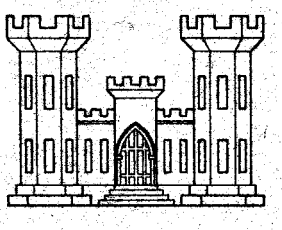
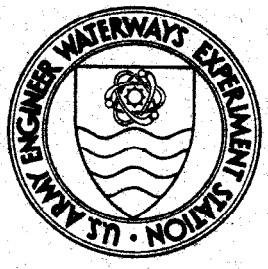


DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-77-24

AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON

APPENDIX D: CHEMICAL AND PHYSICAL ANALYSES OF WATER AND SEDIMENT IN RELATION TO DISPOSAL OF DREDGED MATERIAL IN ELLIOTT BAY

Volume II: September-December 1976

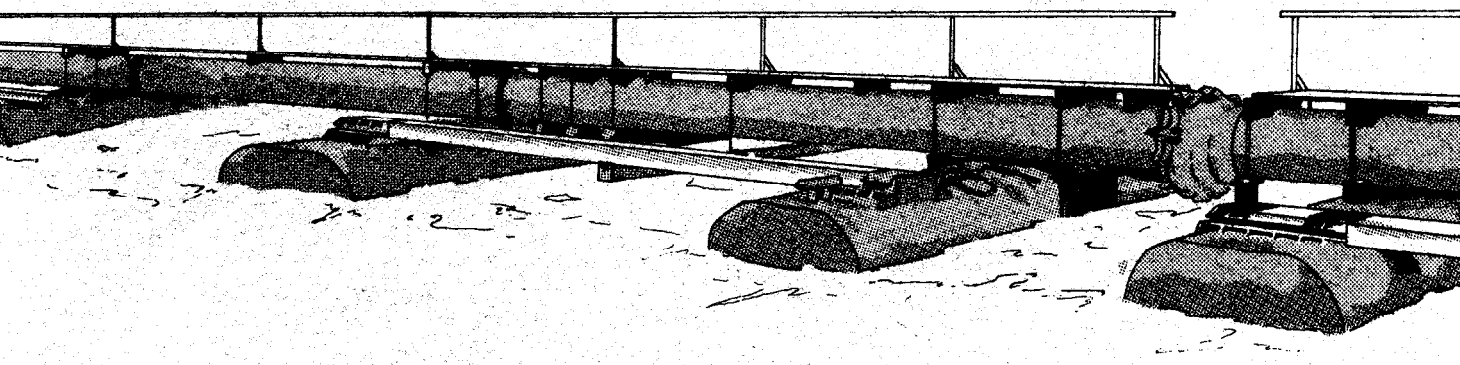
by

S. Sugai, W. R. Schell, A. Nevissi, S. Olsen, D. Huntamer

University of Washington, College of Fisheries
Laboratory of Radiation Ecology
Seattle, Washington 98195

June 1978

Final Report



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Washington, D. C. 20314

Under Contract No. DACW39-76-C-0167
(DMRP Work Unit No. 1A10D)

Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

AQUATIC DISPOSAL FIELD INVESTIGATIONS
DUWAMISH WATERWAY DISPOSAL SITE
PUGET SOUND, WASHINGTON

Appendix A: Effects of Dredged Material Disposal on Demersal Fish and Shellfish in Elliott Bay, Seattle, Washington

Appendix B: Role of Disposal of PCB-Contaminated Sediment in the Accumulation of PCB's by Marine Animals

Appendix C: Effects of Dredged Material Disposal on the Concentration of Mercury and Chromium in Several Species of Marine Animals

Appendix D: Chemical and Physical Analyses of Water and Sediment in Relation to Disposal of Dredged Material in Elliott Bay

Appendix E: Release and Distribution of Polychlorinated Biphenyls Induced by Open-Water Dredge Disposal Activities

Appendix F: Recolonization of Benthic Macrofauna over a Deep-Water Disposal Site

Appendix G: Benthic Community Structural Changes Resulting from Dredged Material Disposal, Elliott Bay Disposal Site

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESYV

31 July 1978

SUBJECT: Transmittal of Technical Report D-77-24 (Appendix D, Volume II)

TO: All Report Recipients

1. The technical report transmitted herewith represents the results of one of several research efforts (work units) undertaken as part of Task 1A, Aquatic Disposal Field Investigations, of the Corps of Engineers' Dredged Material Research Program. Task 1A was a part of the Environmental Impacts and Criteria Development Project (EICDP) and had as a general objective determination of the magnitude and extent of effects of disposal sites on organisms and the quality of surrounding water, and the rate, diversity and extent that such sites are recolonized by benthic flora and fauna. The study reported on herein was an integral part of a series of research contracts jointly developed to achieve the general objective at the Duwamish Waterway Disposal Site, one of five study sites located in several geographical regions of the United States. Consequently, this report presents results and interpretations of but one of several closely interrelated efforts and should be used only in conjunction with and consideration of the other related reports for this site.

2. This report, Appendix D: Chemical and Physical Analyses of Water and Sediment in Relation to Disposal of Dredged Material in Elliott Bay, Volume I February-June 1976 and Volume II September-December 1976, is one of seven contractor-prepared appendices published as Waterways Experiment Station Technical Report D-77-24 entitled: Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington. The titles of all contractor-prepared appendices to this series are listed on the inside front cover of this report. The main report, the Evaluative Summary, will provide additional results, interpretations, and conclusions not found in the additional appendices and will provide a comprehensive summary and synthesis overview of the entire study.

3. The purpose of these two investigations, conducted as Work Units 1A10C (Volume I) and 1A10D (Volume II), was to monitor selected physical and chemical parameters in water-column and sediment samples obtained before, during, and after disposal of contaminated dredged material at

an Elliott Bay disposal site. Appendix D is divided into two volumes since two separate research groups were involved. Volume I discusses the results of analyses of samples collected before, during, and 1 week, 1 month, and 3 months after the disposal operation while Volume II reports on samples collected 6 and 9 months after the operation.

4. The Duwamish River sediments were found to be highly heterogeneous. However, the concentrations of several significant parameters such as ammonia, alkaline-soluble sulfide, and total mercury were in general several times higher than the Elliott Bay disposal site sediments. Standard elutriate tests conducted with the river sediments indicated that ammonia and manganese would probably be released to the water column following each disposal event. Analyses of samples collected during the disposal operation revealed elevated levels of manganese, suspended solids, and ammonia in the water column for a few minutes following each dump. Interstitial water concentrations of manganese, ammonia, and sulfides remained above ambient at the disposal site through the 3 months of postdisposal monitoring discussed in Volume I. One week after the disposal operation, there were no chemical differences found between water-column samples taken at the disposal and reference sites.

5. At 6 and 9 months after the disposal operation, the levels of manganese, ammonia, and inorganic phosphate in the interstitial waters were found to be higher than at both reference sites. There were no detectable chemical differences in water-column samples from the disposal and reference sites at 1, 3, 6, and 9 months after disposal.

6. The results of this study are important in determining placement of dredged material for open-water disposal. Referenced studies, as well as the ones summarized in this report, will aid in determining the optimum disposal conditions and site selection for either the dispersion of the material from the dump site or for its retention within the confines of the site, whichever is preferred for maximum environmental protection at a given site.

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

Unclassified

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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18. SUPPLEMENTARY NOTES

Tables 1-19 were reproduced on microfiche and are enclosed in an envelope attached inside the back cover of this report.

