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REPORT OF THE ICES FOURTH ROUND INTERCALIBRATION FOR TRACE METALS IN SEA WATER

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REPORT OF THE

ICES FOURTH ROUND INTERCALIBRATION

FOR

TRACE METALS IN SEAWATER

by

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ABSTRACT

This document constitutes a final report of the Fourth Round ICES Intercalibration for Trace Metals in Seawater conducted on behalf of the Sub-Group on Contaminant Levels in Seawater and its successor, the Working Group on Marine Chemistry. Forty three laboratories in fifteen countries participated in the experiment and returned analytical data to the organisers by May 1st, 1979. Substantial improvements in both analytical precision and agreement between laboratories are demonstrated by the results. Sufficient participants have adequate analytical capabilities to justify the conduct of the ICES Fifth Round Intercalibration for Trace Metals in Seawater which involves the examination and comparison of commonly-used sampling and sample storage procedures.

INTRODUCTION

A series of intercalibrations, among laboratories in ICES member countries, is being conducted to assess and improve the general capability for trace metal analysis of sea water. The objectives and plans for these intercalibrations are discussed in a recent ICES paper (Bewers *et al.*, 1980). Three intercalibrations involving the distribution of (1) high level standards containing Cr, Fe, Mn, Co, Ni, Cu, Zn, Cd, Pb and Hg (2) sea water and spiked sea water for mercury analysis and (3) two unspiked sea water samples for Cr, Fe, Mn, Co, Ni, Cu, Zn, Cd and Pb analysis have been completed (Jones 1976, Olafsson 1976, 1978, Jones 1977 respectively). After review of these experiments the ICES Sub-group on Contaminant Levels in Seawater proposed the conduct of a further intercalibration to determine analytical precisions for metal analysis of sea water. The detailed design and conduct of this experiment, designated the fourth round intercalibration for trace metals in sea water, was undertaken by the Bedford Institute of Oceanography. Sets of six filtered sea water samples were distributed to participants in acid-washed low density polyethylene bottles in April 1978. Each sample set comprised four (4) replicate sea water samples, one spiked sample and a dummy sample. Sets were distributed by air freight in frozen or acidified form to 63 laboratories in 17 countries (see Appendix I). Sample information provided to participants was restricted to the methods of collection and the salinity range of the sample set. The closing date for receipt of results, originally set for October 31st, 1978 was extended to December 31st, 1978 by which time 41 laboratories had reported analytical results and details of their analytical methodology. A further two returns were received prior to 1 May 1979 when the preliminary report of the intercalibration was distributed to participants and these data have also been included here. This report discusses all these results and draws conclusions concerning the overall and individual laboratory performances whilst maintaining anonymity of the results.

EXPERIMENTAL DESIGN

The experimental design was formulated in consultation with the Applied Statistics and Scientific Computing Branch of the Canadian Department of Fisheries and Environment. The chosen design involves sufficient replication

(4 samples) to enable reliable estimates of precision to be made for each participant. A spiked sample was included in order to estimate low-level spike recovery. The magnitude of each metal spike was determined on the basis of the statistical probability that it could be discerned as different from the replicates by participants with precisions comparable with our own published estimates (Bewers *et al.*, 1976). An additional sample, referred to herein as a 'dummy', was also introduced to the sample set in order to increase the 'blindness' of the experiment. This dummy sample was intended to contain significantly lower metal concentrations than either the spike or the replicates. Sufficient replication in the analysis of replicate samples had to be assured so that both within sample and between sample precisions may be determined. Comparable replication of the spike and dummy sample analyses should permit both an additional check on precision and estimates of spike recovery to be made. Each participant thus received a total of six samples and was asked to analyse each sample in triplicate.

LOGISTICS AND SAMPLE COLLECTION PROCEDURE

The numbers and volumes of frozen and acidified samples required for potential participants were first established through the medium of a questionnaire. Each recipient was also asked to specify the nearest international airport from which samples could be collected. Samples were collected on April 10/11, 1978, from the Canadian Survey Ship *Dawson* using a General Oceanics^{R} rosette equipped with modified 12 litre Niskin^{R} bottles (Bewers *et al.*, 1974). Sea water for replicate sample preparation was collected at 180 metres depth on the Scotian Shelf ($43^{0}53'N$ $62^{0}53'W$) some 100 km offshore. A total of 500 litres of water was pressure filtered from the Niskin samplers, through 0.4 µm Nuclepore^{R} filters, into an acid washed and Super Q^{R} water rinsed polyethylene holding tank. Subsamples were then drawn off from the holding tank into 1 litre and 2 litre acid washed low-density polyethylene bottles. A series of check samples were also collected at intervals during this sub-sampling operation. Subsamples were immediately frozen or acidified (5 ml conc. HCl (Baker-Ultrex) per 2 litres) to fulfill the requirements of all 63 participants.

Two 150 litre samples were also collected at 150 m depth in the Atlantic

Slope Water ($42^0 32'N$, $61^0 24'W$) and similarly filtered into acid washed polyethylene holding tanks. One large sample was subsampled for the provision of dummy samples. The other 150 litre sample was spiked with a previously prepared solution of Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd and Pb (see Table 1) and then homogenized. This sample was then subsampled for the provision of spiked intercalibration samples. The dummy and spike samples were also frozen or acidified to meet the requirements of participants. Each sample was individually marked with a six digit code number and all identification of samples was subsequently based solely on the use of this number.

SAMPLE DISTRIBUTION

Acidified sample sets were packed in wooden crates and dispatched by air freight to the major airports designated by the participants. Prior to the shipment of the samples, the participants were notified by telex or telegram of the impending arrival of their samples.

The frozen samples were shipped in polystyrene-lined wooden crates and packed in dry ice. Prior to shipment of the samples, tests showed the samples packed in this manner would remain frozen for up to 56 hours. Interconnecting flights, set up through the airline shipping agent, were designed to have the samples arrive at their airport of destination within 48 hours. Delivery problems to European and North American laboratories were encountered when the transport of samples necessitated the use of two or more airlines. All participants were notified by telex or telephone of the anticipated time of arrival, flight number and air waybill number to enable the samples to be picked up soon after their arrival at the destination airport.

Each set of frozen and acidified samples was accompanied by two forms. The first tabulated the enclosed sample numbers and described the nature of the samples (eg.; filtered sea water - frozen). The second form was a reply questionnaire requesting information on the date of receipt of the samples and their condition on arrival.

Two crates of frozen samples shipped to U.S. destinations arrived thawed and one set of acidified samples was found to contain a single unacidified sample.

RECEIPT OF RESULTS

Participants (Appendix I) were notified of the closing date for receipt of analytical data (October 31, 1978) which had been agreed at the third meeting of the ICES Sub-Group on Contaminant Levels in Seawater. This closing date was extended to December 31, 1978, by the organizers and every effort has been made to include data received later than this date. Appendix II contains a listing of data returns categorized by element and sample type. All data submitted by May 1st 1979 are included in this appendix and are the subject of the following discussion.

COMMENTS ON ORGANIZATIONAL ASPECTS

The conduct of the experiment demanded the distribution of six 1 l or 2 l seawater samples to over 60 participants and this in turn required the collection, filtration, homogenization, treatment and distribution of approximately 800 l of water. This imposed a number of logistical problems mainly associated with achieving homogeneity whilst avoiding contamination and ensuring the timely and secure shipment of samples to participants. It appears that, except in the cases of zinc and lead, these difficulties were largely surmounted.

The problems associated with sample distribution were particularly pronounced in the case of frozen samples. Nevertheless the ability to make connecting flight arrangements for samples dispatched to European destinations simplified matters and only in the case of two European participants was the condition of the samples on arrival suspect. These two cases involved the use of an intermediary since all samples for French participants were kindly handled by Dr. Chaussepied of CNEXO. The major difficulties arose with samples destined for the United States. No arrangements for connecting flights at U.S. airports were possible and as a result some sets of frozen samples arrived at U.S. destinations partially thawed despite the fact that the shipping crates were packed with enough dry ice to ensure the samples remained frozen for a minimum of 56 hours. European airfreight organization seems somewhat better than comparable airfreight operations in the United States and this was

particularly exemplified by one European airline that took especial care to store sample sets in its own freezer at London (Heathrow) when flight connections were missed. Overall it is remarkable that sample integrity was generally maintained during transshipment but this is principally due to the time and trouble taken in establishing reliable freight arrangements.

The proportion of sample recipients who actually returned analytical data was disappointingly low. Sixty-two complete sets of samples were distributed but only 43 data sets were returned to the organizing laboratory. Several of these returns did not comply with the instructions to participants which specified that the results of three individual analyses of each sample should be reported. Triplicate analysis were not possible in all cases because sample volumes were insufficient to meet participants needs. However in some cases where adequate volumes were provided, participants did not return data in the correct format. There was also considerable tardiness in the return of data and the preparation of this report has been deliberately delayed to include the results of as many participants as possible.

DISCUSSION OF RESULTS

General Observations

The composite mean concentration and standard deviation of the replicate, dummy and spike samples for all elements analyzed by a large number of laboratories are shown in Table 2. Only outliers as determined by Chauvenet's criterion have been excluded. The ranges of reported values are quite large although both the means and standard deviations are smaller than in some previous intercalibrations (Brewer and Spencer, 1970; Jones, 1977). Because of the large ranges reported, it is difficult to make any firm conclusions based on these results. However, the following observations can be made. Results for frozen replicate and dummy samples are generally lower than corresponding results for acidified samples. As expected the reported average concentrations of all elements, except zinc, in the dummy are lower than in the replicate. Previous work, (Bewers *et al.*, 1976) has shown that metal concentrations in the Atlantic Slope water (dummy) are lower than on the Scotian Shelf (replicate). All the means are higher than commonly accepted metal concentrations in the waters of the

open ocean (Bender *et al.*, 1977; Boyle *et al.*, 1976, 1977; Bruland *et al.*, 1978; Patterson *et al.*, 1976; Sclater *et al.*, 1976). Zinc and lead are the most elevated. For logistical reasons we were unable to collect and process the samples with the care needed for the collection of uncontaminated lead samples (Patterson *et al.*, 1976). It is therefore not surprising that the lead levels are elevated. Zinc is also an ubiquitous contaminant, particularly of the linear polyethylene from which the sample homogenization tanks were constructed. Spike recoveries were generally in the 60 to 80% range with better recoveries for acidified samples. Frozen iron samples gave particularly poor spike recoveries.

Several elements (As, Cr, Co, Hg and V) were analysed by a small number of laboratories. These results, which are not amenable to treatment in the same manner as the other elements, are presented individually in Table 3. The intercalibration samples were not preserved in a way thought suitable for mercury analysis and all participants were advised accordingly at the start of the experiment.

One of the principal objectives of the intercalibration was to determine analytical precisions for each participant. These have been determined for all laboratories that have provided us with two or more independent analyses of each of the replicate samples or given us other information suitable for this purpose. The precisions are presented in Appendix III together with other general details of the analyses for each element. If we subset, for each element in Table 2, those laboratories with better analytical precisions we observe a marked improvement in the comparability of results (see Table 4). The limiting precision criterion is approximately equal to one third of the currently established concentration for the metals in shelf waters with the obvious exceptions of lead and zinc for which arbitrary choices have been made based upon the intercalibration returns. As can be seen in Table 4 the average replicate and dummy sample values are lower than those in Table 2 and closer to real environmental levels for all elements except lead and zinc. The replicate standard deviations are generally smaller reflecting improved agreement between high precision participants. In most cases the dummy samples give lower results than the replicates. As in the case of the total data set, lower levels and lower spike recoveries are generally observed for frozen samples. Such differences between acidified and frozen replicates are significant at the 95% level of confidence in all cases except manganese and nickel (Table 5). Lower concentrations in frozen samples could

result from poorer preservation by this technique or contamination of acidified samples by the acid or by increased leaching of the storage bottles at low pH. Generally inferior spike recoveries may, however, indicate poorer preservation of frozen samples.

We have also tested the differences between the two major methods of analysis as applied to the replicate samples. This could only be done for the four metals most commonly analysed by electrochemical and atomic absorption procedures namely, cadmium, copper, lead and zinc. There exist significant (95%) differences between these two techniques in the case of cadmium and lead but insignificant differences for copper and zinc (Table 5). Since the cadmium results were close to levels found in ambient seawater some caution should be exercised in directly equating cadmium analyses by these different techniques.

Individual Laboratory Performances

The data from all laboratories that returned at least two determinations of each sample are amenable to more extensive statistical examination. For each laboratory it is possible to determine analytical precision for each metal analysed, test for variability in the four replicate samples, test for differences between the dummy and replicate or dummy and spike, and assess the extent to which spike recovery is quantitative. These tests can be used in conjunction with consensus values for concentrations in the various samples to investigate the performance of the participants.

It is first necessary to establish the homogeneity of the samples. This is important for two reasons. First we need to know at what level of analytical precision the participants should not have been able to see differences between the replicate samples and secondly to what extent could differences in reported concentrations simply reflect inhomogeneity. During the preparation of the replicate samples, ten additional samples were drawn at intervals and subsequently analysed for these purposes. The results of a statistical analysis of these data are shown in Table 6. The first row lists the analytical precision (S_{anal}) at which inhomogeneity should not be detected at the 95% confidence level. Laboratories with S_{anal} greater than these values should not be able to see differences between the replicate samples. The second row lists that part of the overall standard deviation for the ten samples analysed in duplicate that is due to differences between samples rather than analytical imprecision. The possibility

that a laboratory received a contaminated sample is unavoidable. For this reason individual replicate sample analyses that were noticeably higher than the average of the remaining three were excluded from the statistical treatment. In cases where this occurred, the participant's data (Appendix II) are flagged to identify the excluded replicate.

The statistical analyses for each element, acidified or frozen, are summarized in Appendix III. The first tabulation for each element lists the arithmetic mean and standard deviation for the analyses of the four replicates; the analytical standard deviation (S_{anal}) based on the precision with which individual replicate samples were analysed; a test for the significance of any difference between the four replicate analyses (95% significance level); the arithmetic mean concentration of the dummy sample; and the difference between the replicate and the dummy. The second tabulation lists the arithmetic means for the spike and the dummy samples; the difference between the two; the percent spike recovery; the significance of the difference between the spike and dummy samples; and the significance of the difference between the reported spike and the nominal spike originally added to the sample. Reported mean values that do not exceed 3 x S_{anal} (definition of detection limit given by Strickland and Parsons, 1965) have been indicated by asterisks but not excluded from subsequent calculations.

Cadmium

Cadmium analyses of frozen samples show a very narrow range of reported replicate means with only three exceptions. None of the results from the high precision laboratories differ from the mean value of 0.047 µg ℓ^{-1} by more than 40%. Our homogeneity check indicates that laboratories with S_{anal} >0.016 µg ℓ^{-1} should not see differences between the replicates. Most of the participants have better precision and there may be inhomogeneity problems at these low levels (S_{anal} 0.002 - 0.008 µg ℓ^{-1}). These results suggest that the samples are homogeneous for S_{anal} >0.010 µg ℓ^{-1}. Only one laboratory (#8) with S_{anal} >0.010 µg ℓ^{-1} sees a significant difference between replicates. The dummy sample is obviously indistinguishable from the replicate as 7 participants report higher values and 6 lower. All but two of the laboratories see a significant (95%) difference between the spike and the dummy samples but the recoveries are rather variable. However, seven of the ten high precision

laboratories do report spike recoveries between 50 and 80%.

Cadmium analysis of acidified samples indicates that the replicates are homogeneous for laboratories with S_{anal} greater than 0.012 µg ℓ^{-1}. The range of means reported for the replicate is considerably greater than that reported for frozen samples. A consensus value of 0.065 ± 0.014 µg ℓ^{-1} for the high precision laboratories results if #38 and #44 are omitted. Both of these laboratories have means less than half the consensus value and very low spike recoveries. All but one of the four laboratories with poorer precision report noticeably higher means than those of the high precision laboratories. No distinction is seen between the Cd levels in the dummy and replicate samples nor is there any agreement on the Cd level of the dummy. All but two participants observe a significant difference between the spike and dummy with 8 of the 11 remaining high precision laboratories recovering 55 - 100% of the spike.

Copper

The homogeneity test shows that the respondents should not see differences in the copper concentrations of the replicate samples if their analytical precision is greater than 0.031 µg ℓ^{-1}. Four laboratories analyzing frozen samples with S_{anal} >0.031 µg ℓ^{-1} do see differences with two of these (#8 and #13) in the high precision subset. The results of the laboratories that do not see differences would suggest that the samples may be homogeneous for precisions >0.02 µg ℓ^{-1}. All high precision laboratories except #8 and #13 report replicate results within 50% of the mean value of 0.19 µg ℓ^{-1} in Table 4. With these two laboratories excluded the replicate mean for high precision laboratories becomes 0.162 ± 0.060 µg ℓ^{-1}. Ten of the fifteen respondents find that the copper content of the dummy is less than that of the replicate with a dummy mean of 0.144 ± 0.066 for nine high precision laboratories (#4 has been excluded as well as #8 and #13). All participants but one saw the difference between the spike and dummy with spike recoveries of 43 - 78% for the high precision laboratories.

Seven of the laboratories analysing acidified samples for copper see differences between replicate samples but only two of these (#2 and #46) are high precision laboratories. With the exception of one (#46) the replicate mean for high precision laboratories is 0.255 ± 0.065 µg ℓ^{-1}. All five of these high precision laboratories see the dummy as less than the replicate with good

agreement on the dummy mean (0.176 ± 0.029 µg ℓ^{-1}). The high precision laboratories all find the spike concentration significantly higher than the dummy with recoveries (except for #46) of 61 - 92%. Four of the five have recoveries between 83 and 92%. The remaining lower precision laboratories all report higher mean concentrations and have rather erratic spike recoveries although all but two are significant.

Manganese

Although our homogeneity test indicates that the manganese content of the replicate samples should be very constant (insignificant differences for S_{anal} >0.009 µg ℓ^{-1}) all the laboratories analysing manganese in frozen samples see differences but none of those analysing acidified samples do. This may be due to differences in preservation techniques. MnO_2 may be precipitating in the frozen samples resulting in some inhomogeneity. Three of the four high precision laboratories analysing frozen samples for Mn, plus #3 and #34 whose precision could not be tested, agree on a replicate mean of 0.123 ± 0.038 µg ℓ^{-1}. These same laboratories found the concentration of the dummy to be less than that of the replicate with a mean dummy concentration of 0.075 ± 0.042 µg ℓ^{-1}. Spike recoveries were also fairly consistent at between 58 and 72%. The remaining laboratory reported much higher mean concentrations but better spike recovery.

Two of the three high precision laboratories analysing acidified samples for manganese agree on a replicate mean of 0.150 ± 0.026 µg ℓ^{-1}. They also agree on mean dummy concentrations of 0.084 ± 0.019 µg ℓ^{-1} and spike recovery of 79%. The other high precision laboratories and the only other participant reporting usable data find higher concentrations and spike recoveries. There is remarkably good agreement between five frozen and two acidified sample analysts on both dummy and replicate concentrations.

