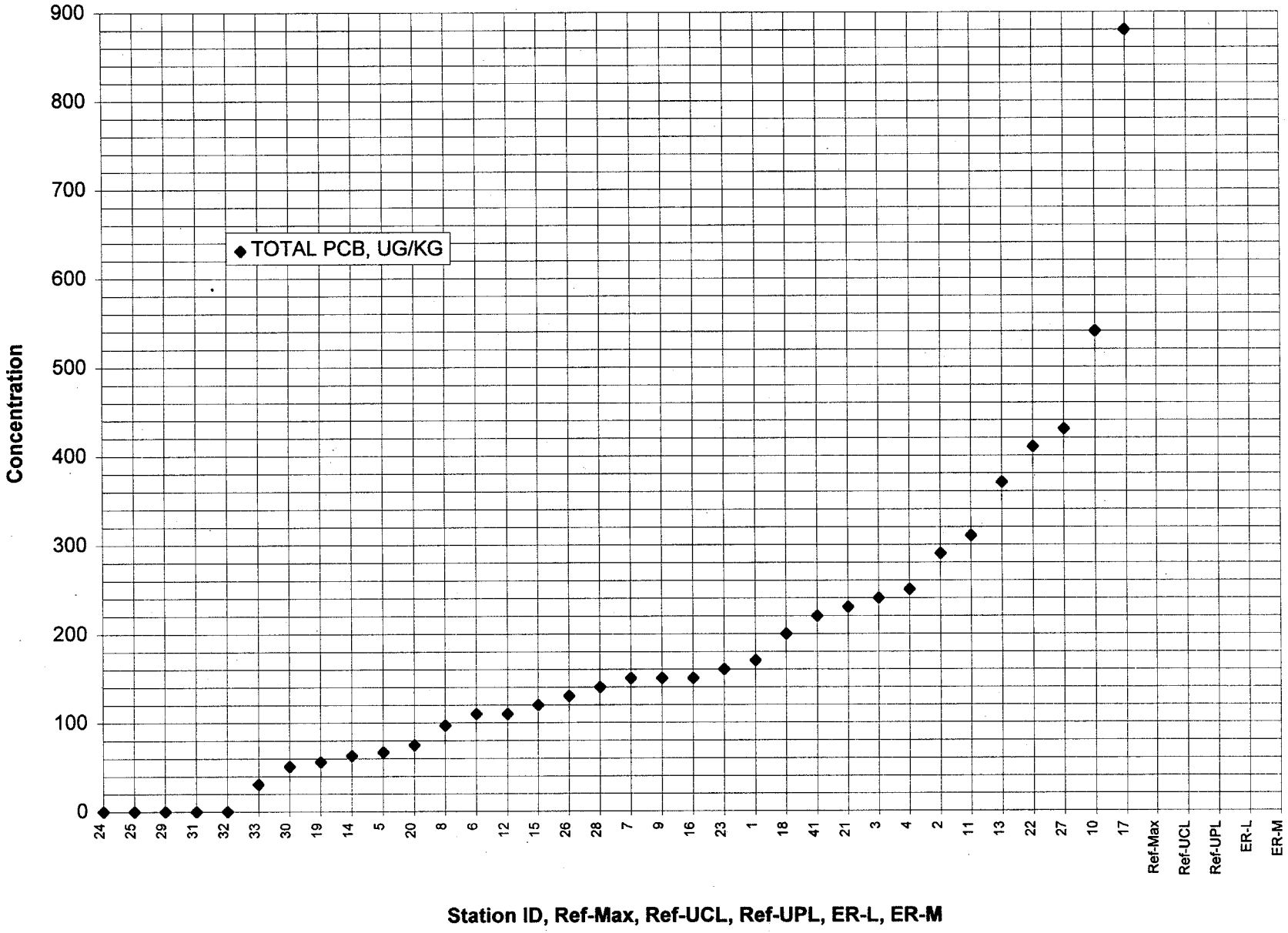

METHYLNAPHTHALENES, UG/KG
Concentration
700
600
500
400
300
200
100
0
1
2
4
6
8
13
14
15
16
17
18
19
20
21
22
23
24
25
26
28
29
30
31
32
33
41
ER-L
ER-M
3
5
7
9
10
11
12
27
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

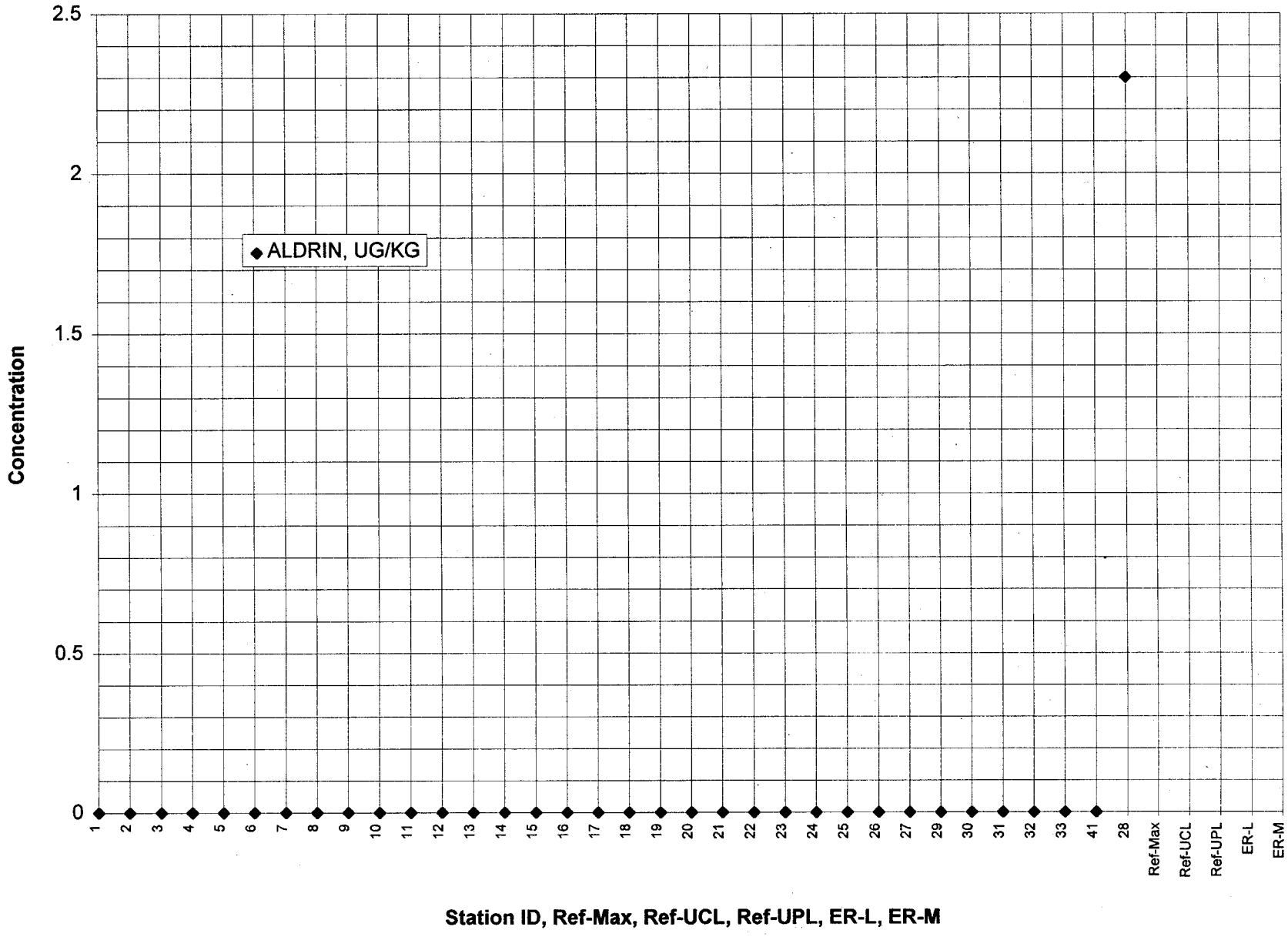

PHENANTHRENE, UG/KG
Concentration
1600
1400
1200
1000
800
600
400
200
0
2
4
13
15
16
17
18
19
20
23
24
25
26
28
29
30
31
32
33
8
27
6
1
7
14
12
3
5
41
11
22
10
21
ER-L
ER-M
9
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

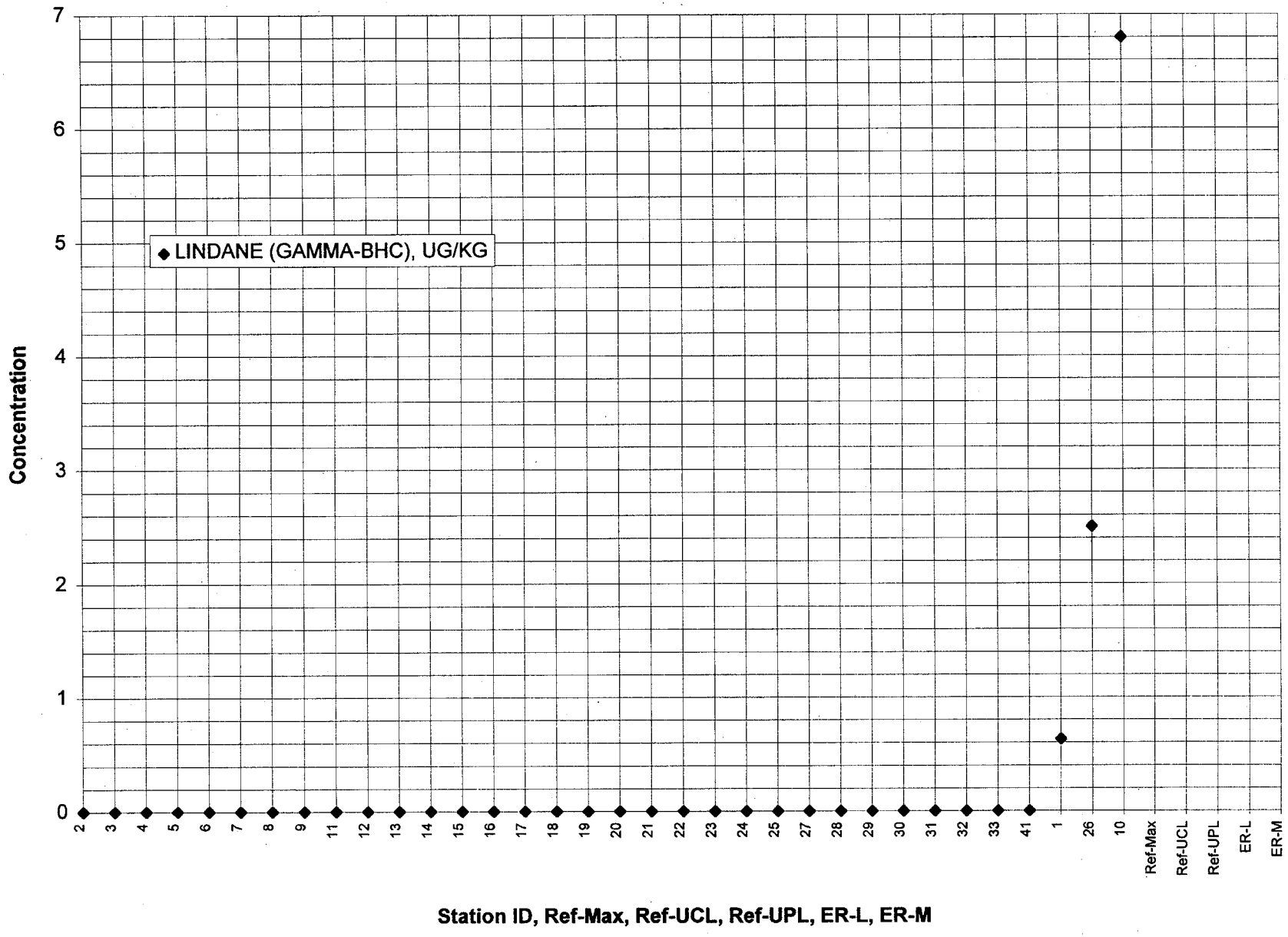

3500
3000
2500
2000
1500
1000
500
0
Concentration
TOTAL LPAH, UG/KG
4
13
15
16
17
18
19
20
23
24
25
26
28
29
30
31
32
33
9
27
2
8
14
12
6
3
1
22
7
5
41
11
10
21
ER-L
ER-M
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

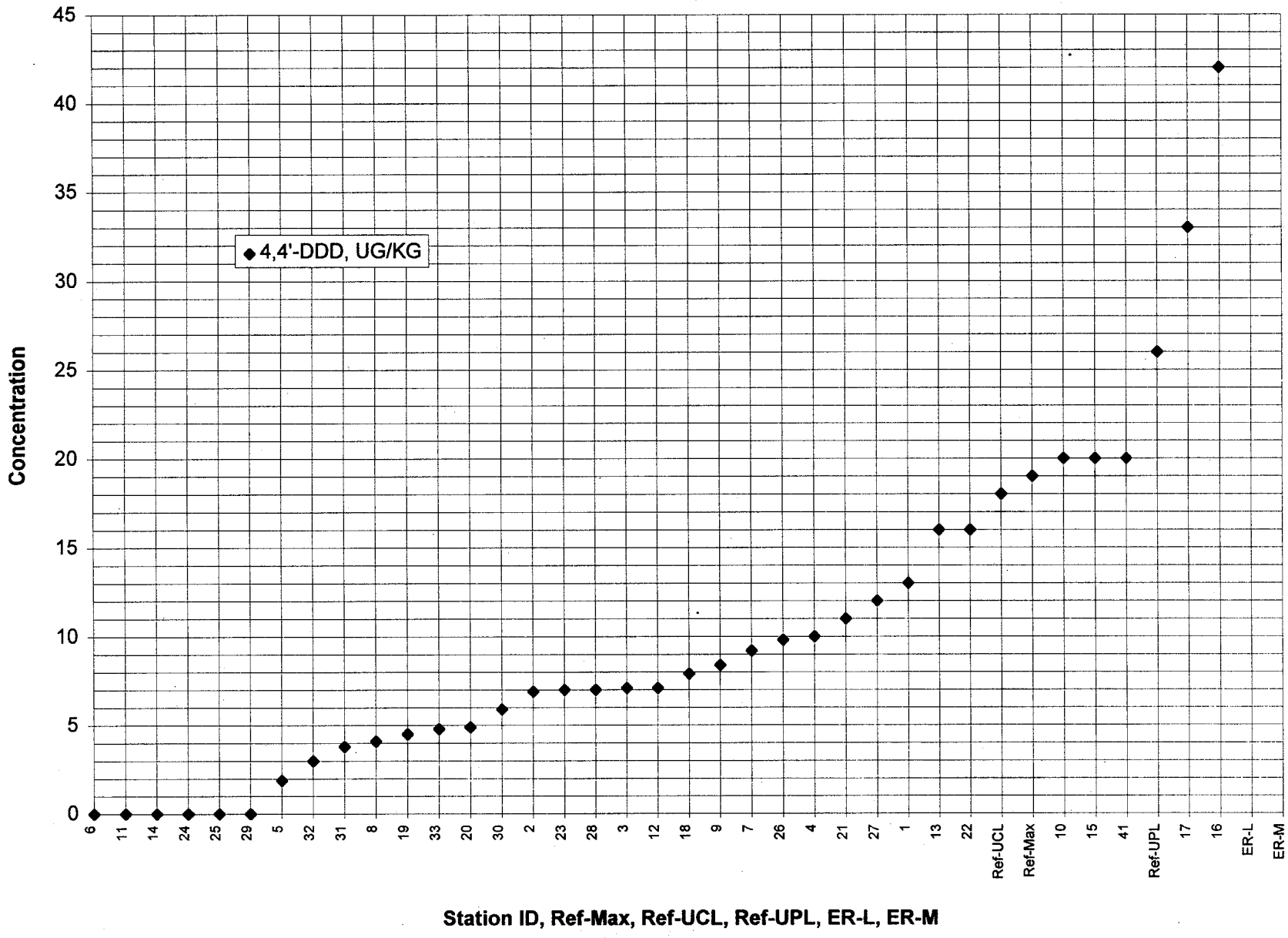

45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Concentration
TOTAL PAH, UG/KG
16
24
25
31
32
33
29
Ref-Max
Ref-UCL
28
30
15
19
Ref-UPL
27
20
9
2
8
13
26
14
4
6
1
12
5
3
7
23
18
22
11
41
17
10
21
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

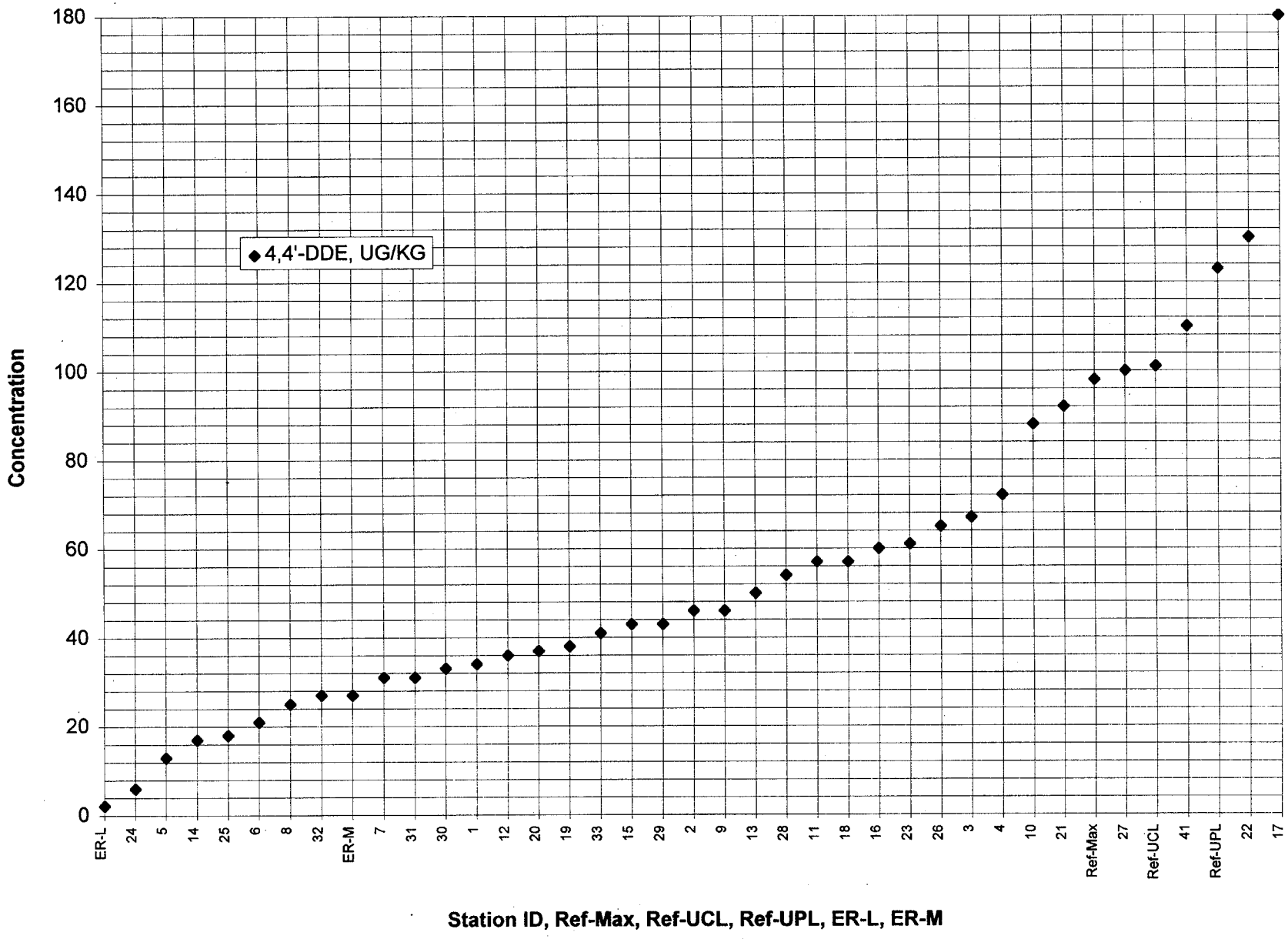

AROCLOR 1260, UG/KG
Concentration
900
800
700
600
500
400
300
200
100
0
24
25
29
31
32
ER-L
33
30
19
14
5
20
8
6
12
15
26
28
7
9
16
23
1
ER-M
18
41
21
3
4
2
11
13
22
27
10
17
Ref-Max
Ref-UCL
Ref-UPL
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