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Aquatic environment	Dredged material disposal	Waste disposal sites
Bottom sediment	Duwamish Waterway	Water analysis
Chemical analysis	Elliott Bay	Water quality
Dredged material	Field investigations	

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report presents results obtained in a study conducted to evaluate the extent and duration of changes in chemical characteristics of Elliott Bay, Washington, six and nine months after disposal of dredged materials from the Duwamish River. The seawater, sediment, and interstitial water were analyzed for the following chemical parameters:

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SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

20. ABSTRACT (Continued).

a. Seawater. Suspended solids, arsenic, manganese, mercury, reactive silicate, inorganic phosphate, nitrate, and ammonia.

b. Sediment. Free and total (acid soluble) sulfide, manganese, chromium, arsenic, mercury, and particle size.

c. Interstitial water. Arsenic, manganese, reactive silicate, ammonia, and inorganic phosphate.

Temporal, depth, and spatial changes in concentrations of chemical variables were evaluated at disposal and reference sites. The results of analyses showed only minimal changes in trace metal concentrations in the water column above the disposal site, but lower Eh and pH values in the sediments than at the reference site. The manganese, inorganic phosphate, and ammonia concentration values were greater in interstitial waters at the disposal site than at the reference site.

SUMMARY

This study is part of a comprehensive program to measure the effects on the biota, sediment, and water quality that result from open-water disposal of dredged material at the Duwamish Waterway site, Elliott Bay, Puget Sound, Washington. Specifically, this work examined the extent and duration of changes in the chemical characteristics of the water and sediment at the disposal site in Elliott Bay six and nine months after disposal. Measurements before, during, and at three months after disposal were made by the Environmental Protection Agency (EPA) laboratory in Corvallis, Oregon.

Disposal of dredged materials from the Duwamish River into Elliott Bay has resulted in minimal long-term changes in the concentrations of trace metals in water above the disposal site. The only significant changes observed were decreases in the concentration of suspended solids and arsenic in the water column above the disposal area between September and December 1976 with no comparable change in concentrations at the reference sites.

Alteration in several chemical parameters of sediments at the disposal site was significant six and nine months after disposal when compared to one or both reference stations. In September and December 1976, the sediments at the disposal site had pH and Eh values significantly lower than those determined at the west reference station. At the disposal site, concentrations of manganese, inorganic phosphate, and ammonia in the interstitial waters were higher than at both reference sites, while the chromium concentration was higher in sediments at the west reference site that at the disposal site.

The significant changes between September and December 1976 in the chemical characteristics of the sediments at the disposal site were a decrease in values for pH, Eh, and inorganic phosphate and an increase in mercury and manganese concentrations. At the reference stations only Eh was significantly different in December than in September and in December the sediments became more reducing in nature.

PREFACE

The study described in this report was performed under Contract DACW39-76-C-0167, entitled "Elliott Bay Dredge Disposal Project--Trace Metals Project," between the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, and the University of Washington, Seattle, Washington. The research was sponsored by the Office, Chief of Engineers (DAEN-CWO-M), under the Civil Works Dredged Material Research Program (DMRP), Work Unit 1A10D. The work was initiated in September 1976 and the chemical analyses of all environmental samples collected during the project were completed in July 1977. This study includes data from collections made six and nine months after disposal and thus the evaluation of changes was restricted to that time period. The measurements on samples collected at the disposal site before, during, and three months after disposal have been made by the EPA laboratory in Corvallis, Oregon.

The work was conducted by the Laboratory of Radiation Ecology, College of Fisheries, University of Washington, whose personnel included Dr. W. R. Schell (Principal Investigator), Dr. A. Nevissi, S. Sugai, S. Olsen, D. Huntamer, and M. Brown. The project officer for this contract was Mr. J. H. Johnson of the WES Environmental Laboratory under the supervision of Dr. R. M. Engler, Manager of the Environmental Impacts and Criteria Development Project at WES.

Director of WES during the period of the contract and the preparation of the report was COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

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VOLUME II: SEPTEMBER-DECEMBER 1976

PART I: INTRODUCTION

Objective

1. This study is part of a comprehensive program to measure effects on the biota, sediment, and water quality resulting from open-water disposal of dredged material at the Duwamish Waterway site, Elliott Bay, Puget Sound, Washington. Specifically, this work examined the extent and duration of changes in the chemical characteristics of the water and sediment at the disposal site in Elliott Bay six and nine months after disposal.

Description of Study Area

2. Elliott Bay is located on the east side of central Puget Sound and is bounded by Duwamish Head to the southwest and Magnolia Bluff to the northwest (Figure 1).

3. The Duwamish River drains an area of 1251 km^2, mostly industrial, and provides fresh water to Elliott Bay at an average annual rate of about 1300 cfs.[1] The river discharges into the southeast corner of Elliott Bay, around Harbor Island, through two channels--the East and West Waterways.

4. Approximately 114,250 m^3 of dredged material from a 1.88-km stretch of the upper Duwamish Estuary (Figure 1) was deposited near the center of a disposal site marked by a Coast Guard lighted buoy (47°35' 42"N; 122°21'42"W) during the period 16 February 1976 to 6 March 1976. The locations of the 16 stations (1-16) at the experimental disposal