Iron

Results of iron analyses of frozen samples do not show agreement on the concentration of the replicate samples, with two high precision laboratories reporting means of ~0.5 µg ℓ^{-1} and three of ~1.3 µg ℓ^{-1}. The remaining two participants have poor precision and much higher results. Only one of the

laboratories with poorer precision than the cutoff for homogeneity sees a significant difference between the replicates. There is no better agreement on the concentration of the dummy sample, not even whether or not the dummy is smaller than the replicate. Spike recoveries are also erratic varying between 15 and 76%. Three of the participants did not even see a significant difference between the spike and dummy.

Three of four high precision laboratories analysing iron in acidified samples agree very closely on a replicate mean of 1.02 ± 0.27 µg ℓ^{-1}. Two of the lower precision laboratories also report quite similar replicate means. The remaining two participants report means 2.5 and 4 times the consensus value. Two of the seven laboratories see replicate inhomogeneity when the homogeneity test indicated that they should not. All but one laboratory (#38) found that the dummy was lower than the replicate and that the spike was significantly greater than the dummy. The four high precision laboratories plus #1 report a dummy concentration of 0.81 ± 0.27 µg ℓ^{-1} and spike recoveries greater than 62%.

Nickel

Results of the replicate analyses of frozen samples for nickel are clustered around two means; 4 laboratories at 0.176 ± 0.040 µg ℓ^{-1} and 3 at 0.425 ± 0.078 µg ℓ^{-1}. High precision laboratories are included in both groups although two of the three plus #34 are in the group with lower concentrations. Most agree that the dummy is lower than the replicate but not on the concentrations. All six laboratories find that the spike sample concentration is significantly greater than the dummy with five of them getting spike recoveries greater than 63%.

Three high precision laboratories analysing acidified samples also give two estimates of the replicate mean (1 at 0.37 µg ℓ^{-1} and two at 0.19 ± 0.03 µg ℓ^{-1}) that are very similar to the means of frozen samples. All three find that the sample is homogeneous at their precision levels. There is better agreement on the dummy, at least they all agree it is less than the replicate. Two of the three give spike recoveries of 71 and 90%, the third is rather low but all show the spike to be significantly higher than the dummy. The fourth acidified laboratory has poorer precision and reports rather higher concentrations.

Combining acidified and frozen high precision results plus those of #34 we find five of seven laboratories with a replicate mean of 0.176 ± 0.036 µg ℓ^{-1} and a dummy mean of 0.149 ± 0.060 µg ℓ^{-1}. Three of these have spike recoveries of 66, 70 and 73%.

Lead and Zinc

Very few conclusions can be reached after examination of the lead and zinc returns because of the obviously elevated levels of both elements due to contamination.

In looking at the frozen lead data we do have the benefit of a reference value (from Dr. C. C. Patterson, CALTECH) of 0.30 µg ℓ^{-1} for the replicate. Three of the high precision laboratories plus #34 found similar concentrations. Three of these four also report similar concentrations for the dummy (0.12 ±0.02 µg ℓ^{-1}). The remaining laboratories analysing frozen samples and most of those analysing acidified samples report replicate means between 0.4 and 0.6 µg ℓ^{-1}. Most participants agree that the dummy was less than the replicate but spike recoveries are erratic; some even greatly negative.

Even less can be said about the zinc results because contamination problems were equally severe, the replicate was found to be inhomogeneous by most laboratories and the spike was not seen. About the only point of agreement is that the concentration of the dummy is greater than that of the replicate.

CONCLUSIONS

The results of this intercalibration demonstrate a substantial improvement in the agreement between laboratories compared with previous intercalibrations of this type (Brewer and Spencer, 1970; Jones, 1977). In this respect the experiment was largely successful although the obvious contamination of intercalibration samples with zinc and lead makes the results for these metals of limited value. The concentrations of metals in the distributed samples were, with the exceptions of zinc and lead, comparable with those in typical continental shelf waters. The results of the intercalibration can therefore be used to assess the capabilities of the participants in respect to the analysis of shelf and nearshore waters. Their ability to analyse open ocean samples should

be assessed through further intercalibrations using samples containing metal levels more closely approaching those in the deep ocean basins as has been done in the case of lead (Participants of the lead in seawater workshop 1974).

This experiment has also shown that considerable improvements in analytical precisions for metals in seawater have been made. Such improvements impose greater restrictions upon the degree of sample inhomogeneity that can be tolerated in future similar intercalibrations. The 'state of the art' of trace metal analyses in seawater has obviously improved sufficiently to warrant greater efforts to ensure that replicate intercalibration samples are homogeneous within the uncertainties imposed by the better analytical precisions now being obtained. Different approaches to the preparation of replicate seawater samples should be considered in order to avoid sample contamination during homogenization procedures.

Significantly lower values for all metals except manganese and nickel resulted from the analysis of frozen, as opposed to acidified, samples. Spike recoveries from frozen samples were also generally lower especially in the cases of iron and manganese. Closer examination of such differences would obviously be warranted in order to determine the better procedure for sample preservation. Only in the case of cadmium are there significant differences between the results of electrochemical and atomic absorption methods applied to samples containing near-ambient metal concentrations. Some caution should therefore be exercised in directly equating the results of electrochemical and spectroscopic analyses for cadmium in seawater.

A major problem in the interpretation of these intercalibration data arises because the actual concentrations of the metals in the distributed samples cannot be established. Although a consensus among high-precision laboratories may suggest that this consensus reflects the true value, the only authoritative way of solving this difficulty is to obtain reliable reference values for the samples. This condition is only met in the case of lead in this intercalibration. A frozen replicate sample was analysed for lead by Dr. C.C. Patterson of the California Institute of Technology by isotope dilution mass spectrometry. Since widespread international credence is given to Dr. Patterson's lead analyses, we believe that we can accept his value of $0.30 \mu g l^{-1}$ as a reference value for the frozen replicate samples. This value may not apply to the acidified samples since they may be contaminated by the acid or

leaching of the storage bottles at low pH. It would be most desirable to have similar reference values for the other metals but this is not yet possible. As a result the main criteria by which participant performance can be gauged are precision and spike recovery although the most precise laboratories may not be the most accurate. The use of spiked samples to determine relative accuracy of analytical procedures in such circumstances can be valuable. However as analytical precisions have been substantially improved, efforts should also be made to reduce the levels of such spikes to values comparable with ambient seawater concentrations.

Finally, the results of the intercalibration adequately demonstrate that sufficient participants have both high precision and satisfactory mutual agreement to justify closer attention to an examination of routinely-used sampling and sample storage procedures as proposed to ICES by the Working Groups on Marine Chemistry and Pollution Baselines and Monitoring in the North Atlantic and discussed in a paper submitted to the 1978 ICES Statutory Meeting . (See Cooperative Research Report, No.97, pp. 39-43.)

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REFERENCES

BENDER, M.L., G.P. KLINKHAMMER and D.W. SPENCER. 1977. Manganese in seawater and the marine manganese balance. *Deep Sea Research* 24: 799-812.

BEWERS, J.M., W.W. HALL and I.D. MACAULAY. 1974. A modified Niskin bottle for trace element sample collection. BIO Report BI-R-74-2.

BEWERS, J.M., B. SUNDBY and P.A. YEATS. 1976. The distribution of trace metals in the western North Atlantic off Nova Scotia. *Geochim. Cosmochim Acta* 40: 687-696.

BEWERS, J.M., G. TOPPING and H.L. WINDOM. 1980. Status and plans regarding ICES intercalibrations for trace metals in sea water. ICES Coop. Res.Rep., No.97:39-43.

BOYLE, E.A., F. SCLATER and J.M. EDMOND. 1976. On the marine geochemistry of cadmium. *Nature* 263: 42-44.

BOYLE, E.A., F.R. SCLATER and J.M. EDMOND. 1977. The distribution of dissolved copper in the Pacific. *Earth and Planetary Sciences Letters* 37: 38-54.

BREWER, P.G. and D.W. SPENCER. 1970. Trace element intercalibration study. Woods Hole Oceanographic Institution. Technical Report #70-62.

BRULAND, K.W., G.A. KNAUER and J.H. MARTIN. 1978. Zinc in northeast Pacific water. *Nature* 271: 741-743.

JONES, P.G.W. 1976. An ICES intercalibration exercise for trace metal standard solutions. ICES CM 1976/E:15 (9 pp).

JONES, P.G.W. 1977. A preliminary report on the ICES intercalibration of sea water samples for the analysis of trace metals. ICES CM 1977/E:16 (13 pp).

OLAFSSON, J. 1976. Report on the ICES international intercalibration on mercury in sea water. ICES CM 1976/E:49 (11 pp).

OLAFSSON, J. 1978. Report on the ICES international intercalibration on mercury in sea water. *Marine Chemistry* 6: 87-95.

PARTICIPANTS IN THE LEAD IN SEA WATER WORKSHOP. 1974. Interlaboratory lead analyses of standardized samples of sea water. *Marine Chemistry* 2: 69-84.

PATTERSON, C., D. SETTLE and B. GLOVER. 1976. Analysis of lead in polluted coastal sea water. *Marine Chemistry* 4: 305-319.

SCLATER, F.R., E. BOYLE and J.M. EDMOND. 1976. On the marine geochemistry of nickel. *Earth and Planetary Science Letters* 31: 119-128.

STRICKLAND, J.D.M. and T.R. PARSONS. 1965. A manual of sea water analysis. *Fisheries Research Board of Canada Bulletin* 125 (203 pp).

TABLE 1

METAL ADDITIONS TO SPIKED SAMPLE

Element	Volume (mℓ) of 1 mg ℓ^{-1} stock solution* added to 150 ℓ	Corresponding concentration of spike µg ℓ^{-1}
Cr	150	1.0
Fe	510	3.4
Mn	54	0.36
Co	75	0.50
Ni	120	0.80
Cu	315	2.1
Zn	300	2.0
Pb	30	0.2
Cd	32	0.21

* Stock solution prepared 1000 ppm BDH AAS metal solution.

TABLE 2

SUMMARY OF RESULTS FOR ALL LABORATORIES EXCLUDING OUTLIERS ($\mu g \ell^{-1}$)

	Cadmium		Copper		Iron		Lead		Manganese		Nickel		Zinc	
	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen
Number of labs*	20	16	19	17	7	6	18	14	4	6	4	8	16	15
replicate $\bar{x}$	0.097	0.068	0.92	0.40	1.76	1.81	0.79	0.64	0.23	0.18	0.42	0.35	6.55	3.69
s	0.084	0.040	0.72	0.46	1.23	2.02	0.55	0.61	0.09	0.16	0.34	0.23	1.97	1.42
dummy $\bar{x}$	0.100	0.055	0.71	0.48	1.17	1.57	0.53	0.33	0.18	0.20	0.46	0.33	9.58	6.52
s	0.086	0.021	0.55	0.59	0.67	1.45	0.55	0.22	0.11	0.19	0.52	0.34	2.92	2.66
spike $\bar{x}$	0.244	0.186	2.58	1.67	3.79	3.07	0.60	0.41	0.52	0.39	1.11	0.94	8.86	5.59
s	0.094	0.055	1.34	0.52	1.72	1.48	0.47	0.19	0.17	0.21	0.76	0.56	2.42	2.31
% spike recovery	68	62	89	57	77	44	36	38	94	53	81	76	-	-

* Outliers excluded on the basis of Chauvenet's criterion.

TABLE 3

SUMMARY OF RESULTS FOR INFREQUENTLY ANALYSED ELEMENTS ($\mu g\ \ell^{-1}$)

	Arsenic		Chromium		Cobalt		Mercury		Vanadium	
	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen
Number of labs	0	1	3	4	3	3	2	0	0	1
Replicate $\bar{x}$		2.50	0.27 1.59 <0.5	0.52 <0.5 <0.3 <5	0.5 <0.5 <0.02	0.19 2.3 <0.5	0.030 0.026			<5
Analytical precision		0.10	0.067 0.59	0.33	0.29	0.011 1.30	0.006 0.004			
Dummy $\bar{x}$		2.26	0.16 1.41 <0.5	0.37 <0.5 <0.3 <5	0.4 <0.5 <0.02	0.19 2.0 <0.5	0.033 0.033			<5
Spike $\bar{x}$		1.97	1.0 1.8 <0.5	0.76 0.5 1.45 <5	0.9 <0.5 0.33	0.64 2.7 <0.5	0.033 0.048			<5
Nominal spike		0.0	1.00	1.00	0.50	0.50	0.0			0.0

TABLE 4

SUMMARY OF RESULTS FOR HIGH PRECISION LABORATORIES ($\mu g\ \ell^{-1}$)

	Cadmium		Copper		Iron		Lead		Manganese		Nickel		Zinc	
	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen	acidified	frozen
Required analytical precision*	0.015	0.015	0.06	0.06	0.25	0.25	0.08	0.08	0.05	0.05	0.06	0.06	0.8	0.8
Number of labs	13	10	6	12	4	5	6	9	3	4	3	3	7	11
replicate $\bar{x}$	0.059	0.047	0.33	0.19	1.42	1.01	0.45	0.41	0.20	0.23	0.25	0.22	5.68	3.95
s	0.020	0.011	0.20	0.10	0.80	0.50	0.08	0.16	0.09	0.18	0.10	0.11	1.23	1.30
dummy $\bar{x}$	0.063	0.053	0.29	0.22	0.88	1.04	0.27	0.33	0.13	0.19	0.20	0.21	9.02	6.84
s	0.020	0.012	0.27	0.17	0.27	0.70	0.07	0.20	0.09	0.20	0.07	0.15	2.37	1.97
spike $\bar{x}$	0.207	0.195	1.84	1.50	3.71	2.51	0.39	0.40	0.48	0.45	0.74	0.86	8.21	5.78
s	0.076	0.062	0.37	0.32	1.03	0.66	0.09	0.16	0.19	0.24	0.25	0.31	1.36	1.82
% spike recovery	68	67	74	61	83	43	62	35	97	72	68	82	-	-

* analytical precision for repeated analyses of each replicate subsample <~20% of the replicate mean.

TABLE 5

Comparison of sample storage and methodological differences based upon high-precision results

Element	FROZEN SAMPLES				ACIDIFIED SAMPLES				DIFFERENCE		
	Mean	SD	N_r	N_p	Mean	SD	N_r	N_p	Diff	T	Sig
Cd	0.046	0.016	109	10	0.061	0.024	151	13	-0.015	-6.05	Sig
Cu	0.205	0.158	130	12	0.335	0.199	74	6	-0.130	-4.81	Sig
Fe	0.940	0.516	51	5	1.318	0.673	49	4	-0.378	-3.16	Sig
Mn	0.246	0.178	40	4	0.193	0.079	40	3	0.053	1.71	NS
Ni	0.226	0.118	30	3	0.235	0.088	35	3	-0.009	-0.35	NS
Pb	0.383	0.164	104	9	0.447	0.102	77	6	-0.064	-3.24	Sig
Zn	3.918	1.418	122	11	5.676	1.578	78	7	-1.758	-8.18	Sig

Element	ATOMIC ABSORPTION				ELECTROCHEMISTRY				DIFFERENCE		
	Mean	SD	N_r	N_p	Mean	SD	N_r	N_p	Diff	T	Sig
Cd	0.056	0.021	214	19	0.048	0.026	46	4	0.008	2.17	Sig
Cu	0.258	0.191	160	15	0.230	0.159	44	3	0.029	0.92	NS
Pb	0.446	0.155	112	10	0.352	0.101	69	5	0.093	4.91	Sig
Zn	4.601	1.202	129	12	4.797	2.574	59	5	-0.195	-0.56	NS

N_r is the number of individual analyses

N_p is the number of laboratories from which data are drawn

NB Mean values will differ from those given in Table 4 since the number of individual analyses per laboratory varies.

TABLE 6

Statistical analysis of homogeneity check samples

	Mn $\mu g l^{-1}$	Fe $\mu g l^{-1}$	Ni $\mu g l^{-1}$	Cu $\mu g l^{-1}$	Zn $\mu g l^{-1}$	Cd $\mu g l^{-1}$	Pb $\mu g l^{-1}$
S_{anal} cutoff for replicate homogeneity	0.009	0.16	0.011	0.031	1.43	0.016	0.056
Standard deviation of sample differences	0.010	0.18	0.011	0.035	1.68	0.017	0.032 (I)

(I) indicates that sample variance is negative i.e. analytical variance is much larger than sample inhomogeneity

APPENDIX I

ICES 4TH ROUND INTERCALIBRATION

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* signifies laboratories from which analytical data were received.