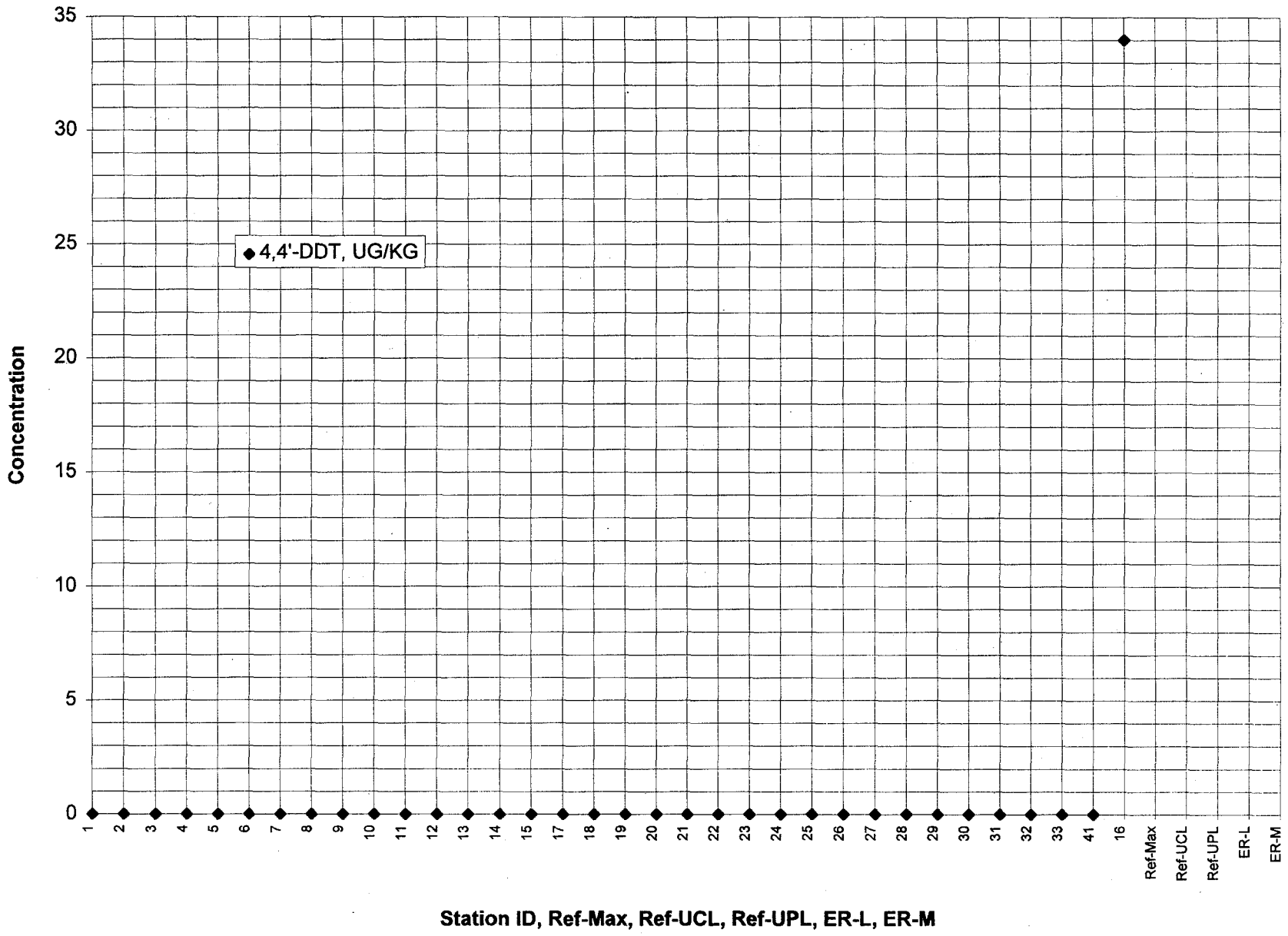

900
800
700
600
500
400
300
200
100
0
Concentration
TOTAL PCB, UG/KG
24
25
29
31
32
33
30
19
14
5
20
8
6
12
15
26
28
7
9
16
23
1
18
41
21
3
4
2
11
13
22
27
10
17
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

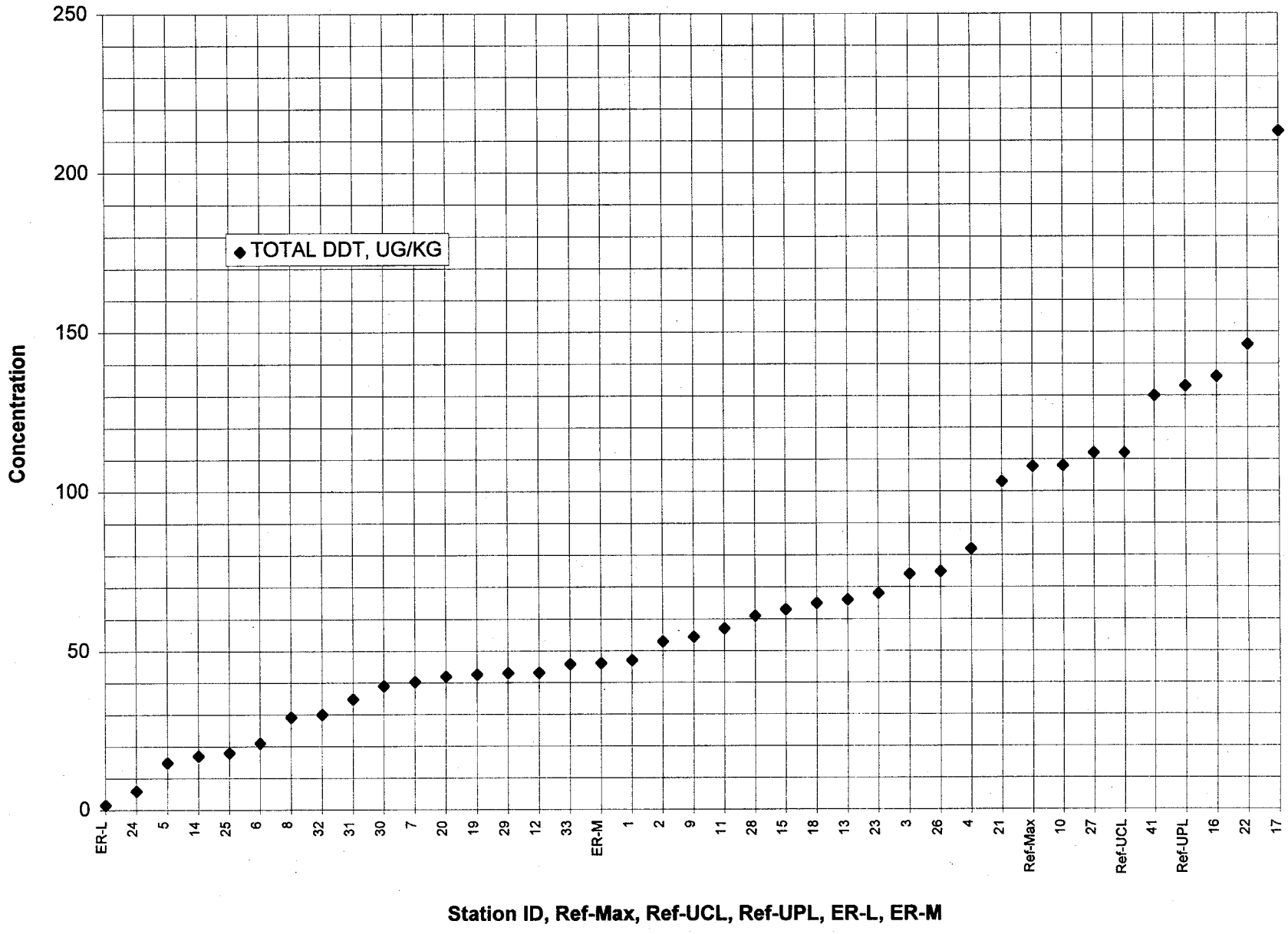

2.5
2
1.5
1
0.5
0
Concentration
ALDRIN, UG/KG
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
29
30
31
32
33
41
28
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

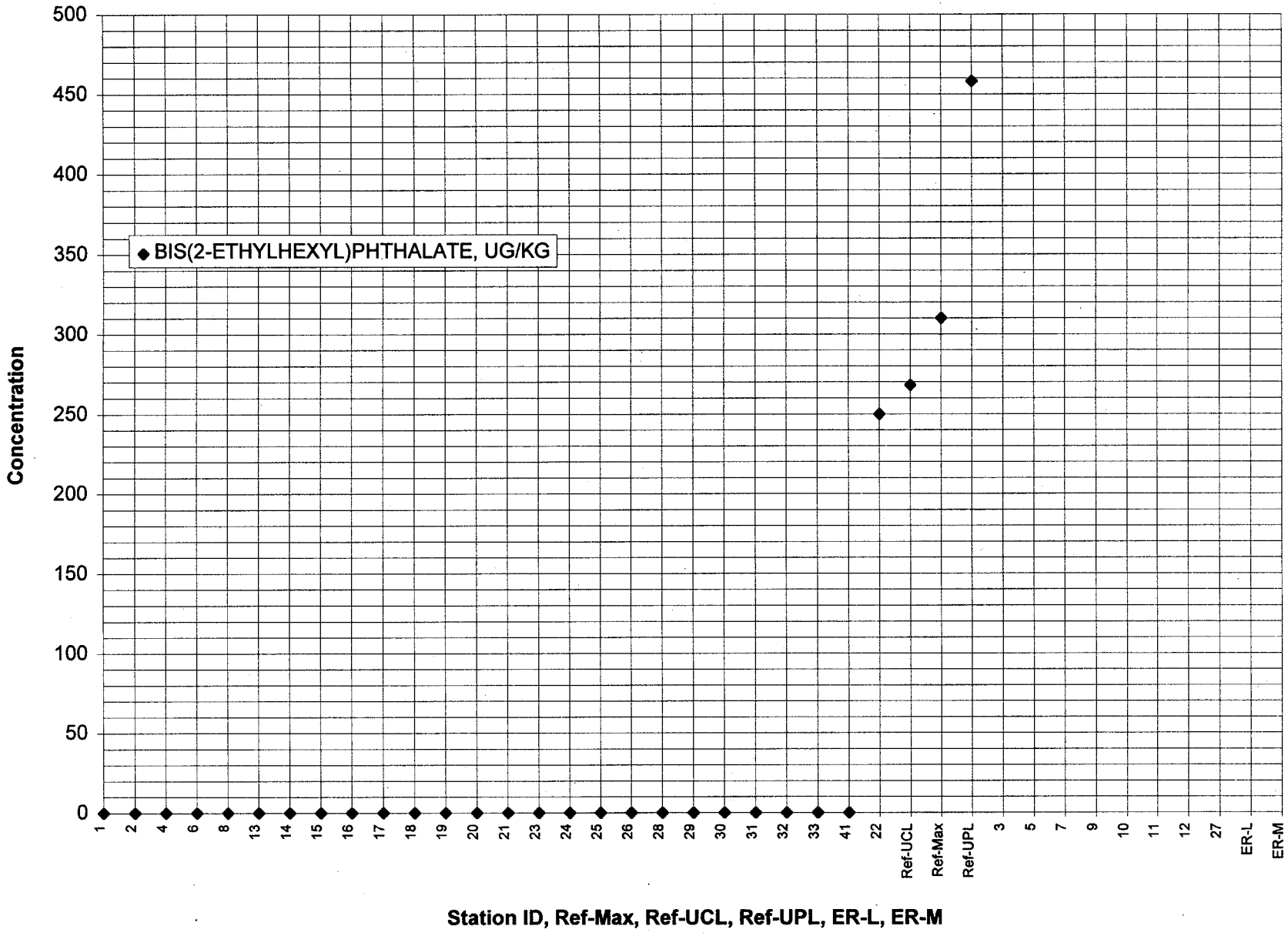

LINDANE (GAMMA-BHC), UG/KG
Concentration
0
1
2
3
4
5
6
7
2
3
4
5
6
7
8
9
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
27
28
29
30
31
32
33
41
1
26
10
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

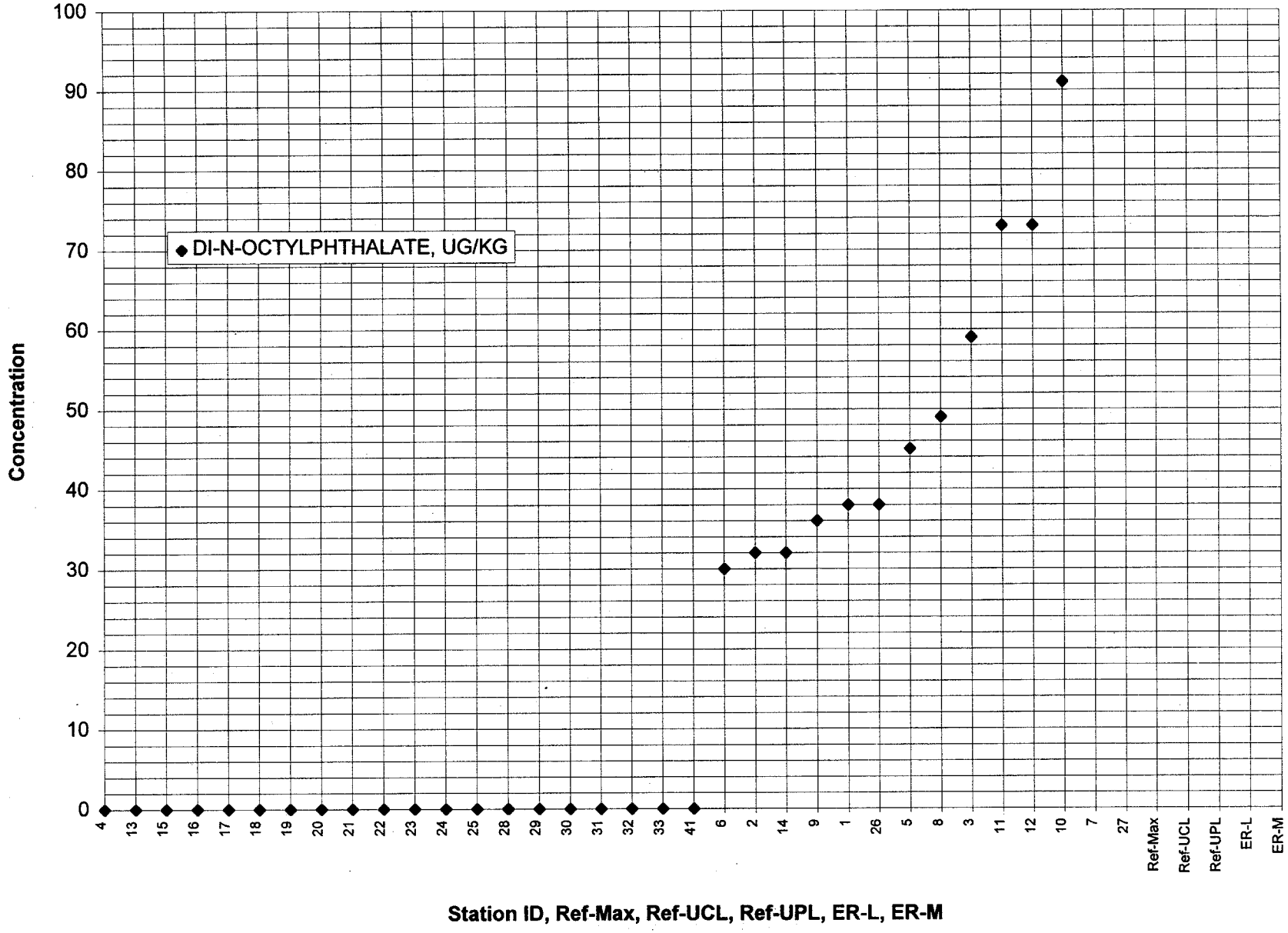

4,4'-DDD, UG/KG
Concentration
0
5
10
15
20
25
30
35
40
45
6
11
14
24
25
29
5
32
31
8
19
33
20
30
2
23
28
3
12
18
9
7
26
4
21
27
1
13
22
Ref-UCL
Ref-Max
10
15
41
Ref-UPL
17
16
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

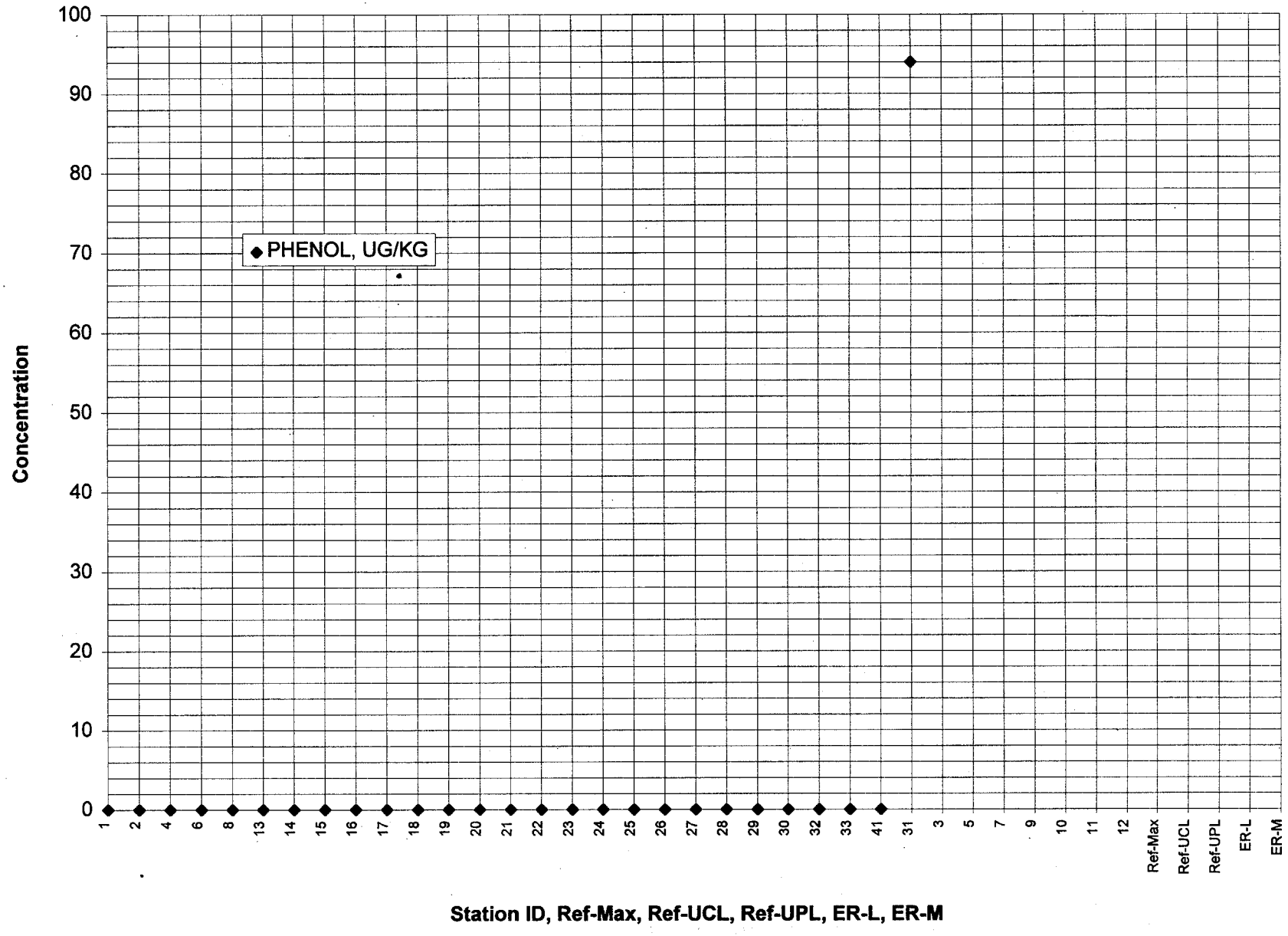

4,4'-DDE, UG/KG
Concentration
0
20
40
60
80
100
120
140
160
180
ER-L
24
5
14
25
6
8
32
ER-M
7
31
30
1
12
20
19
33
15
29
2
9
13
28
11
18
16
23
26
3
4
10
21
Ref-Max
27
Ref-UCL
41
Ref-UPL
22
17
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

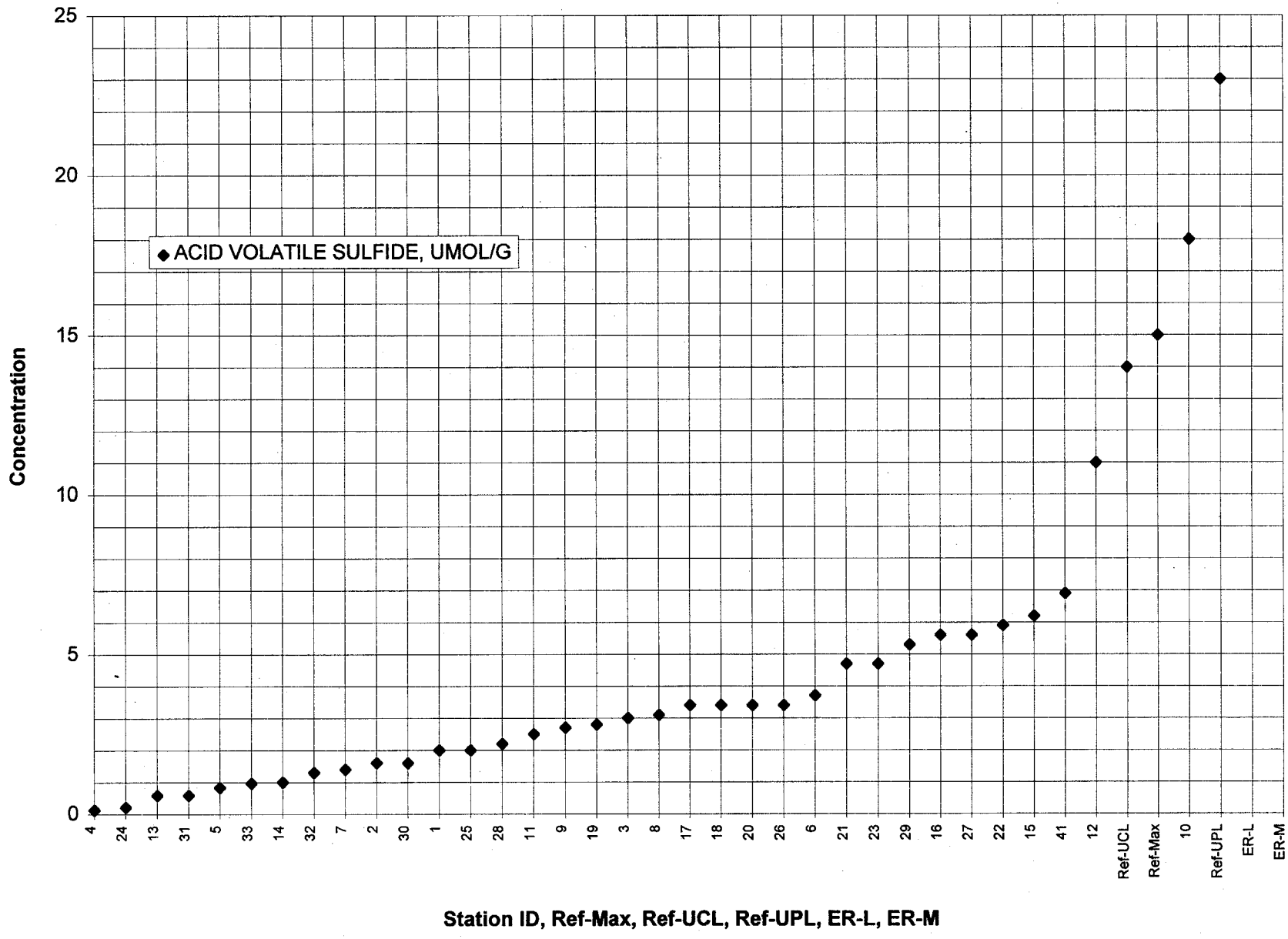

35
30
25
20
15
10
5
0
Concentration
4,4'-DDT, UG/KG
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
41
16
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