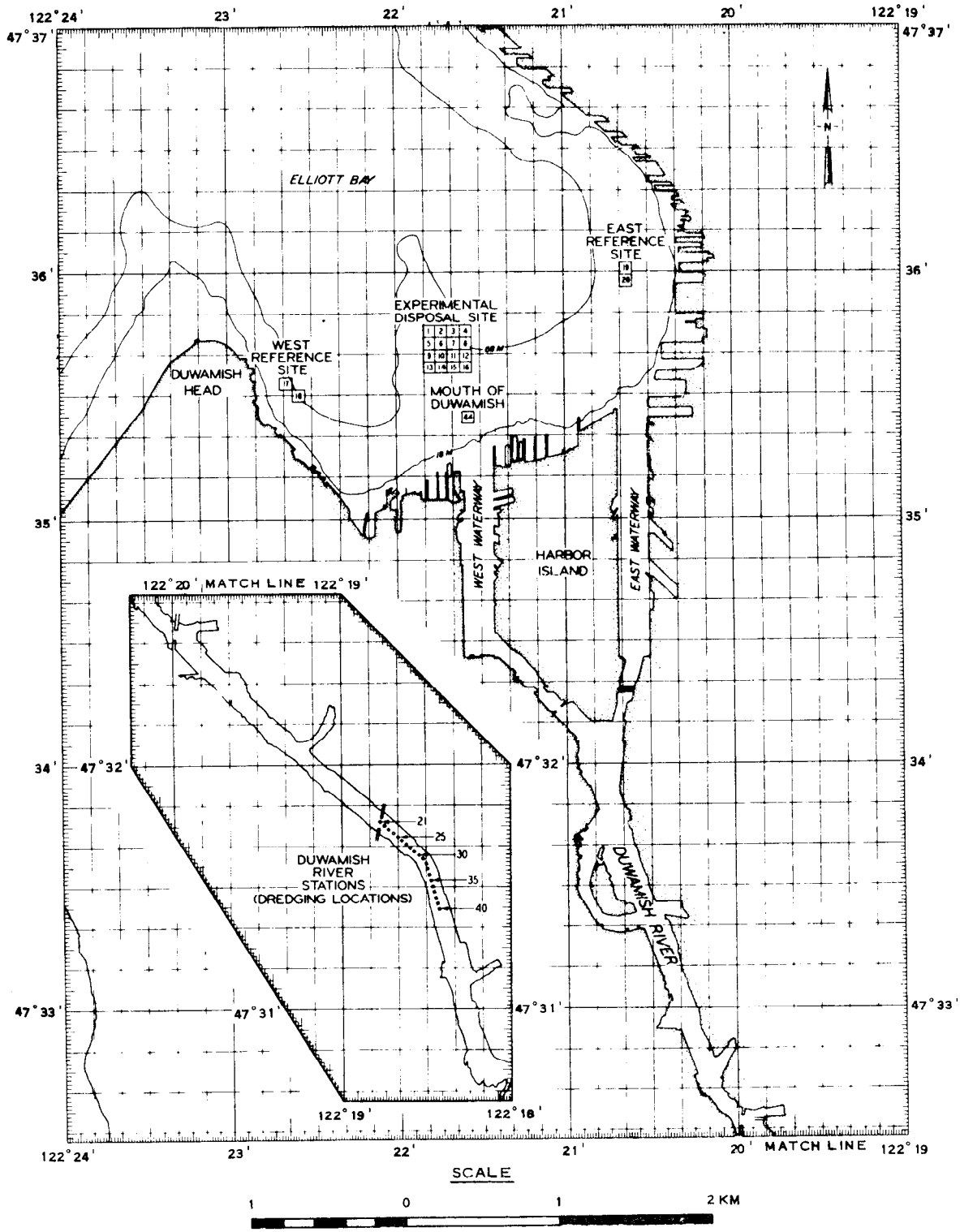

Figure 1. Locations of dredging, disposal, and reference sites

site, located due north of the mouth of the West Waterway, were selected by use of a 4 by 4 grid with the grid lines 76.2 m apart. The two reference sites were located along the east and west shores of Elliott Bay and consisted of two stations each (Figure 1). Historically the west reference site (stations 17, 18) has received the least impact from the municipal, commercial, and industrial activities of the Seattle area. Water flow over this location originates primarily from the main basin of Puget Sound rather than from the interior of Elliott Bay. The east reference site (stations 19, 20) has received effluents from the Duwamish River, shipping, and nearby shore-based activities, as well as from storm sewage overflow along the Seattle waterfront.

PART II: EXPERIMENTAL PROCEDURES

Sampling Design

5. Seawater and sediment samples for chemical analyses were collected during September and December 1976 following sampling and field procedures used during earlier portions of the disposal study.

Seawater samples

6. Water samples were collected at five stations: two stations near the center of the disposal site (station 6, north of buoy; station 10, south of buoy), two reference stations (station 17, west reference site; station 19, east reference site), and at the mouth of Duwamish River (station 44).

7. Water samples were collected at depths of 1 and 10 m above the bottom and 2 m below the surface. Two samples were taken at each station using a peristaltic pump attached to 1/2-in.-ID polyethylene tubing that had been lowered to depth on the hydrowire and then flushed thoroughly before sample collection.

Sediment samples

8. Sediment samples were taken using a double-barreled gravity cover with 67-mm-ID lucite liners at 20 sampling stations in the experimental disposal site (stations 1-20) and at two reference sites (one on the west side of the bay, stations 17 and 18; one on the east side, stations 19 and 20).

Shipboard Procedures

Seawater samples

9. Sufficient water was pumped to determine suspended solids, trace metals, and nutrients. To determine suspended solids, 2 to 10 litres of water were filtered through weighed 0.4 µm Nuclepore filters and stored in plastic petri dishes. Samples for determination of chromium (Cr), manganese (Mn), and arsenic (As) were collected in acid-cleaned 2-litre polyethylene bottles and acidified to pH 1.0 with 2 ml/l doubly distilled

6 M hydrochloric acid (HCl). Mercury (Hg) samples were collected in acid-cleaned 1-litre polyethylene bottles and acidified with 2 ml/l of doubly distilled 16 M nitric acid (HNO_3), to give a pH of less than 1.0, and stored frozen. Nutrient (nitrate, reactive silicate, inorganic phosphate, ammonia) samples were frozen at -15°C in 250-ml polyethylene bottles.

Sediment samples

10. For each of the two casts (two cores per cast) taken at a station, the top 10 cm of one core was extruded into a nitrogen-filled polyethylene bag, the next 15 cm extruded into a second bag, and the excess discarded. The second core on each cast was processed for the trace organics program of S. Pavlou. Each sample was homogenized, subsampled, and stored at 5°C.

Processing of Sediment Samples

11. In the field initial measurements of Eh, pH, and free sulfide ($S^=$) in the sediments were made using appropriate probes while working in a nitrogen-filled glove box. Upon return to the laboratory, in a nitrogen-atmosphere glove box, sediment samples were divided into two sections: one for Eh, pH, $S^=$, total sulfide, percent water, and heavy metals analyses; and the other for centrifugation to remove interstitial water for trace metal and nutrient determinations. Particle size analyses were made on the sediment remaining after centrifugation.

12. After Eh, pH, and free sulfide were determined on the first aliquot of sediment, 30 g was removed and oven-dried at 70°C to determine the percent water. The dry aliquot was retained for heavy metal analyses.

13. In the nitrogen atmosphere of the glove box, 100 g of the second sediment aliquot was sealed into a 250-ml centrifuge bottle and centrifuged at 5°C for 20 minutes at 9000 rpm. Upon return to the glove box the interstitial water was decanted into a 10-dram vial, extracted from the vial with a 25-cc clean polyethylene syringe, and filtered through a 0.4 µm Nuclepore® filter into a tared, clean 60-ml polyethylene

bottle. One aliquot was frozen at 15°C for nutrient analyses, and a second aliquot was acidified with 25 µl/ml of 6 M doubly distilled HCl for heavy metals analyses.

Analytical Procedures

14. The analytical methods used in determining chemical parameters in the seawater and sediment are given below.

Seawater and interstitial water

15. Arsenic. Twenty mg of ferric ion was added to a measured aliquot of acidified seawater or interstitial water in an acid-cleaned polyethylene bottle and mixed. Concentrated ammonium hydroxide (NH_4OH) was added to raise the pH of the sample to between 9 and 10 to coprecipitate As with ferric hydroxide ($Fe(OH)_3$), digested at 80°C for 30 min and allowed to cool. Samples were then filtered through 0.45 µm Millipore or 0.4 µm Nuclepore filters and precipitates were rinsed with deionized distilled water. Filters were removed and placed in 2/5 dram neutron activation analysis (NAA) vials to dry at room temperature. When dry, vials were sealed and irradiated for 2 hours along with As standards sorbed to silica gel and National Bureau of Standards (NBS) orchard leaves.[2]

16. Mercury. Distilled 8 M HNO_3 and reagent grade 18 M sulfuric acid (H_2SO_4) were added to the 470-500 ml seawater and 0.5 - 5 ml interstitial water samples. These samples were then loosely capped and digested in a 90°C water bath for 1 hour. Saturated potassium thiosulfate ($K_2S_2O_8$) was added and the solution allowed to cool. Analysis of the mercury concentration was then made using the flameless atomic absorption method of Melton, Hoover, and Howard.[3]

17. Manganese. Acidified seawater and interstitial water samples were diluted 1:10 with acidified, deionized distilled water and analyzed by flameless atomic absorption using the method of standard additions.