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ARSENIC

FROZEN

LABORATORY 15 ELEMENT ARSENIC FROZEN LABORATORY 15
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.973	.081	3	2.01	2.03	1.88	
DUMMY	2.263	.067	3	2.19	2.28	2.32	
R1	2.693	.045	3	2.69	2.65	2.74	
R2	2.390	.101	3	2.41	2.28	2.48	
R3	2.367	.081	3	2.38	2.44	2.28	
R4	2.550	.151	3	2.53	2.41	2.71	

CADMIUM

ACIDIFIED

LABORATORY 1 ELEMENT CADMIUM ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.139	.036	3	.120	.181	.116	
DUMMY	.073	.006	3	0.07	0.07	0.08	
R1	.120	.030	3	0.15	0.12	.091	
R2	.062	.026	2	0.08	.043		
R3	.058	.006	3	.054	.055	.065	
R4	.044	.003	2	.046	.042		

LABORATORY 2 ELEMENT CADMIUM ACIDIFIED LABORATORY 2
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.273	.026	4	0.26	0.25	0.27	0.31
DUMMY	.083	.022	4	.087	.058	.077	.110
R1	.090	.015	4	.092	.089	.108	.072
R2	.088	.008	4	.098	.078	.089	.087
R3	.084	.004	4	.082	.086	.087	.079
R4	.078	.016	4	.072	.060	.096	.085

LABORATORY 7 ELEMENT CADMIUM ACIDIFIED LABORATORY 7
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.280	.014	2	0.29	0.27		
DUMMY	.125	.007	2	0.12	0.13		
R1	.108	.046	2	.075	0.14		
R2	.080	.042	2	0.11	0.05		
R3	.088	.011	2	0.08	.095		
R4	.065	.021	2	0.09	0.05		

CADMIUM ACIDIFIED (CONTINUED)

LABORATORY 24 ELEMENT CADMIUM ACIDIFIED LABORATORY 24
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.250	.017	3	0.24	0.24	0.27	
DUMMY	.080	.014	2	0.09	0.07		
R1	.065	.007	2	0.07	0.06		
R2	.065	.021	2	0.05	0.08		
R3	.065	.007	2	0.06	0.07		
R4	.070	.021	1	0.07			

LABORATORY 25 ELEMENT CADMIUM ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.500	0.000	3	0.5	0.5	0.5	
DUMMY	.433	.058	3	0.4	0.4	0.5	
R1	.467	.058	3	0.5	0.5	0.4	
R2	.333	.115	3	0.4	0.4	0.2	
R3	.367	.153	3	0.4	0.2	0.5	
R4	.400	.000	3	0.4	0.4	0.4	

LABORATORY 26 ELEMENT CADMIUM ACIDIFIED LABORATORY 26
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.198	.013	4	0.18	0.20	0.20	0.21
DUMMY	.030	.000	4	0.03	0.03	0.03	0.03
R1	.043	.015	3	0.06	0.03	0.04	
R2	.033	.012	3	0.04	0.04	0.02	
R3	.043	.015	3	0.06	0.04	0.03	
R4	.038	.013	4	0.05	0.04	0.04	0.02

LABORATORY 27 ELEMENT CADMIUM ACIDIFIED LABORATORY 27
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				.32	.28	.21	.26
DUMMY				<.08	<.08	<.08	<.08
R1				<.08	<.08	<.08	<.08
R2				<.08	<.08	<.08	<.08
R3				<.08	<.08	<.08	<.08
R4				<.08	<.08	<.08	<.08

LABORATORY 33 ELEMENT CADMIUM ACIDIFIED LABORATORY 33
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.332	.002	3				
DUMMY	.082	.001	4				
R1	.079	.002	4				
R2	.074	.002	4				
R3	.083	.005	4				
R4	.083	.003	4				

CADMIUM ACIDIFIED (CONTINUED)

LABORATORY 38 ELEMENT CADMIUM ACIDIFIED LABORATORY 38
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.073	.012	3	0.06	0.08	0.08	
DUMMY	.067	.025	3	0.04	0.07	0.09	
R1	.010	0.000	3	0.01	0.01	0.01	
R2	.060	.020	3	0.04	0.06	0.08	
R3	.010	0.000	3	0.01	0.01	0.01	
R4	.160	.030	3	0.13	0.19	0.16	

LABORATORY 42 ELEMENT CADMIUM ACIDIFIED LABORATORY 42
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.310	.060	3				
DUMMY	.100	.030	3				
R1	.240	.030	3				
R2	.060	.010	3				
R3	.230	.050	3				
R4	.180	.010	3				

LABORATORY 44 ELEMENT CADMIUM ACIDIFIED LABORATORY 44
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.080	.010	3	0.08	0.09	0.07	
DUMMY	.033	.015	3	0.05	0.02	0.03	
R1	.020	0.000	3	0.02	0.02	0.02	
R2	.028	.010	3	.025	.020	0.04	
R3	.020	0.000	3	0.02	0.02	0.02	
R4	.023	.006	3	0.02	0.03	0.02	

LABORATORY 46 ELEMENT CADMIUM ACIDIFIED LABORATORY 46
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.180	.010	3	0.17	0.18	0.19	
DUMMY	.040	0.000	3	0.04	0.04	0.04	
R1	.063	.006	3	0.06	0.06	0.07	
R2	.077	.021	3	0.06	0.07	0.10	
R3	.047	.006	3	0.05	0.05	0.04	
R4	.050	.000	3	0.05	0.05	0.05	

LABORATORY 47 ELEMENT CADMIUM ACIDIFIED LABORATORY 47
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.223	.006	3	0.23	0.22	0.22	
DUMMY	.047	.006	3	0.05	0.05	0.04	
R1	.037	.006	3	0.03	0.04	0.04	
R2	.093	.006	3	0.09	0.09	0.10	
R3	.060	.010	3	0.07	0.06	0.05	
R4	.050	.000	3	0.05	0.05	0.05	

CADMIUM ACIDIFIED (CONTINUED)

LABORATORY 49 ELEMENT CADMIUM ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.2	<0.2	<0.2	
DUMMY				<0.2	<0.2	<0.2	
R1				<0.2	<0.2	<0.2	
R2				<0.2	<0.2	<0.2	
R3				<0.2	<0.2	<0.2	
R4				<0.2	<0.2	<0.2	

LABORATORY 51 ELEMENT CADMIUM ACIDIFIED LABORATORY 51
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.230	.026	3	0.24	0.25	0.20	
DUMMY	.067	.006	3	0.07	0.07	0.06	
R1	.070	.010	3	0.06	0.08	0.07	
R2	.080	0.000	3	0.08	0.08	0.08	
R3	.067	.006	3	0.07	0.07	0.06	
R4	.077	.006	3	0.08	0.07	0.08	

LABORATORY 52 ELEMENT CADMIUM ACIDIFIED LABORATORY 52
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.273	.747	3	2.56	4.05	3.21	
DUMMY	1.420	.422	3	1.79	1.51	0.96	
R1	2.090	1.048	3	3.30	1.47	1.50	
R2	1.593	.107	3	1.50	1.57	1.71	
R3	1.020	.085	2	1.08	0.96		
R4	1.120	.010	3	1.12	1.13	1.11	

LABORATORY 53 ELEMENT CADMIUM ACIDIFIED LABORATORY 53
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.225	.007	2	0.23	0.22		
DUMMY	.065	.007	2	0.07	0.06		
R1	.070	0.000	2	0.07	0.07		
R2	.055	.007	2	0.05	0.06		
R3	.065	.007	2	0.07	0.06		
R4	.070	0.000	2	0.07	0.07		

LABORATORY 54 ELEMENT CADMIUM ACIDIFIED LABORATORY 54
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.237	.015	3	0.24	0.22	0.25	
DUMMY	.103	.015	3	0.12	0.10	0.09	
R1	.323	.025	3	0.35	0.30	0.32	
R2	.140	.036	3	0.15	0.10	0.17	
R3	.100	.020	3	0.12	0.10	0.08	
R4	.090	.017	3	0.10	0.10	0.07	

CADMIUM ACIDIFIED (CONTINUED)

LABORATORY 58 ELEMENT CADMIUM ACIDIFIED LABORATORY 58
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.26	0.26	0.26	
DUMMY				0.13	0.13	0.26	
R1				<0.1	<0.1	<0.1	
R2				<0.1	<0.1	<0.1	
R3				<0.1	<0.1	<0.1	
R4				<0.1	<0.1	<0.1	

LABORATORY 61 ELEMENT CADMIUM ACIDIFIED LABORATORY 61
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.35			
DUMMY				0.15			
R1				0.14			
R2				0.18			
R3				0.15			
R4				0.14			

LABORATORY 62 ELEMENT CADMIUM ACIDIFIED LABORATORY 62
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.290	.017	3	0.28	0.31	0.28	
DUMMY	.060	.000	3	0.06	0.06	0.06	
R1	.060	.000	3	0.06	0.06	0.06	
R2	.080	0.000	3	0.08	0.08	0.08	
R3	.100	.000	3	0.10	0.10	0.10	
R4	.090	0.000	3	0.09	0.09	0.09	

LABORATORY 63 ELEMENT CADMIUM ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.203	.022	4	0.23	0.21	0.18	0.19
DUMMY	.088	.029	4	0.11	0.11	0.05	0.08
R1	.065	.010	4	0.07	0.05	0.07	0.07
R2	.058	.010	4	0.05	0.05	0.07	0.06
R3	.053	.010	4	0.05	0.04	0.06	0.06
R4	.053	.013	4	0.04	0.07	0.05	0.05

CADMIUM

FROZEN

LABORATORY 3 ELEMENT CADMIUM FROZEN LABORATORY 3
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.131	.018	2	.118	.143		
DUMMY	.043	.009	3	.054	.038	.038	
R1	.073	.001	2	.074	.072		
R2	.061	.003	4	.063	.064	.059	.059
R3	.042	.003	3	.044	.043	.039	
R4	.036	.004	4	.040	.031	.035	.039

LABORATORY 4 ELEMENT CADMIUM FROZEN LABORATORY 4
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.165	.024	4	0.13	0.18	0.18	0.17
DUMMY	.043	.010	4	0.05	0.05	0.03	0.04
R1	.038	.021	4	0.02	0.02	0.05	0.06
R2	.045	.010	4	0.03	0.05	0.05	0.05
R3	.045	.013	4	0.04	0.03	0.05	0.06
R4	.023	.013	4	0.02	0.01	0.02	0.04

LABORATORY 5 ELEMENT CADMIUM FROZEN LABORATORY 5
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.200	.020	3	0.20	0.18	0.22	
DUMMY	.057	.003	3	.060	.055	.055	
R1	.070	.003	3	.072	.071	.066	
R2	.037	.001	3	.036	.038	.037	
R3	.038	.002	3	.037	.037	.041	
R4	0.000	0.000	0				

LABORATORY 8 ELEMENT CADMIUM FROZEN LABORATORY 8
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.183	.015	3	.18	.20	.17	
DUMMY	.023	.006	3	.02	.03	.02	
R1	.113	.006	3	.11	.11	.12	
R2	.010	0.000	3	.01	.01	.01	
R3	.163	.023	3	.15	.19	.15	
R4	.117	.025	3	.09	.14	.12	

LABORATORY 10 ELEMENT CADMIUM FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.230	.017	3	0.25	0.22	0.22	
DUMMY	.065	.005	3	.066	.059	.069	
R1	.081	.026	3	.063	.110	.069	
R2	.059	.006	3	.053	.059	.065	
R3	.064	.004	3	.062	.069	.062	
R4	.055	.005	3	.051	.060	.054	

CADMIUM FROZEN (CONTINUED)

LABORATORY 11 ELEMENT CADMIUM FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.200	.017	3	0.21	0.21	0.18	
DUMMY	.054	.001	3	0.053	0.054	0.055	
R1	.052	.007	3	0.044	0.055	0.057	
R2	.037	.008	3	0.031	0.046	0.035	
R3	.036	.004	3	0.032	0.039	0.036	
R4	.014	.003	3	0.018	0.012	0.012	

LABORATORY 12 ELEMENT CADMIUM FROZEN LABORATORY 12
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R3

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.345	.007	2	.35	.34		
DUMMY	.074	.006	2	.078	.07		
R1	.070	0.000	2	.07	.07		
R2	.060	0.000	2	.06	.06		
R3	.058	.004	1	.058			
R4	.058	.003	2	.056	.06		

LABORATORY 13 ELEMENT CADMIUM FROZEN LABORATORY 13
ELECTROCHEMISTRY
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.155	.035	2	.13	.18		
DUMMY	.070	.028	2	.09	.05		
R1	.040	0.000	2	.04	.04		
R2	.375	.035	2	.35	.40		
R3	.100	.014	2	.09	.11		
R4	.060	.028	2	.04	.08		

LABORATORY 13 ELEMENT CADMIUM FROZEN LABORATORY 13
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.140	.057	2	.18	.10		
DUMMY	.055	.007	2	.06	.05		
R1	.045	.007	2	.04	.05		
R2	.060	0.000	2	.06	.06		
R3	.035	.007	2	.03	.04		
R4	.155	.021	2	.17	.14		

LABORATORY 14 ELEMENT CADMIUM FROZEN LABORATORY 14
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.05			
DUMMY				<0.05			
R1				<0.05			
R2				0.10			
R3				<0.05			
R4				<0.05			

CADMIUM FROZEN (CONTINUED)

LABORATORY 15 ELEMENT CADMIUM FROZEN LABORATORY 15
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.145	.003	3	.146	.148	.142	
DUMMY	.039	.002	3	.041	.038	.038	
R1	.049	.011	3	.040	.062	.046	
R2	.055	.002	3	.057	.056	.053	
R3	.053	.005	3	.049	.058	.051	
R4	.036	.009	3	.037	.026	.044	

LABORATORY 16 ELEMENT CADMIUM FROZEN LABORATORY 16
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.2	<0.2	0.5	
DUMMY				<0.2	<0.2	0.8	
R1				<0.2	<0.2	<0.2	
R2				<0.2	<0.2	<0.2	
R3				<0.2	<0.2	<0.2	
R4				<0.2	<0.2	<0.2	

LABORATORY 17 ELEMENT CADMIUM FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.16	0.26	0.10	0.15
DUMMY				<.10	<.10	<.10	<.10
R1				<.10	<.10	<.10	<.10
R2				<.10	<.10	<.10	<.10
R3				<.10	<.10	<.10	<.10
R4				<.10	<.10	<.10	<.10

LABORATORY 23 ELEMENT CADMIUM FROZEN LABORATORY 23
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.140	0.000	2	.14	.14		
DUMMY	.040	.014	2	.05	.03		
R1	.353	.166	3	.53	.33	.20	
R2	.177	.055	3	.12	.23	.18	
R3	.050	0.000	2	.05	.05		
R4	.080	.071	2	.13	.03		

LABORATORY 32 ELEMENT CADMIUM FROZEN LABORATORY 32
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.2	<0.2	<0.2	
DUMMY				0.2	0.2	0.2	
R1				0.2	<.15	<.15	
R2				<.15	<.15	<.15	
R3				<.15	0.3	<.15	
R4				<0.2	<0.2	<0.2	

CADMIUM FROZEN (CONTINUED)

LABORATORY 34 ELEMENT CADMIUM FROZEN LABORATORY 34
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.187			
DUMMY				0.052			
R1				0.052			
R2				0.046			
R3				0.052			
R4				0.047			

LABORATORY 39 ELEMENT CADMIUM FROZEN LABORATORY 39
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.185	.007	2	.190	.180		
DUMMY	.058	.014	3	.050	.050	.075	
R1	.038	.008	3	.030	.038	.045	
R2	.014	.003	3	.016	.011	.014	
R3	.032	.003	2	.030	.034		
R4	.046	.012	3	.056	.033	.048	

LABORATORY 41 ELEMENT CADMIUM FROZEN LABORATORY 41
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.230	.010	3	.24	.23	.22	
DUMMY	.113	.006	3	.11	.12	.11	
R1	.130	.017	3	.15	.12	.12	
R2	.133	.021	3	.11	.14	.15	
R3	.130	.010	3	.12	.14	.13	
R4	.123	.015	3	.11	.12	.14	

LABORATORY 48 ELEMENT CADMIUM FROZEN LABORATORY 48
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.12			
DUMMY				<0.05			
R1				<0.05			
R2				0.10			
R3				<0.05			
R4				0.12			

LABORATORY 55 ELEMENT CADMIUM FROZEN LABORATORY 55
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5			
DUMMY				<0.5			
R1				<0.5			
R2				<0.5			
R3				<0.5			
R4				<0.5			

CADMIUM FROZEN (CONTINUED)

LABORATORY 56 ELEMENT CADMIUM FROZEN LABORATORY 56
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.213	.011	3				
DUMMY	.038	.002	3				
R1	.039	.001	3				
R2	.048	.003	3				
R3	.042	.001	3				
R4	.038	.001	3				

CHROMIUM

ACIDIFIED

LABORATORY 1 ELEMENT CHROMIUM ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.005	.262	2	1.19	0.82		
DUMMY	.157	.091	3	0.24	0.06	0.17	
R1	.235	.092	2	0.30	0.17		
R2	.220	.030	3	0.25	0.22	0.19	
R3	.385	.106	2	0.31	0.46		
R4	.270	.028	2	0.25	0.29		

LABORATORY 38 ELEMENT CHROMIUM ACIDIFIED LABORATORY 38
FURNACE ATOMIC ABSORPTION DIRECT INJECTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.800	.855	3	1.21	1.41	2.78	
DUMMY	1.413	.264	3	1.49	1.63	1.12	
R1	1.570	.461	3	1.21	1.41	2.09	
R2	1.673	.637	3	1.21	1.41	2.40	
R3	1.413	.788	3	1.63	2.07	0.54	
R4	1.713	.393	3	1.92	1.96	1.26	

LABORATORY 49 ELEMENT CHROMIUM ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

CHROMIUM

FROZEN

LABORATORY 10 ELEMENT CHROMIUM FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.757	.251	3	0.86	0.47	0.94	
DUMMY	.373	.029	3	0.39	0.34	0.39	
R1	.440	.044	3	0.46	0.39	0.47	
R2	.363	.023	3	0.39	0.35	0.35	
R3	.623	.362	3	0.44	0.39	1.04	
R4	.667	.548	3	0.35	1.30	0.35	

LABORATORY 14 ELEMENT CHROMIUM FROZEN LABORATORY 14
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.5			
DUMMY				<0.5			
R1				<0.5			
R2				<0.5			
R3				<0.5			
R4				<0.5			

LABORATORY 15 ELEMENT CHROMIUM FROZEN LABORATORY 15
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				1.41	1.44	1.49	
DUMMY				<0.3	<0.3	<0.3	
R1				<0.3	<0.3	<0.3	
R2				<0.3	<0.3	<0.3	
R3				<0.3	<0.3	<0.3	
R4				<0.3	<0.3	<0.3	

LABORATORY 17 ELEMENT CHROMIUM FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<5	<5	<5	<5
DUMMY				<5	<5	<5	<5
R1				<5	<5	<5	<5
R2				<5	<5	<5	<5
R3				<5	<5	<5	<5
R4				<5	<5	<5	<5

COBALT

ACIDIFIED

LABORATORY 25 ELEMENT COBALT ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.900	0.000	3	.9	.9	.9	
DUMMY	.400	.000	3	.4	.4	.4	
R1	.433	.252	3	.4	.7	.2	
R2	.500	.361	3	.9	.4	.2	
R3	.333	.115	3	.2	.4	.4	
R4	.733	.351	3	.7	.4	1.1	

LABORATORY 49 ELEMENT COBALT ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

LABORATORY 63 ELEMENT COBALT ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.33	0.34	0.32	0.32
DUMMY				<0.02	<0.02	<0.02	
R1				<0.02	<0.02	<0.02	
R2				<0.02	<0.02	<0.02	
R3				<0.02	<0.02	<0.02	
R4				<0.02	<0.02	<0.02	

COBALT

FROZEN

LABORATORY 10 ELEMENT COBALT FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.640	.070	3	.71	.64	.57	
DUMMY	.193	.006	3	.19	.20	.19	
R1	.180	.017	3	.19	.19	.16	
R2	.203	.012	3	.21	.21	.19	
R3	.167	.006	3	.17	.17	.16	
R4	.190	0.000	3	.19	.19	.19	

COBALT FROZEN (CONTINUED)

LABORATORY 16 ELEMENT COBALT FROZEN LABORATORY 16
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.650	.919	2	2.0	3.3		
DUMMY	2.000	0.000	2	2.0	2.0		
R1	1.150	.212	2	1.3	1.0		
R2	3.600	2.404	2	5.3	1.9		
R3	2.600	1.127	3	2.0	1.9	3.9	
R4	2.033	.950	3	2.0	1.1	3.0	

LABORATORY 17 ELEMENT COBALT FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

COPPER

ACIDIFIED

LABORATORY 1 ELEMENT COPPER ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.700	.990	2	1.0	2.4		
DUMMY	.300	.100	3	0.4	0.2	0.3	
R1	.497	.025	3	.47	.52	.50	
R2	.967	.607	3	1.6	.39	.91	
R3	.243	.045	3	.29	.24	.20	
R4	.550	.151	3	.72	.50	.43	