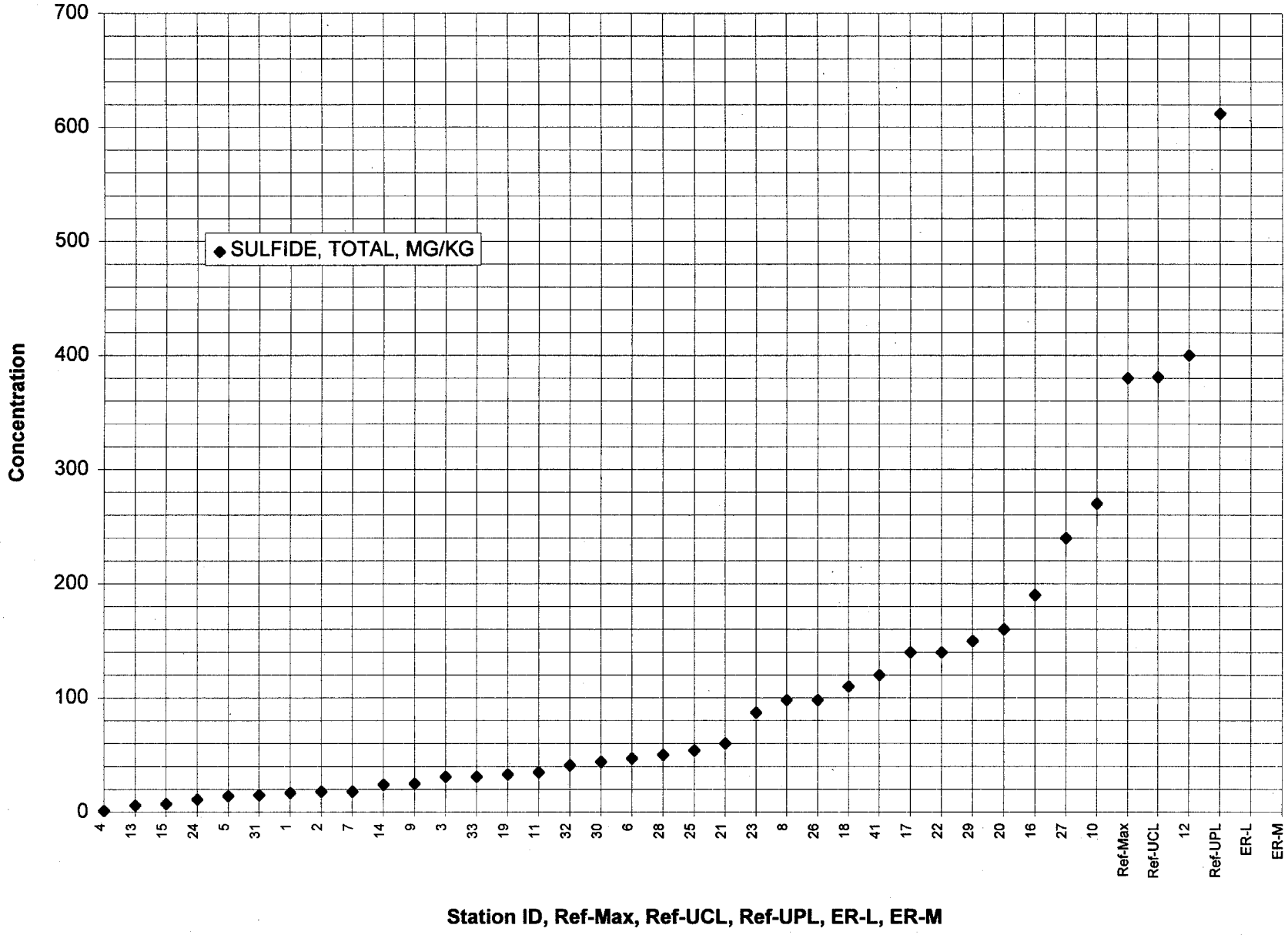

TOTAL DDT, UG/KG
Concentration
250
200
150
100
50
0
ER-L
24
5
14
25
6
8
32
31
30
7
20
19
29
12
33
ER-M
1
2
9
11
28
15
18
13
23
3
26
4
21
Ref-Max
10
27
Ref-UCL
41
Ref-UPL
16
22
17
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

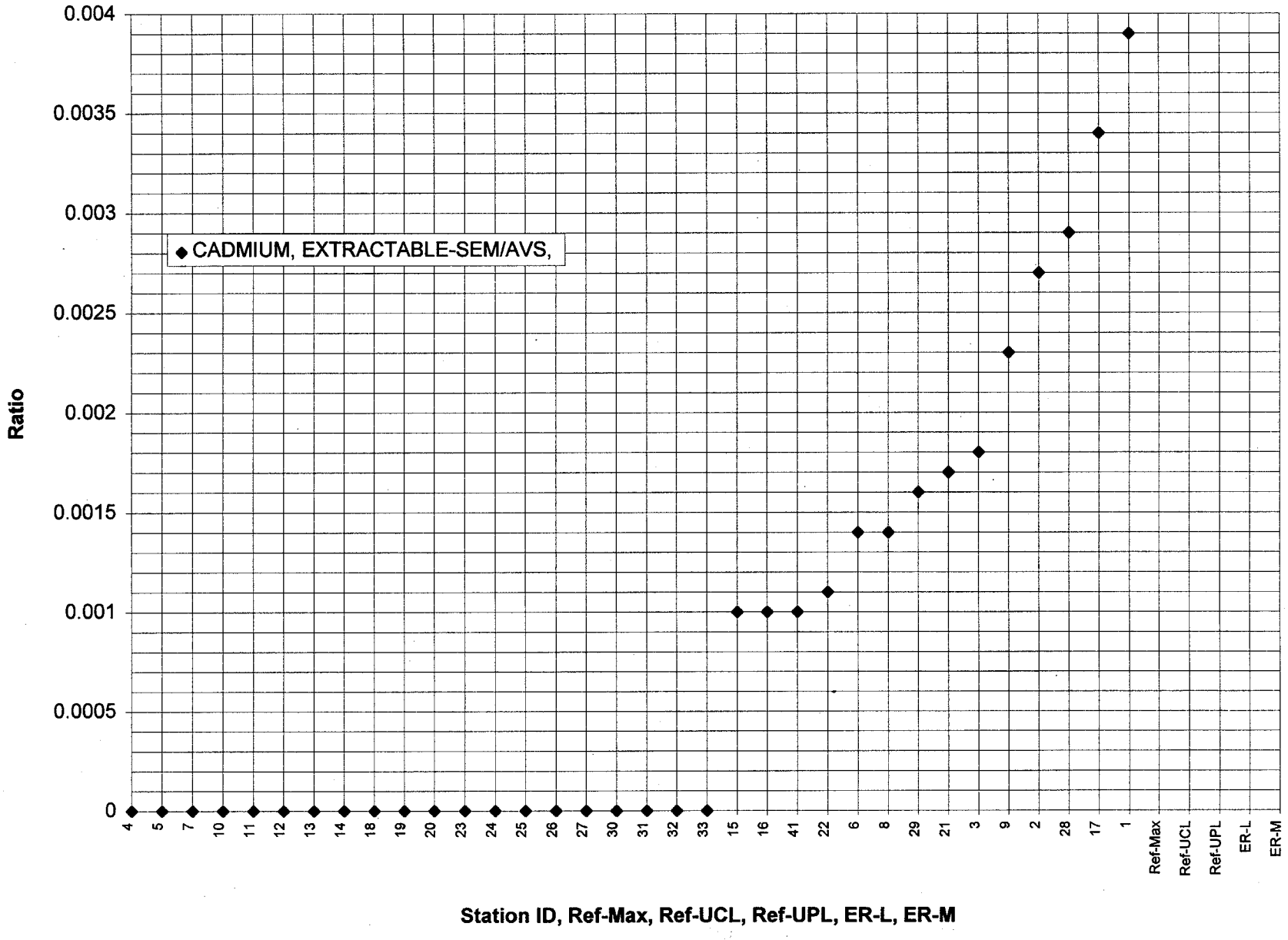

BIS(2-ETHYLHEXYL)PHTHALATE, UG/KG
Concentration
500
450
400
350
300
250
200
150
100
50
0
1
2
4
6
8
13
14
15
16
17
18
19
20
21
23
24
25
26
28
29
30
31
32
33
41
22
Ref-UCL
Ref-Max
Ref-UPL
3
5
7
9
10
11
12
27
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

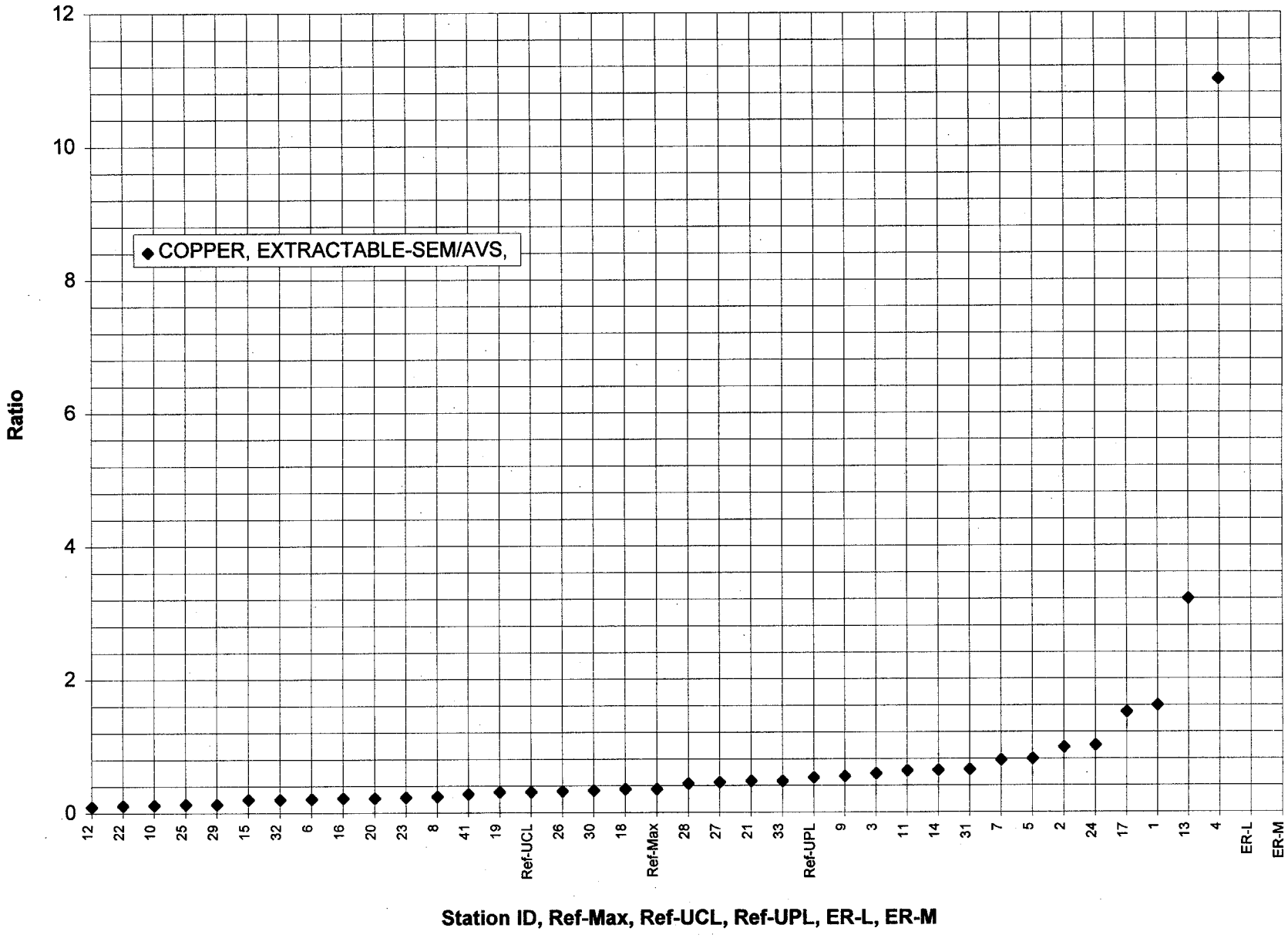

DI-N-OCTYLPHTHALATE, UG/KG
Concentration
100
90
80
70
60
50
40
30
20
10
0
4
13
15
16
17
18
19
20
21
22
23
24
25
28
29
30
31
32
33
41
6
2
14
9
1
26
5
8
3
11
12
10
7
27
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

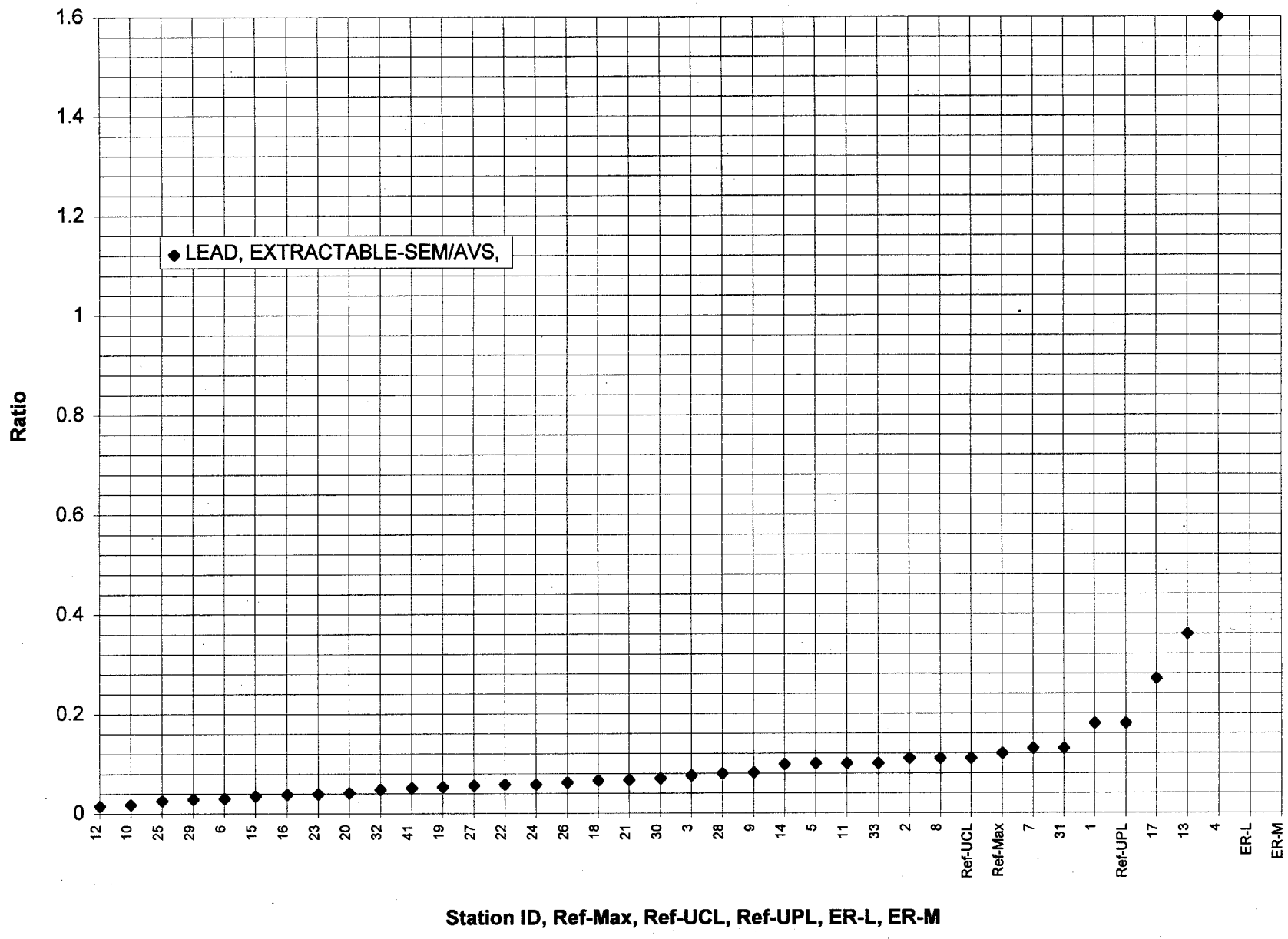

PHENOL, UG/KG
Concentration
100
90
80
70
60
50
40
30
20
10
0
1
2
4
6
8
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
32
33
41
31
3
5
7
9
10
11
12
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

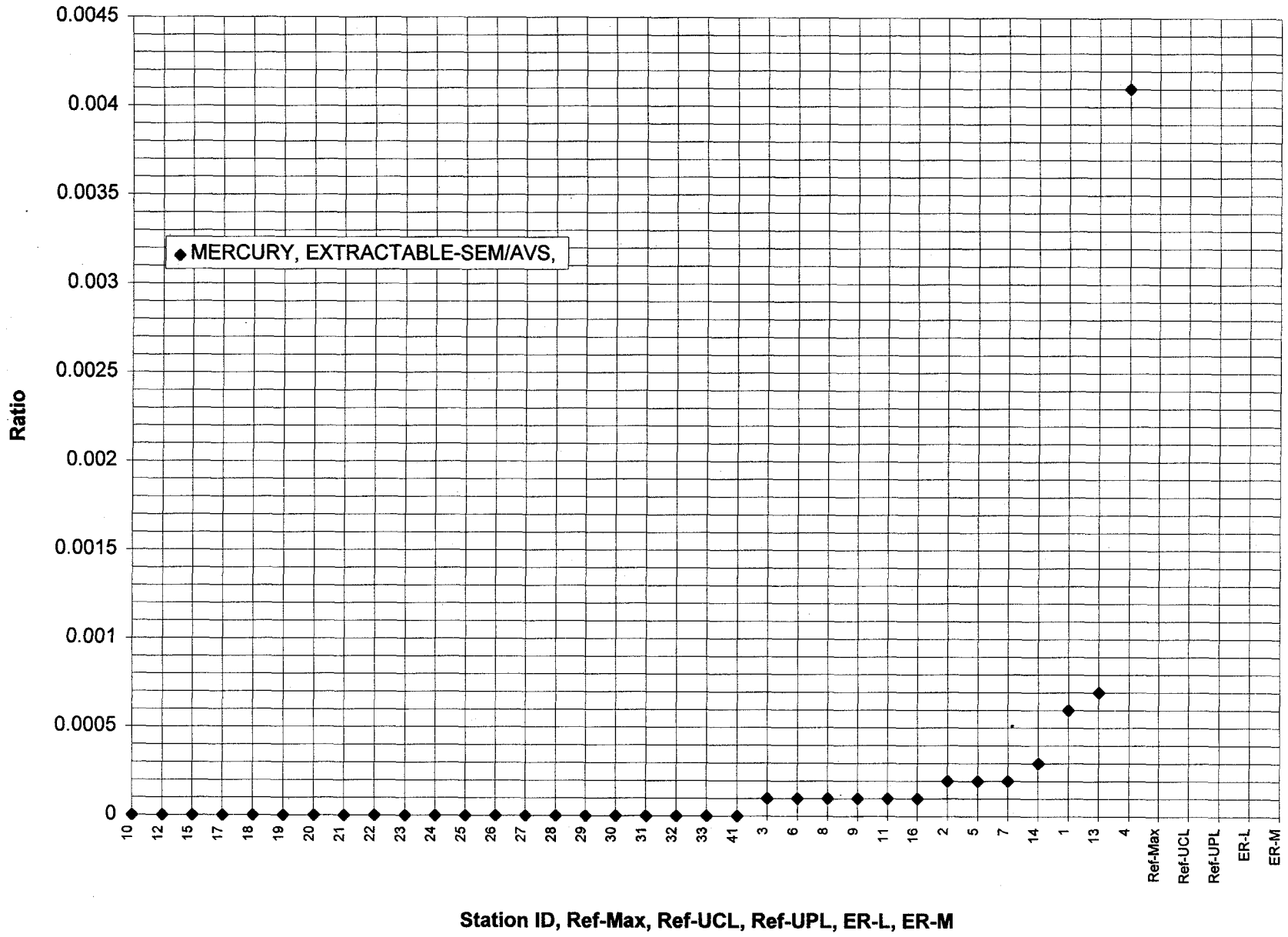

ACID VOLATILE SULFIDE, UMOL/G
Concentration
25
20
15
10
5
0
4
24
13
31
5
33
14
32
7
2
30
1
25
28
11
9
19
3
8
17
18
20
26
6
21
23
29
16
27
22
15
41
12
Ref-UCL
Ref-Max
10
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