18. Nutrients. Nitrate, inorganic phosphate, ammonia, and reactive silicate were determined using a Technicon Autoanalyzer. Nitrate was analyzed by the cadmium-copper reduction of nitrate to nitrite with

corrections made for nitrite measured in samples.[4,5] Inorganic phosphate was determined by the ascorbic acid reduction method, ammonia by the phenate procedure, and reactive silicate by reduction of silicomolybdate complexes by a solution of Metol and oxalic acid.[6]

Sediment samples

19. Free sulfide. Free sulfide was measured using an Orion specific ion electrode and a Chemtrix Model 60A pH/pIon meter. The sulfide electrode was calibrated by bubbling H_2S (gas) through buffered solutions at different pH values. After the electrode reached equilibrium with the saturated solution (changes of < 1 mv/min), the millivolt reading and pH of the solution were recorded.

20. Manganese. To each 2-gram aliquot of dried sediment, 20 ml of dionized water and 20 ml of distilled HNO_3 were added. The samples were heated, 5 ml of perchloric acid was added, and then the samples were evaporated to dryness. Subsequently, 10 ml of distilled HCl and 50 ml of dionized distilled water were added and the samples were boiled 10 to 15 min. Samples were then filtered and filtrates were combined with washings of the filter. Volume of filtrate was measured and concentration of manganese was determined by flameless atomic absorption.

20. Arsenic. Weighed aliquots of dried sediment were sealed in 2/5 dram vials and irradiated for 2 hours. Arsenic concentration was determined by comparison with As standards sorbed on silica gel and NBS standardized orchard leaves.

22. Mercury. Sediment samples were leached with distilled HNO_3 and reagent grade H_2SO_4 in a water bath at 90°C. Saturated $K_2S_2O_8$ was added to each sample and samples were then treated as the seawater and interstitial water samples. Mercury in leachate was determined by flameless atomic absorption.

23. Chromium. Weighed aliquots of dried sediment were sealed in 2/5 dram vials and irradiated for 8 hours. Chromium concentration was determined by comparison with Cr standards sorbed on silica gel and NBS standardized orchard leaves.

24. Total (acid soluble) sulfide. Sulfide was separated by acidifying the sediment samples to produce hydrogen sulfide (H_2S) which was

bubbled and trapped quantitatively in a zinc (Zn) solution as zinc sulfide precipitate. Iodometric titration was then used to determine the sulfide in the precipitate and solution. The total (acid soluble) sulfide determination measured dissolved HS^-, H_2S, and soluble metal sulfides.[7]

25. Particle size analyses. Following the removal of the interstitial water from the sediment by centrifugation, the particle size distributions of samples were determined by procedures suggested by H. P. Guy.[8]

Statistical Treatment of Experimental Data

26. A listing of the experimental data broken down by position, time, and depth is tabulated in Table 1. The data reduction and analysis was done by use of SPSS (Statistical Package for the Social Sciences) programs.[9]

27. The statistical treatment of experimental data was divided into the analysis of the independent variables and the correlation of dependent variables. For water and sediment samples, the independent variables of time (sampling date), depth (in core or water column), and position (station location) were analyzed by analysis of covariance using position as the factor with time and depth as the covariates. The response parameters for these analyses of covariances were the dependent variables listed in paragraph 31. The strength of association between dependent variables in both the water and sediment was evaluated by means of the Pearson product-moment correlation.

Analytical treatment of independent variables

28. Using the analysis of covariance to test independent variables, the effect of time and depth was isolated and checked for significance at the 95 percent ($S \leq 0.05$) and 99 percent ($S \leq 0.01$) confidence levels. This approach allowed position effects to be examined after being corrected for time and depth. The corrected means are tabulated in the multiple classification section of the analysis of covariance tables.

The assumptions for analysis of variance (ANOVA) were assumed valid for all data and the covariate-by-factor interaction was assumed to be zero.

29. Analysis of covariance for water samples. In the water samples the treatment design was a 5 × 2 × 3 factorial. The factor was position with the five levels being the five stations: 6, 10, 17, 19, and 44. The first covariate was time with the two levels being September 1976 and December 1976. The second covariant was depth with the three levels being 2 m from surface, 10 m from bottom, and 1 m from bottom. The position effects were compared pairwise with the corrected means given in the multiple classification analysis of Scheffé's multiple comparison test.[10] The time and depth effects were broken down into three parts by a further analysis of covariance. Three areas were examined (disposal site, stations 6, 10; reference sites, stations 17, 19; and Duwamish River mouth, station 44) so that the disposal site could be compared with the reference sites.

30. Analysis of covariance for sediment samples. The sediment samples were analyzed in a manner similar to that used for the water samples. However, the data for the sediment were reduced into four categories to aid in interpretation. The first group was the central disposal site consisting of stations 6, 7, 10, and 11. The second and third groups were the west (stations 17, 18) and east (stations 19, 20) reference sites. The fringe area of the disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, and 16) was included in the fourth group. After the data reduction, the treatment design was a 4 × 2 × 2 factorial. The factor was position with the four levels described above. The first covariate was time with the two levels being September 1976 and December 1976; and the second covariate was depth with the two levels being 0 to 10 cm and 10 to 25 cm in the core. The significant effects of time, position, and depth were compared, as with the water samples, except that time and depth were broken down into only disposal and reference sites.

Analytical treatment of dependent variables

31. Pairwise matrices were constructed to examine the linear

correlations between response parameters. The correlation coefficients not only summarized the strength of association between a pair of variables, but also provided an easy means for comparing the strength of relationships between one pair of variables and a different pair. In order to evaluate whether elements were behaving differently in the disposal and reference sites, two correlations were done for each dependent variable: disposal and reference. The dependent variables for the water samples are as follows: suspended solids, As, Mn, Hg, nitrate, ammonia, inorganic phosphate, and reactive silicate. The dependent variables for the sediment samples are as follows: pH, Eh, sediment manganese (Mn(Sed)), interstitial water manganese (Mn(IW)), sediment arsenic (As(Sed)), intersittial water arsenic (As(IW)), sediment mercury (Hg(Sed)), interstitial water mercury (Hg(IW)), sediment chromium (Cr(Sed)), free sulfide, inorganic phosphate, ammonia, and particle size coarse fractions (CF1-CF6), silt, and clay. The data were assumed to be normally distributed and the linearity of the correlation was determined by inspection of scattergrams.[11]

PART III: RESULTS AND DISCUSSION

32. The concentrations of four trace metals (Mn, As, Hg, Cr) and four nutrients (nitrate, ammonia, reactive silicate, inorganic phosphate), and supporting chemical and physical information determined in water, sediment, and interstitial water of Elliott Bay are listed in Tables 2-11.

Chemical Characteristics of Elliott Bay Water

33. The concentrations of suspended solids, trace metals, and nutrients at the Elliott Bay dredge disposal site (stations 6, 10), Duwamish River mouth (station 44), and two reference sites (stations 17, 19) are shown in Table 2. The significance of temporal, depth, and spatial differences in the chemical parameters as determined by analysis of covariance is tabulated in Table 12.

Temporal differences in chemical parameters

34. Suspended solids measured over the disposal site decreased between September and December 1976 sampling cruises although no significant changes occurred in the reference sites. Seawater arsenic concentrations at the disposal site were lower in December than in September although arsenic in the reference sites remained constant. Other observed temporal changes occurred at both disposal and reference sites and therefore were likely seasonal rather than disposal effects.