LABORATORY 2 ELEMENT COPPER ACIDIFIED LABORATORY 2
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.120	.093	4	2.05	2.19	2.21	2.03
DUMMY	.195	.047	4	.18	.19	.15	.26
R1	.433	.074	4	.35	.50	.39	.49
R2	.345	.073	4	.29	.30	.34	.45
R3	.245	.042	4	.20	.25	.30	.23
R4	.435	.024	4	.45	.45	.40	.44

COPPER ACIDIFIED (CONTINUED)

LABORATORY 7 ELEMENT COPPER ACIDIFIED LABORATORY 7
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.500	.283	2	2.3	2.7		
DUMMY	.975	.106	2	0.90	1.05		
R1	1.650	.212	2	1.5	1.8		
R2	.880	.141	2	0.78	0.98		
R3	.610	.028	2	0.63	0.59		
R4	2.150	.919	2	2.8	1.5		

LABORATORY 24 ELEMENT COPPER ACIDIFIED LABORATORY 24
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.033	.252	3	2.0	1.8	2.3	
DUMMY	.130	.042	2	0.10	0.16		
R1	.160	0.000	2	0.16	0.16		
R2	.170	.042	2	0.14	0.20		
R3	.170	.042	2	0.14	0.20		
R4	.225	.035	2	0.20	0.25		

LABORATORY 25 ELEMENT COPPER ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	7.100	.200	3	7.1	6.9	7.3	
DUMMY	1.300	0.000	3	1.3	1.3	1.3	
R1	1.700	.346	3	1.3	1.9	1.9	
R2	2.667	.115	3	2.6	2.6	2.8	
R3	2.800	.529	3	3.2	2.2	3.0	
R4	2.433	.473	3	2.6	2.8	1.9	

LABORATORY 26 ELEMENT COPPER ACIDIFIED LABORATORY 26
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	N/A						
DUMMY	.367	.115	3	.5	.3	.3	
R1	.600	.100	3	.7	.5	.6	
R2	.475	.050	4	.5	.4	.5	.5
R3	.700	.100	3	.7	.6	.8	
R4	.700	.100	3	.6	.8	.7	

LABORATORY 27 ELEMENT COPPER ACIDIFIED LABORATORY 27
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				3.3	2.9	2.8	2.8
DUMMY				<.54	<.54	<.53	<.53
R1				.69	1.1	.77	.87
R2				1.4	1.5	1.6	1.6
R3				.36	.27	.44	.26
R4				<.54	<.54	<.53	<.53

COPPER ACIDIFIED (CONTINUED)

LABORATORY 33 ELEMENT COPPER ACIDIFIED LABORATORY 33
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.070	.030	4				
DUMMY	.170	.010	3				
R1	.230	.010	4				
R2	.240	.010	4				
R3	.230	.010	4				
R4	.230	.010	4				

LABORATORY 38 ELEMENT COPPER ACIDIFIED LABORATORY 38
FURNACE ATOMIC ABSORPTION DIRECT INJECTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	7.623	1.625	3	9.27	7.58	6.02	
DUMMY	3.110	.243	3	3.24	3.26	2.83	
R1	9.163	2.699	3	12.28	7.60	7.61	
R2	9.137	2.342	3	11.68	8.66	7.07	
R3	11.890	1.888	3	14.07	10.82	10.78	
R4	13.343	3.124	3	15.29	9.74	15.00	

LABORATORY 42 ELEMENT COPPER ACIDIFIED LABORATORY 42
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.530	.240	3				
DUMMY	1.430	.110	3				
R1	1.810	.100	3				
R2	1.090	.090	3				
R3	1.530	.100	3				
R4	1.600	.140	3				

LABORATORY 44 ELEMENT COPPER ACIDIFIED LABORATORY 44
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.967	.208	3	.8	.9	1.2	
DUMMY	.667	.208	3	.5	.9	.6	
R1	.943	.172	3	.75	1.00	1.08	
R2	.867	.351	3	.50	1.20	0.90	
R3	1.000	.200	3	1.00	1.20	0.80	
R4	1.023	.346	3	0.95	1.40	0.72	

LABORATORY 46 ELEMENT COPPER ACIDIFIED LABORATORY 46
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.700	.100	3	1.6	1.7	1.8	
DUMMY	.833	.058	3	0.8	0.9	0.8	
R1	.633	.058	3	.6	.7	.6	
R2	.567	.058	3	.5	.6	.6	
R3	.933	.058	3	.9	.9	1.0	
R4	.767	.058	3	.8	.8	.7	

COPPER ACIDIFIED (CONTINUED)

LABORATORY 47 ELEMENT COPPER ACIDIFIED LABORATORY 47
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				3.2	2.9	3.0	
DUMMY				<0.3	<0.3	<0.3	
R1				0.5	0.3	0.3	
R2				<0.3	<0.3	<0.3	
R3				0.3	0.3	0.3	
R4				0.3	0.3	0.3	

LABORATORY 49 ELEMENT COPPER ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

LABORATORY 51 ELEMENT COPPER ACIDIFIED LABORATORY 51
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.933	.379	3	3.2	3.1	2.5	
DUMMY	.367	.153	3	0.5	0.4	0.2	
R1	2.867	.321	3	3.0	2.5	3.1	
R2	2.033	.153	3	2.2	1.9	2.0	
R3	1.000	.173	3	1.2	0.9	0.9	
R4	.800	.173	3	0.7	1.0	0.7	

LABORATORY 52 ELEMENT COPPER ACIDIFIED LABORATORY 52
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.023	.563	3	2.43	3.55	3.09	
DUMMY	1.797	.473	3	2.07	1.25	2.07	
R1	2.247	.873	3	3.24	1.90	1.60	
R2	1.010	.348	3	0.90	1.40	0.73	
R3	1.780	.481	2	2.12	1.44		
R4	1.270	.423	3	1.66	1.33	0.82	

LABORATORY 53 ELEMENT COPPER ACIDIFIED LABORATORY 53
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.967	.058	3	1.9	2.0	2.0	
DUMMY	.215	.007	2	.21	.22		
R1	.510	0.000	2	.51	.51		
R2	.350	.014	2	.34	.36		
R3	.225	.007	2	.23	.22		
R4	.295	.007	2	.29	.30		

COPPER ACIDIFIED (CONTINUED)

LABORATORY 54 ELEMENT COPPER ACIDIFIED LABORATORY 54
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	25.500	.500	3	25.0	26.0	25.5	
DUMMY	1.467	.153	3	1.6	1.3	1.5	
R1	5.100	.100	3	5.2	5.0	5.1	
R2	17.500	.500	3	18.0	17.0	17.5	
R3	1.567	.058	3	1.6	1.5	1.6	
R4	.967	.058	3	1.0	0.9	1.0	

LABORATORY 58 ELEMENT COPPER ACIDIFIED LABORATORY 58
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				2.5	2.0	2.0	
DUMMY				<0.5	<0.5	<0.5	
R1				0.5	0.5	0.5	
R2				0.5	0.5	0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

LABORATORY 61 ELEMENT COPPER ACIDIFIED LABORATORY 61
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				2.7			
DUMMY				0.95			
R1				0.67			
R2				0.50			
R3				0.73			
R4				0.58			

LABORATORY 62 ELEMENT COPPER ACIDIFIED LABORATORY 62
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.04	<0.04	<0.04	
DUMMY				<0.04	<0.04	<0.04	
R1				<0.04	<0.04	<0.04	
R2				<0.04	<0.04	<0.04	
R3				<0.04	<0.04	<0.04	
R4				<0.04	<0.04	<0.04	

LABORATORY 63 ELEMENT COPPER ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.440	.199	4	1.64	1.58	1.24	1.30
DUMMY	.170	.042	4	0.22	0.19	0.14	0.13
R1	.235	.031	4	0.22	0.20	0.27	0.25
R2	.198	.022	4	0.17	0.19	0.22	0.21
R3	.213	.024	4	0.21	0.18	0.23	0.23
R4	.188	.017	4	0.18	0.17	0.21	0.19

COPPER

FROZEN

LABORATORY 3 ELEMENT COPPER FROZEN LABORATORY 3
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.780	.110	4	1.87	1.83	1.62	1.80
DUMMY	.150	.036	3	.19	.14	.12	
R1	.275	.007	2	.27	.28		
R2	.210	0.000	3	.21	.21	.21	
R3	.243	.015	3	.24	.23	.26	
R4	.415	.007	2	.42	.41		

LABORATORY 4 ELEMENT COPPER FROZEN LABORATORY 4
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.755	.180	4	2.00	1.61	1.78	1.63
DUMMY	2.240	.580	2	1.83	2.65		
R1	.215	.007	2	0.22	0.21		
R2	.215	.007	2	0.22	0.21		
R3	.175	.007	2	0.17	0.18		
R4	.025	.007	2	0.02	0.03		

LABORATORY 5 ELEMENT COPPER FROZEN LABORATORY 5
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.233	.058	3	1.2	1.3	1.2	
DUMMY	.203	.006	3	0.20	0.21	0.20	
R1	.090	.010	3	0.09	0.10	0.08	
R2	.113	.025	3	0.11	0.14	0.09	
R3	.127	.006	3	0.12	0.13	0.13	
R4	.123	.012	3	0.11	0.13	0.13	

LABORATORY 8 ELEMENT COPPER FROZEN LABORATORY 8
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.013	.211	3	2.14	1.77	2.13	
DUMMY	.483	.091	3	.38	.55	.52	
R1	.300	.035	3	.32	.32	.26	
R2	.537	.035	3	.54	.50	.57	
R3	.440	.040	3	.48	.40	.44	
R4	.553	.076	3	.62	.57	.47	

LABORATORY 10 ELEMENT COPPER FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.867	.081	3	1.96	1.82	1.82	
DUMMY	.610	0.000	3	.61	.61	.61	
R1	.933	.176	3	.79	1.13	.88	
R2	.783	.046	3	.73	.81	.81	
R3	.720	0.000	3	.72	.72	.72	
R4	.680	.000	3	.68	.68	.68	

COPPER FROZEN (CONTINUED)

LABORATORY 11 ELEMENT COPPER FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.507	.031	3	1.48	1.54	1.50	
DUMMY	.140	.030	3	0.17	0.14	0.11	
R1	.180	.010	3	0.18	0.17	0.19	
R2	.137	.015	3	0.14	0.15	0.12	
R3	.187	.012	3	0.18	0.18	0.20	
R4	.147	.032	3	0.16	0.11	0.17	

LABORATORY 12 ELEMENT COPPER FROZEN LABORATORY 12
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.500	.141	2	2.4	2.6		
DUMMY	1.280	.311	2	1.5	1.06		
R1	2.700	.424	2	2.4	3.0		
R2	1.200	.015	1	1.2			
R3	.675	.177	2	.55	0.8		
R4	1.825	.035	2	1.8	1.85		

LABORATORY 13 ELEMENT COPPER FROZEN LABORATORY 13
ELECTROCHEMISTRY

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.400	.141	2	1.3	1.5		
DUMMY	.650	.071	2	0.7	0.6		
R1	.850	.071	2	.9	.8		
R2	1.300	.424	2	1.0	1.6		
R3	1.000	.141	2	0.9	1.1		
R4	.950	.212	2	0.8	1.1		

LABORATORY 13 ELEMENT COPPER FROZEN LABORATORY 13
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.050	.071	2	2.1	2.0		
DUMMY	.600	.141	2	0.5	0.7		
R1	.950	.071	2	0.9	1.0		
R2	.100	0.000	2	0.1	0.1		
R3	.100	0.000	2	0.1	0.1		
R4	.650	.071	2	0.7	0.6		

LABORATORY 14 ELEMENT COPPER FROZEN LABORATORY 14
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				1.3			
DUMMY				0.1			
R1				0.4			
R2				0.5			
R3				0.4			
R4				0.2			

COPPER FROZEN (CONTINUED)

LABORATORY 15 ELEMENT COPPER FROZEN LABORATORY 15
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.280	.115	3	1.16	1.29	1.39	
DUMMY	.050	.000	3	.05	.05	.05	
R1	.093	.021	3	.10	.07	.11	
R2	.157	.015	3	.14	.17	.16	
R3	.067	.021	3	.05	.09	.06	
R4	.050	.000	3	.05	.05	.05	

LABORATORY 16 ELEMENT COPPER FROZEN LABORATORY 16
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.8	<0.6	<0.6	
DUMMY				<0.6	<0.6	<0.6	
R1				<0.6	<0.6	<0.6	
R2				4.8	2.1	<0.6	
R3				<0.6	<0.6	<0.6	
R4				<0.6	<0.6	<0.6	

LABORATORY 17 ELEMENT COPPER FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				1.4	1.4	1.7	1.6
DUMMY				<0.2	<0.2	<0.2	<0.2
R1				<0.2	<0.2	<0.2	<0.2
R2				<0.2	<0.2	<0.2	<0.2
R3				<0.2	<0.2	<0.2	<0.2
R4				<0.2	<0.2	<0.2	<0.2

LABORATORY 23 ELEMENT COPPER FROZEN LABORATORY 23
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.300	0.000	2	1.3	1.3		
DUMMY	.140	.014	2	.13	.15		
R1	.207	.023	3	.22	.18	.22	
R2	.160	.010	3	.15	.16	.17	
R3	.105	.021	2	.12	.09		
R4	.100	0.000	2	.10	.10		

LABORATORY 32 ELEMENT COPPER FROZEN LABORATORY 32
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<.25	<.25	<.25	
DUMMY				<.25	.25	.25	
R1				<0.2	<0.2	<0.2	
R2				<0.2	<0.2	<0.2	
R3				<0.2	<0.2	<0.2	
R4				<.25	<.25	<.25	

COPPER FROZEN (CONTINUED)

LABORATORY 39 ELEMENT COPPER FROZEN LABORATORY 39
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.200	.100	3	1.200	1.100	1.300	
DUMMY	.052	.014	3	.035	.060	.060	
R1	.140	.042	2	.110	.170		
R2	.113	.006	3	.110	.120	.110	
R3	.099	.020	3	.120	.097	.080	
R4	.079	.013	2	.088	.070		

LABORATORY 41 ELEMENT COPPER FROZEN LABORATORY 41
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.307	.051	3	1.25	1.35	1.32	
DUMMY	.260	.010	3	.26	.25	.27	
R1	.853	.047	3	.80	.89	.87	
R2	.270	.040	3	.23	.27	.31	
R3	.310	.026	3	.32	.28	.33	
R4	.280	.020	3	.26	.30	.28	

LABORATORY 48 ELEMENT COPPER FROZEN LABORATORY 48
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.100	.100	5				
DUMMY	.200	.060	5				
R1	.110	.040	5				
R2	.200	.040	5				
R3	.150	.080	5				
R4	.190	.040	5				

LABORATORY 55 ELEMENT COPPER FROZEN LABORATORY 55
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				3.1			
DUMMY				2.9			
R1				2.3			
R2				1.0			
R3				2.7			
R4				2.9			

LABORATORY 56 ELEMENT COPPER FROZEN LABORATORY 56
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.500	.060	3				
DUMMY	.100	.010	3				
R1	.200	.030	3				
R2	.170	.020	3				
R3	.160	.010	3				
R4	.150	.010	3				

IRON

ACIDIFIED

LABORATORY 1 ELEMENT IRON ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	4.067	.757	3	4.4	4.6	3.2	
DUMMY	.555	.361	2	0.30	0.81		
R1	.945	.007	2	0.95	0.94		
R2	1.100	.460	3	0.64	1.56	1.1	
R3	.780	.144	3	0.74	0.94	0.66	
R4	1.210	.515	3	1.73	1.2	0.7	

LABORATORY 25 ELEMENT IRON ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	4.000	.872	3	4.6	3.0	4.4	
DUMMY	1.233	.473	3	1.4	1.6	0.7	
R1	2.433	.115	3	2.3	2.5	2.5	
R2	5.400	.520	3	5.7	4.8	5.7	
R3	3.067	.115	3	3.0	3.0	3.2	
R4	2.367	.115	3	2.5	2.3	2.3	

LABORATORY 27 ELEMENT IRON ACIDIFIED LABORATORY 27
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				3.1	2.7	3.3	3.1
DUMMY				<1.3	<1.3	<1.6	<1.6
R1				<1.3	<1.3	<1.6	<1.6
R2				<1.3	<1.3	<1.6	<1.6
R3				<1.3	<1.3	<1.6	<1.6
R4				<1.3	<1.3	<1.6	<1.6

LABORATORY 33 ELEMENT IRON ACIDIFIED LABORATORY 33
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.040	.060	3				
DUMMY	.760	.020	3				
R1	1.060	.120	4				
R2	1.210	.040	4				
R3	.920	.040	4				
R4	.910	.060	4				

LABORATORY 38 ELEMENT IRON ACIDIFIED LABORATORY 38
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
BAD REPLICATE --- R3

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.103	.302	3	0.96	1.45	0.90	
DUMMY	1.787	.337	3	2.10	1.83	1.43	
R1	1.390	.641	3	1.02	1.02	2.13	
R2	1.613	.283	3	1.31	1.87	1.66	
R3	2.913	.354	3	2.75	2.67	3.32	
R4	1.220	.597	3	0.78	0.98	1.90	

IRON ACIDIFIED (CONTINUED)

LABORATORY 49 ELEMENT IRON ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4							

LABORATORY 51 ELEMENT IRON ACIDIFIED LABORATORY 51
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.500	.500	3	6.0	7.0	6.5	
DUMMY	2.333	.577	3	2.0	2.0	3.0	
R1	5.667	1.155	3	5.0	7.0	5.0	
R2	3.500	.500	3	4.0	3.5	3.0	
R3	5.333	.289	3	5.0	5.5	5.5	
R4	2.333	.577	3	3.0	2.0	2.0	

LABORATORY 53 ELEMENT IRON ACIDIFIED LABORATORY 53
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.800	.693	3	3.2	3.2	2.	
DUMMY	.600	0.000	2	0.6	0.6		
R1	.800	0.000	2	0.8	0.8		
R2	1.000	.283	2	0.8	1.2		
R3	1.100	.141	2	1.2	1.0		
R4	1.100	.141	2	1.2	1.0		

LABORATORY 58 ELEMENT IRON ACIDIFIED LABORATORY 58
SPECTROPHOTOMETRY NO TREATMENT SPECIFIED
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<10.	<10.	<10.	
DUMMY				<10.	<10.	<10.	
R1				<10.	<10.	<10.	
R2				<10.	<10.	<10.	
R3				<10.	<10.	<10.	
R4				<10.	<10.	<10.	