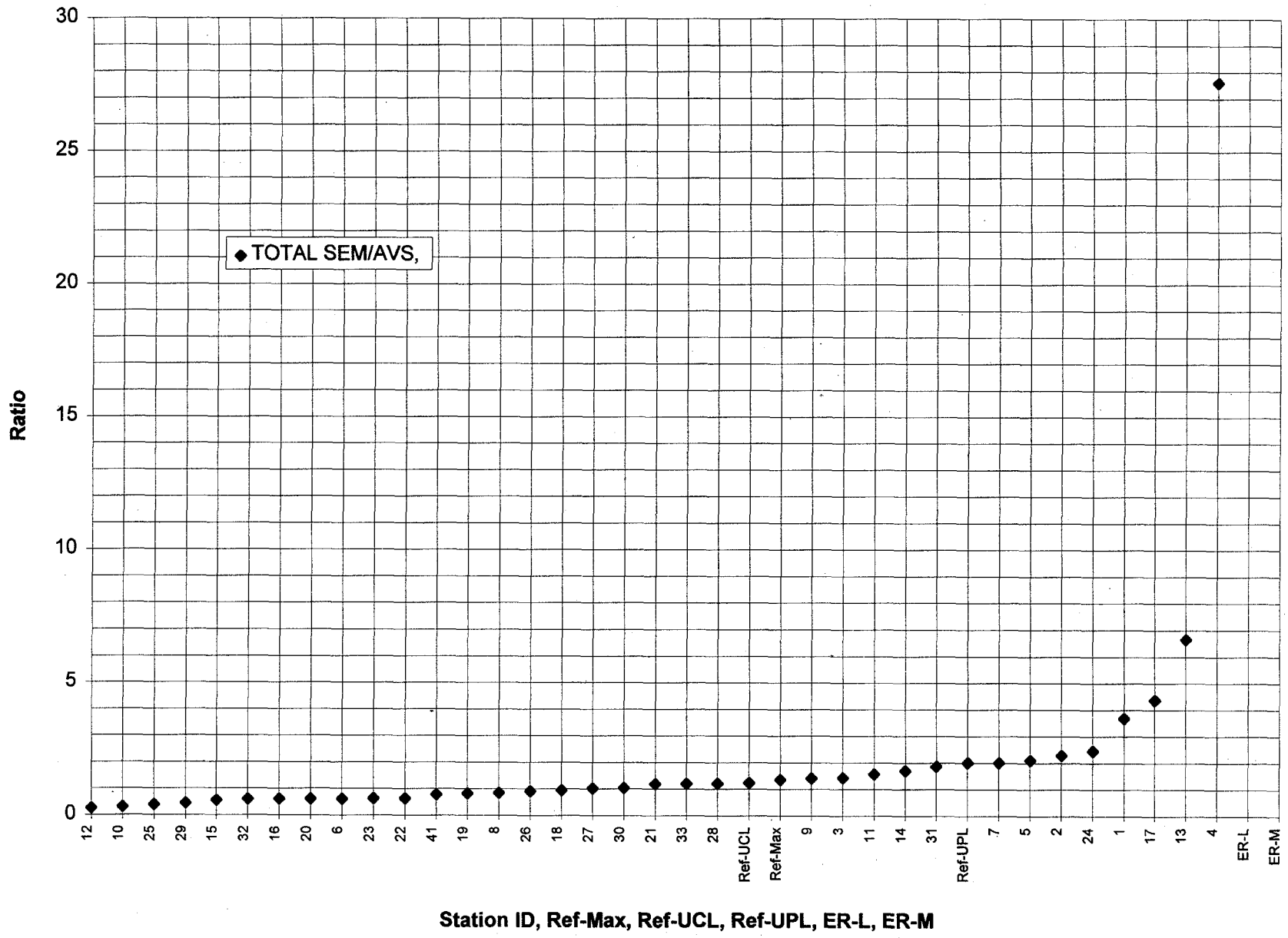

SULFIDE, TOTAL, MG/KG
Concentration
700
600
500
400
300
200
100
0
4
13
15
24
5
31
1
2
7
14
9
3
33
19
11
32
30
6
28
25
21
23
8
26
18
41
17
22
29
20
16
27
10
Ref-Max
Ref-UCL
12
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

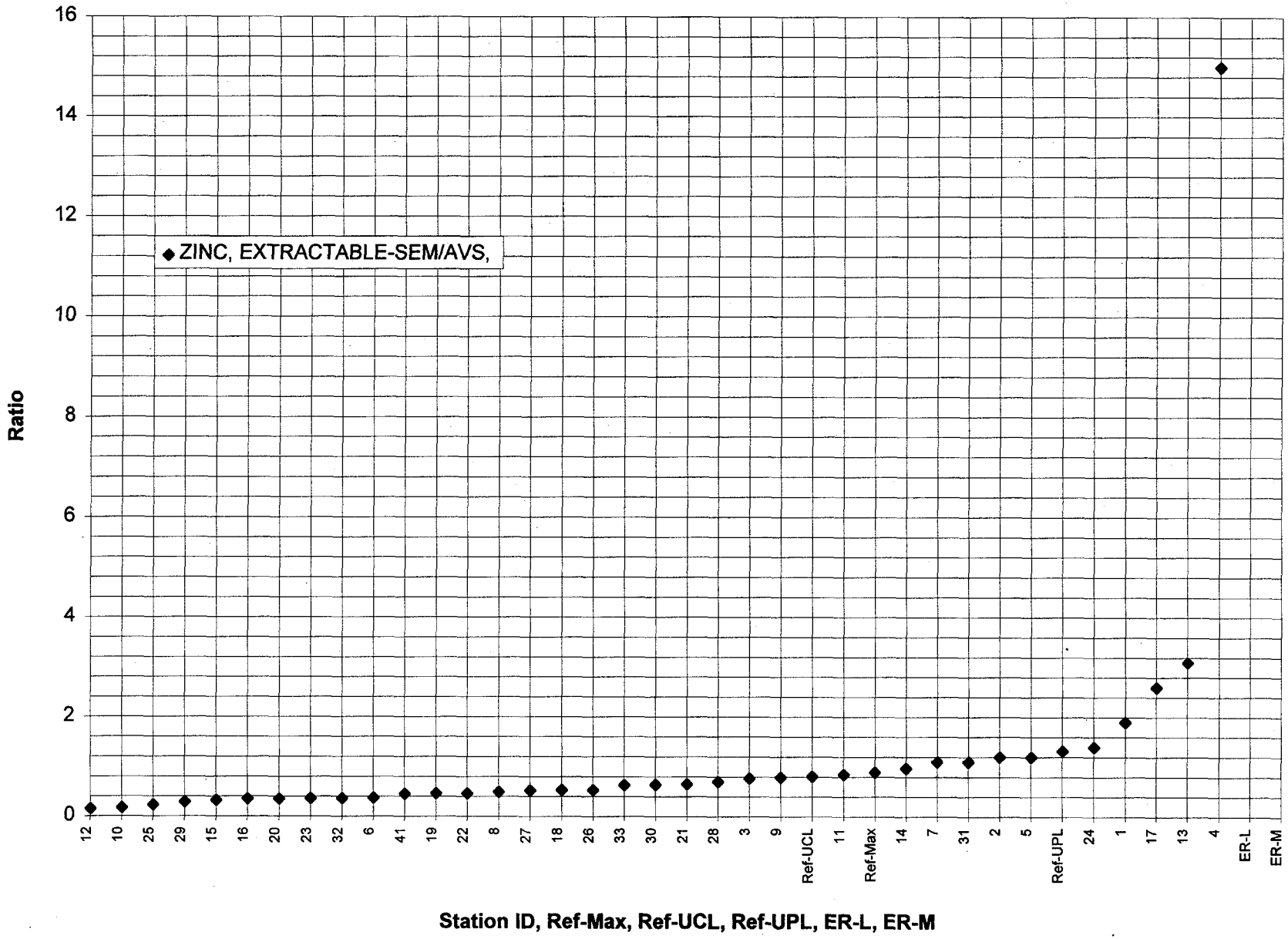

0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Ratio
CADMIUM, EXTRACTABLE-SEM/AVS,
4
5
7
10
11
12
13
14
18
19
20
23
24
25
26
27
30
31
32
33
15
16
41
22
6
8
29
21
3
9
2
28
17
1
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

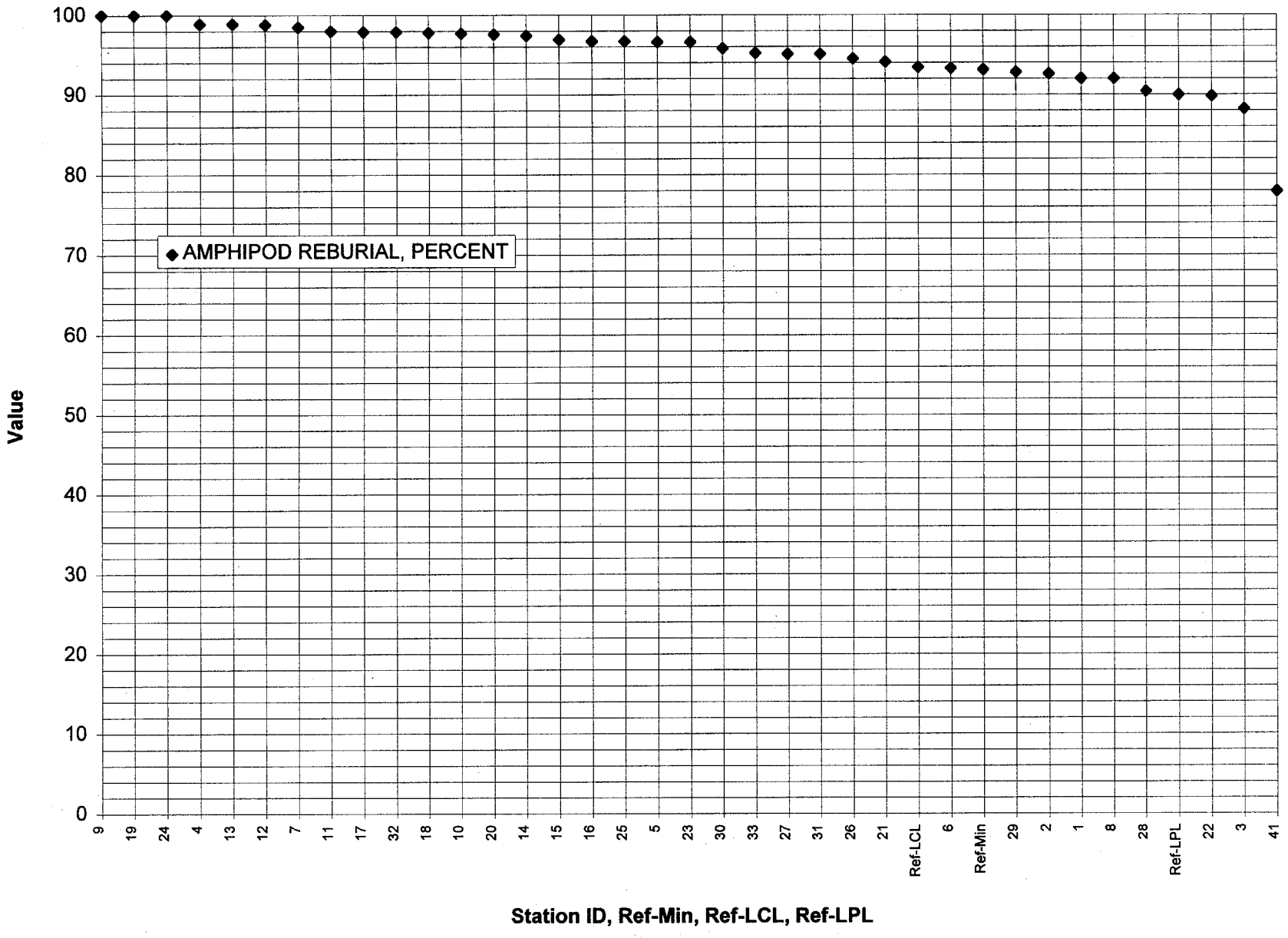

COPPER, EXTRACTABLE-SEM/AVS,
Ratio
0
2
4
6
8
10
12
12
22
10
25
29
15
32
6
16
20
23
8
41
19
Ref-UCL
26
30
18
Ref-Max
28
27
21
33
Ref-UPL
9
3
11
14
31
7
5
2
24
17
1
13
4
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

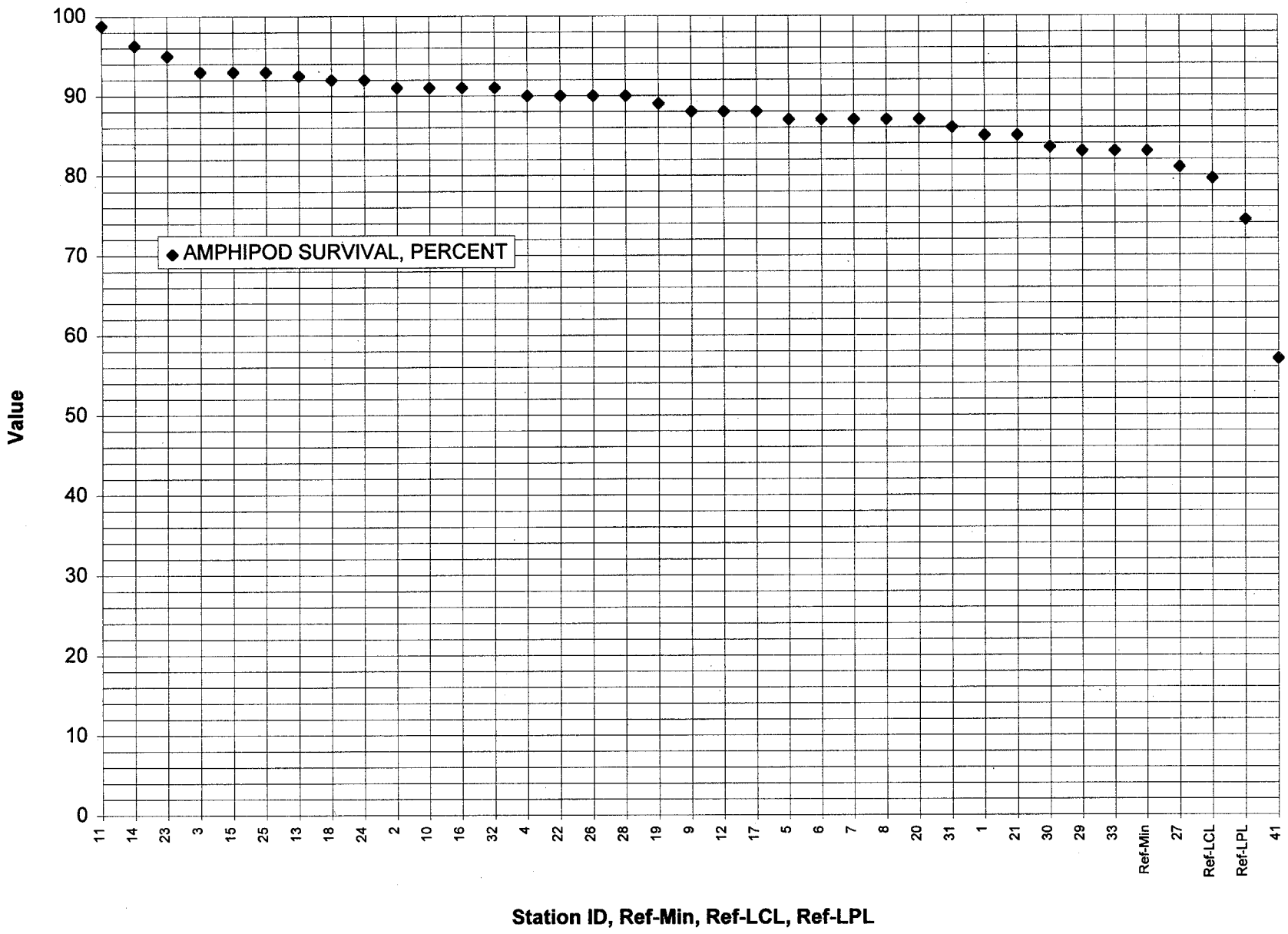

LEAD, EXTRACTABLE-SEM/AVS,
Ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
12
10
25
29
6
15
16
23
20
32
41
19
27
22
24
26
18
21
30
3
28
9
14
5
11
33
2
8
Ref-UCL
Ref-Max
7
31
1
Ref-UPL
17
13
4
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

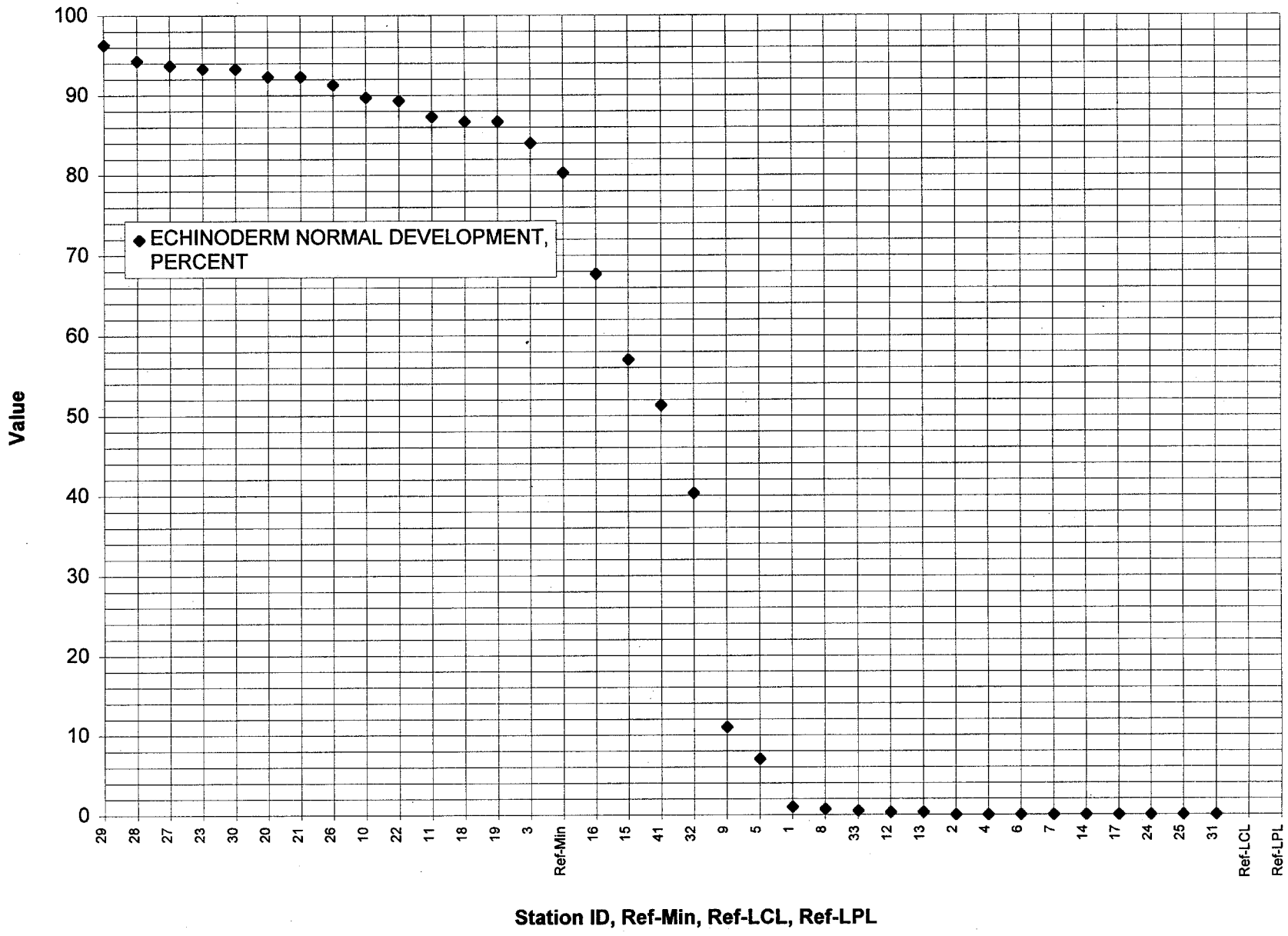

0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Ratio
MERCURY, EXTRACTABLE-SEM/AVS,
10
12
15
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
41
3
6
8
9
11
16
2
5
7
14
1
13
4
Ref-Max
Ref-UCL
Ref-UPL
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

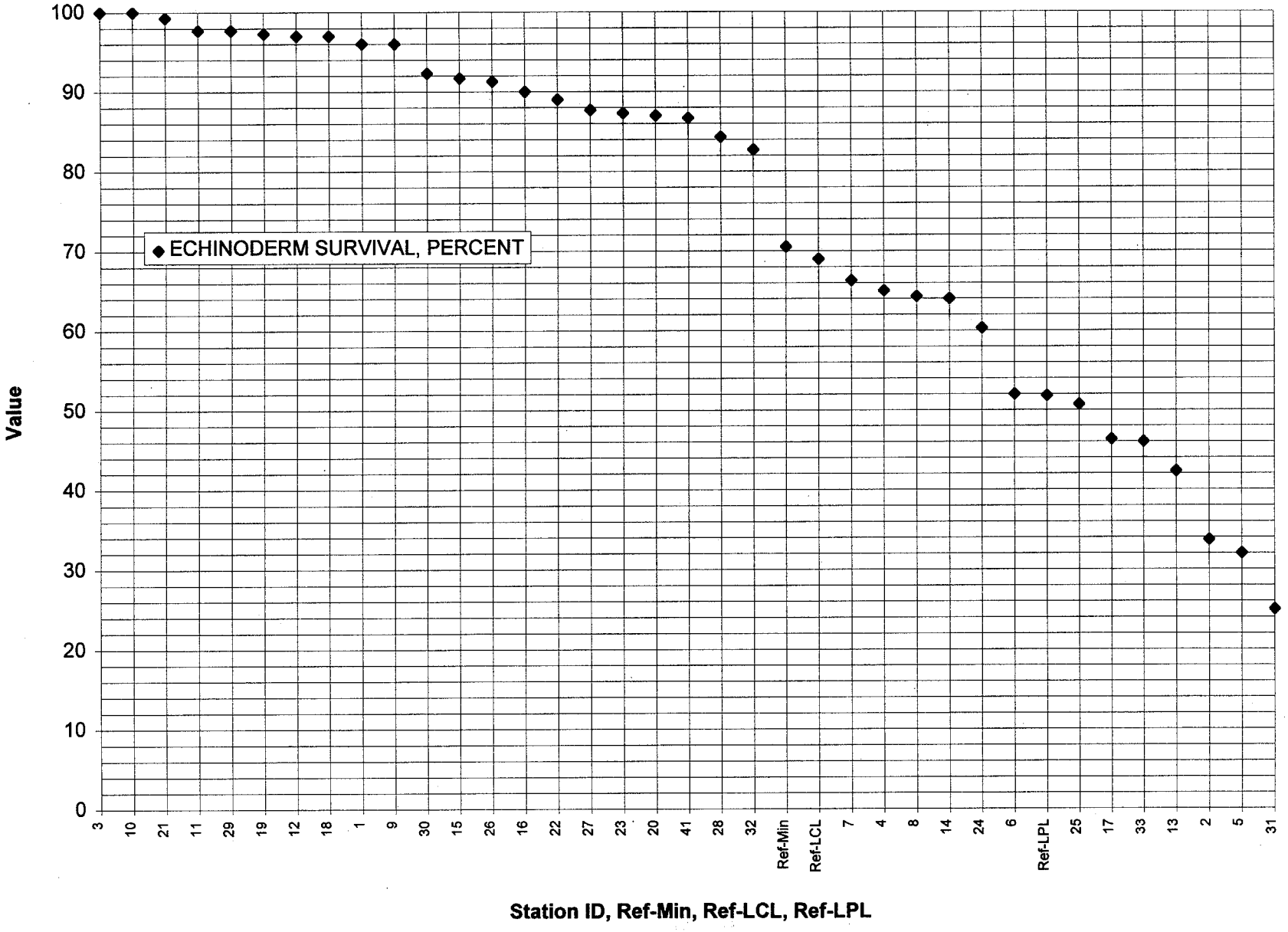

30
25
20
15
10
5
0
Ratio
TOTAL SEM/AVS,
12
10
25
29
15
32
16
20
6
23
22
41
19
8
26
18
27
30
21
33
28
Ref-UCL
Ref-Max
9
3
11
14
31
Ref-UPL
7
5
2
24
1
17
13
4
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