Position differences over depth in the water column

35. Over the disposal site, manganese concentrations were higher in bottom waters than in surface waters, while in reference sites the opposite trend was observed.

Spatial differences in chemical parameters

36. Concentration levels of the various trace metals and nutrients measured in the water above the disposal site were not statistically

different from levels measured at the reference sites except for mercury concentrations in September. In September, the mercury concentrations at the east reference site (station 19) were approximately two to three times higher than levels in other parts of Elliott Bay.

Chemical Characteristics of Elliott Bay Sediment

37. The pH, Eh, and free and total sulfide concentrations are tabulated in Table 3. Concentrations of arsenic, chromium, manganese, and mercury in sediments are shown in Tables 4-7. Particle size distribution and percent water values are given in Table 8. Tables 9 and 10 list the concentrations of arsenic and manganese in interstitial waters. Inorganic phosphate, reactive silicate, and ammonia concentrations are tabulated in Table 11. The significance of temporal, depth, and spatial differences in the chemical parameters as determined by analysis of covariance is tabulated in Table 13.

Sediment parameters

38. pH. Sediment pH was lower at the Elliott Bay disposal site than at reference sites for both sampling cruises and decreased between September and December (Table 3). No temporal effect was observed for the west reference site. In addition, pH values for the central disposal site increased from the top to bottom sections of the core.

39. Eh. Eh values were more negative in December than in September for central disposal and reference sites (Table 3). The Eh values in the west reference site were higher than values obtained in the central disposal area and in the fringe of the experimental disposal area. No Eh differences were observed with depth in the core.

40. Free sulfide. No spatial or temporal differences were observed for free sulfide concentrations in Elliott Bay (Table 3).

41. Manganese. Manganese concentrations in sediment from the disposal area were greater in December than in September (Table 6). Concentrations in the central disposal area were higher than those in the east reference site.

42. Arsenic. The arsenic concentration in sediment from the

central disposal site was higher in the top section of the core than in the lower section (Table 4). No temporal differences were observed and differences in concentration between the central disposal site and the west reference station were not significant.

43. Mercury. Mercury concentrations in sediment at the disposal site increased between the September and December sampling cruises (Table 7). The concentration at the disposal site decreased from the top to the bottom sections of the cores. Mercury concentrations were two to three times greater in sediments from the east reference site than elsewhere in Elliott Bay.

44. Chromium. Chromium concentrations in sediment were higher at the west reference station than at the central disposal, fringe disposal, or east reference sites (Table 5). The chromium concentration in sediment at the disposal site decreased with depth in the core. No temporal differences were observed.

45. Particle Size. Coarse fractions 1 (>2 mm) and 2 (1-2 mm) decreased with depth in the cores taken from the central disposal area while coarse fractions 3 (0.5-1 mm) and 4 (0.25-0.5 mm) increased with depth (Table 8). No particle size variation with depth was seen for the west reference site. CF2 was higher at the west reference site than at either the central disposal area or the east reference site. CF4 was higher at the disposal site than at the east reference site. The silt fraction was higher at the disposal site than at the west reference site.

Interstitial water parameters

46. Manganese. Manganese concentrations in interstitial waters from Elliott Bay sediments were significantly higher within the disposal site than at reference stations (stations 17-20) (see Table 10). No consistent pattern of increasing or decreasing manganese concentration was observed with depth or distance from the center of the disposal site. No temporal effect upon concentration was seen for disposal site sediments. A decrease in manganese concentration with depth was seen at the west reference site.

47. Arsenic. No statistically significant differences in

concentration of arsenic were observed between disposal and reference sites or with depth in the cores (Table 9).

48. Phosphate. Inorganic phosphate concentrations decreased from September to December for the central disposal site (Table 11). The phosphate concentration at the central disposal region was higher than that observed at either of the reference sites. No concentration gradients were observed with depth in the core.

49. Ammonia. Ammonia concentration was significantly higher at the center of the disposal site than at the reference sites and concentrations were generally higher in December than in September for both the disposal and west reference sites (Table 11). No significant concentration differences were observed with depth.

Discussion of Results

Correlations between various chemical and physical parameters

50. Seawater. Table 14 lists the Pearson product-moment correlation coefficients, R, for seawater samples taken at stations 6 and 10 of the disposal site. A similar matrix constructed for the reference stations (stations 17, 19) is shown in Table 15. The only significant correlations ($S \leq 0.01$, 99 percent confidence limit) present in the reference stations are between the various nutrients: nitrate and phosphate, nitrate and silicate, and phosphate and silicate. In the disposal site there is also a correlation between suspended solids and manganese ($S \leq 0.001$) and between arsenic and phosphate ($S \leq 0.005$).

51. Sediment. Correlation coefficient matrices for sediment parameters in disposal and reference stations are given in Tables 16 and 17, respectively. At the reference stations, arsenic in sediment correlates ($S \leq 0.001$) with arsenic and mercury in interstitial water and with mercury and chromium in sediment. Arsenic in interstitial water correlates strongly with mercury in interstitial water and with chromium in sediment. At the disposal area pH correlates with Eh ($S \leq 0.003$), with manganese (0.006), arsenic (0.001), and mercury (0.001) in sediment,

and with manganese in interstitial water (0.001). However, the strong correlations between the various heavy metals seen at the reference stations were not observed.

Choice of reference sites

52. When undertaking a study of the effect of a perturbation upon a natural system it is important to have a reference area that is similar to the study area in every way except that it is not subject to the experimental stress, in this case disposal of dredged material. However, in this study the east reference site, located offshore from the Seattle piers, had mercury concentrations in the water, sediment, and interstitial waters which were elevated with respect to both the disposal and west reference sites. In addition, Eh and Cr(Sed) values at the east reference site were significantly lower than values measured at the west reference site. Sediments at the east reference site had a much greater percentage of finer particle size material than either the west reference site or the disposal area. Thus, the choice of the reference sites for sediment and water chemistry comparisons was not ideal. Only stations 19 and 20 were used in Table 13 for determinations of temporal and depth differences between the central disposal site and the undisturbed areas of Elliott Bay.

Improper storage and pretreatment problems

53. Although estuarine samples can contain airborne and waterborne contamination from industrial and human sources which result in elevated concentrations of heavy metals relative to pristine open ocean areas, parts per billion levels necessitate that care be exercised to minimize metal contamination or loss during collection, storage, and analysis. Without adequate protection of sample integrity, spatial and temporal changes in metal concentration which occur in the natural marine system cannot be determined. Threats to the sample integrity include metal contamination or loss in the laboratory and care must be taken to quantify these problems.

54. Following centrifugation, interstitial water samples that were to be analyzed for trace metals were acidified with HCl and stored at

room temperature in polyethylene bottles. Because samples were not frozen, considerable amounts of arsenic and mercury were lost to the container walls in the 5 to 6 months the December samples were stored before the analyses were completed.

55. Arsenic. Table 18 shows the effect of storage upon the observed arsenic concentration in interstitial waters collected in September. The first arsenic concentration, As1, was measured in November within about a month of collection. As2 is a second aliquot taken from the same storage bottle and analyzed in May, approximately 6 months later. As shown in Table 18, the percent change in arsenic concentration ranged from -75 percent to +231 percent of the value determined in November. Although adsorption of metals on the walls of containers is probably the most likely mechanism for change in concentration, resulting in a decrease in observed concentration, contamination can increase the measured concentration. Samples from the December cruise were not analyzed until 5 months after collection and were considerably lower in concentration reflecting the loss of arsenic to the container walls. Thus, the only arsenic concentrations reported were from the September cruise.