LABORATORY 61 ELEMENT IRON ACIDIFIED LABORATORY 61
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				10.3			
DUMMY				6.6			
R1				8.9			
R2				6.6			
R3				6.6			
R4				6.8			

IRON ACIDIFIED (CONTINUED)

LABORATORY 63 ELEMENT IRON ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.008	.295	4	3.39	3.09	2.76	2.79
DUMMY	.910	.614	4	1.27	1.59	0.39	0.39
R1	1.398	.295	4	1.43	1.80	1.22	1.14
R2	.958	.086	4	0.85	0.97	0.95	1.06
R3	1.033	.244	4	1.18	0.74	1.28	0.93
R4	.753	.201	4	0.64	0.53	0.96	0.88

IRON

FROZEN

LABORATORY 3 ELEMENT IRON FROZEN LABORATORY 3
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.745	.417	2	1.45	2.04		
DUMMY	.477	.075	3	0.55	0.48	0.40	
R1	.150	.042	2	0.12	0.18		
R2	.647	.032	3	0.66	0.61	0.67	
R3	.450	.036	3	0.41	0.48	0.46	
R4	.418	.052	4	0.37	0.38	0.44	0.48

LABORATORY 4 ELEMENT IRON FROZEN LABORATORY 4
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.440	.028	2	3.46	3.42		
DUMMY	.860	.170	2	0.74	0.98		
R1	1.863	.344	4	1.96	2.30	1.52	1.67
R2	.960	.188	4	0.77	1.01	0.86	1.20
R3	1.215	.113	4	1.19	1.13	1.16	1.38
R4	1.283	.047	3	1.23	1.30	1.32	

LABORATORY 10 ELEMENT IRON FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.833	.503	3	6.3	5.9	5.3	
DUMMY	4.233	.289	3	4.4	4.4	3.9	
R1	6.200	.173	3	6.3	6.3	6.0	
R2	5.700	.529	3	6.3	5.3	5.5	
R3	6.267	2.074	3	5.9	4.4	8.5	
R4	5.133	.635	3	4.4	5.5	5.5	

IRON FROZEN (CONTINUED)

LABORATORY 11 ELEMENT IRON FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.190	.030	3	2.16	2.22	2.19	
DUMMY	.307	.029	3	0.34	0.29	0.29	
R1	.603	.032	3	0.59	0.64	0.58	
R2	.507	.080	3	0.50	0.43	0.59	
R3	.507	.055	3	0.48	0.47	0.57	
R4	.443	.042	3	0.41	0.43	0.49	

LABORATORY 13 ELEMENT IRON FROZEN LABORATORY 13
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.300	.424	2	2.6	2.0		
DUMMY	1.800	0.000	2	1.8	1.8		
R1	1.500	0.000	2	1.5	1.5		
R2	.900	.141	2	1.0	0.8		
R3	1.300	.283	2	1.5	1.1		
R4	4.150	.495	2	3.8	4.5		

LABORATORY 13 ELEMENT IRON FROZEN LABORATORY 13
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R4

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.900	.566	2	3.3	2.5		
DUMMY	1.750	.495	2	1.4	2.1		
R1	1.400	.141	2	1.5	1.3		
R2	1.600	.141	2	1.7	1.5		
R3	1.550	.354	2	1.8	1.3		
R4	4.450	.354	2	4.2	4.7		

LABORATORY 16 ELEMENT IRON FROZEN LABORATORY 16
SPECTROPHOTOMETRY ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	18.500	20.506	2	4.	33.		
DUMMY	5.667	2.887	3	4.	9.	4.	
R1	4.000	0.000	2	4.	4.		
R2	16.000	5.196	3	13.	22.	13.	
R3	16.000	6.557	3	9.	17.	22.	
R4	21.667	15.535	3	9.	39.	17.	

LABORATORY 17 ELEMENT IRON FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				1.0	0.9	0.9	
DUMMY				<1.0	<1.0	<1.0	
R1				<1.0	<1.0	<1.0	<1.0
R2				<1.0	<1.0	1.0	
R3				<1.0	<1.0	1.0	
R4				0.9	<1.0	<1.0	

IRON FROZEN (CONTINUED)

LABORATORY 32 ELEMENT IRON FROZEN LABORATORY 32
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<.7	<.7	<.7	
DUMMY				<.7	<.7	<.7	
R1				<.7	<.7	<.7	
R2				<.7	<.7	<.7	
R3				<.7	<.7	<.7	
R4				<.7	<.7	<.7	

LEAD

ACIDIFIED

LABORATORY 1 ELEMENT LEAD ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.370	.026	3	.34	.38	.39	
DUMMY	.433	.040	3	.47	.39	.44	
R1	.807	.349	3	1.21	.61	.60	
R2	.610	.030	3	.58	.61	.64	
R3	.593	.086	3	.61	.67	.50	
R4	.597	.065	3	.60	.53	.66	

LABORATORY 2 ELEMENT LEAD ACIDIFIED LABORATORY 2
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.500	.043	4	0.54	0.44	0.50	0.52
DUMMY	.205	.087	4	0.28	0.12	0.28	0.14
R1	.955	.192	4	0.88	0.72	1.08	1.14
R2	.545	.057	4	0.54	0.54	0.62	0.48
R3	.430	.038	4	0.46	0.38	0.42	0.46
R4	.400	.046	4	0.36	0.44	0.44	0.36

LABORATORY 7 ELEMENT LEAD ACIDIFIED LABORATORY 7
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.41			
DUMMY				0.40	0.35		
R1				0.64	0.47		
R2				0.70			
R3				0.54			
R4				0.70	0.47		

LEAD ACIDIFIED (CONTINUED)

LABORATORY 24 ELEMENT LEAD ACIDIFIED LABORATORY 24
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.283	.076	3	0.3	0.2	0.35	
DUMMY	.125	.035	2	0.15	0.1		
R1	.500	.141	2	0.4	0.6		
R2	.450	.071	2	0.5	0.4		
R3	.650	.071	2	0.7	0.6		
R4	.300	.141	2	0.4	0.2		

LABORATORY 25 ELEMENT LEAD ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.733	1.115	3	0.9	3.0	1.3	
DUMMY	2.133	.586	3	1.9	2.8	1.7	
R1	1.867	.862	3	1.7	2.8	1.1	
R2	2.700	.361	3	3.0	2.8	2.3	
R3	2.100	.346	3	2.3	1.7	2.3	
R4	1.900	.200	3	1.7	1.9	2.1	

LABORATORY 26 ELEMENT LEAD ACIDIFIED LABORATORY 26
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	N/A						
DUMMY	.300	.100	3	0.4	0.2	0.3	
R1	.467	.058	3	0.4	0.5	0.5	
R2	.450	.058	4	0.4	0.4	0.5	0.5
R3	.433	.115	3	0.3	0.5	0.5	
R4	.333	.058	3	0.3	0.4	0.3	

LABORATORY 33 ELEMENT LEAD ACIDIFIED LABORATORY 33
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.410	.040	4				
DUMMY	.250	.010	4				
R1	.390	.020	4				
R2	.360	.030	4				
R3	.400	.030	4				
R4	.410	.030	4				

LABORATORY 42 ELEMENT LEAD ACIDIFIED LABORATORY 42
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.250	.030	3				
DUMMY	.190	.010	3				
R1	.270	.020	3				
R2	.300	.040	3				
R3	.360	.010	3				
R4	.440	.040	3				

LEAD ACIDIFIED (CONTINUED)

LABORATORY 44 ELEMENT LEAD ACIDIFIED LABORATORY 44
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
BAD REPLICATE --- R3

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.580	.085	3	0.67	0.57	0.50	
DUMMY	.650	.132	3	0.50	0.75	0.70	
R1	.650	.150	3	0.80	0.65	0.50	
R2	.450	.050	3	0.45	0.50	0.40	
R3	1.183	.126	3	1.30	1.20	1.05	
R4	.550	.118	3	0.52	0.68	0.45	

LABORATORY 46 ELEMENT LEAD ACIDIFIED LABORATORY 46
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.517	.076	3	0.55	0.43	0.57	
DUMMY	.490	.132	3	0.64	0.44	0.39	
R1	.680	.040	3	0.68	0.64	0.72	
R2	.727	.055	3	0.67	0.78	0.73	
R3	.577	.156	3	0.43	0.74	0.56	
R4	.787	.093	3	0.71	0.76	0.89	

LABORATORY 47 ELEMENT LEAD ACIDIFIED LABORATORY 47
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.3	0.3	<0.3	
DUMMY				<0.3	<0.3	<0.3	
R1				0.3	<0.3	0.3	
R2				0.3	0.3	0.3	
R3				0.3	<0.3	0.3	
R4				0.3	<0.3	0.3	

LABORATORY 49 ELEMENT LEAD ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

LABORATORY 51 ELEMENT LEAD ACIDIFIED LABORATORY 51
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.667	.208	3	0.6	0.5	0.9	
DUMMY	.333	.058	3	0.3	0.3	0.4	
R1	.700	.100	3	0.7	0.6	0.8	
R2	.600	.200	3	0.6	0.4	0.8	
R3	.533	.153	3	0.5	0.4	0.7	
R4	.600	.100	3	0.6	0.5	0.7	

LEAD ACIDIFIED (CONTINUED)

LABORATORY 52 ELEMENT LEAD ACIDIFIED LABORATORY 52
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.453	.441	3	3.91	3.03	3.42	
DUMMY	2.777	.451	3	3.09	2.26	2.98	
R1	5.897	.612	3	6.60	5.49	5.60	
R2	6.447	1.956	3	4.19	7.65	7.50	
R3	5.320	.905	2	5.96	4.68		
R4	3.253	.224	3	3.30	3.45	3.01	

LABORATORY 53 ELEMENT LEAD ACIDIFIED LABORATORY 53
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.390	.057	2	.43	.35		
DUMMY	.305	.021	2	.29	.32		
R1	.640	.042	2	.67	.61		
R2	.510	.042	2	.48	.54		
R3	.470	.014	2	.48	.46		
R4	.580	.014	2	.57	.59		

LABORATORY 54 ELEMENT LEAD ACIDIFIED LABORATORY 54
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	0.000	0.000	3	0.00	0.00	0.00	
DUMMY	.417	.076	3	0.40	0.35	0.50	
R1	2.480	.271	3	2.74	2.50	2.20	
R2	1.250	.050	3	1.30	1.20	1.25	
R3	.283	.076	3	0.30	0.20	0.35	
R4	1.450	.377	3	1.40	1.85	1.10	

LABORATORY 58 ELEMENT LEAD ACIDIFIED LABORATORY 58
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	3.533	1.007	3	2.6	4.6	3.4	
DUMMY	3.433	.289	3	3.6	3.6	3.1	
R1	2.033	.289	3	2.2	2.2	1.7	
R2	1.367	.289	3	1.2	1.7	1.2	
R3	1.700	0.000	3	1.7	1.7	1.7	
R4	1.767	.404	3	2.2	1.7	1.4	

LABORATORY 61 ELEMENT LEAD ACIDIFIED LABORATORY 61
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				1.6			
DUMMY				1.6			
R1				1.6			
R2				1.5			
R3				1.6			
R4				1.6			

LEAD ACIDIFIED (CONTINUED)

LABORATORY 63 ELEMENT LEAD ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.418	.096	4	0.50	0.50	0.32	0.35
DUMMY	.363	.163	4	0.54	0.46	0.25	0.20
R1	.643	.075	4	0.69	0.72	0.60	0.56
R2	.558	.038	4	0.51	0.55	0.57	0.60
R3	.493	.050	4	0.53	0.52	0.50	0.42
R4	.478	.031	4	0.48	0.52	0.46	0.45

LEAD

FROZEN

LABORATORY 5 ELEMENT LEAD FROZEN LABORATORY 5
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.420	.046	3	0.38	0.41	0.47	
DUMMY	.383	.021	3	0.36	0.39	0.40	
R1	.433	.006	3	0.43	0.43	0.44	
R2	.430	.050	3	0.38	0.43	0.48	
R3	.480	.010	3	0.47	0.48	0.49	
R4	.477	.015	3	0.48	0.46	0.49	

LABORATORY 8 ELEMENT LEAD FROZEN LABORATORY 8
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.190	.017	3	.17	.20	.20	
DUMMY	.110	.020	3	.13	.11	.09	
R1	.233	.029	3	.25	.20	.25	
R2	.373	.021	3	.39	.38	.35	
R3	.210	.035	3	.17	.23	.23	
R4	.300	.036	3	.26	.33	.31	

LABORATORY 10 ELEMENT LEAD FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.480	.087	3	0.38	0.53	0.53	
DUMMY	.320	.046	3	0.37	0.31	0.28	
R1	1.790	.177	3	1.95	1.60	1.82	
R2	1.583	.068	3	1.66	1.56	1.53	
R3	.500	.104	3	0.62	0.44	0.44	
R4	.460	.017	3	0.44	0.47	0.47	

LEAD FROZEN (CONTINUED)

LABORATORY 11 ELEMENT LEAD FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.237	.025	3	.21	.24	.26	
DUMMY	.173	.015	3	.16	.17	.19	
R1	.190	.040	3	.15	.19	.23	
R2	.143	.023	3	.17	.13	.13	
R3	.173	.067	3	.14	.13	.25	
R4	.175	.035	2	.15	.20		

LABORATORY 12 ELEMENT LEAD FROZEN LABORATORY 12
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.510	.028	2	.53	.49		
DUMMY	.730	.127	2	.82	.64		
R1	.730	.042	2	.7	.76		
R2	.430	.014	2	.44	.42		
R3	.570	.014	2	.56	.58		
R4	.565	.021	2	.55	.58		

LABORATORY 13 ELEMENT LEAD FROZEN LABORATORY 13
ELECTROCHEMISTRY

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.750	.071	2	0.7	0.8		
DUMMY	.750	.071	2	0.7	0.8		
R1	1.100	.283	2	0.9	1.3		
R2	.900	.141	2	0.8	1.0		
R3	1.150	.071	2	1.1	1.2		
R4	1.100	0.000	2	1.1	1.1		

LABORATORY 13 ELEMENT LEAD FROZEN LABORATORY 13
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.650	.354	2	.9	.4		
DUMMY	.450	.212	2	.6	.3		
R1	.700	0.000	2	.7	.7		
R2	.600	0.000	2	.6	.6		
R3	.450	.071	2	.4	.5		
R4	.650	.071	2	.7	.6		

LABORATORY 14 ELEMENT LEAD FROZEN LABORATORY 14
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.5			
DUMMY				<0.5			
R1				2.5			
R2				4.5			
R3				1.0			
R4				2.0			

LEAD FROZEN (CONTINUED)

LABORATORY 15 ELEMENT LEAD FROZEN LABORATORY 15
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.535	.033	3	.498	.546	.562	
DUMMY	.339	.037	3	.304	.337	.377	
R1	.512	.066	3	.587	.466	.482	
R2	.594	.057	3	.554	.570	.659	
R3	.487	.094	3	.401	.587	.474	
R4	.414	.033	3	.441	.377	.425	

LABORATORY 16 ELEMENT LEAD FROZEN LABORATORY 16
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.8	2.9	3.2	
DUMMY				2.2	1.8	4.8	
R1				<0.8	<0.8	0.8	
R2				<0.8	<0.8	2.1	
R3				2.3	<0.8	3.0	
R4				3.2	<0.8	1.8	

LABORATORY 17 ELEMENT LEAD FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	<0.5
DUMMY				<0.5	<0.5	<0.5	<0.5
R1				<0.5	<0.5	<0.5	<0.5
R2				<0.5	<0.5	<0.5	0.7
R3				<0.5	0.7	<0.5	<0.5
R4				<0.5	<0.5	0.7	<0.5

LABORATORY 23 ELEMENT LEAD FROZEN LABORATORY 23
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.115	.021	2	.13	.10		
DUMMY	.075	.035	2	.10	.05		
R1	.707	.473	3	.48	1.25	.39	
R2	.287	.074	3	.26	.23	.37	
R3	.130	.028	2	.11	.15		
R4	.100	.071	2	.15	.05		

LABORATORY 34 ELEMENT LEAD FROZEN LABORATORY 34
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.215			
DUMMY				0.150			
R1				0.236			
R2				0.250			
R3				0.220			
R4				0.282			

LEAD FROZEN (CONTINUED)

LABORATORY 41 ELEMENT LEAD FROZEN LABORATORY 41
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.487	.023	3	0.50	0.50	0.46	
DUMMY	.407	.012	3	0.40	0.40	0.42	
R1	1.060	.066	3	1.05	1.00	1.13	
R2	.657	.023	3	0.67	0.63	0.67	
R3	.467	.029	3	0.45	0.50	0.45	
R4	.520	.000	3	0.52	0.52	0.52	

LABORATORY 48 ELEMENT LEAD FROZEN LABORATORY 48
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.330	.070	5				
DUMMY	.310	.080	5				
R1	.230	.030	5				
R2	.350	.030	5				
R3	.200	.030	5				
R4	.400	.060	5				

LABORATORY 55 ELEMENT LEAD FROZEN LABORATORY 55
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5			
DUMMY				<0.5			
R1				<0.5			
R2				<0.5			
R3				<0.5			
R4				<0.5			

LABORATORY 56 ELEMENT LEAD FROZEN LABORATORY 56
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.260	.040	3				
DUMMY	.110	.010	3				
R1	.210	.030	3				
R2	.310	.060	3				
R3	.230	.030	3				
R4	.220	.020	3				

MANGANESE

ACIDIFIED

LABORATORY 1 ELEMENT MANGANESE ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.383	.051	3	0.37	0.44	0.34	
DUMMY	.097	.015	3	0.08	0.11	0.10	
R1	.200	.044	3	0.25	0.17	0.18	
R2	.147	.031	3	0.14	0.12	0.18	
R3	.140	.020	3	0.16	0.12	0.14	
R4	.187	.031	3	0.18	0.22	0.16	

LABORATORY 25 ELEMENT MANGANESE ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.633	.058	3	.7	.6	.6	
DUMMY	.300	0.000	3	.3	.3	.3	
R1	.300	0.000	3	.3	.3	.3	
R2	.333	.153	3	.5	.3	.2	
R3	.333	.058	3	.3	.3	.4	
R4	.300	.100	3	.2	.4	.3	

LABORATORY 27 ELEMENT MANGANESE ACIDIFIED LABORATORY 27
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<.43	<.43	<.38	<.38
DUMMY				<.43	<.43	<.38	<.38
R1				<.43	<.43	<.38	<.38
R2				<.43	<.43	<.38	<.38
R3				<.43	<.43	<.38	<.38
R4				.43	.43	<.38	<.38

LABORATORY 49 ELEMENT MANGANESE ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.1	<0.1	<0.1	
DUMMY				<0.1	<0.1	<0.1	
R1				<0.1	<0.1	<0.1	
R2				<0.1	<0.1	<0.1	
R3				<0.1	<0.1	<0.1	
R4				<0.1	<0.1	<0.1	

LABORATORY 51 ELEMENT MANGANESE ACIDIFIED LABORATORY 51
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.700	.200	3	0.5	0.9	0.7	
DUMMY	.233	.058	3	0.2	0.3	0.2	
R1	.333	.058	3	0.3	0.3	0.4	
R2	.300	0.000	3	0.3	0.3	0.3	
R3	.300	0.000	3	0.3	0.3	0.3	
R4	.267	.058	3	0.2	0.3	0.3	