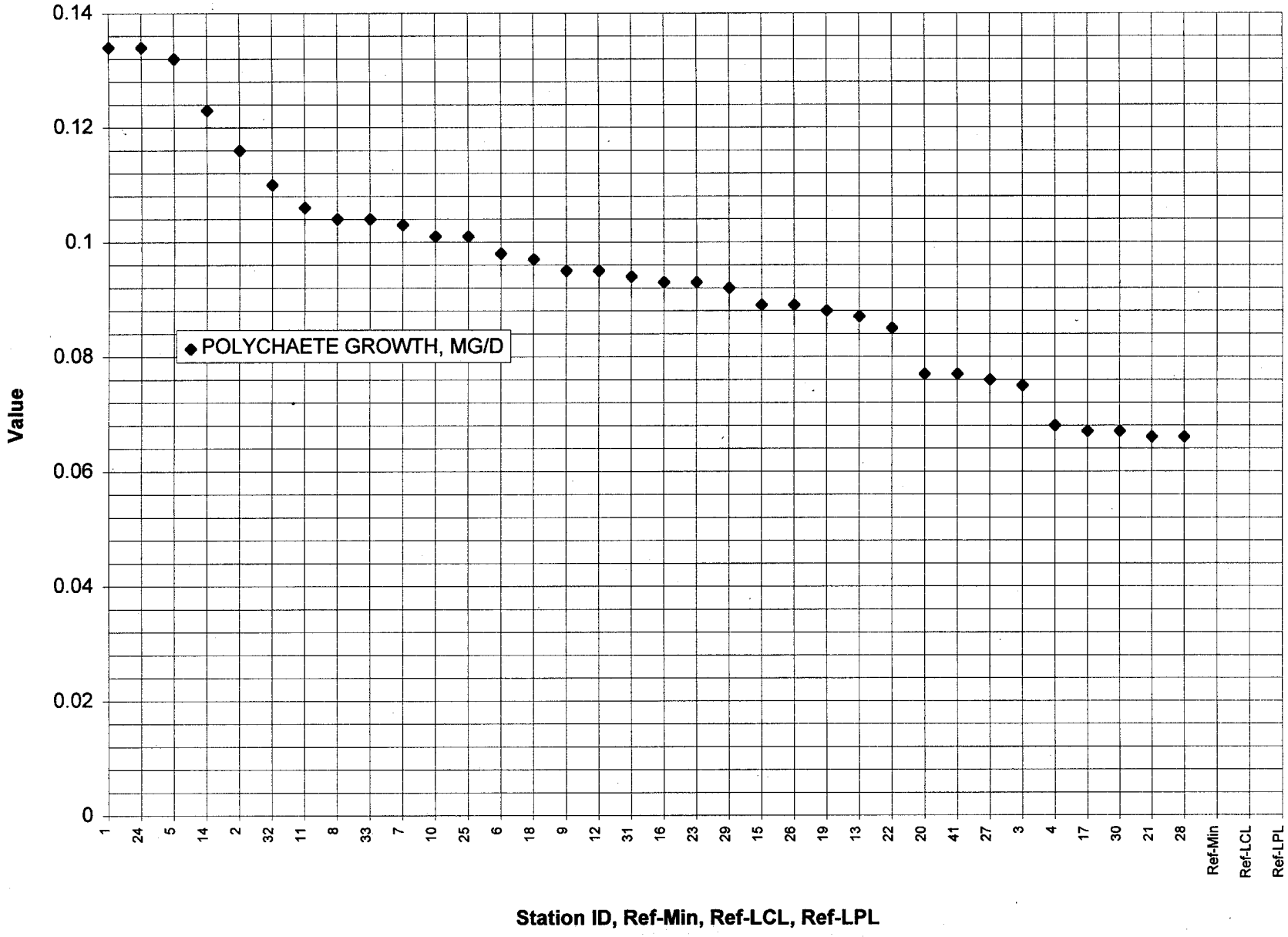

ZINC, EXTRACTABLE-SEM/AVS,
Ratio
0
2
4
6
8
10
12
14
16
12
10
25
29
15
16
20
23
32
6
41
19
22
8
27
18
26
33
30
21
28
3
9
Ref-UCL
11
Ref-Max
14
7
31
2
5
Ref-UPL
24
1
17
13
4
ER-L
ER-M
Station ID, Ref-Max, Ref-UCL, Ref-UPL, ER-L, ER-M

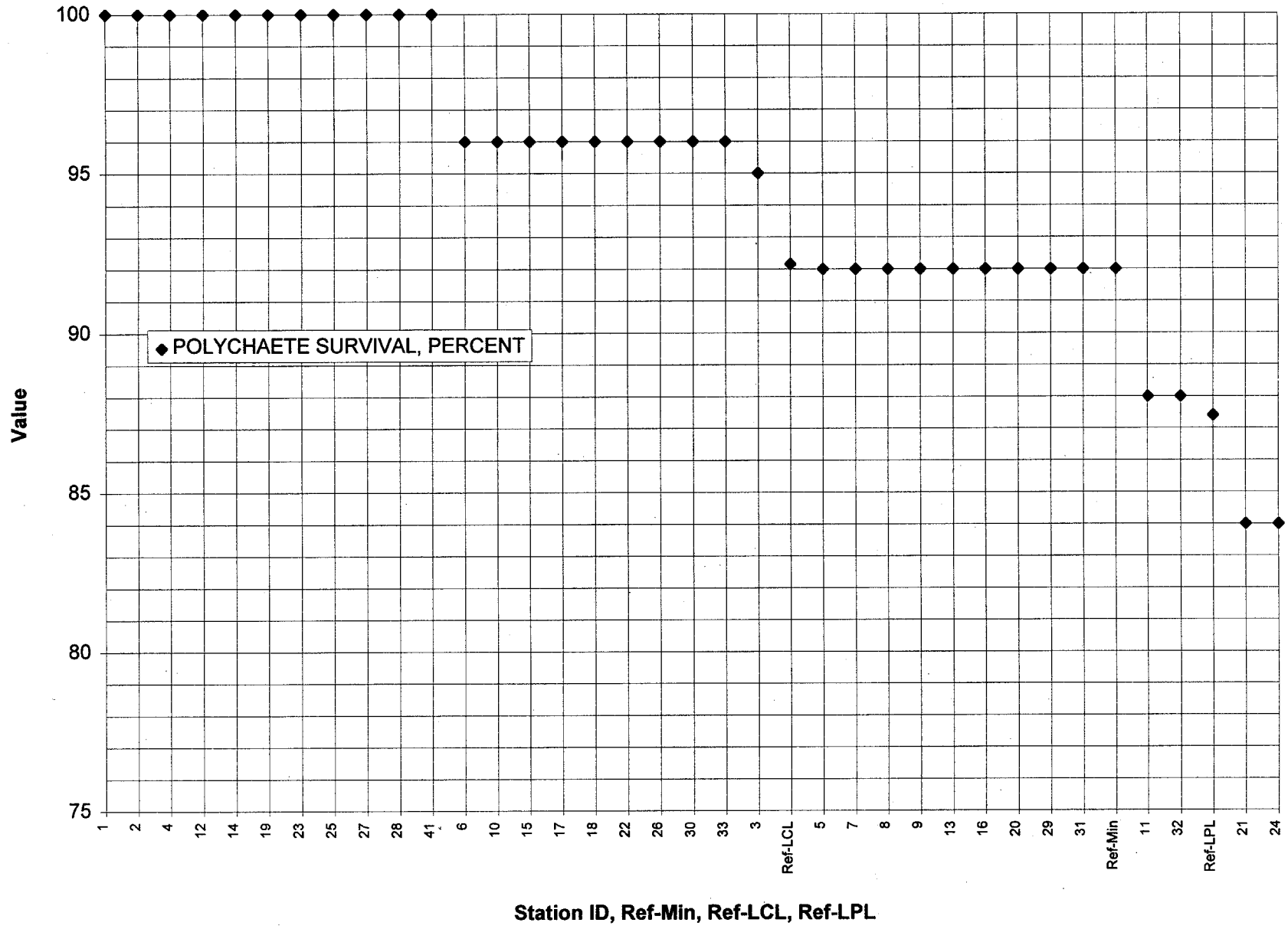

AMPHIPOD REBURIAL, PERCENT
Value
100
90
80
70
60
50
40
30
20
10
0
9
19
24
4
13
12
7
11
17
32
18
10
20
14
15
16
25
5
23
30
33
27
31
26
21
Ref-LCL
6
Ref-Min
29
2
1
8
28
Ref-LPL
22
3
41
Station ID, Ref-Min, Ref-LCL, Ref-LPL

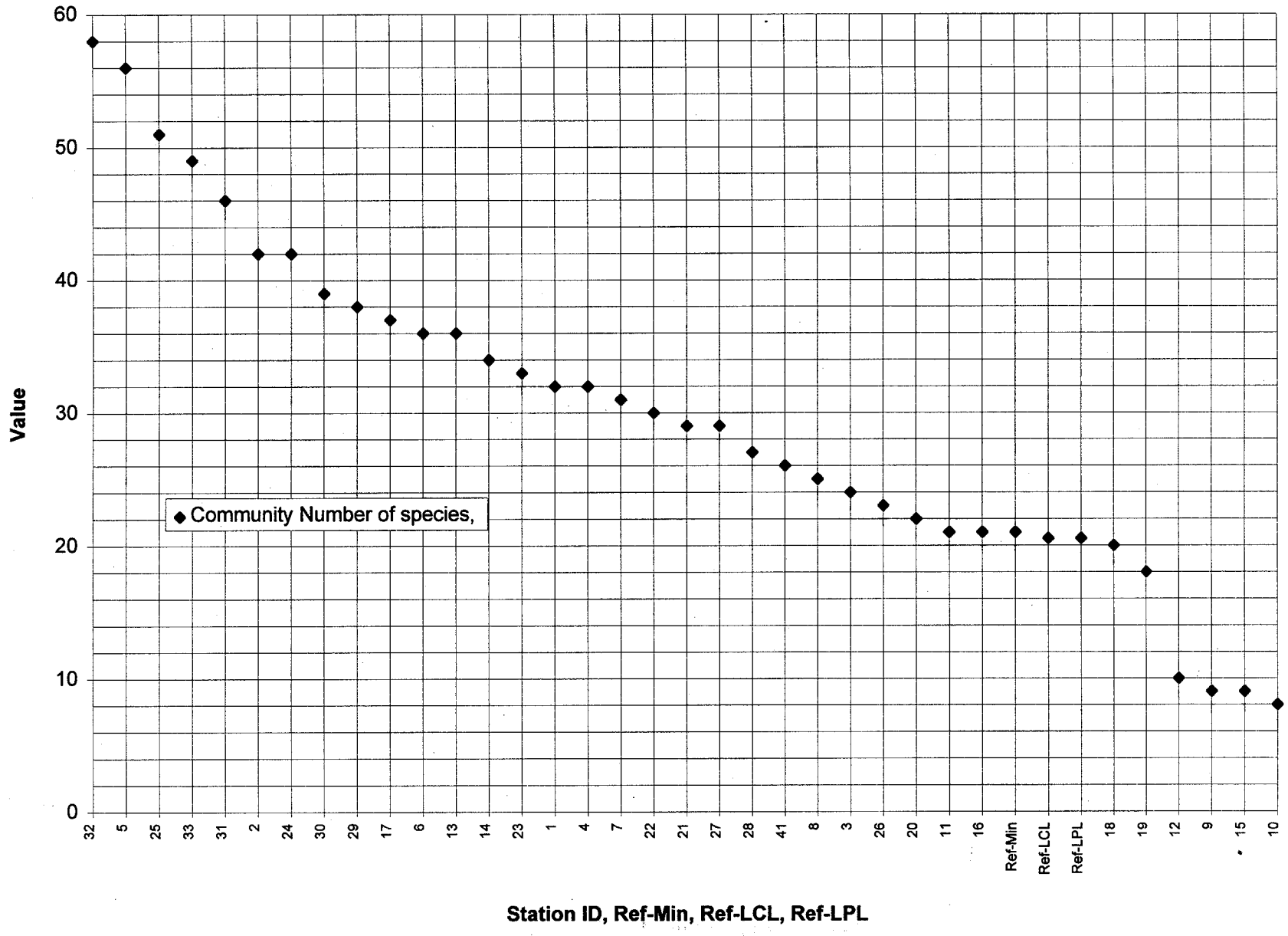

AMPHIPOD SURVIVAL, PERCENT
Value
100
90
80
70
60
50
40
30
20
10
0
11
14
23
3
15
25
13
18
24
2
10
16
32
4
22
26
28
19
9
12
17
5
6
7
8
20
31
1
21
30
29
33
Ref-Min
27
Ref-LCL
Ref-LPL
41
Station ID, Ref-Min, Ref-LCL, Ref-LPL

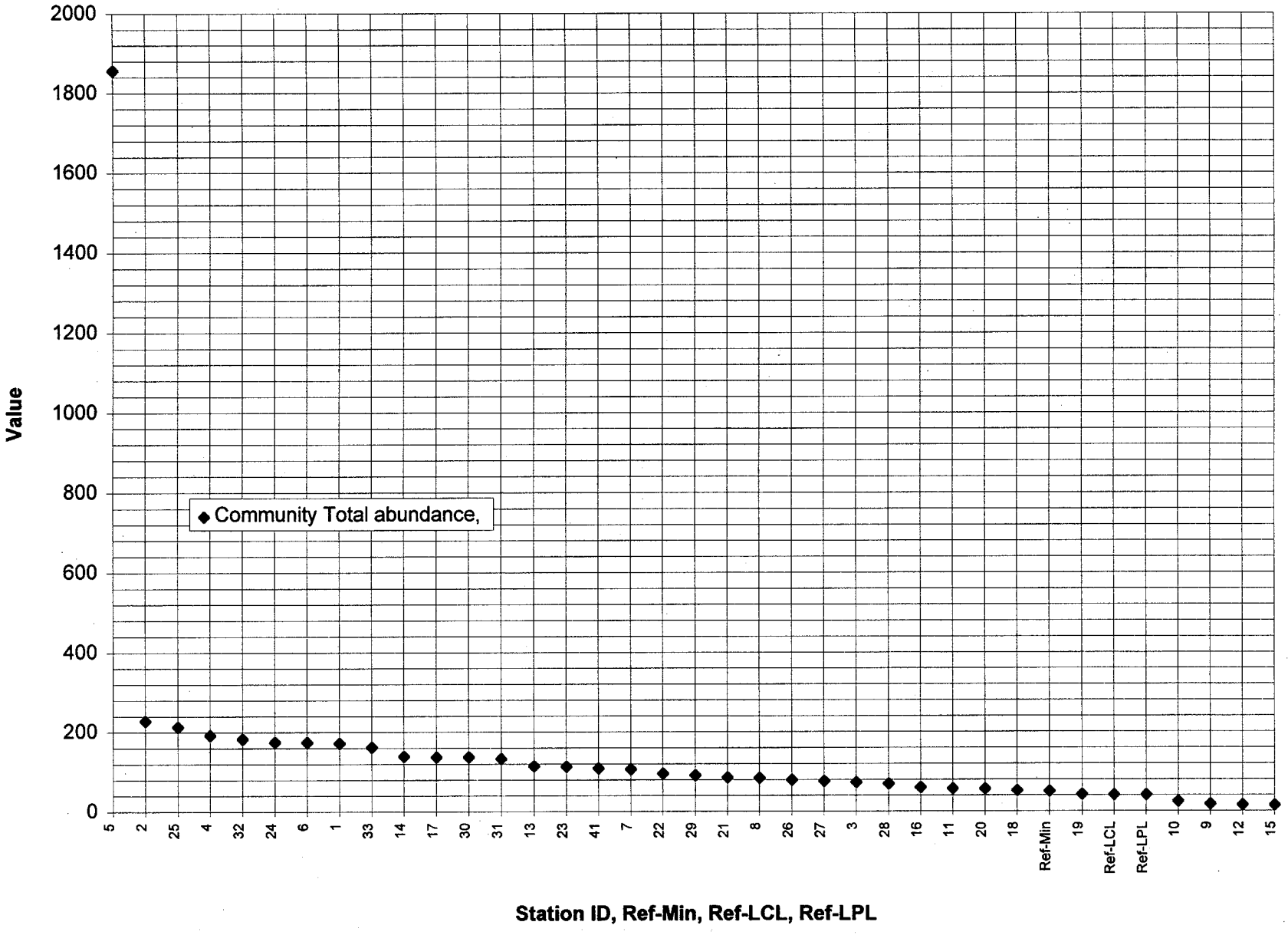

ECHINODERM NORMAL DEVELOPMENT, PERCENT
Value
100
90
80
70
60
50
40
30
20
10
0
29
28
27
23
30
20
21
26
10
22
11
18
19
3
Ref-Min
16
15
41
32
9
5
1
8
33
12
13
2
4
6
7
14
17
24
25
31
Ref-LCL
Ref-LPL
Station ID, Ref-Min, Ref-LCL, Ref-LPL

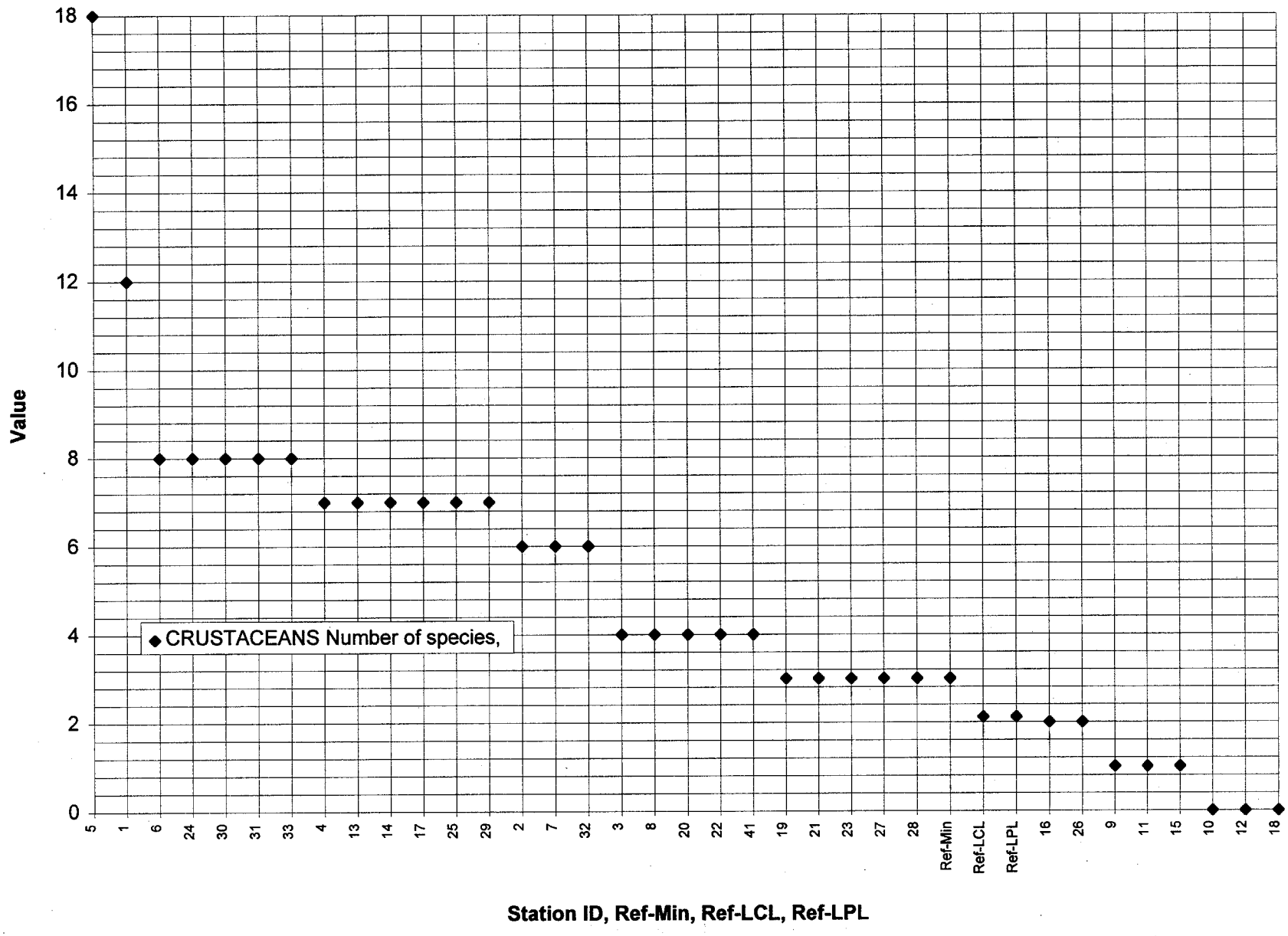

ECHINODERM SURVIVAL, PERCENT
Value
100
90
80
70
60
50
40
30
20
10
0
3
10
21
11
29
19
12
18
1
9
30
15
26
16
22
27
23
20
41
28
32
Ref-Min
Ref-LCL
7
4
8
14
24
6
Ref-LPL
25
17
33
13
2
5
31
Station ID, Ref-Min, Ref-LCL, Ref-LPL