56. Mercury. A similar problem was encountered in analyses for mercury in interstitial waters. Acidified aqueous solutions initially containing 0.34 mg/l have been observed to lose more than 65 percent of the original mercury when stored in polyethylene containers for 10 days.[12] Table 19 shows the change in mercury concentration measured in September samples following 7 months of storage. Because December samples were stored 6 months before analyses, the results were not reported. September samples were stored for over a month and therefore are also questionable and not reported. Lindberg and Harriss[13] indicate that interstitial dissolved mercury is much greater than that in the overlying water. Results of this study did not support this observation, and, rather than being indicative of unique conditions in the study area, measured mercury concentrations in interstitial water are believed to reflect the improper storage of the samples. Seawater samples to be analyzed for mercury were frozen immediately after the collection,

but interstitial water samples were not.

57. Nitrate. Nitrate values for interstitial waters are not reported because samples were mistakenly stored in bottles that had been soaked in nitric acid which contaminated the samples for this nutrient.

PART IV: SUMMARY AND CONCLUSIONS

58. Disposal of dredged material from the Duwamish River into Elliott Bay has resulted in minimal long-term changes in concentrations of trace metals observed in water above the disposal site. Six and nine months after the disposal of dredged material, the only significant difference between water at the disposal site and at the two reference sites was a higher mercury concentration in waters of the east reference site located near the Seattle waterfront. The concentrations of suspended solids and arsenic in the water column above the disposal area decreased between September and December although no significant change in concentration was observed at the reference sites.

59. Alteration in chemical parameters of the disposal site sediments was significant six and nine months after disposal when compared to one or both reference stations. In September and December 1976, the sediments of the disposal area had pH and Eh values significantly lower than those determined at the west reference station. At the disposal site, concentrations of manganese, inorganic phosphate, and ammonia in the interstitial waters were higher than at both reference sites, while chromium was highest in sediments at the west reference site.

60. Significant temporal changes in the sediment chemistry of the disposal site were observed between September and December 1976; pH, Eh, and inorganic phosphate decreased at the disposal site and mercury and manganese concentrations in sediment increased. At the reference stations only Eh was significantly different in December than in September and also, in December, the sediments became more reducing in nature.

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APPENDIX A'

ANOVA AND MULTIPLE CLASSIFICATION ANALYSIS TABLES FOR SEAWATER AND SEDIMENT VARIABLES WITH SIGNIFICANT POSITION EFFECTS

ANOVA Table for Seawater Mercury by Position with Time and Depth as Covariates

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Position = Station location; central disposal site (stations 6, 10,) west reference site (station 17,), east reference site (station 19)

Time = Sampling date (September, December 1976)

Depth = Depth in water column (2m from surface, 10m above bottom, 1m above bottom)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	110.008	2	55.004	.193	.825
Time	30.343	1	30.343	.106	.746
Depth	79.665	1	79.665	.279	.600
Main effects	4318.674	4	1079.669	3.782	.009
Position	4318.674	4	1079.669	3.782	.009
Explained	4428.682	6	738.114	2.586	.029
Residual	14844.381	52	285.469		
Total	19273.063	58	332.294		

Covariate	Beta
Time	-1.434
Depth	-1.411

60 cases were processed

1 case (1.7 PCT) was missing

Multiple Classification Analysis for Seawater Mercury by Position with Time and Depth as Covariates

Grand Mean = 26.26

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for Independents DEV≠N	Beta	Adjusted for indepedents + Covariates DEV≠N	Beta
Position							
St. 6. central disposal site	11	-5.39				-5.35	
St. 10 central disposal site	12	-2.46				-2.47	
St. 17 west reference site	12	-2.26				-2.27	
St. 19 east reference site	12	16.58				16.57	
St. 44 Duwamish River mouth	12	-6.92				-6.93	
			.47				.47

ANOVA Table for Seawater Manganese by Position with

Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 10,) west reference site (station 17), east reference site (station 19),

Time = Sampling date (September, December 1976)

Depth = Depth in water column (2m from surface, 10m above bottom, 1m above bottom)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	334.604	2	167.303	31.388	.001
Time	212.105	1	212.105	39.794	.001
Depth	122.500	1	122.500	22.983	.001
Main effects	264.417	4	66.104	12.402	.001
Position	264.417	4	66.104	12.402	.001
Explained	599.023	6	99.837	18.731	.001
Residual	277.165	52	5.330		
Total	876.187	58	15.107		

Covariate	Beta
Time	-3.793
Depth	1.750

60 cases were processed
1 case (1.7 PCT) was missing

Multiple Classification Analysis for Seawater Manganese

by Position with Time and Depth as Covariates

Grand Mean = 18.35

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for Independents DEV≠N	Beta	Adjusted for Independents + Covariates DEV≠N	Beta
Position							
St. 6 central disposal site	11	-1.52				-1.39	
St. 10 central disposal site	12	3.80				3.77	
St. 17 west reference site	12	.32				.28	
St. 19 east reference site	12	- .33				- .36	
St. 44 Duwamish River mouth	12	-2.39				-2.42	
			.56				.55

ANOVA Table for Sediment pH by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11, west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	1.044	2	.522	8.622	.001
Time	.430	1	.430	7.100	.009
Depth	.614	1	.614	10.144	.002
Main Effects	10.130	3	3.377	55.751	.001
Position	10.130	3	3.377	55.751	.001
Explained	11.174	5	2.235	36.900	.001
Residual	8.721	144	.061		
Total	19.896	149	.134		

Covariate	Beta
Time	-.107
Depth	.128

160 cases were processed
10 cases (6.3 PCT) were missing

Multiple Classification Analysis for Sediment pH

by Position with Time and Depth as Covariates

Grand Mean = 6.86

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	31	-.16				-.17	
2 West reference	16	.50				.50	
3 East reference	16	.50				.50	
4 Fringe disposal	87	-.13				-.12	
			.72				.71

ANOVA Table for Sediment Manganese by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	32881.749	2	16440.875	5.006	.008
Time	32516.971	1	32518.971	9.901	.002
Depth	277.986	1	277.986	.085	.772
Main Effects	39583.925	3	13194.642	4.017	.009
Position	39583.925	3	13194.642	4.017	.009
Explained	72465.674	5	14493.135	4.413	.001
Residual	492668.236	150	3284.455		
Total	565133.910	155	3646.025		

Covariate	Beta
Time	28.881
Depth	-2.671

160 cases were processed
4 cases (2.5 PCT) were missing

Multiple Classification Analysis for Sediment Manganese by Position with Time and Depth as Covariates

Grand Mean = 255.88

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	28.00				27.86	
2 West reference	16	-11.56				-11.71	
3 East reference	15	-28.63				-27.93	
4 Fringe disposal	93	- 3.03				- 3.07	
			.27				.26

ANOVA Table for Sediment Mercury by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	11.822	2	5.911	3.568	.031
Time	2.326	1	2.326	1.404	.238
Depth	9.557	1	9.557	5.768	.018
Main effects	42.977	3	14.326	8.646	.001
Position	42.977	3	14.326	8.646	.001
Explained	54.799	5	10.960	6.615	.001
Residual	250.191	151	1.657		
Total	304.990	156	1.955		