MANGANESE ACIDIFIED (CONTINUED)

LABORATORY 63 ELEMENT MANGANESE ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.355	.010	4	0.36	0.36	0.34	0.36
DUMMY	.070	.012	4	0.08	0.08	0.06	0.06
R1	.140	.018	4	0.13	0.12	0.16	0.15
R2	.138	.010	4	0.13	0.13	0.14	0.15
R3	.120	.008	4	0.12	0.12	0.13	0.11
R4	.128	.010	4	0.13	0.14	0.12	0.12

MANGANESE

FROZEN

LABORATORY 3 ELEMENT MANGANESE FROZEN LABORATORY 3
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.34	0.23	0.35	
DUMMY				0.050	0.038	0.064	
R1				0.078			
R2				0.13			
R3				0.10	0.10	0.11	
R4				0.18	0.16	0.18	

LABORATORY 4 ELEMENT MANGANESE FROZEN LABORATORY 4
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.370	0.000	2	0.37	0.37		
DUMMY	.145	.021	2	0.16	0.13		
R1	.140	.014	2	0.13	0.15		
R2	.200	.042	2	0.17	0.23		
R3	.115	.007	2	0.11	0.12		
R4	.250	.014	2	0.24	0.26		

LABORATORY 10 ELEMENT MANGANESE FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.803	.040	3	.85	.78	.78	
DUMMY	.480	.075	3	.56	.41	.47	
R1	.510	.035	3	.53	.47	.53	
R2	.440	.000	3	.44	.44	.44	
R3	.540	.046	3	.50	.53	.59	
R4	.517	.040	3	.54	.54	.47	

MANGANESE FROZEN (CONTINUED)

LABORATORY 11 ELEMENT MANGANESE FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.340	.010	3	0.34	0.35	0.33	
DUMMY	.083	.006	3	0.09	0.08	0.08	
R1	.203	.021	3	0.18	0.21	0.22	
R2	.113	.012	3	0.10	0.12	0.12	
R3	.073	.006	3	0.08	0.07	0.07	
R4	.097	.006	3	0.10	0.09	0.10	

LABORATORY 13 ELEMENT MANGANESE FROZEN LABORATORY 13
FURNACE ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.1	<0.5	<0.5	

LABORATORY 16 ELEMENT MANGANESE FROZEN LABORATORY 16
FLAME ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<50	<50	<50	
DUMMY				<50	<50	<50	
R1				<50	<50	<50	
R2				<50	<50	<50	
R3				<50	<50	<50	
R4				<50	<50	<50	

LABORATORY 17 ELEMENT MANGANESE FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<20	<20	<20	<20
DUMMY				<20	<20	<20	<20
R1				<20	<20	<20	<20
R2				<20	<20	<20	<20
R3				<20	<20	<20	<20
R4				<20	<20	<20	<20

LABORATORY 34 ELEMENT MANGANESE FROZEN LABORATORY 34
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.25			
DUMMY				0.041			
R1				0.059			
R2				0.074			
R3				0.069			
R4				0.080			

MANGANESE FROZEN (CONTINUED)

LABORATORY 39 ELEMENT MANGANESE FROZEN LABORATORY 39
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.285	.035	2	.26	.31		
DUMMY	.055	.021	2	.04	.07		
R1	.170	.042	2	.14	.20		
R2	.115	.007	2	.11	.12		
R3	.055	.007	2	.06	.05		
R4	.128	.011	2	.12	.135		

MERCURY

ACIDIFIED

LABORATORY 47 ELEMENT MERCURY ACIDIFIED LABORATORY 47
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R3

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.033	.006	3	.03	.03	.04	
DUMMY	.033	.006	3	.03	.04	.03	
R1	.040	.010	3	.04	.05	.03	
R2	.030	.000	3	.03	.03	.03	
R3	.063	.006	3	.07	.06	.06	
R4	.020	0.000	3	.02	.02	.02	

LABORATORY 53 ELEMENT MERCURY ACIDIFIED LABORATORY 53
COLD VAPOUR ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.048	.011	2	.055	.040		
DUMMY	.033	.004	2	.035	.030		
R1	.016	.001	2	.015	.017		
R2	.028	.004	2	.025	.030		
R3	.030	0.000	2	.030	.030		
R4	.030	.007	2	.035	.025		

NICKEL

ACIDIFIED

LABORATORY 1 ELEMENT NICKEL ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.497	.060	3	0.44	0.49	0.56	
DUMMY	.160	.044	3	0.11	0.19	0.18	
R1	.152	.002	2	.153	.15		
R2	.230	.106	3	.35	.19	.15	
R3	.114	.019	3	.132	.094	.117	
R4	.183	.023	3	.21	.17	.17	

LABORATORY 7 ELEMENT NICKEL ACIDIFIED LABORATORY 7
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.25			
DUMMY				<0.25			
R1				<0.25			
R2				<0.25			
R3				<0.25			
R4				<0.25			

LABORATORY 24 ELEMENT NICKEL ACIDIFIED LABORATORY 24
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.000	.180	3	1.05	0.8	1.15	
DUMMY	.275	.035	2	0.25	0.3		
R1	.375	.035	2	0.4	0.35		
R2	.375	.035	2	0.35	0.4		
R3	.375	.035	2	0.35	0.4		
R4	.350	.071	2	0.4	0.3		

LABORATORY 25 ELEMENT NICKEL ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	2.200	.361	3	1.8	2.3	2.5	
DUMMY	1.233	.289	3	1.4	1.4	0.9	
R1	1.467	.603	3	2.1	1.4	0.9	
R2	.800	.520	3	1.4	0.5	0.5	
R3	.433	.404	3	0.2	0.2	0.9	
R4	.933	.586	3	0.5	0.7	1.6	

LABORATORY 49 ELEMENT NICKEL ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<0.5	<0.5	<0.5	
DUMMY				<0.5	<0.5	<0.5	
R1				<0.5	<0.5	<0.5	
R2				<0.5	<0.5	<0.5	
R3				<0.5	<0.5	<0.5	
R4				<0.5	<0.5	<0.5	

NICKEL ACIDIFIED (CONTINUED)

LABORATORY 63 ELEMENT NICKEL ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.723	.084	4	0.80	0.79	0.65	0.65
DUMMY	.160	.014	4	0.18	0.16	0.15	0.15
R1	.215	.010	4	0.22	0.20	0.22	0.22
R2	.213	.021	4	0.20	0.19	0.23	0.23
R3	.225	.051	4	0.18	0.19	0.24	0.29
R4	.198	.022	4	0.19	0.17	0.21	0.22

NICKEL

FROZEN

LABORATORY 3 ELEMENT NICKEL FROZEN LABORATORY 3
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.010	.135	3	.86	1.12	1.05	
DUMMY	.240	.030	3	.21	.27	.24	
R1	.625	.021	2	.64	.61		
R2	.270	.050	3	.27	.22	.32	
R3	.430	.115	3	.30	.52	.47	
R4	.477	.040	3	.44	.47	.52	

LABORATORY 4 ELEMENT NICKEL FROZEN LABORATORY 4
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.585	.021	2	0.60	0.57		
DUMMY	.055	.007	2	0.06	0.05		
R1	.160	.057	2	0.12	0.20		
R2	.105	.035	2	0.08	0.13		
R3	.140	.042	2	0.17	0.11		
R4	.070	.014	2	0.06	0.08		

LABORATORY 10 ELEMENT NICKEL FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.750	.089	3	.82	.65	.78	
DUMMY	.470	.052	3	.44	.44	.53	
R1	.460	.035	3	.44	.50	.44	
R2	.523	.144	3	.44	.44	.69	
R3	.447	.006	3	.45	.45	.44	
R4	.563	.143	3	.53	.72	.44	

NICKEL FROZEN (CONTINUED)

LABORATORY 11 ELEMENT NICKEL FROZEN LABORATORY 11
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.803	.045	3	0.85	0.80	0.76	
DUMMY	.223	.045	3	0.27	0.22	0.18	
R1	.270	.044	3	0.30	0.29	0.22	
R2	.133	.040	3	0.09	0.17	0.14	
R3	.247	.031	3	0.24	0.28	0.22	
R4	.153	.025	3	0.15	0.13	0.18	

LABORATORY 14 ELEMENT NICKEL FROZEN LABORATORY 14
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.8			
DUMMY				1.1			
R1				0.9			
R2				0.9			
R3				0.9			
R4				0.6			

LABORATORY 16 ELEMENT NICKEL FROZEN LABORATORY 16
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				4.1	<1.4	<1.4	
DUMMY				2.6	<1.4	<1.4	
R1				4.8	2.6	<1.4	
R2				2.4	6.6	<1.4	
R3				1.6	7.4	1.6	
R4				1.8	3.0	<1.4	

LABORATORY 17 ELEMENT NICKEL FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.5	0.8	0.4	0.5
DUMMY				<0.5	<0.5	<0.5	<0.5
R1				<0.5	<0.5	<0.5	<0.5
R2				<0.5	<0.5	<0.5	<0.5
R3				<0.5	<0.5	<0.5	<0.5
R4				<0.5	<0.5	<0.5	<0.5

LABORATORY 23 ELEMENT NICKEL FROZEN LABORATORY 23
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	.575	.021	2	.59	.56		
DUMMY	.070	.028	2	.09	.05		
R1	.180	.089	3	.21	.25	.08	
R2	.300	.052	3	.33	.33	.24	
R3	.175	.120	2	.09	.26		
R4	.135	.021	2	.15	.12		

NICKEL FROZEN (CONTINUED)

LABORATORY 32 ELEMENT NICKEL FROZEN LABORATORY 32
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<.5	<.5	<.5	
DUMMY				<.5	<.5	<.5	
R1				<.4	<.4	<.4	
R2				<.4	<.4	<.4	
R3				<.4	<.4	<.4	
R4				<.5	<.5	<.5	

LABORATORY 34 ELEMENT NICKEL FROZEN LABORATORY 34
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.447			
DUMMY				0.149			
R1				0.191			
R2				0.172			
R3				0.172			
R4				0.169			

LABORATORY 39 ELEMENT NICKEL FROZEN LABORATORY 39
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.200	.100	3	1.20	1.30	1.10	
DUMMY	.353	.127	3	.21	.40	.45	
R1	.417	.067	3	.36	.49	.40	
R2	.420	.036	3	.38	.43	.45	
R3	.235	.021	2	.25	.22		
R4	.225	.021	2	.21	.24		

ZINC

ACIDIFIED

LABORATORY 1 ELEMENT ZINC ACIDIFIED LABORATORY 1
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	9.400	1.700	3	9.4	11.1	7.7	
DUMMY	10.700	1.044	3	9.5	11.4	11.2	
R1	5.850	.636	2	5.4	6.3		
R2	4.433	.839	3	5.4	3.9	4.0	
R3	6.967	.777	3	7.6	7.2	6.1	
R4	6.300	.424	2	6.0	6.6		

ZINC ACIDIFIED (CONTINUED)

LABORATORY 7 ELEMENT ZINC ACIDIFIED LABORATORY 7
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	9.333	1.137	3	8.4	9.0	10.6	
DUMMY	9.550	.354	2	9.3	9.8		
R1	7.000	1.414	2	6.0	8.0		
R2	5.350	.212	2	5.2	5.5		
R3	6.000	1.414	2	5.0	7.0		
R4	7.200	1.697	2	6.0	8.4		

LABORATORY 24 ELEMENT ZINC ACIDIFIED LABORATORY 24
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	8.567	.981	3	8.0	8.0	9.7	
DUMMY	9.800	1.131	2	9.0	10.6		
R1	5.550	.212	2	5.7	5.4		
R2	5.550	.212	2	5.7	5.4		
R3	5.700	.141	2	5.8	5.6		
R4	6.050	.778	2	5.5	6.6		

LABORATORY 25 ELEMENT ZINC ACIDIFIED LABORATORY 25
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	10.467	2.350	3	12.8	8.1	10.5	
DUMMY	12.100	2.905	3	9.3	15.1	11.9	
R1	7.467	1.436	3	9.1	6.9	6.4	
R2	6.933	2.723	3	4.8	10.0	6.0	
R3	7.267	3.099	3	7.9	3.9	10.0	
R4	6.767	4.423	3	11.8	5.0	3.5	

LABORATORY 27 ELEMENT ZINC ACIDIFIED LABORATORY 27
FURNACE ATOMIC ABSORPTION DIRECT INJECTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	13.500	2.031	4	16.0	14.3	11.7	12.0
DUMMY	12.675	1.987	4	13.0	15.3	11.7	10.7
R1	10.200	1.982	4	12.0	11.7	9.2	7.9
R2	10.475	2.253	4	11.7	13.0	9.0	8.2
R3	10.300	2.159	4	12.0	12.3	8.8	8.1
R4	10.000	1.747	4	11.7	11.3	8.3	8.7

LABORATORY 44 ELEMENT ZINC ACIDIFIED LABORATORY 44
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.117	.355	3	6.05	6.5	5.8	
DUMMY	5.433	.850	3	4.8	6.4	5.1	
R1	9.133	1.102	3	8.0	10.2	9.2	
R2	9.167	.902	3	8.3	10.1	9.1	
R3	8.767	.513	3	8.2	8.9	9.2	
R4	5.833	.321	3	5.7	6.2	5.6	

ZINC ACIDIFIED (CONTINUED)

LABORATORY 46 ELEMENT ZINC ACIDIFIED LABORATORY 46
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	8.900	.900	3	8.9	8.0	9.8	
DUMMY	12.467	.751	3	11.7	12.5	13.2	
R1	4.533	.551	3	5.1	4.5	4.0	
R2	4.500	.100	3	4.4	4.6	4.5	
R3	5.500	.436	3	5.2	5.3	6.0	
R4	5.667	1.286	3	4.2	6.6	6.2	

LABORATORY 47 ELEMENT ZINC ACIDIFIED LABORATORY 47
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.467	.577	3	6.8	6.8	5.8	
DUMMY	7.400	.346	3	7.8	7.2	7.2	
R1	3.867	.115	3	3.8	4.0	3.8	
R2	5.667	.416	3	5.8	6.0	5.2	
R3	5.600	.173	3	5.7	5.7	5.4	
R4	5.633	.586	3	6.3	5.4	5.2	

LABORATORY 49 ELEMENT ZINC ACIDIFIED LABORATORY 49
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.000	1.000	3	4.0	6.0	5.0	
DUMMY	3.933	1.102	3	5.0	2.8	4.0	
R1	3.467	1.361	3	2.4	5.0	3.0	
R2	3.933	1.102	3	4.0	5.0	2.8	
R3	3.733	1.973	3	2.4	6.0	2.8	
R4	3.500	1.323	3	2.5	5.0	3.0	

LABORATORY 51 ELEMENT ZINC ACIDIFIED LABORATORY 51
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	12.333	1.528	3	11.0	12.0	14.0	
DUMMY	14.667	2.309	3	12.0	16.0	16.0	
R1	5.333	1.155	3	6.0	4.0	6.0	
R2	7.333	1.155	3	6.0	8.0	8.0	
R3	7.333	1.155	3	6.0	8.0	8.0	
R4	7.333	1.155	3	6.0	8.0	8.0	

LABORATORY 52 ELEMENT ZINC ACIDIFIED LABORATORY 52
ELECTROCHEMISTRY NO TREATMENT SPECIFIED
BAD REPLICATE --- R1

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	11.053	1.575	3	9.49	11.03	12.64	
DUMMY	9.413	.466	3	9.45	8.93	9.86	
R1	9.530	.822	3	9.83	10.16	8.60	
R2	6.683	.645	3	6.50	6.15	7.40	
R3	7.430	.806	2	8.00	6.86		
R4	7.887	1.201	3	7.03	9.26	7.37	

ZINC ACIDIFIED (CONTINUED)

LABORATORY 53 ELEMENT ZINC ACIDIFIED LABORATORY 53
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	9.467	2.650	3	12.5	8.3	7.6	
DUMMY	9.833	.153	3	10.0	9.7	9.8	
R1	5.767	.252	3	5.5	6.0	5.8	
R2	5.433	.379	3	5.0	5.7	5.6	
R3	5.200	.173	3	5.0	5.3	5.3	
R4	5.300	.173	3	5.5	5.2	5.2	

LABORATORY 54 ELEMENT ZINC ACIDIFIED LABORATORY 54
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.500	.500	3	6.0	5.0	5.5	
DUMMY	31.167	1.258	3	30.0	31.0	32.5	
R1	8.933	.702	3	9.6	8.2	9.0	
R2	5.700	3.119	3	9.3	3.8	4.0	
R3	2.667	.416	3	2.8	2.2	3.0	
R4	3.500	.889	3	3.8	2.5	4.2	

LABORATORY 58 ELEMENT ZINC ACIDIFIED LABORATORY 58
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	26.433	2.325	3	27.3	23.8	28.2	
DUMMY	44.733	1.501	3	46.2	44.8	43.2	
R1	8.500	1.732	3	7.5	7.5	10.5	
R2	11.600	.520	3	11.0	11.9	11.9	
R3	11.000	0.000	3	11.0	11.0	11.0	
R4	12.200	1.039	3	12.8	12.8	11.0	

LABORATORY 61 ELEMENT ZINC ACIDIFIED LABORATORY 61
FLAME ATOMIC ABSORPTION DIRECT INJECTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				10			
DUMMY				10			
R1				<10			
R2				<10			
R3				<10			
R4				<10			

LABORATORY 62 ELEMENT ZINC ACIDIFIED LABORATORY 62
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	8.567	.971	3	8.8	9.4	7.5	
DUMMY	7.500	.200	3	7.3	7.5	7.7	
R1	5.267	.306	3	5.6	5.2	5.0	
R2	6.000	.889	3	5.0	6.3	6.7	
R3	2.833	.208	3	2.6	3.0	2.9	
R4	3.167	.153	3	3.2	3.3	3.0	

ZINC ACIDIFIED (CONTINUED)

LABORATORY 63 ELEMENT ZINC ACIDIFIED LABORATORY 63
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	8.293	.897	4	8.90	9.18	7.81	7.28
DUMMY	8.663	1.193	4	9.65	9.74	7.64	7.62
R1	7.518	1.630	4	9.92	7.11	6.66	6.38
R2	7.848	2.252	4	11.08	7.69	6.38	6.24
R3	7.775	1.424	4	6.44	7.51	7.36	9.79
R4	6.560	.626	4	7.11	6.97	5.73	6.43

ZINC

FROZEN

LABORATORY 3 ELEMENT ZINC FROZEN LABORATORY 3
ELECTROCHEMISTRY ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.867	.503	3	7.4	6.4	6.8	
DUMMY	7.467	.651	3	6.8	7.5	8.1	
R1	4.100	.283	2	4.3	3.9		
R2	3.900	.500	3	3.9	4.4	3.4	
R3	3.767	.416	3	3.3	3.9	4.1	
R4	4.833	.058	3	4.9	4.8	4.8	