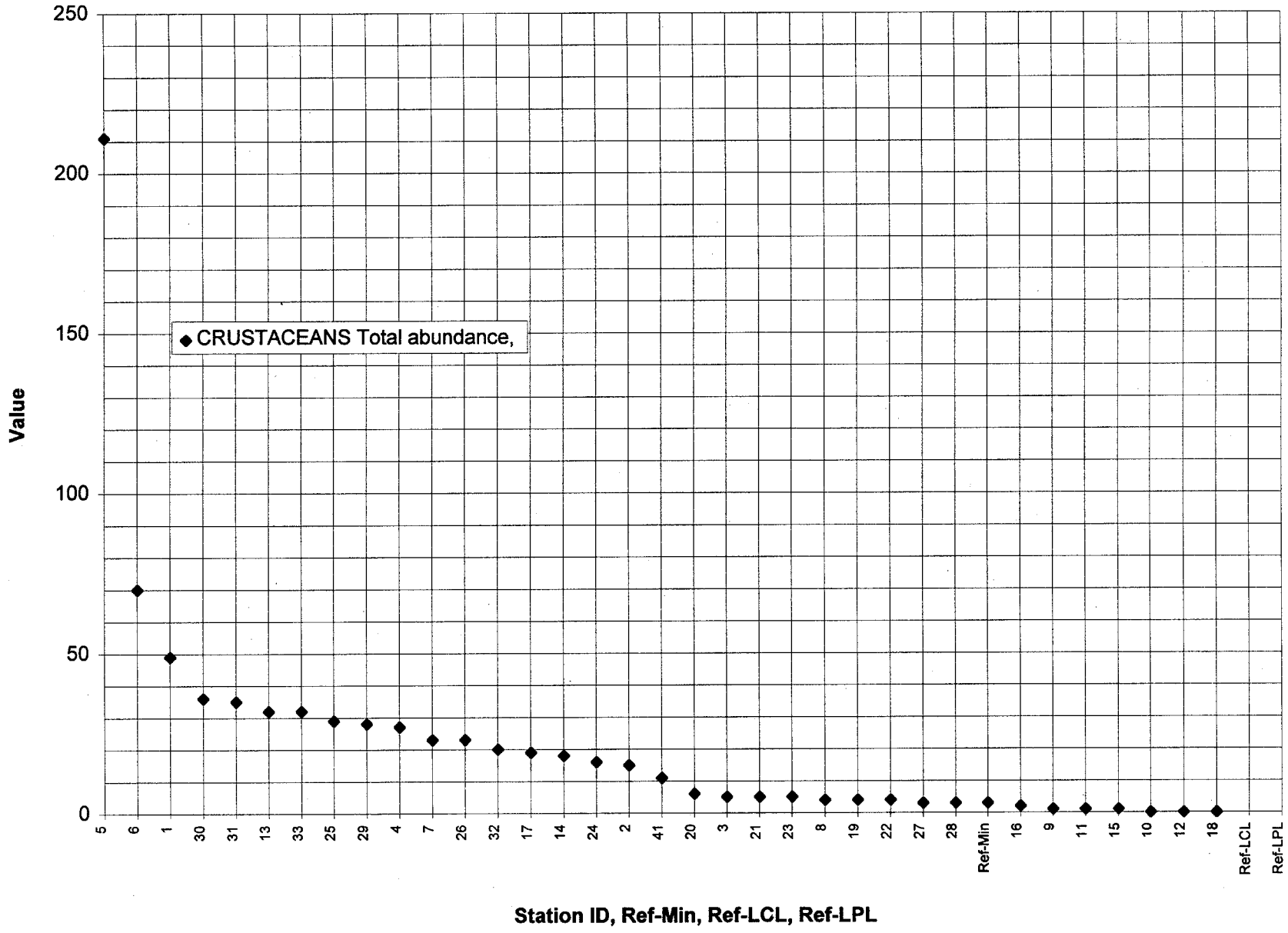

0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Value
POLYCHAETE GROWTH, MG/D
1
24
5
14
2
32
11
8
33
7
10
25
6
18
9
12
31
16
23
29
15
26
19
13
22
20
41
27
3
4
17
30
21
28
Ref-Min
Ref-LCL
Ref-LPL
Station ID, Ref-Min, Ref-LCL, Ref-LPL

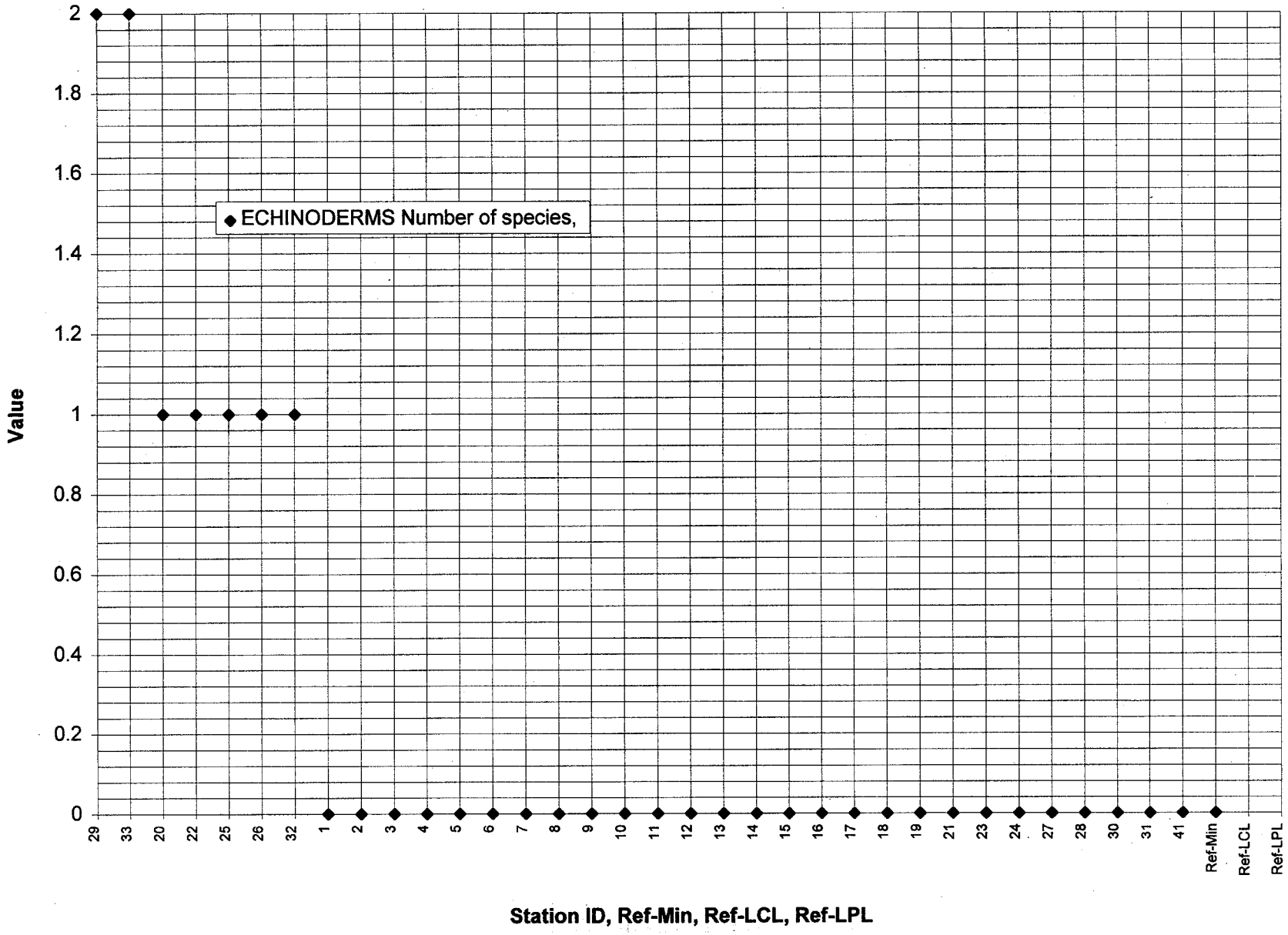

100
95
90
85
80
75
Value
POLYCHAETE SURVIVAL, PERCENT
1
2
4
12
14
19
23
25
27
28
41
6
10
15
17
18
22
26
30
33
3
Ref-LCL
5
7
8
9
13
16
20
29
31
Ref-Min
11
32
Ref-LPL
21
24
Station ID, Ref-Min, Ref-LCL, Ref-LPL

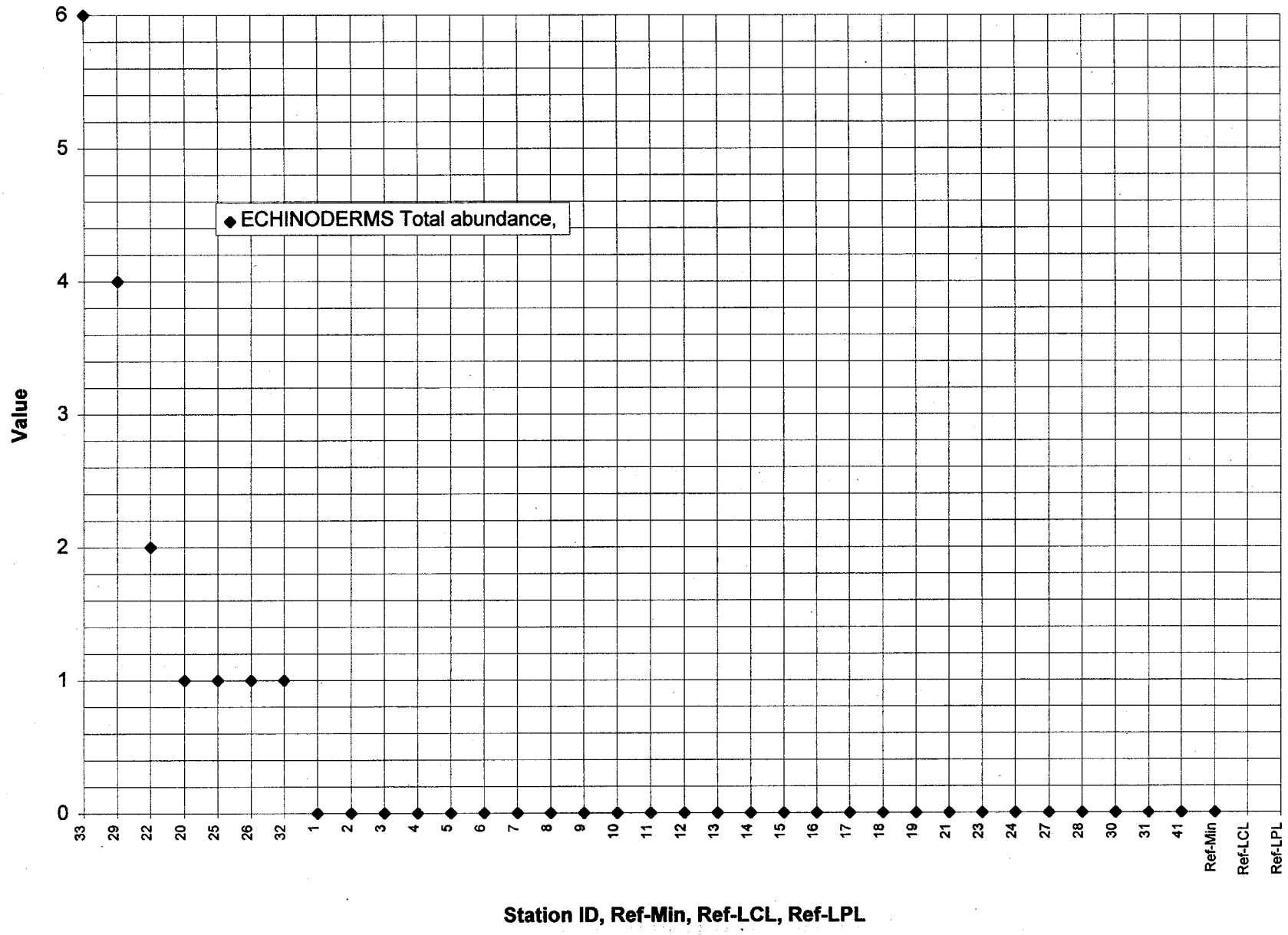

60
50
40
30
20
10
0
Value
Community Number of species,
32
5
25
33
31
2
24
30
29
17
6
13
14
23
1
4
7
22
21
27
28
41
8
3
26
20
11
16
Ref-Min
Ref-LCL
Ref-LPL
18
19
12
9
15
10
Station ID, Ref-Min, Ref-LCL, Ref-LPL

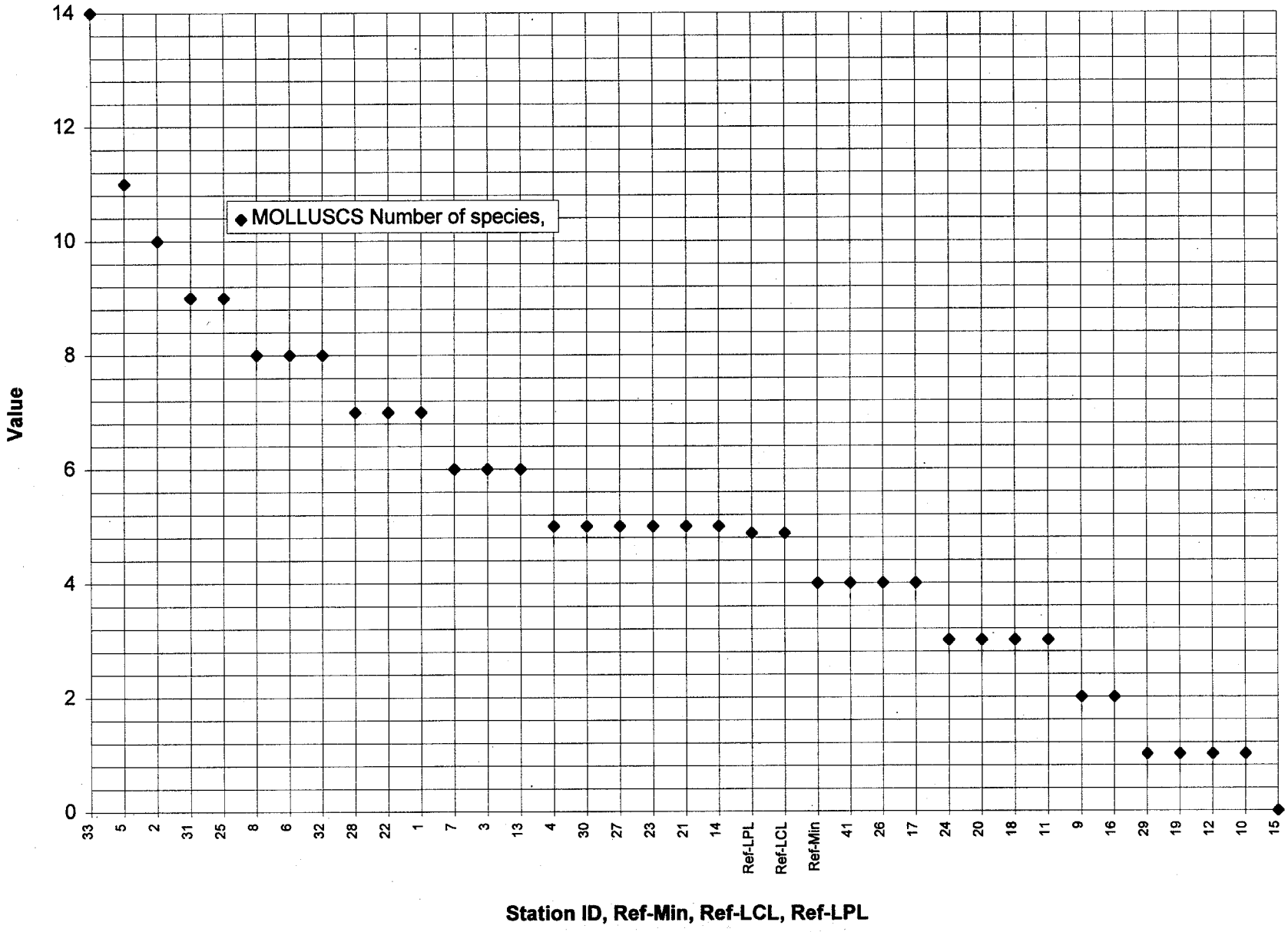

2000
1800
1600
1400
1200
1000
800
600
400
200
0
Value
Community Total abundance,
5
2
25
4
32
24
6
1
33
14
17
30
31
13
23
41
7
22
29
21
8
26
27
3
28
16
11
20
18
Ref-Min
19
Ref-LCL
Ref-LPL
10
9
12
15
Station ID, Ref-Min, Ref-LCL, Ref-LPL

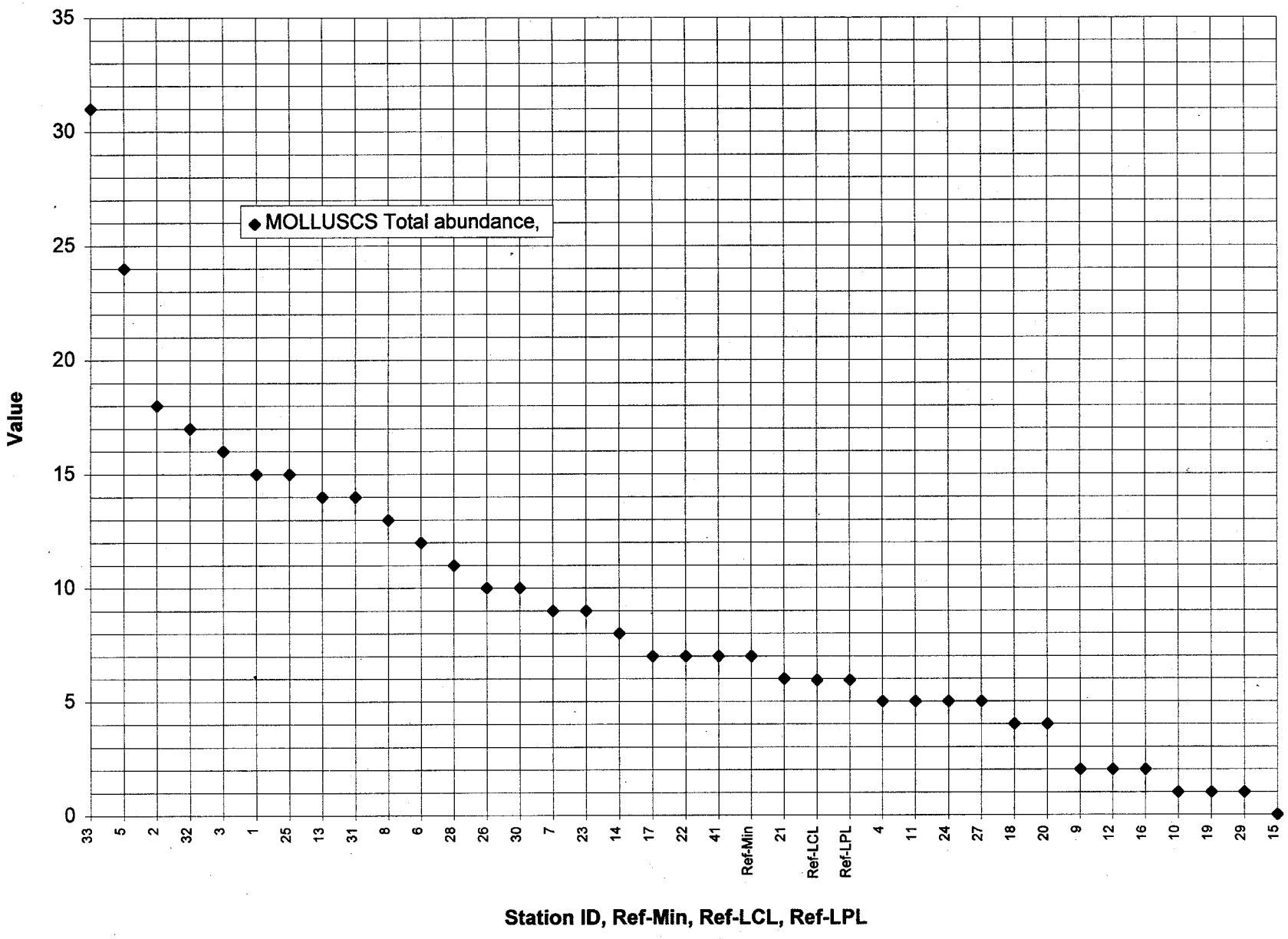

Value
18
16
14
12
10
8
6
4
2
0
CRUSTACEANS Number of species,
5
1
6
24
30
31
33
4
13
14
17
25
29
2
7
32
3
8
20
22
41
19
21
23
27
28
Ref-Min
Ref-LCL
Ref-LPL
16
26
9
11
15
10
12
18
Station ID, Ref-Min, Ref-LCL, Ref-LPL