Covariate	Beta
Time	.243
Depth	.493

160 cases were processed

3 cases (1.9 PCT) were missing

Multiple Classification Analysis for Sediment Mercury by Position with Time and Depth as Covariates

Grand Mean = .51

Variable + category	N	Unadjusted DEV≠	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for Independents + Covariates DEV≠N	Beta
Position							
1 Central disposal	32	-.33				-.33	
2 West reference	16	-.28				-.29	
3 East reference	15	1.59				1.58	
4 Fringe disposal	94	-.09				-.09	
			.38				.38

ANOVA Table for Sediment Chromium by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	2537.371	2	1268.686	3.886	.023
Time	124.786	1	124.786	.382	.537
Depth	2412.586	1	2412.586	7.390	.007
Main Effects	37231.017	3	12410.339	38.014	.001
Position	34231.017	3	12410.339	38.014	.001
Explained	39768.388	5	7953.678	24.363	.001
Residual	50275.372	154	326.463		
Total	90043.759	159	566.313		

Covariate	Beta
Time	1.766
Depth	-7.766

160 cases were processed
0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Chromium by Position with Time and Depth as Covariates

Grand Mean = 76.79

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- 6.92				- 6.92	
2 West reference	16	44.58				44.58	
3 East reference	16	5.25				5.25	
4 Fringe disposal	96	- 6.00				- 6.00	
			.64				.64

ANOVA Table for Sediment Coarse Size Fraction 1(> 2mm) by Position with Time and Depth as Covariates

---

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	182.800	2	91.400	3.834	.024
Time	6.400	1	6.400	.268	.605
Depth	176.400	1	176.400	7.399	.007
Main effects	200.860	3	66.953	2.808	.041
Position	200.860	3	66.953	2.808	.041
Explained	383.660	5	76.732	3.219	.009
Residual	3671.315	154	23.840		
Total	4054.975	159	25.503		

Covariate	Beta
Time	- .400
Depth	2.100

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 1 (> 2mm) by Position with Time and Depth as Covariates

Grand Mean = 5.76

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	-1.29				-1.29	
2 West reference	16	1.43				1.43	
3 East reference	16	2.61				2.61	
4 Fringe disposal	96	- .24				- .24	
			.22				.22

ANOVA Table for Sediment Coarse Size Fraction 2 (1 to 2mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	374.291	2	187.146	4.322	.015
Time	15.191	1	15.191	.351	.555
Depth	359.101	1	359.101	8.293	.005
Main effects	939.575	3	313.192	7.233	.001
Position	939.575	3	313.192	7.233	.001
Explained	1313.867	5	262.773	6.069	.001
Residual	6668.195	154	43.300		
Total	7982.062	159	50.202		

Covariate	Beta
Time	.616
Depth	2.996

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 2 (1 to 2mm) by Position with Time and Depth as Covariates

Grand Mean = 10.98

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	-1.49				-1.49	
2 West reference	16	5.39				5.39	
3 East reference	16	-4.92				-4.92	
4 Fringe disposal	96	.42				.42	
			.34				34

ANOVA Table for Sediment Coarse Size Fraction 3 (0.5 - 1mm) by Position with Time and Depth as Covariates

---

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	263.081	2	131.540	1.869	.158
Time	102.881	1	102.881	1.462	.229
Depth	160.200	1	160.200	2.276	.133
Main effects	3116.202	3	1038.734	14.757	.001
Position	3116.202	3	1038.734	14.757	.001
Explained	3379.283	5	675.857	9.601	.001
Residual	10840.217	154	70.391		
Total	14219.499	159	89.431		

Covariate	Beta
Time	-1.604
Depth	-2.001

160 cases were processed

0 cases (0 PCT) were missing.

Multiple Classification Analysis for Sediment Coarse Size Fraction 3 (0.5 - 1mm) by Position with Time and Depth as Covariates

Grand Mean = 19.65

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- .60				- .60	
2 West reference	16	3.36				3.36	
3 East reference	16	-12.80				-12.80	
4 Fringe disposal	96	1.77				1.77	
			.47				.47

ANOVA Table for Sediment Coarse Size Fraction 4 (0.25 - 0.5mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	150.783	2	75.391	1.728	.181
Time	2.906	1	2.906	.067	.797
Depth	147.609	1	147.609	3.383	.068
Main effects	3484.783	3	1161.594	26.623	.001
Position	3484.783	3	1161.594	26.623	.001
Explained	3635.566	5	727.113	16.665	.001
Residual	6575.634	153	43.632		
Total	10311.200	158	65.261		

Covariate	Beta
Time	.270
Depth	-1.927

160 cases were processed

1 case (.6 PCT) was missing

Multiple Classification Analysis for Sediment Coarse Size Fraction 4 (0.25 - 0.5mm) by Position with Time and Depth as Covariates

Grand Mean = 19.03

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	- 2.23				- 2.24	
2 West reference	16	- .31				- .32	
3 East reference	16	-12.53				-12.53	
4 Fringe disposal	95	2.91				2.92	
			.58				.58

ANOVA Table for Sediment Silt Size Fraction (0.002 - 0.05mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covarites	17.640	2	8.820	.042	.959
Time	1.764	1	1.764	.008	.927
Depth	15.876	1	15.876	.076	.783
Main effects	10222.910	3	3407.637	16.321	.001
Position	10222.910	3	3407.637	16.321	.001
Explained	10240.550	5	2048.110	9.810	.001
Residual	32153.261	154	208.787		
Total	42393.811	159	266.628		

Covariate	Beta
Time	-.210
Depth	-.630

160 cases were processed

0 cases (0 PCT) were missing

Multiple Classification Analysis for Sediment Silt Size Fraction (0.002 - 0.05mm) by Position with Time and Depth as Covariates

Grand Mean = 43.47

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	6.39				6.39	
2 West reference	16	- 8.25				- 8.25	
3 East reference	16	19.77				19.77	
4 Fringe disposal	96	- 4.05				- 4.05	
			.49				.49

ANOVA Table for Sediment Clay Size Fraction (<0.002mm) by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	40.107	2	20.053	.742	.478
Time	9.448	1	9.448	.349	.555
Depth	30.659	1	30.659	1.134	.289
Main effects	683.896	3	227.965	8.430	.001
Position	683.896	3	227.965	8.430	.001
Explained	724.003	5	144.801	5.355	.001
Residual	4110.354	152	27.042		
Total	4834.357	157	30.792		

Covariate	Beta
Time	-.489
Depth	-.881

160 cases were processed

2 cases (1.3 PCT) were missing

Multiple Classification Analysis for Sediment Clay Size Fraction (<0.002m) by Position with Time and Depth as Covariates

Grand Mean = 3.52

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	32	-1.04				-1.04	
2 West reference	16	- .19				- .19	
3 East reference	16	6.16				6.16	
4 Fringe disposal	94	- .67				- .66	
			.38				.38

ANOVA Table for Interstitial Water Manganese by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11, west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12,13,14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	.354	2	.177	.036	.965
Time	.354	1	.354	.072	.789
Depth	.000	1	.000	.000	.993
Main Effects	324.870	3	108.290	22.062	.001
Position	324.870	3	108.290	22.062	.001
Explained	325.223	5	65.045	13.251	.001
Residual	721.549	147	4.908		
Total	1046.773	152	6.887		

Covariate	Beta
Time	.096
Depth	-.003

160 cases were processed
7 cases (4.4 PCT) were missing

Multiple Classification Analysis for Interstitial Water Manganese by Position with Time and Depth as Covariates