LABORATORY 5 ELEMENT ZINC FROZEN LABORATORY 5
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.800	.265	3	5.7	5.6	6.1	
DUMMY	9.000	.100	3	8.9	9.0	9.1	
R1	5.033	.153	3	4.9	5.2	5.0	
R2	5.333	.058	3	5.3	5.4	5.3	
R3	6.767	.153	3	6.6	6.9	6.8	
R4	6.867	.058	3	6.8	6.9	6.9	

LABORATORY 8 ELEMENT ZINC FROZEN LABORATORY 8
ELECTROCHEMISTRY NO TREATMENT SPECIFIED

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	1.183	.119	3	1.10	1.13	1.32	
DUMMY	2.473	.071	3	2.46	2.41	2.55	
R1	1.973	.075	3	1.97	1.90	2.05	
R2	1.443	.125	3	1.50	1.53	1.30	
R3	.830	.069	3	0.75	0.87	0.87	
R4	.687	.180	3	0.77	0.48	0.81	

ZINC FROZEN (CONTINUED)

LABORATORY 10 ELEMENT ZINC FROZEN LABORATORY 10
FURNACE ATOMIC ABSORPTION CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	8.000	.436	3	8.3	8.2	7.5	
DUMMY	8.733	.569	3	8.9	8.1	9.2	
R1	5.933	.289	3	5.6	6.1	6.1	
R2	5.867	.252	3	6.1	5.6	5.9	
R3	5.267	.289	3	5.6	5.1	5.1	
R4	4.733	.289	3	4.4	4.9	4.9	

LABORATORY 11 ELEMENT ZINC FROZEN LABORATORY 11
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	7.017	.112	3	7.10	7.06	6.89	
DUMMY	7.420	.040	3	7.42	7.46	7.38	
R1	4.570	.128	3	4.54	4.46	4.71	
R2	3.280	.052	3	3.34	3.25	3.25	
R3	4.527	.214	3	4.28	4.65	4.65	
R4	3.620	.399	3	3.31	3.48	4.07	

LABORATORY 13 ELEMENT ZINC FROZEN LABORATORY 13
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.500	.707	2	7.0	6.0		
DUMMY	8.300	1.131	2	9.1	7.5		
R1	4.700	.283	2	4.5	4.9		
R2	3.950	.495	2	4.3	3.6		
R3	5.550	.636	2	5.1	6.0		
R4	5.950	.071	2	5.9	6.0		

LABORATORY 14 ELEMENT ZINC FROZEN LABORATORY 14
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				0.8			
DUMMY				1.1			
R1				0.9			
R2				0.9			
R3				0.9			
R4				0.6			

LABORATORY 15 ELEMENT ZINC FROZEN LABORATORY 15
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	4.993	.012	3	5.00	4.98	5.00	
DUMMY	5.800	.141	3	5.95	5.67	5.78	
R1	3.707	.168	3	3.89	3.67	3.56	
R2	4.170	.259	3	4.40	4.22	3.89	
R3	2.937	.166	3	2.78	3.11	2.92	
R4	2.943	.309	3	3.00	2.61	3.22	

ZINC FROZEN (CONTINUED)

LABORATORY 16 ELEMENT ZINC FROZEN LABORATORY 16
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<3.2	<3.2	<3.2	
DUMMY				<3.2	3.3	<3.2	
R1				<3.2	<3.2	3.5	
R2				<3.2	<3.2	3.9	
R3				<3.2	<3.2	<3.2	
R4				<3.2	<3.2	<3.2	

LABORATORY 17 ELEMENT ZINC FROZEN LABORATORY 17
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.875	.532	4	5.9	5.9	6.5	5.2
DUMMY	6.000	.173	3	6.2	5.9	5.9	
R1	3.500	.458	3	3.9	3.6	3.0	
R2	3.600	.300	3	3.9	3.6	3.3	
R3	5.467	2.650	3	4.3	3.6	8.5	
R4	3.900	.000	3	3.9	3.9	3.9	

LABORATORY 23 ELEMENT ZINC FROZEN LABORATORY 23
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
BAD REPLICATE --- R2

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	5.500	.141	2	5.4	5.6		
DUMMY	6.900	.141	2	7.0	6.8		
R1	4.300	.200	3	4.5	4.1	4.3	
R2	11.067	.351	3	11.4	11.1	10.7	
R3	3.850	.071	2	3.8	3.9		
R4	3.300	0.000	2	3.3	3.3		

LABORATORY 32 ELEMENT ZINC FROZEN LABORATORY 32
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				<.25	<.25	<.25	
DUMMY				1.3	0.5	<.25	
R1				<.4	<.4	<.4	
R2				<.4	<.4	<.4	
R3				<.4	<.4	<.4	
R4				<.25	<.25	<.25	

LABORATORY 34 ELEMENT ZINC FROZEN LABORATORY 34
FURNACE ATOMIC ABSORPTION ION EXCHANGE RESIN
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				4.060			
DUMMY				4.130			
R1				2.310			
R2				2.500			
R3				2.690			
R4				2.500			

ZINC FROZEN (CONTINUED)

LABORATORY 39 ELEMENT ZINC FROZEN LABORATORY 39
FURNACE ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	7.067	.058	3	7.1	7.0	7.1	
DUMMY	8.400	.200	3	8.2	8.6	8.4	
R1	3.600	0.000	3	3.6	3.6	3.6	
R2	4.300	.200	3	4.3	4.5	4.1	
R3	3.767	.404	3	4.0	4.0	3.3	
R4	3.967	.153	3	4.1	4.0	3.8	

LABORATORY 41 ELEMENT ZINC FROZEN LABORATORY 41
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	4.633	.115	3	4.7	4.5	4.7	
DUMMY	4.700	.200	3	4.5	4.7	4.9	
R1	3.233	.351	3	2.9	3.2	3.6	
R2	3.000	.300	3	2.7	3.0	3.3	
R3	1.167	.153	3	1.0	1.2	1.3	
R4	3.367	.058	3	3.3	3.4	3.4	

LABORATORY 55 ELEMENT ZINC FROZEN LABORATORY 55
FLAME ATOMIC ABSORPTION ORGANIC EXTRACTION
DATA CANNOT BE ANALYZED.

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE				9.6			
DUMMY				11.4			
R1				2.5			
R2				4.4			
R3				6.4			
R4				4.8			

LABORATORY 56 ELEMENT ZINC FROZEN LABORATORY 56
SPECTROPHOTOMETRY CO-PRECIPITATION

IDENT	MEAN	S.D.	N	C1	C2	C3	C4
SPIKE	6.000	.100	3				
DUMMY	6.000	.300	3				
R1	3.500	.100	3				
R2	3.900	.100	3				
R3	3.700	.100	3				
R4	3.600	.100	3				

APPENDIX II ADDENDUM

An extra set of results was received from an additional Canadian laboratory that analysed residual water within samples provided to a listed participant. Their reported concentrations for acidified samples analysed by anodic stripping voltometry at the storage pH are listed below but not included in any of the data interpretation.

IDENT.	MEAN	S.D.	N.	C_1	C_2	C_3	C_4
Cadmium							
Spike	.22	0	2	0.22	0.22	-	-
Dummy	.070	.020	4	0.049	0.072	0.063	0.097
R1	.035	.010	4	0.023	0.033	0.036	0.048
R2	.048	.010	4	0.042	0.039	0.061	0.048
R3	.058	.003	3	0.057	0.061	0.056	-
Copper							
Spike	1.95	.07	2	1.9	2.0	-	-
Dummy	.64	.22	4	0.55	0.51	0.51	0.97
R1	.16	.04	4	0.12	0.147	0.21	0.18
R2	.25	.14	4	0.17	0.46	0.15	0.21
R3	2.83	.75	4	2.3	3.9	2.3	2.8
Lead							
Spike	.43	.01	3	0.43	0.43	0.44	-
Dummy	.42	.09	4	0.29	0.43	0.49	0.46
R1	.47	.02	4	0.45	0.46	0.49	0.50
R2	.52	.03	4	0.48	0.52	0.52	0.54
R3	.68	.05	3	0.63	0.73	0.68	-

APPENDIX III

ARSENIC FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
15	2.500	.163	.102	6.70	SIG	2.263	.237

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
15	1.973	2.263	-.290	0.0	22.80	SIG	-4.77	SIG

NOMINAL SPIKE VALUE IS 0.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

CADMIUM ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.055	.014	.014	.92	NS	.073	-.018
2	.085	.011	.012	.83	NS	.083	.002
7	.085*	.030	.033	.56	NS	.125	-.040
24	.065	.010	.014	.00	NS	.080	-.015
25	.392	.100	.100	.97	NS	.433	-.042
26	.039*	.013	.014	.39	NS	.030*	.009
27	----	----	----	----	---	----	----
33	.080	.005	.003	6.95	SIG	.082	-.002
38	.027*	.027	.012	18.75	SIG	.067	-.040
42	.178	.079	.030	22.75	SIG	.100	.077
44	.023	.006	.006	1.31	NS	.033	-.010
46	.059	.016	.011	4.51	SIG	.040	.019
47	.060	.023	.006	42.13	SIG	.047	.013
49	----	----	----	----	---	----	----
51	.073	.008	.006	2.67	NS	.067	.007
52	1.495*	.647	.564	2.06	NS	1.420*	.075
53	.065	.008	.005	4.00	NS	.065	-.000
54	.110	.032	.026	3.15	NS	.103	.007
58	----	----	----	----	---	----	----
61	----	----	----	----	---	----	----
62	.083	.015	.000	999.00	SIG	.060	.023
63	.057	.011	.011	1.26	NS	.088	-.031

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	.139	.073	.066	30.8	9.51	SIG	-6.92+	SIG
2	.273	.083	.190	89.0	123.79	SIG	-1.38	NS
7	.280	.125	.155	72.8	192.20	SIG	-5.19	SIG
24	.250	.080	.170	79.8	130.05	SIG	-2.88	NS
25	.500	.433	.067	31.3	4.00	NS	-4.39+	SIG
26	.198	.030*	.168	78.6	708.79	SIG	-7.23+	SIG
27	----	----	----	----	----	---	----	---
33	.332	.082	.250	117.4	999.00	SIG	32.66	SIG
38	.073	.067	.007	3.1	.17	NS	-12.91	SIG
42	.310	.100	.210	98.6	29.40	SIG	-.08	NS
44	.080	.033	.047	21.9	19.60	SIG	-15.78	SIG
46	.180	.040	.140	65.7	588.00	SIG	-12.64+	SIG
47	.223	.047	.177	82.9	999.00	SIG	-7.71	SIG
49	----	----	----	----	----	---	----	---
51	.230	.067	.163	76.7	109.14	SIG	-3.18+	NS
52	3.273	1.420*	1.853	870.1	13.99	SIG	3.31	SIG
53	.225	.065	.160	75.1	512.00	SIG	-7.50	SIG
54	.237	.103	.133	62.6	114.29	SIG	-6.39	SIG
58	----	----	----	----	----	---	----	---
61	----	----	----	----	----	---	----	---
62	.290	.060	.230	108.0	529.00	SIG	1.70+	NS
63	.203	.088	.115	54.0	40.18	SIG	-5.40	SIG

NOMINAL SPIKE VALUE IS .213 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

CADMIUM FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	.051	.015	.003	85.76	SIG	.043	.008
4	.038*	.016	.015	2.12	NS	.043*	-.005
5	.048	.016	.002	184.56	SIG	.057	-.008
8	.101	.060	.017	41.88	SIG	.023*	.078
10	.065	.015	.013	2.10	NS	.065	.000
11	.035	.015	.006	22.01	SIG	.054	-.019
12	.063	.006	.002	31.00	SIG	.074	-.011
13	.067	.031	.018	5.60	NS	.070	-.003
13	.047	.012	.006	9.50	NS	.055	-.008
14	----	----	----	----	---	----	----
15	.048	.010	.008	3.85	NS	.039	.009
16	----	----	----	----	---	----	----
17	----	----	----	----	---	----	----
23	.185*	.153	.105	4.33	NS	.040*	.145
32	----	----	----	----	---	----	----
34	----	----	----	----	---	----	----
39	.032	.014	.008	9.56	SIG	.058	-.026
41	.129	.014	.016	.20	NS	.113	.016
48	----	----	----	----	---	----	----
55	----	----	----	----	---	----	----
56	.042	.004	.002	20.25	SIG	.038	.004

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	.131	.043	.087	40.9	56.61	SIG	-10.86	SIG
4	.165	.043*	.123	57.5	91.18	SIG	-7.05	SIG
5	.200	.057	.143	67.3	150.94	SIG	-5.97+	SIG
8	.183	.023*	.160	75.1	288.00	SIG	-5.62	SIG
10	.230	.065	.165	77.6	251.29	SIG	-4.57	SIG
11	.200	.054	.146	68.5	212.45	SIG	-6.69+	SIG
12	.345	.074	.271	127.2	999.00	SIG	9.06	SIG
13	.155	.070	.085	39.9	7.05	NS	-4.00	NS
13	.140	.055	.085	39.9	4.45	NS	-3.18+	NS
14	----	----	----	----	----	---	----	---
15	.145	.039	.106	49.9	999.00	SIG	-52.61	SIG
16	----	----	----	----	----	---	----	---
17	----	----	----	----	----	---	----	---
23	.140*	.040*	.100	46.9	100.00	SIG	-11.30+	NS
32	----	----	----	----	----	---	----	---
34	----	----	----	----	----	---	----	---
39	.185	.058	.127	59.5	123.77	SIG	-7.58	SIG
41	.230	.113	.117	54.8	306.25	SIG	-14.45	SIG
48	----	----	----	----	----	---	----	---
55	----	----	----	----	----	---	----	---
56	.213	.038	.175	82.2	735.00	SIG	-5.89+	SIG

NOMINAL SPIKE VALUE IS .213 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

CHROMIUM ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.271	.086	.067	2.72	NS	.157*	.114
38	1.593*	.518	.590	.15	NS	1.413*	.179
49	----	----	----	----	---	----	----

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	1.005	.157*	.848	84.8	30.51	SIG	-.99	NS
38	1.800	1.413*	.387	38.7	.56	NS	-1.19	NS
49	----	----	----	----	----	---	----	---

NOMINAL SPIKE VALUE IS 1.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

CHROMIUM FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
10	.523*	.310	.329	.58	NS	.373*	.150
14	----	----	----	----	---	----	----
15	----	----	----	----	---	----	----
17	----	----	----	----	---	----	----

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
10	.757*	.373*	.383	38.3	6.88	NS	-4.22+	NS
14	----	----	----	----	----	---	----	---
15	----	----	----	----	----	---	----	---
17	----	----	----	----	----	---	----	---

NOMINAL SPIKE VALUE IS 1.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

COBALT ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
25	.500*	.289	.287	1.05	NS	.400*	.100
49	----	----	----	----	---	----	----
63	----	----	----	----	---	----	----

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
25	.900	.400*	.500	100.0	999.00	SIG	-.00+	NS
49	----	----	----	----	----	---	----	---
63	----	----	----	----	----	---	----	---

NOMINAL SPIKE VALUE IS .500 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

COBALT FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
10	.185	.017	.011	6.19	SIG	.193	-.008
16	2.340*	1.361	1.302	1.28	NS	2.000*	.340
17	----	----	----	----	---	----	----

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
10	.640	.193	.447	89.3	121.32	SIG	-1.32+	NS
16	2.650*	2.000*	.650	130.0	1.00	NS	.23+	NS
17	----	----	----	----	----	---	----	---

NOMINAL SPIKE VALUE IS .500 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

COPPER ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.564*	.381	.314	2.74	NS	.300*	.264
2	.364	.095	.057	9.81	SIG	.195	.169
7	1.323*	.747	.477	4.38	NS	.975*	.348
24	.181	.038	.035	1.44	NS	.130	.051
25	2.400	.559	.399	4.54	SIG	1.300	1.100
26	.608	.126	.087	5.41	SIG	.367	.241
27	----	----	----	----	---	----	----
33	.233	.010	.010	1.00	NS	.170	.063
38	10.883	2.883	2.554	2.00	NS	3.110*	7.773
42	1.508	.289	.109	23.05	SIG	1.430	.077
44	.958	.247	.280	.19	NS	.667*	.292
46	.725	.154	.058	23.58	SIG	.833	-.108
47	----	----	----	----	---	----	----
49	----	----	----	----	---	----	----
51	1.675	.888	.216	59.35	SIG	.367*	1.308
52	1.558*	.709	.580	2.64	NS	1.797	-.238
53	.290	.057	.010	78.50	SIG	.215	.075
54	2.544	1.935	.075	999.00	SIG	1.467	1.078
58	----	----	----	----	---	----	----
61	----	----	----	----	---	----	----
62	----	----	----	----	---	----	----
63	.208	.028	.024	2.96	NS	.170	.038

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	1.700	.300*	1.400	66.7	7.06	NS	-1.00+	NS
2	2.120	.195	1.925	91.7	999.00	SIG	-3.36	SIG
7	2.500	.975*	1.525	72.6	50.97	SIG	-2.69	NS
24	2.033	.130	1.903	90.6	101.52	SIG	-1.04	NS
25	7.100	1.300	5.800	276.2	999.00	SIG	32.04+	SIG
26	----	.367	----	----	----	N/A	----	N/A
27	----	----	----	----	----	---	----	---
33	2.070	.170	1.900	90.5	999.00	SIG	-10.87	SIG
38	7.623*	3.110*	4.513	214.9	22.63	SIG	2.54+	NS
42	3.530	1.430	2.100	100.0	189.81	SIG	0.00	NS
44	.967	.667*	.300	14.3	3.12	NS	-10.59	SIG
46	1.700	.833	.867	41.3	169.00	SIG	-18.50	SIG
47	----	----	----	----	----	---	----	---
49	----	----	----	----	----	---	----	---
51	2.933	.367*	2.567	122.2	118.58	SIG	1.98	NS
52	3.023	1.797	1.227	58.4	8.34	SIG	-2.06	NS
53	1.967	.215	1.752	83.4	999.00	SIG	-10.33+	SIG
54	25.500	1.467	24.033	1144.4	999.00	SIG	72.66	SIG
58	----	----	----	----	----	---	----	---
61	----	----	----	----	----	---	----	---
62	----	----	----	----	----	---	----	---
63	1.440	.170	1.270	60.5	155.34	SIG	-8.15+	SIG

NOMINAL SPIKE VALUE IS 2.100 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