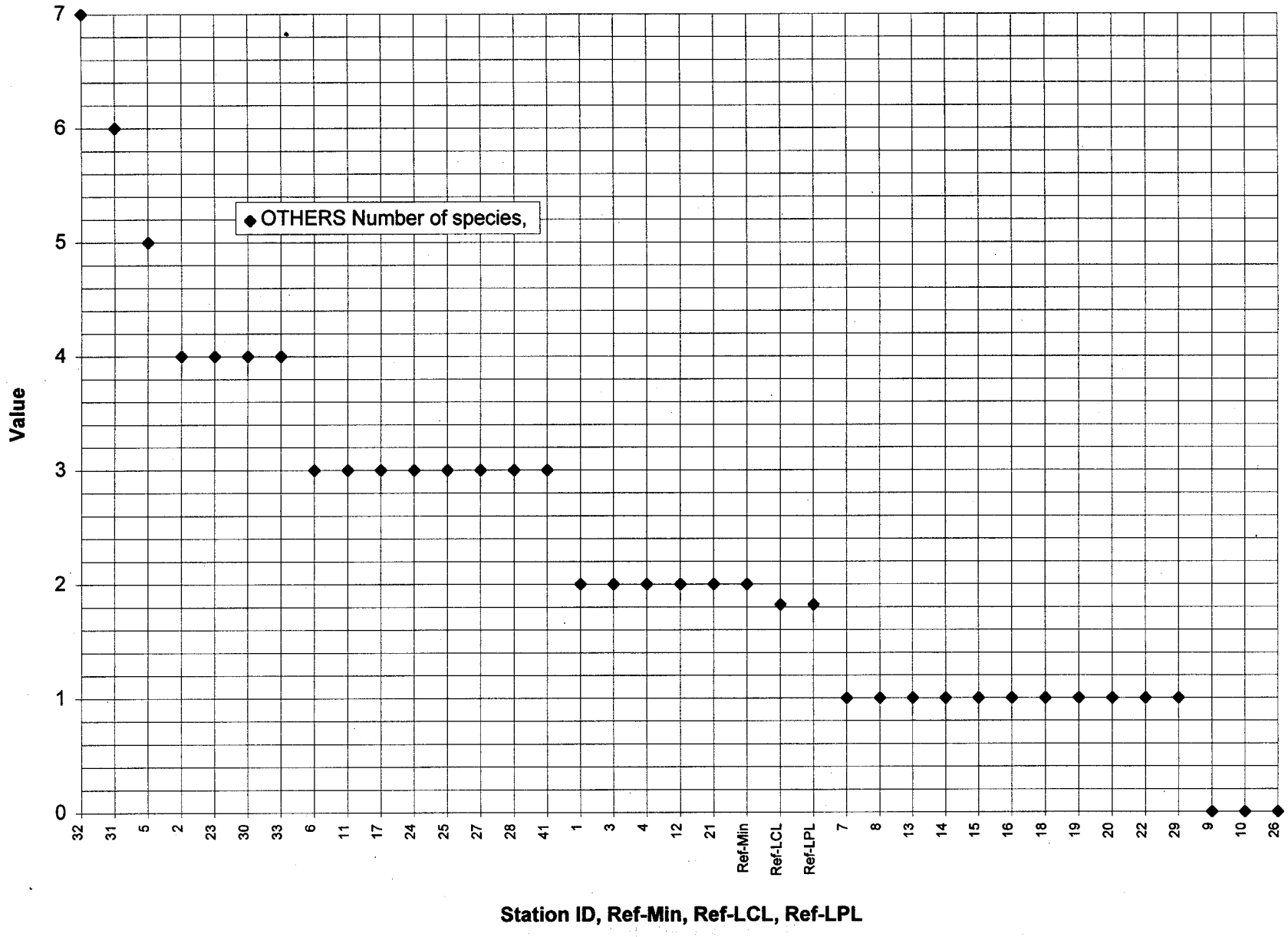

250
200
150
100
50
0
Value
CRUSTACEANS Total abundance,
5
6
1
30
31
13
33
25
29
4
7
26
32
17
14
24
2
41
20
3
21
23
8
19
22
27
28
Ref-Min
16
9
11
15
10
12
18
Ref-LCL
Ref-LPL
Station ID, Ref-Min, Ref-LCL, Ref-LPL

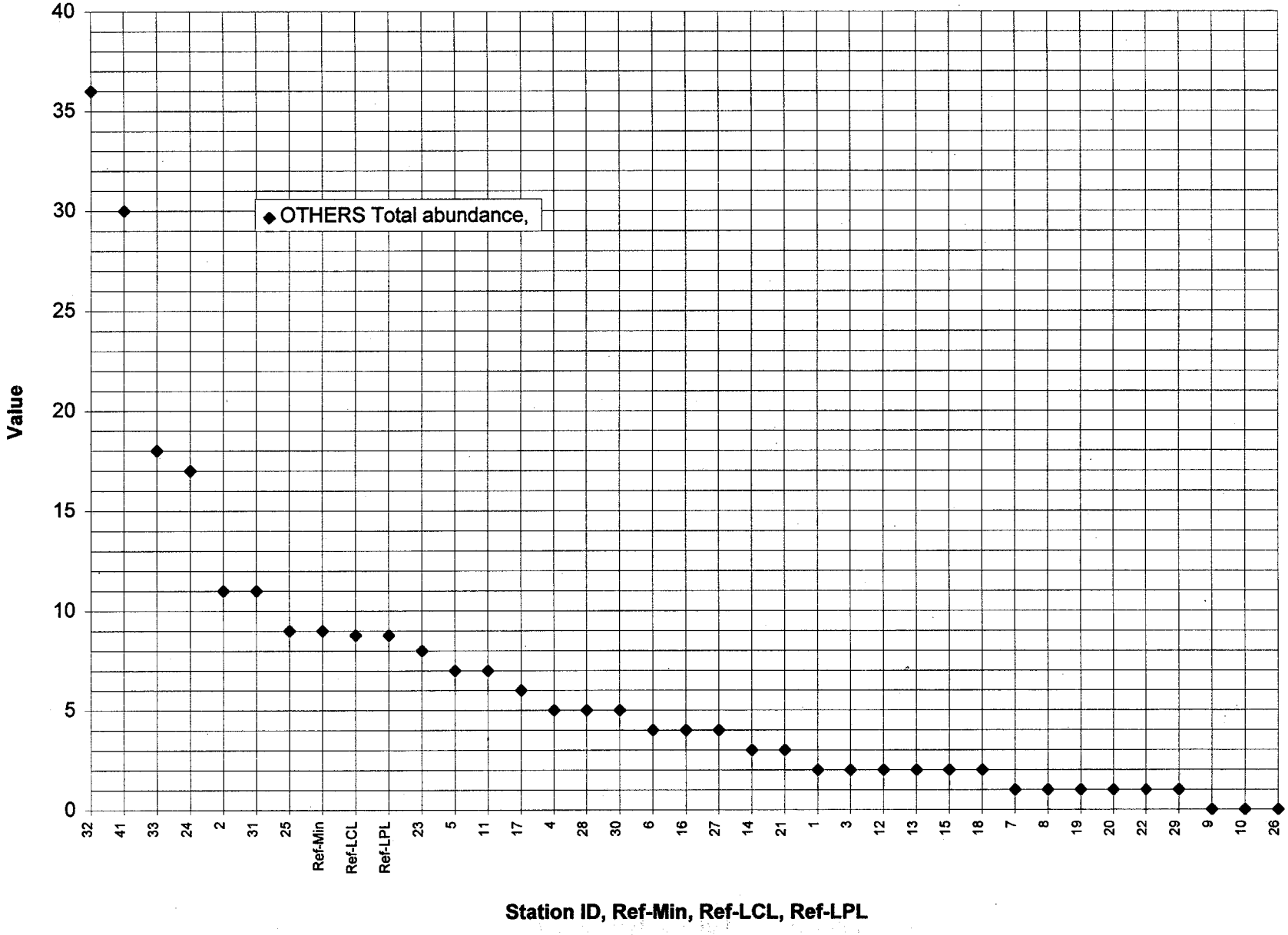

ECHINODERMS Number of species,
Value
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
29
33
20
22
25
26
32
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
21
23
24
27
28
30
31
41
Ref-Min
Ref-LCL
Ref-LPL
Station ID, Ref-Min, Ref-LCL, Ref-LPL

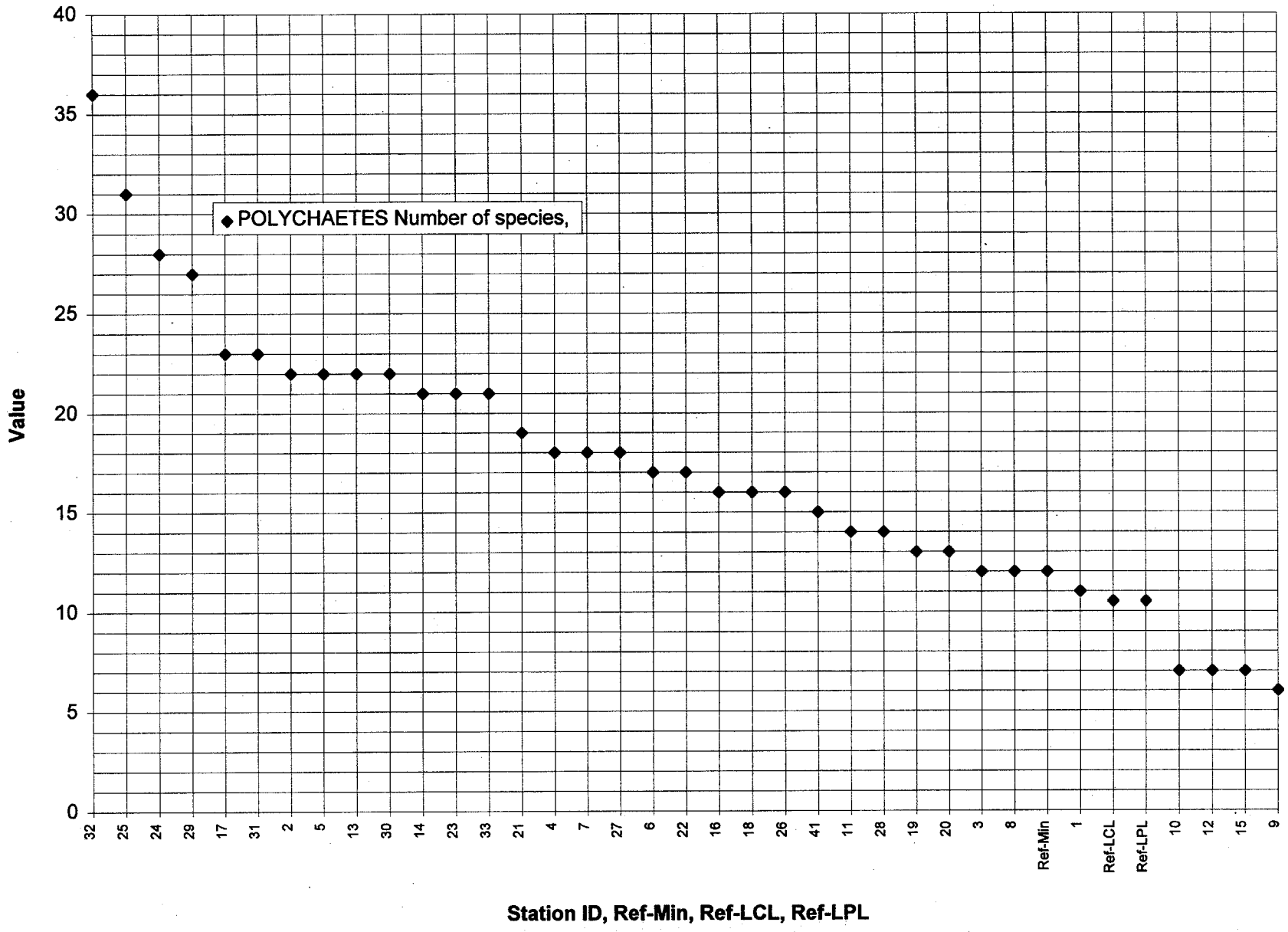

ECHINODERMS Total abundance,
Value
0
1
2
3
4
5
6
33
29
22
20
25
26
32
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
21
23
24
27
28
30
31
41
Ref-Min
Ref-LCL
Ref-LPL
Station ID, Ref-Min, Ref-LCL, Ref-LPL

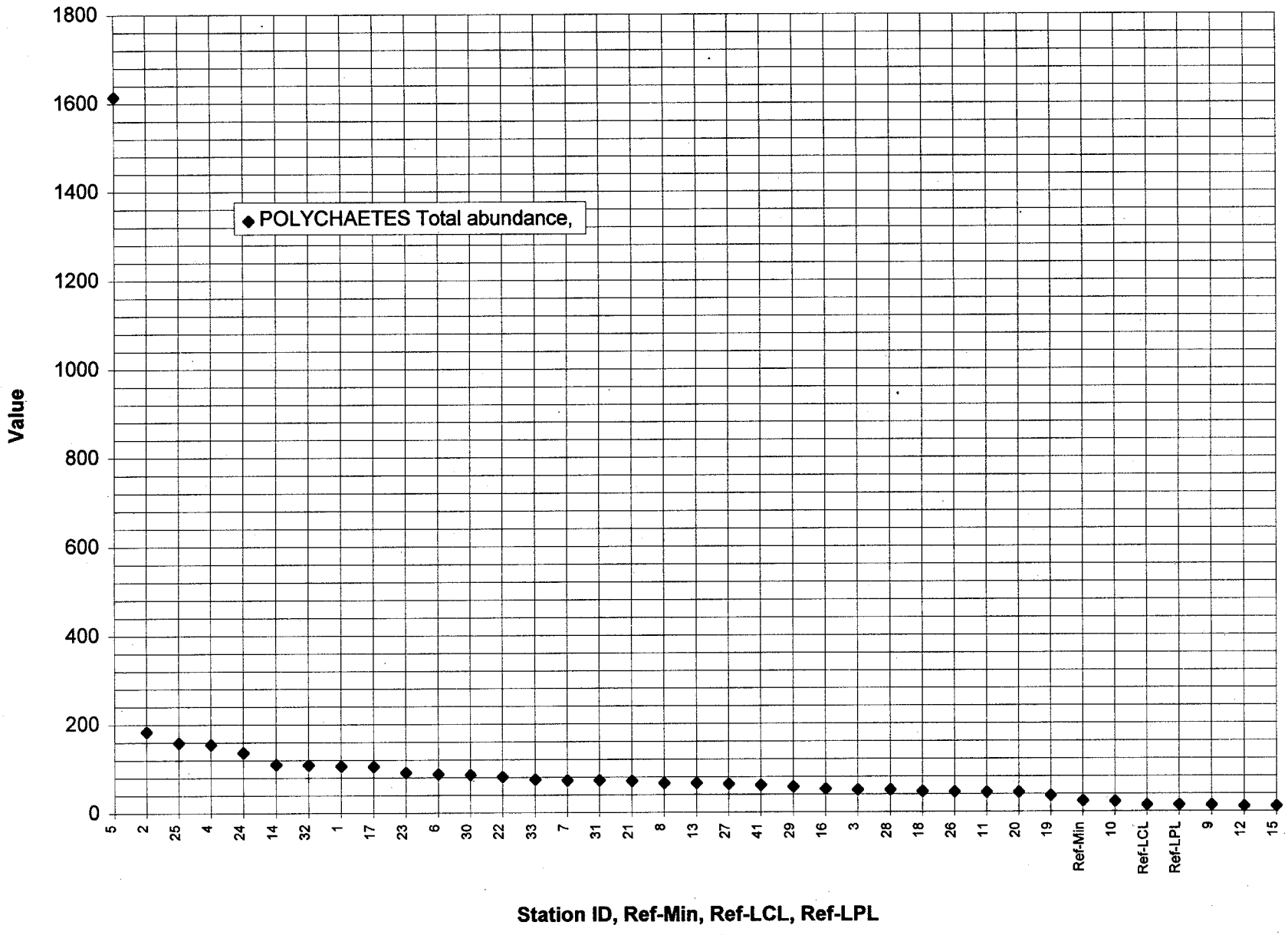

MOLLUSCS Number of species,
Value
0
2
4
6
8
10
12
14
33
5
2
31
25
8
6
32
28
22
1
7
3
13
4
30
27
23
21
14
Ref-LPL
Ref-LCL
Ref-Min
41
26
17
24
20
18
11
9
16
29
19
12
10
15
Station ID, Ref-Min, Ref-LCL, Ref-LPL


MOLLUSCS Total abundance,
Value
35
30
25
20
15
10
5
0
33
5
2
32
3
1
25
13
31
8
6
28
26
30
7
23
14
17
22
41
Ref-Min
21
Ref-LCL
Ref-LPL
4
11
24
27
18
20
9
12
16
10
19
29
15
Station ID, Ref-Min, Ref-LCL, Ref-LPL


OTHERS Number of species,
Value
0
1
2
3
4
5
6
7
32
31
5
2
23
30
33
6
11
17
24
25
27
28
41
1
3
4
12
21
Ref-Min
Ref-LCL
Ref-LPL
7
8
13
14
15
16
18
19
20
22
29
9
10
26
Station ID, Ref-Min, Ref-LCL, Ref-LPL


OTHERS Total abundance,
Value
40
35
30
25
20
15
10
5
0
32
41
33
24
2
31
25
Ref-Min
Ref-LCL
Ref-LPL
23
5
11
17
4
28
30
6
16
27
14
21
1
3
12
13
15
18
7
8
19
20
22
29
9
10
26
Station ID, Ref-Min, Ref-LCL, Ref-LPL


POLYCHAETES Number of species,
Value
40
35
30
25
20
15
10
5
0
32
25
24
29
17
31
2
5
13
30
14
23
33
21
4
7
27
6
22
16
18
26
41
11
28
19
20
3
8
Ref-Min
1
Ref-LCL
Ref-LPL
10
12
15
9
Station ID, Ref-Min, Ref-LCL, Ref-LPL


POLYCHAETES Total abundance,
Value
1800
1600
1400
1200
1000
800
600
400
200
0
5
2
25
4
24
14
32
1
17
23
6
30
22
33
7
31
21
8
13
27
41
29
16
3
28
18
26
11
20
19
Ref-Min
10
Ref-LCL
Ref-LPL
9
12
15
Station ID, Ref-Min, Ref-LCL, Ref-LPL

ANOVA Results with Reference n=4

	Metals											PAHs																	PCBs	Pesticides						SVOCs			Sulfide	Toxicity					Benthos									
Station ID	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Zinc	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Pyrene	Benzofluoranthenes	Total HPAH	Acenaphthylene	Anthracene	Phenanthrene	Total LPAH	Total PAH	Aroclor 1260	Aldrin	Lindane (gamma-BHC)	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	Bis(2-ethylhexyl)phthalate	Di-n-octylphthalate	Phenol	Sulfide, Total	Amphipod Reburial	Amphipod Survival	Echinoderm: Normal Development	Echinoderm Survival	Polychaete Survival	Total Number of Species	CRUSTACEANS Number of species,	ECHINODERMS Number of species,	MOLLUSCS Number of species,	POLYCHAETES Number of species,	Total Abundance	CRUSTACEANS Abundance,	ECHINODERMS Abundance,	MOLLUSCS Abundance,	POLYCHAETES Abundance,
1	H			H	H		H	H		H	H	H	H	H	H	H				H		H	H	H	H	H	H	H								H						H											
2	H			H	H		H	H		H	H	H	H	H	H	H				H		H	H		H		H	H								H						H	H										
3	H			H	H		H	H		H	H	H	H	H	H	H	H		H	H		H	H	H	H	H	H	H								H																	
4	H			H	H		H	H		H	H		H	H		H	H		H			H	H					H	H														H											
5												H	H	H	H	H				H		H	H	H	H	H	H	H	H								H						H	H										
6												H	H	H	H	H				H		H	H	H	H	H	H	H	H								H						H	H										
7				H	H			H		H	H	H	H	H	H	H	H		H	H		H	H	H	H	H	H	H	H														H											
8													H	H	H	H				H		H	H		H	H	H	H	H								H						H											
9	H			H	H		H	H		H	H	H	H	H	H	H				H		H	H		H		H	H	H								H						H			H	H		H	H	H	H		H	H
10	H	H		H	H	H	H	H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H	H	H	H	H		H	H					H									H	H		H	H	H	H		H	H
11	H			H	H		H	H		H	H	H	H	H	H	H	H		H	H	H	H	H	H	H	H	H	H	H								H									H	H		H		H			H	
12				H	H			H		H	H	H	H	H	H	H				H		H	H	H	H	H	H	H	H								H						H			H	H		H	H	H	H		H	H
13	H			H	H		H	H		H	H		H	H	H	H						H	H					H	H			H											H	H										
14												H	H	H	H	H		H		H		H	H		H	H	H	H	H								H						H											
15	H			H	H		H	H		H	H		H	H		H						H	H					H	H			H											H			H	H		H	H	H	H		H	H
16	H			H	H		H	H		H	H																		H			H		H	H								H			H	H		H		H			H	
17	H	H	H	H	H	H	H	H		H	H	H	H	H	H	H	H		H	H	H	H	H					H	H			H	H		H								H	H										
18	H			H	H		H	H		H	H	H	H	H	H	H	H	H	H	H		H	H					H	H																	H	H		H		H			H	
19				H	H			H		H	H		H	H		H						H	H					H	H																	H	H		H		H			H	
20				H	H			H		H	H		H	H		H						H	H					H	H																	H	H		H		H			H	
21	H	H		H	H	H	H	H	H	H	H	H	H	H	H	H	H		H	H	H	H	H		H	H	H	H	H																									
22	H	H		H	H	H	H	H		H	H	H	H	H	H	H	H		H	H	H	H	H		H	H	H	H	H			H																							
23				H	H			H		H	H	H	H	H	H	H	H		H	H		H	H					H	H																										
24																																											H											
25													H	H		H																											H	H										
26	H	H		H	H		H	H		H	H	H	H	H	H	H		H		H		H	H					H	H		H					H																		
27	H	H		H	H	H	H	H		H	H		H	H		H						H	H			H	H	H	H																									
28	H			H	H		H	H		H	H		H	H		H													H	H																									
29				H	H			H		H	H		H	H		H																																						
30				H	H			H		H	H		H	H		H													H																										
31																																						H					H	H										
32																																											H											
33				H	H			H		H	H																		H														H	H										
41	H			H	H		H	H		H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H			H										H	H										

Hit (H) = Exceedance of a statistically significant (P < 0.05) difference between test stations grouped by zones and reference stations. Bioassays also exceed a relative percent difference from reference.

Preliminary Evaluation Matrix

Sediment Evaluation Zone	Subzone	Sampling Stations Included in Zone	Sediment Chemistry				Sediment Bioassay			Benthic Community Analysis
			Metals	PAHs/ SVOCs	PCBs	Pesticides	Echinoderm (pore water)	Amphipod (solid phase)	Polychaete (solid phase)	
I	a	15	+	+	+	+	+	-	-	+
	b	16	+	-	+	+	+	-	-	+
	c	9, 12	+	+	+	-	+	-	-	+
II	a	10	+	+	+	+	-	-	-	+
	b	11, 18, 19, 20	+	+	+	-	-	-	-	+
III	a	41	+	+	+	+	+	+	-	-
	b	13, 17	+	+	+	+	+	-	-	-
	c	1, 2, 4, 7	+	+	+	-	+	-	-	-
	d	5, 6, 8, 14	-	+	+	-	+	-	-	-
	e	33	+	-	+	-	+	-	-	-
	f	25, 31	-	+	-	-	+	-	-	-
IV	a	24, 32	-	-	-	-	+	-	-	-
V	a	22, 26, 28	+	+	+	+	-	-	-	-
	b	3, 21, 23, 27, 30	+	+	+	-	-	-	-	-
	c	29	+	+	-	-	-	-	-	-

FIGURE

SEDIMENT EVALUATION ZONES

NAVAL STATION, LONG BEACH, CALIFORNIA

Bechtel National, Inc

CLEAN II Program

DATE: 2/27/96
FILE NO.: 26P.DWG
JOB NO.: 22214-026

ENCLOSURE 2
MEETING MINUTES OF 13 FEBRUARY 1997
TELECONFERENCE

DATED 27 FEBRUARY 1997

CCN: CTO-0026/0445
FILE: 0208

MEETING MINUTES

Meeting Subject:	Meeting Date: 13 February 1997
Project Status Teleconference Site 7 - West Basin Long Beach Naval Complex	Meeting Time: 0930 BNI - Norwalk Teleconference

Attendees:

SWDIV	BNI	Agencies
Mike Radecki (RPM)	Krish Kapur (PM)	John Christopher, Cal-EPA/DTSC
Alan Lee	Ömer Kadaster (K) (CTOL)	Alvaro Gutierrez, Cal-EPA/DTSC
Chris Leadon (RTM)	Sharon Ohannessian (K)	Laurie Sullivan, NOAA
Anna Ulaszewski (LBNSY)	Tom McDonnell (BC)	Martin Hausladen, USEPA - Region IX
	Serge Baghdikian	Ned Black, USEPA - Region IX
		Sophia Serda, USEPA - Region IX
		Nancy Musgrove, Weston (USEPA)
		Roger McGinnis, Weston (USEPA)
		Dena Hughes, Weston (USEPA)
		Patricia Velez, Cal-DFG
		Max Puckett, Cal-DFG
		Hugh Marley, RWQCB-LA
		Alex Fu, RWQCB-LA
	BC = Brown and Caldwell	
	K = Kleinfelder	

Copies to:		
Walter Sandza, SWDIV	Jim Moe, BNI	Michael Lyons, RWQCB-LA
Tony DiDomenico, SWDIV	John Kluesener, BNI	Carol Roberts, USFWS
	Bong Kown, BNI	Karla Brasaemle, Weston (USEPA)
	Noriko Kawamoto, BNI	

Mike Radecki, RPM, welcomed the attendees and called the meeting to order. The objectives of the meeting were to discuss the Agencies' and Trustees' responses to BNI/SWDIV responses to comments on the Draft RI Report, to discuss the additional data evaluations conducted by BNI pursuant to the joint Agency/Trustee memorandum of 05 August 1996, and to schedule a technical workshop for the near future. Ömer Kadaster then solicited comments from the Agencies and Trustees regarding BNI/SWDIV responses to the Draft RI Report comments.

John Christopher began by discussing the response to DTSC's first general comment, and said that he partially agrees with the response but wants to hold judgment with respect to which beneath-pier sediments are contaminated. BNI/SWDIV responded by answering that there appears to be a problem with the sediments underneath Piers 7, 12, and 16, however the remaining piers do not seem to exhibit adverse ecological problems. BNI/SWDIV also stated that the exact cause of the echinoderm toxicity could not be determined. Mr. Christopher was pleased that SWDIV had moved towards agreeing that there may be problems with some of the beneath-pier sediments, and agreed that it did not seem possible to determine the cause of echinoderm toxicity.

Mr. Christopher stated that he was not satisfied with the response to DTSC's second general comment regarding DQOs. The response states that all Agencies/Trustees agreed with the methods chosen for the RI and that it is not clear from the DTSC comment which methods were not agreed to by the Agencies/Trustees. Mr. Christopher reiterated that the comment focused on the sampling design, and that the RI Report should state the limitations of the sampling design and the statistical methods chosen (e.g., a discussion of Type I and Type II error).

Laurie Sullivan stated that there are several instances where it appeared SWDIV did not understand NOAA's comments regarding statistical analyses (e.g., the response to NOAA's Comment Number 55). The RI text states that the bioassay data were rank-transformed and a nonparametric statistical test was conducted; however, it appears from the information in Appendix S that a nonparametric test (e.g., Kruskal-Wallis) was not conducted. Tom McDonnell responded that a Kruskal-Wallis test is equivalent to conducting an ANOVA on rank-transformed data. BNI agreed to consult a statistician regarding this issue.

Mr. Christopher restated that the RI Report needed a description of the limitations of the statistical methods used in the RI (i.e., certain types of conclusions may or may not be drawn from the results). DTSC also requests more specific text than what is proposed in the response to Comment No. 2.

Regarding the response to DTSC's Comment No. 3, Mr. Christopher said that the West Basin RI is the first time he has seen an upper predictive limit (UPL) used. He has seen percentiles, upper tolerance limits (UTLs), and upper confidence limits (UCLs). Ms. Sullivan responded that the UPL is like a UCL, but is used to predict a single sample versus a group of samples (i.e., a distribution). Mr. Christopher asked if Type II error is quantifiable using the UPL. Based on his experience using the UTL, as sample size (n) gets smaller, the use of the UTL becomes limited (i.e., he is worried about false negatives). Mr. McDonnell responded that the UPL is the only technical method available to compare a single sample against a group of samples. BNI agreed to show the minimum, maximum, mean, UCL, and UPL for each analyte for purposes of relative comparisons/review.

Ms. Sullivan remarked that when Station 40010 data is removed from the reference pool, the variability goes down substantially and the UPL closes in, however, other studies have

used the maximum data point for comparative purposes when the UPL is greater than any other data point. Mr. Christopher agreed that this is one limitation that arises from this type of study design (i.e., small reference n). It seem highly uncertain to construct an upper percentile on n = 4, and suggested instead using the highest measured value. Ms. Sullivan suggested comparing the West Basin data with the UPL and the maximum reference concentration, but not to go over the highest measured value if the UPL is greater than the highest measured value, and let the risk managers decide which comparative value to adhere to. Mr. Christopher replied that for UTLs and UCLs, when n decreases the method falls apart (i.e., a lot of uncertainty arises from such data comparisons yielding false negatives).

BNI replied that a specific criterion must be adhered to for determination of hits and that such a criterion must be decided upon today. Ms. Sullivan then replied that a weight-of-evidence approach should be used to determine hits.

Mr. Radecki asked Mr. Christopher if his discussion regarding UPLs, UTLs, and UCLs was based on State guidelines. Mr. Christopher responded no, his information was based on his personal experience. The high coefficient of variation (CV) at the reference was a problem; dropping Station 40010 data from the reference pool lowers the CV, which makes DTSC more comfortable with the Site 7 reference choice. Ms. Sullivan agreed.

Mr. Kadaster reminded the attendees that BNI/SWDIV was not committed to altogether dropping Station 40010 data and asked for the information proving that Station 40010 is contaminated. Ms. Sullivan replied that Table 4-6 of the Draft RI Report shows that metals are 2 times higher at Station 40010 than the other reference stations; PAHs are also higher. Mr. Kadaster thought that the Agencies and Trustees had stated that additional data on Station 40010 had been generated since the Site 7 RI, and based on that information the Agencies/Trustees have decided that Station 40010 was not a suitable reference. Ms. Sullivan responded that the RWQCB or DTSC would have such data. Mr. Kadaster asked Hugh Marley for a copy of the Station 40010 data that was used by the Agencies and Trustees to decide that Station 40010 should not be used as a reference station. Hugh Marley said that he would check with Shirley Birosik on the additional Station 40010 data.

Mr. Christopher continued commenting on the BNI/SWDIV responses to Draft RI Report comments regarding the polychaete bioassay data and their usefulness. He agreed to the response regarding this issue; the polychaete bioassay data can be meaningfully utilized. It must be kept in mind however, that if one bioassay shows toxicity and the controls were okay (e.g., the echinoderm), and another bioassay does not show toxicity and the controls were not okay (e.g., the polychaete), then the results of bioassay tests which were in control should be favored over the results of bioassay tests which were not in control. Mr. McDonnell responded that the RI tested a range of bioassay sensitivities by using three organisms, and that the polychaete bioassay is on one end of this range; the polychaete data is useful as it shows patterns in West Basin sediments. Ms. Sullivan stated that the polychaete bioassay is not a sensitive test, and should no be given much weight.

Patricia Velez asked how BNI/SWDIV will attempt to use the polychaete data. Mr. McDonnell responded that the polychaete data will be used to identify spatial patterns within the West Basin and that it will be added to the preponderance of evidence. Mr. Christopher reiterated that BNI/SWDIV should give more weight to the more sensitive bioassays and the bioassays that had acceptable controls.

The discussion then turned back to how the reference station data would be grouped and used to compare against West Basin data. Ms. Sullivan suggested speaking to NRADD, as they had just completed a RI for North Island sediments. Ms. Sullivan said that NRADD grouped 10 reference stations by grain size (i.e., the highest 5 and the lowest 5). Mr. Radecki interjected that he is very interested in the Agency/Trustee response to the North Island RI Report currently under review by the Agencies and Trustees. Mr. Christopher stated that the reference station data are being pooled in the case of the Site 7 RI.

Mr. Christopher said that SWDIV appeared to have selected the first option provided in the Joint Agency/Trustee memo with respect to reference stations, but what about the second option? Mr. Kadaster asked how Station 40010 could still be used with the second option. Mr. Christopher responded that the option would be chosen (40010 versus 40018 and 40032) and applied individually to each zone.

Weston agreed to removing Station 40010 from the reference pool, but stated that stratifying the reference stations by grain size does not work for Site 7 because there exists only one station (40032) representing coarse grains, and that the 50% - 60% grain size cutoff is where benthic community differences become apparent. Mr. Kadaster stated that if the mean fines of 40018 and 40032 is calculated, and the West Basin stations are compared to such mean $\pm$ 20%, most of the stations will be covered by the grain size range of 40018 and 40032. Ms. Sullivan noted that discarding Station 40010 from the reference pool would not cause a loss of West Basin station grain size coverage.

Mr. Christopher stated that his main concern with the response to DTSC's Comment No. 6 regarding pooling of reference stations was that it did not state which option BNI has chosen. Mr. Kadaster responded that on the basis of the Agency/Trustee comment that today they would not allow using Station 40010 as a reference station, BNI/SWDIV had been proceeding with performing the additional analyses without using Station 40010.

Mr. Radecki proposed that simple clarifications of the responses to comments should be sent to BNI by the Agencies. In response to this proposal, Mr. Christopher completed his comments presentation by reiterating DTSC's main problems with BNI/SWDIV response to Draft RI Report comments: limitations of the statistical analyses, and pooling of reference data. He also noted the major change from the Draft RI Report was BNI/SWDIV agreeing that a problem may exist with some beneath-pier sediments. Ms. Sullivan stated that she would note clarifications in the margins of the response to comments package and facsimile her notes to BNI. However, the response to NOAA's Comment No. 55 should be looked at more closely. Ms. Sullivan also asked if the Agencies/Trustees should expect a formal response to the Joint Agency comments.

Mr. Kadaster proposed a technical workshop for 01 April 1997 to discuss the formulation of the additional data evaluations and their implications. After a discussion of schedules, 01 April 1997 appeared to be acceptable to the participants. Mr. Christopher requested that the Agencies/Trustees be suppiied with handouts the week of 24 March 1997. Ms. Sullivan also requested the ability to review the new sediment evaluation zones as they evolve prior to the April workshop. Ms. Sullivan then asked if the tributyltin (TBT) data issue had ever been resolved.

Ms. Velez stated that she had not completed her review of the response to comments package, and that she will respond by writing her comments in the margins. She also stated that the reference stations and the TBT data remained as problem issues to Cal -DFG.

Regarding the TBT data, Martin Hausladen stated that the data are acceptable. Roger McGinnis agreed that most of the Site 7 data are of high quality and acceptable; it is mostly selected TBT data that are nonuseable. Less than 20% of the Site 7 TBT data should be rejected according to Weston due to factors such as holding time, temperature, and low matrix spike recovery. Any data qualified as "J" are useable; such data is just a little bit more uncertain. Mr. McGinnis will compose a letter (to be submitted to Mr. Hausladen the week of 18 February 1997) stating his professional opinion on the usability/acceptability of the Site 7 data. A re-review of the TBT data by Weston has resulted in a revision of the method blank assessment and therefore less data were rejected. Weston had received the additional standard operating procedures (SOPs) and matrix spike data; the additional information resulted in many "R" qualified data being re-qualified as "J". However, any holding time exceedances and warm samples upon arrival at the laboratory still resulted in "R" qualified data, especially TBT data. NOAA has conducted studies that show TBT rapidly degrades under warm temperatures and also adsorbs to glass. Battelle has shown that if TBT samples are frozen at -20° C, the TBT can remain stable for up to one month.

Regarding beneath pier sediments, Mr. McGinnis could not locate beneath pier depositional models he had mentioned in the 09 December 1996 teleconference. Mr. Marley will request beneath-pier sediment data from Ms. Birosik.

Continuing for the USEPA, Sophia Serda and Ned Black had no issues with BNI/SWDIV response to the Draft RI Report comments. Weston stated that they are forwarding their comments to Mr. Hausladen. Weston is a proponent of the preponderance-of-evidence approach. However, according to Weston, data whose interpretation is unquestioned (e.g., chemistry and bioassay data) should be relied upon more heavily for purposes of decision-making than data whose interpretation is uncertain (e.g., beneath-pier benthic community data). Mr. Radecki responded that such an approach is easy to suggest, but it is not so easy to give up an entire data set just because it is difficult to interpret without first understanding the significance of the impacts of rejecting such data. SWDIV believes that there is a strong rationale for the benthic community being what it is underneath the piers based on the existing physical environment. Ms. Sullivan agreed that the benthic community data should not be discarded. Mr. Christopher noted that it seems Weston believes there is enough data to make a decision; what is the decision? Weston then

stated that the issue the RI is focusing upon is exposure to sediment, but the beneath-pier community is primarily composed of epifauna and is thus exposed to the water column, not the sediment. Therefore, the bioassay data should be weighed more heavily in the decision-making process. A Puget Sound investigation regarding wood waste has set the precedent for dismissing benthic community data. In addition, Max Puckett stated that investigations in the San Francisco Bay area have used chemistry and toxicity data only, and used benthic community data only if it added to the information. Mr. Black said that it looks as if it may not be easy to have everybody agree on how to use benthic community data for beneath-pier sediments, and therefore suggested not using benthic community data, but rather using toxicity data. Weston reiterated that if there is a problem with interpreting the benthic community data, other data should be used in order to move forward with the clean-up decision.

Ms. Velez said that Cal-DFG had not received formal responses to some of its data review comments. Mr. Radecki responded that SWDIV and BNI were under the impression that all the requests from the data review comments had been satisfied.

Alvaro Gutierrez requested that BNI transmit copies of all responses to comments to all of the Agencies and Trustees. The Agencies and Trustees will have their own meeting (04 March 1997) prior to the 01 April 1997 technical workshop for purposes of obtaining consensus on outstanding Site 7 issues.

BNI then continued the teleconference by discussing the remaining issues on the agenda. Since the reference station combinations were already discussed, the topic focused on sediment evaluation zones (SEZs). BNI has conducted additional cluster analyses by using various combinations of biological data. The primary goal for defining alternative SEZs is low variance among data within each zone. This goal was not being achieved when biological variables were used to define SEZs. Therefore, BNI moved towards using various combinations of chemistry, physical, and biological data, but the variance among the data was still relatively high (i.e., CVs much greater than 30%). After further study and the acknowledgment that certain parameters covary, BNI proposed to define separate SEZs for each chemical and biological group of variables (i.e., metals, PAHs, pesticides, PCBs, sulfide, echinoderm, amphipod, and polychaete bioassay results, and benthic community parameters). Analysis of variance (ANOVA) would be performed on each of the separate clusters against reference data. The evaluation matrix would then be completed by station for each analyte and biological variable.

Ms. Sullivan asked why BNI maintains defining SEZs using greater than 50% detected chemicals and not all detected chemicals. Mr. McDonnell responded that a problem arises when dilution factors are high; in such cases, cluster patterns become based on quantitation limits and not detected data, and seem to reflect a pattern of dilution and not the actual chemical concentration. Mr. Christopher replied that the dilution factor concept did make sense. However, Ms. Sullivan commented that rare compounds may be driving the chemistry patterns in West Basin.

Mr. Christopher was curious if BNI has recognized distinct chemical/biological patterns in West Basin based on the separate SEZs. BNI responded that yes, distinct patterns could

be distinguished. Mr. Christopher then stated that it did make sense that different chemical classes such as metals and PAHs would cluster differently based on the different sources from which they originated.

The Agencies/Trustees expressed interest in reviewing the new clusters and statistical results based on the new clusters. They requested to receive the new information by the last week in February 1997.

The teleconference ended by confirming the next team technical workshop on 01 April 1997 at 09:30 AM.

N68311.000925
NAVSTA LONG BEACH
SSIC NO. 5090.3

ENCLOSURE 3
RESPONSE TO COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT

DATED 27 FEBRUARY 1997

General Comments

1. The DON has and continues to include all agency requests to participate in this and all environmental projects. DFG infers in its comment that DON has not allowed DFG to participated in this program. Additionally, the DON aware of and has documentation showing DFG participation in this project as far back as 1993. The DON is also aware of the funding issues between the DTSC and DFG regarding the allotment of DSMOA resources. In a October 13, 1994 letter to Mr David Wang, DON estimated DFG resource requirements in excess of 800 hours for FY 1995 alone (Long Beach). To our knowledge, no additional request for DON assistance were submitted or required. As such, Don requests DFG recant existing reference and refrain from future indication that DON has not allowed DFG participation

2. Comment noted - DON is working with agencies to develop appropriate course of action for completion of CERCLA at Site 7

3. Selection of a remedial alternative can not be made until the need for remediation has been made. The need for remediation can not be made until adequate background or reference is agreed upon

4. Although a preliminary request for ARARS was submitted to DTSC, ARARs determinations have not been made, nor has a final remedial alternative been selected.

SPECIFIC COMMENTS

1. Comment noted - DON has not at this point indicated its obligations under CERCLA have been fully met.

2. Please refer to general comment response 1

3. Comment noted - DON will revise the RI to more appropriately characterize the "focused" nature of the RI. However, it should be noted that the RI was never intended to serve as a natural resources damages assessment, although several aspects of the investigation completed meet the overall intent of a damages assessment.

4. The process utilized to select and evaluate reference stations is documents in meeting minutes, Agency comments and project work plans, all of which are available to DFG. Revisions to reference station evaluations have been agreed

to by DON as outlined in the Joint Agency Comments dated 5 august 1996, which DFG was a participant.

5. DON is aware of the CERCLA requirements as related to site remediation and restoration. DON's actions are balanced by not only those requirements but the requirements under DOD policy and directives, particularly those which require DON to prepare property for RE-USE.

DON is not prepared to address the need for damages resources assessment at this time. However, as with all environmental activities, DON will consult with participating Agencies as appropriate.

DON can revise the RI report to indicate that DFG was not consulted until March 1996 as this would be a lie (see general comment response 1) and would place contradictory information in the administrative record. DON can indicate that DFG participated on an intermittent basis prior to that point, if DFG so desires.

6. See general response 1. Additionally, DON evaluated all Agency input as to the identification and selection of receptors for this evaluation.

7. As stated in previous environmental investigation reports (Preliminary Assessment, Site Inspection Report), historical discharges are for the most part based on conjecture and a general understanding of the operations of ships and shore facilities.

8. BNI to respond

9. BNI to respond

10. BNI to respond -

11. Comment noted. Additionally, it is comforting to note that DFG does recall participation in this program, contrary to DFG General comment 1 in which it indicates no prior participation in this project. Further, chemical, location and action specific ARARS for site 7 have not been requested from the participating Regulatory Agencies. DON appreciates DFG's explanation of the ARARS process and is aware of its obligations regarding resolution of ARARS.

12. Pleas refer to General Response #1. Additionally, DON is aware of the need for reduction of staff and workforce as the DON is faced with the same dilemma, hence BRAC.....!

13. The manner in which historical information is based on the information itself and the quality of the data. That is, for example, when referring to information

prepared by the CLEAN I contractor, there is relatively high confidence in the fat that a Quality Control program was in place and that the data is of good quality. Second hand or hearsay is naturally used with much less confidence and so forth. DON does not feel it has misapplied or used any historical information inappropriately. Any evidence to the contrary should be immediately brought to the attention of DON.

14. Please refer to response #13.

15. DFG is welcome to review the Administrative Record contained at Southwest Division, Naval Facilities Engineering Command, located in San Diego. DON is certain that DFG will find answers to many of its questions within the Administrative Record for the Long Beach Naval Complex. Additionally, DON feels the current RI Report contains sufficient notification that the findings contained in previous reports and the current RI report are subject to interpretation and change based on new or revised information.

16. Reference to the "background" sample collected in the SI report as a basis for additional action is irrelevant at this point, as the results of the SI indicated that additional investigations were warranted, hence this investigation.

17. Don will gladly provide a copy of the SI report to DFG for their review, upon review DON can discuss the report with DFG.

18. Please see response to response #17 above.

19. Please refer to response #13 and #17 above.

20. DON consulted with all participating agencies during the preparation of the various RI Work plans, including DFG.

21. Comment noted. Efforts to strengthen the RI are the focus of the coming months. In addition, DON is pursuing various avenues of information regarding Los Angeles / Long Beach Harbors.

22. BNI to respond

23. BNI to respond

24. It would be impossible for DON to verify historical discharges that occurred as long as 40 years ago. As previously stated, historical information is used subjectively to develop an investigation that would identify the presence of contaminants from reported discharges. Given the nature of the contaminants in question, DON sees not benefit to dwell on quantifying historical discharges.

25. Comment noted

26. Evaluation of organotin data continues, as well as evaluation of organotin data collected by the Port of Long Beach within the West Basin for its port expansion dredging program. Don continues to consult with participating Agencies as to the actual or potential impacts of contaminants detected.

27. BNI to respond

28. BNI to respond

29. Please refer to General response #1 and Specific response #11.