COPPER FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	.239	.029	.010	25.02	SIG	.150	.089
4	.158	.084	.007	326.33	SIG	2.240	-2.083
5	.113	.020	.015	3.65	NS	.203	-.090
8	.458	.113	.050	16.44	SIG	.483	-.026
10	.779	.127	.091	4.48	SIG	.610	.169
11	.163	.028	.019	4.82	SIG	.140	.023
12	1.733	.931	.266	29.12	SIG	1.280	.453
13	1.025	.260	.250	1.20	NS	.650*	.375
13	.450	.393	.050	142.67	SIG	.600	-.150
14	----	----	----	----	---	----	----
15	.070	.024	.017	4.96	NS	.050*	.020
16	----	----	----	----	---	----	----
17	----	----	----	----	---	----	----
23	.151	.048	.017	22.10	SIG	.140	.011
32	----	----	----	----	---	----	----
39	.108	.028	.022	2.86	NS	.052*	.056
41	.287	.032	.030	1.44	NS	.260	.027
48	.163	.061	.053	3.02	NS	.200	-.038
55	----	----	----	----	---	----	----
56	.170	.026	.019	3.73	NS	.100	.070

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	1.780	.150	1.630	77.6	580.95	SIG	-6.95	SIG
4	1.755	2.240	-.485	-23.1	2.89	NS	-9.07	SIG
5	1.233	.203	1.030	49.0	945.36	SIG	-31.94+	SIG
8	2.013	.483	1.530	72.9	133.34	SIG	-4.30	SIG
10	1.867	.610	1.257	59.8	725.15	SIG	-18.07+	SIG
11	1.507	.140	1.367	65.1	999.00	SIG	-29.66	SIG
12	2.500	1.280	1.220	58.1	25.49	SIG	-3.64	NS
13	1.400	.650*	.750	35.7	45.00	SIG	-12.07	SIG
13	2.050	.600	1.450	69.0	168.20	SIG	-5.81	SIG
14	----	----	----	----	----	---	----	---
15	1.280	.050*	1.230	58.6	341.26	SIG	-13.07+	SIG
16	----	----	----	----	----	---	----	---
17	----	----	----	----	----	---	----	---
23	1.300	.140	1.160	55.2	999.00	SIG	-94.00+	SIG
32	----	----	----	----	----	---	----	---
39	1.200	.052*	1.148	54.7	387.53	SIG	-16.31+	SIG
41	1.307	.260	1.047	49.8	999.00	SIG	-34.90+	SIG
48	1.100	.200	.900	42.9	297.79	SIG	-23.01	SIG
55	----	----	----	----	----	---	----	---
56	1.500	.100	1.400	66.7	999.00	SIG	-19.93+	SIG

NOMINAL SPIKE VALUE IS 2.100 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

IRON ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	1.015*	.361	.377	.73	NS	.555*	.460
25	2.622	.349	.115	33.58	SIG	1.233	1.389
27	----	----	----	----	---	----	----
33	1.025	.142	.073	15.02	SIG	.760	.265
38	1.408*	.491	.532	.41	NS	1.787	-.379
49	----	----	----	----	---	----	----
51	4.208	1.544	.707	14.82	SIG	2.333	1.875
53	1.000	.185	.173	1.33	NS	.600	.400
58	----	----	----	----	---	----	----
61	----	----	----	----	---	----	----
63	1.035	.311	.221	5.95	SIG	.910	.125

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	4.067	.555*	3.512	103.3	34.77	SIG	.19	NS
25	4.000	1.233	2.767	81.4	23.35	SIG	-1.11	NS
27	----	----	----	----	----	---	----	---
33	5.040	.760	4.280	125.9	999.00	SIG	24.10	SIG
38	1.103*	1.787	-.683	-20.1	6.84	NS	-15.63	SIG
49	----	----	----	----	----	---	----	---
51	6.500	2.333	4.167	122.5	89.29	SIG	1.74	NS
53	2.800	.600	2.200	64.7	18.15	SIG	-3.00+	NS
58	----	----	----	----	----	---	----	---
61	----	----	----	----	----	---	----	---
63	3.008	.910	2.098	61.7	37.86	SIG	-3.82	SIG

NOMINAL SPIKE VALUE IS 3.400 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

IRON FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	.438	.169	.043	54.76	SIG	.477	-.038
4	1.333	.400	.214	12.67	SIG	.860	.473
10	5.825	1.067	1.120	.66	NS	4.233	1.592
11	.515	.076	.055	4.28	SIG	.307	.208
13	1.233	.308	.183	5.60	NS	1.800	-.567
13	1.517	.204	.235	.39	NS	1.750	-.233
16	15.364*	10.013	9.431	1.42	NS	5.667*	9.697
17	----	----	----	----	---	----	----
32	----	----	----	----	---	----	----

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	1.745	.477	1.268	37.3	31.25	SIG	-7.15+	NS
4	3.440	.860	2.580	75.9	449.76	SIG	-6.74	SIG
10	5.833	4.233	1.600	47.1	22.81	SIG	-5.37	SIG
11	2.190	.307	1.883	55.4	999.00	SIG	-63.10	SIG
13	2.300	1.800	.500	14.7	2.78	NS	-9.67+	NS
13	2.900	1.750	1.150	33.8	4.68	NS	-4.23	NS
16	18.500*	5.667*	12.833	377.5	1.36	NS	.65+	NS
17	----	----	----	----	----	---	----	---
32	----	----	----	----	----	---	----	---

NOMINAL SPIKE VALUE IS 3.400 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

LEAD ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.652	.182	.183	.96	NS	.433*	.218
2	.458	.078	.048	10.19	SIG	.205	.253
7	----	----	----	----	---	----	----
24	.475	.158	.112	3.33	NS	.125*	.350
25	2.142	.557	.508	1.73	NS	2.133	.008
26	.423	.083	.075	1.98	NS	.300	.123
33	.390	.032	.028	2.41	NS	.250	.140
42	.343	.073	.030	18.24	SIG	.190	.153
44	.550	.131	.114	2.31	NS	.650	-.100
46	.692	.115	.097	2.52	NS	.490	.203
47	----	----	----	----	---	----	----
49	----	----	----	----	---	----	----
51	.608	.138	.144	.68	NS	.333*	.275
52	5.221	1.638	1.154	4.39	SIG	2.777*	2.444
53	.550	.074	.032	11.33	SIG	.305	.245
54	1.366	.839	.237	43.45	SIG	.417*	.949
58	1.717	.349	.287	2.73	NS	3.433	-1.717
61	----	----	----	----	---	----	----
63	.543	.081	.051	8.61	SIG	.363	.180

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	.370*	.433*	-.063	-31.7	5.16	NS	-9.44	SIG
2	.500	.205	.295	147.5	36.90	SIG	1.96	NS
7	----	----	----	----	----	---	----	---
24	.283*	.125*	.158	79.2	6.99	NS	-.70	NS
25	1.733	2.133	-.400	-200.0	.30	NS	-.83	NS
26	----	.300	----	----	----	N/A	----	N/A
33	.410	.250	.160	80.0	60.24	SIG	-1.94+	NS
42	.250	.190	.060	30.0	10.80	SIG	-7.67	SIG
44	.580	.650	-.070	-35.0	.59	NS	-2.97	SIG
46	.517	.490	.027	13.3	.09	NS	-1.97	NS
47	----	----	----	----	----	---	----	---
49	----	----	----	----	----	---	----	---
51	.667	.333*	.333	166.7	7.14	NS	1.07	NS
52	3.453*	2.777*	.677	338.3	3.45	NS	1.31	NS
53	.390	.305	.085	42.5	3.96	NS	-2.69	NS
54	0.000*	.417*	-.417	-208.3	89.29	SIG	-13.98+	SIG
58	3.533	3.433	.100	50.0	.03	NS	-.17	NS
61	----	----	----	----	----	---	----	---
63	.418	.363	.055	27.5	.34	NS	-1.53	NS

NOMINAL SPIKE VALUE IS .200 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

LEAD FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
5	.455	.033	.027	3.05	NS	.383	.072
8	.279	.071	.031	17.19	SIG	.110	.169
10	1.083	.642	.108	125.72	SIG	.320*	.763
11	.170	.042	.045	.55	NS	.173	-.003
12	.574	.115	.026	45.45	SIG	.730	-.156
13	1.063	.160	.162	.94	NS	.750	.313
13	.600	.107	.050	9.33	SIG	.450	.150
14	----	----	----	----	---	----	----
15	.502	.088	.066	3.79	NS	.339	.163
16	----	----	----	----	---	----	----
17	----	----	----	----	---	----	----
23	.344*	.346	.278	2.65	NS	.075*	.269
34	----	----	----	----	---	----	----
41	.548	.087	.021	63.24	SIG	.407	.141
48	.295	.092	.040	28.89	SIG	.310	-.015
55	----	----	----	----	---	----	----
56	.243	.053	.038	4.33	SIG	.110*	.133

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
5	.420	.383	.037	18.3	1.59	NS	-5.62	SIG
8	.190	.110	.080	40.0	27.43	SIG	-7.86	SIG
10	.480	.320*	.160	80.0	8.00	SIG	-.71	NS
11	.237	.173	.063	31.7	13.88	SIG	-8.04	SIG
12	.510	.730	-.220	-110.0	5.69	NS	-4.56	SIG
13	.750	.750	0.000	0.0	0.00	NS	-2.83	NS
13	.650	.450	.200	100.0	.47	NS	-.00	NS
14	----	----	----	----	----	---	----	---
15	.535	.339	.196	98.0	47.12	SIG	-.14	NS
16	----	----	----	----	----	---	----	---
17	----	----	----	----	----	---	----	---
23	.115*	.075*	.040	20.0	1.88	NS	-5.49	SIG
34	----	----	----	----	----	---	----	---
41	.487	.407	.080	40.0	28.80	SIG	-8.05	SIG
48	.330	.310	.020	10.0	.18	NS	-3.79	SIG
55	----	----	----	----	----	---	----	---
56	.260	.110*	.150	75.0	39.71	SIG	-2.10+	NS

NOMINAL SPIKE VALUE IS .200 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

MANGANESE ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.168	.038	.032	2.51	NS	.097*	.072
25	.317	.083	.096	.12	NS	.300	.017
27	----	----	----	----	---	----	----
49	----	----	----	----	---	----	----
51	.300	.043	.041	1.33	NS	.233	.067
63	.131	.014	.012	2.34	NS	.070	.061

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	.383	.097*	.287	79.6	86.00	SIG	-2.37	NS
25	.633	.300	.333	92.6	100.00	SIG	-.80+	NS
27	----	----	----	----	----	---	----	---
49	----	----	----	----	----	---	----	---
51	.700	.233	.467	129.6	15.08	SIG	.89	NS
63	.355	.070	.285	79.2	999.00	SIG	-9.82	SIG

NOMINAL SPIKE VALUE IS .360 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

MANGANESE FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	----	----	----	----	---	----	----
4	.176	.059	.024	13.12	SIG	.145	.031
10	.502	.049	.035	4.51	SIG	.480	.022
11	.122	.053	.013	61.26	SIG	.083	.038
13	----	----	----	----	---	----	----
16	----	----	----	----	---	----	----
17	----	----	----	----	---	----	----
34	----	----	----	----	---	----	----
39	.117	.047	.022	8.97	SIG	.055*	.062

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	----	----	----	----	----	---	----	---
4	.370	.145	.225	62.5	225.00	SIG	-9.00+	NS
10	.803	.480	.323	89.8	42.77	SIG	-.74	NS
11	.340	.083	.257	71.3	999.00	SIG	-15.50	SIG
13	----	----	----	----	----	---	----	---
16	----	----	----	----	----	---	----	---
17	----	----	----	----	----	---	----	---
34	----	----	----	----	----	---	----	---
39	.285	.055*	.230	63.9	62.24	SIG	-4.46	SIG

NOMINAL SPIKE VALUE IS .360 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

MERCURY ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
47	.030	.010	.006	9.00	SIG	.033	-.003
53	.026	.007	.004	5.55	NS	.033	-.007

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
47	.033	.033	0.000	0.0	0.00	NS	0.00	NS
53	.048	.033	.015	0.0	3.60	NS	1.90	NS

NOMINAL SPIKE VALUE IS 0.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

NICKEL ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	.171*	.067	.059	2.05	NS	.160*	.011
7							
24	.369	.037	.047	.14	NS	.275	.094
25	.908*	.598	.534	1.93	NS	1.233*	-.325
49							
63	.213	.029	.030	.58	NS	.160	.052

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	.497	.160*	.337	42.1	61.45	SIG	-10.79	SIG
7								
24	1.000	.275	.725	90.6	28.56	SIG	-.55	NS
25	2.200	1.233*	.967	120.8	13.14	SIG	.62	NS
49								
63	.723	.160	.563	70.3	175.17	SIG	-5.59+	SIG

NOMINAL SPIKE VALUE IS .800 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

NICKEL FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	.435	.139	.071	10.52	SIG	.240	.195
4	.119*	.048	.040	1.95	NS	.055*	.064
10	.498	.101	.103	.85	NS	.470	.028
11	.201	.068	.036	10.74	SIG	.223	-.023
14							
16							
17							
23	.206*	.092	.078	2.25	NS	.070*	.136
32							
34							
39	.343	.104	.045	13.79	SIG	.353	-.010

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	1.010	.240	.770	96.2	93.62	SIG	-.38+	NS
4	.585	.055*	.530	66.2	999.00	SIG	-17.08	SIG
10	.750	.470	.280	35.0	22.19	SIG	-8.75	SIG
11	.803	.223	.580	72.5	248.16	SIG	-5.98	SIG
14								
16								
17								
23	.575	.070*	.505	63.1	408.04	SIG	-11.80	SIG
32								
34								
39	1.200	.353	.847	105.8	82.61	SIG	.50	NS

NOMINAL SPIKE VALUE IS .800 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

ZINC ACIDIFIED

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
1	5.850	1.219	.730	6.36	SIG	10.700	-4.850
7	6.388	1.279	1.316	.87	NS	9.550	-3.163
24	5.713	.387	.423	.62	NS	9.800	-4.088
25	7.108*	2.666	3.108	.03	NS	12.100	-4.992
27	10.244	1.837	2.044	.04	NS	12.675	-2.431
44	8.225	1.594	.774	12.91	SIG	5.433	2.792
46	5.050	.840	.734	2.14	NS	12.467	-7.417
47	5.192	.861	.374	16.74	SIG	7.400	-2.208
49	3.658*	1.274	1.476	.07	NS	3.933*	-.275
51	6.833	1.337	1.155	2.25	NS	14.667	-7.833
52	7.321	.969	.935	1.26	NS	9.413	-2.092
53	5.425	.314	.258	2.75	NS	9.833	-4.408
54	5.200	2.905	1.672	8.40	SIG	31.167	-25.967
58	10.825	1.718	1.043	7.29	SIG	44.733	-33.908
61	----	----	----	----	---	----	----
62	4.317	1.467	.487	30.56	SIG	7.500	-3.183
63	7.425	1.520	1.593	.56	NS	8.663	-1.238

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
1	9.400	10.700	-1.300	-65.0	1.27	NS	-2.87	SIG
7	9.333	9.550	-.217	-10.8	.06	NS	-2.55	NS
24	8.567	9.800	-1.233	-61.7	1.71	NS	-3.43	SIG
25	10.467	12.100	-1.633	-81.7	.57	NS	-1.68	NS
27	13.500	12.675	.825	41.3	.34	NS	-.83	NS
44	6.117	5.433	.683	34.2	1.65	NS	-2.47	NS
46	8.900	12.467	-3.567	-178.3	27.79	SIG	-8.23	SIG
47	6.467	7.400	-.933	-46.7	5.76	NS	-7.55	SIG
49	5.000	3.933*	1.067	53.3	1.54	NS	-1.09	NS
51	12.333	14.667	-2.333	-116.7	2.13	NS	-2.71	NS
52	11.053	9.413	1.640	82.0	2.99	NS	-.38	NS
53	9.467	9.833	-.367	-18.3	.06	NS	-1.54+	NS
54	5.500	31.167	-25.667	-1283.3	999.00	SIG	-35.39	SIG
58	26.433	44.733	-18.300	-915.0	131.22	SIG	-12.71	SIG
61	----	----	----	----	----	---	----	---
62	8.567	7.500	1.067	53.3	3.47	NS	-1.63+	NS
63	8.293	8.663	-.370	-18.5	.25	NS	-3.18	SIG

NOMINAL SPIKE VALUE IS 2.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

ZINC FROZEN

REPLICATES / DUMMY

LAB	MEAN REPS	S.D. REPS	SANAL	F	SIGNIF	MEAN DUMMY	DIFF
3	4.155	.545	.365	5.08	SIG	7.467	-3.312
5	6.000	.867	.115	203.83	SIG	9.000	-3.000
8	1.233	.546	.121	72.02	SIG	2.473	-1.240
10	5.450	.563	.280	12.18	SIG	8.733	-3.283
11	3.999	.621	.237	22.62	SIG	7.420	-3.421
13	5.038	.888	.429	8.68	SIG	8.300	-3.263
14	----	----	----	----	---	----	----
15	3.439	.584	.233	20.26	SIG	5.800	-2.361
16	----	----	----	----	---	----	----
17	4.117	1.421	1.353	1.37	NS	6.000	-1.883
23	3.886	.463	.146	28.32	SIG	6.900	-3.014
32	----	----	----	----	---	----	----
34	----	----	----	----	---	----	----
39	3.908	.340	.238	4.80	SIG	8.400	-4.492
41	2.692	.953	.245	52.83	SIG	4.700	-2.008
55	----	----	----	----	---	----	----
56	3.675	.176	.100	8.75	SIG	6.000	-2.325

SPIKE / DUMMY

LAB	MEAN SPIKE	MEAN DUMMY	DIFF	PER CENT RECOVERY	F	SIGNIF	T	SIGNIF
3	6.867	7.467	-.600	-30.0	1.60	NS	-5.47	SIG
5	5.800	9.000	-3.200	-160.0	384.00	SIG	-31.84	SIG
8	1.183	2.473	-1.290	-64.5	259.12	SIG	-41.05	SIG
10	8.000	8.733	-.733	-36.7	3.14	NS	-6.61	SIG
11	7.017	7.420	-.403	-20.2	34.78	SIG	-35.14	SIG
13	6.500	8.300	-1.800	-90.0	3.64	NS	-4.03	NS
14	----	----	----	----	----	---	----	---
15	4.993	5.800	-.807	-40.3	97.44	SIG	-34.35+	SIG
16	----	----	----	----	----	---	----	---
17	5.875	6.000	-.125	-6.2	.15	NS	-6.53	SIG
23	5.500	6.900	-1.400	-70.0	98.00	SIG	-24.04	SIG
32	----	----	----	----	----	---	----	---
34	----	----	----	----	----	---	----	---
39	7.067	8.400	-1.333	-66.7	123.08	SIG	-27.74	SIG
41	4.633	4.700	-.067	-3.3	.25	NS	-15.50	SIG
55	----	----	----	----	----	---	----	---
56	6.000	6.000	0.000	0.0	0.00	NS	-10.95	SIG

NOMINAL SPIKE VALUE IS 2.000 UG/L.

AN ASTERISK INDICATES A MEAN LESS THAN THREE TIMES SANAL.
A PLUS SIGN INDICATES UNEQUAL VARIANCES FOR A T-TEST.

Indication of spine colours

Reports of the Advisory Committee on Fishery Management	Red
Reports of the Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

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