Grand Mean = 3.26

Variable + category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central reference	30	.99				.99	
2 West reference	15	-2.81				-2.81	
3 East reference	16	-2.94				-2.94	
4 Fringe disposal	92	.65				.65	
			.56				.56

ANOVA Table for Interstitial Water Inorganic Phosphate by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	9030.382	2	4515.191	18.117	.001
Time	8563.243	1	8563.243	34.359	.001
Depth	527.040	1	527.040	2.115	.148
Main effects	3182.612	3	1060.871	4.257	.007
Position	3182.612	3	1060.871	4.257	.007
Explained	12212.994	5	2442.599	9.801	.001
Residual	32898.386	132	249.230		
Total	45111.380	137	329.280		

Covariate	Beta
Time	-15.816
Depth	- 3.909

160 cases were processed
22 cases (13.8 PCT) were missing

Multiple Classification Analysis for Interstitial Water Inorganic Phosphate by Position with Time and Depth as Covariates

Grand Mean = 13.13

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	23	7.13				5.91	
2 West reference	13	-10.27				-10.06	
3 East reference	15	- 9.18				- 7.89	
4 Fringe disposal	87	1.23				1.30	
			.30				.27

ANOVA Table for Interstitial Water Ammonia by Position with Time and Depth as Covariates

Position = Station location; central disposal site (stations 6, 7, 10, 11), west reference site (stations 17, 18), east reference site (stations 19, 20), fringe of disposal site (stations 1, 2, 3, 4, 5, 8, 9, 12, 13, 14, 15, 16)

Time = Sampling date (September, December 1976)

Depth = Depth in core (top 10 cm, bottom 15 cm)

Source of Variation	Sum of Squares	DF	Mean Square	F	Significance of F
Covariates	1786.749	2	893.375	6.272	.003
Time	1442.863	1	1442.863	10.131	.002
Depth	356.045	1	356.045	2.500	.116
Main Effects	2605.421	3	868.474	6.098	.001
Position	2605.421	3	868.474	6.098	.001
Explained	4392.171	5	878.434	6.168	.001
Residual	18373.146	129	142.427		
Total	22765.316	134	169.890		

Covariate	Beta
Time	6.548
Depth	-3.249

160 cases were processed
25 cases (15.6 PCT) were missing

Multiple Classification Analysis for Interstitial Water Ammonia by Position with Time and Depth as Covariates

Grand Mean = 7.99

Variable + Category	N	Unadjusted DEV≠N	Eta	Adjusted for independents DEV≠N	Beta	Adjusted for independents + covariates DEV≠N	Beta
Position							
1 Central disposal	20	9.90				9.57	
2 West reference	13	-5.60				-5.44	
3 East reference	15	-4.67				-4.99	
4 Fringe disposal	87	- .64				- .53	
			.35				.34

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Sugai, S

Aquatic disposal field investigations, Duwamish Waterway disposal site, Puget Sound, Washington; Appendix D: Chemical and physical analyses of water and sediment in relation to disposal of dredged material in Elliott Bay; Volume II: September-December 1976 / by S. Sugai ... [et al.], University of Washington, College of Fisheries, Laboratory of Radiation Ecology, Seattle, Washington. Vicksburg, Miss. : U. S. Waterways Experiment Station ; Springfield, Va. : available from National Technical Information Service, 1978.

24, [106] p. : ill. : 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; D-77-24, Appendix D, v.2)

Prepared for Office, Chief of Engineers, U. S. Army. Washington, D. C., under Contract No. DACW39-76-C-0167 (DMRP Work Unit No. 1A10D)

Tables 1-19 on microfiche in pocket.

References: p. 24.

1. Aquatic environment. 2. Bottom sediment. 3. Chemical analysis. 4. Dredged material. 5. Dredged material disposal.

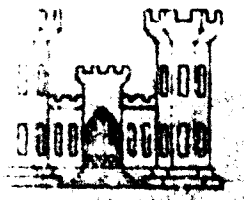
(Continued on next card)

Sugai, S

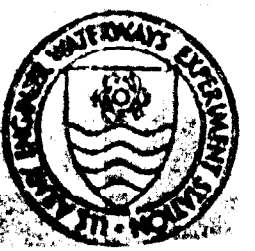
Aquatic disposal field investigations, Duwamish Waterway disposal site, Puget Sound, Washington; Appendix D: Chemical and physical analyses of water and sediment ... 1978. (Card 2)

6. Duwamish Waterway. 7. Elliott Bay. 8. Field investigations. 9. Waste disposal sites. 10. Water analysis. 11. Water quality. I. United States. Army. Corps of Engineers. II. Washington (State). University. Laboratory of Radiation Ecology. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; D-77-24, Appendix D, v.2)

TA7.W34 no. D-77-24 Appendix D v.2



DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-77-24

AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON

APPENDIX D: CHEMICAL AND PHYSICAL ANALYSES OF WATER AND SEDIMENT IN RELATION TO DISPOSAL OF DREDGED MATERIAL IN ELLIOTT BAY

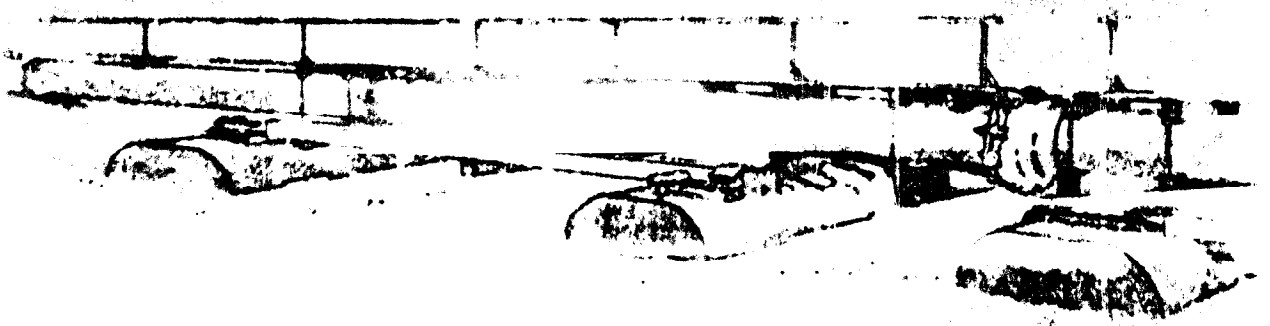
VOLUME II: SEPTEMBER-DECEMBER 1976

S. Sugai, W. R. Schell, A. Nevissi
S. Olsen, D. Huntamer

University of Washington, College of Fisheries
Laboratory of Radiation Ecology
Seattle, Washington 98195

June 1978

Final Report



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under Contract No. DACW39-76-C-0167
(DMRP Work Unit No. 1A10D)

Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

Listing of [illegible] ...tion, Time, and Depth

[illegible] (Suspended Solids)

[illegible]

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
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[illegible]	1.	[illegible]	[illegible]	[illegible]	.3536	.1250	[illegible]
[illegible]	2.	[illegible]	[illegible]	[illegible]	0	0	[illegible]
[illegible]	3.	[illegible]	[illegible]	[illegible]	.3536	.1250	[illegible]
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[illegible]	2.	[illegible]	2.4000	1.4111	.3503	.2417	[illegible]
[illegible]	1.	[illegible]	1.0000	1.5000	0	0	[illegible]

(continued)

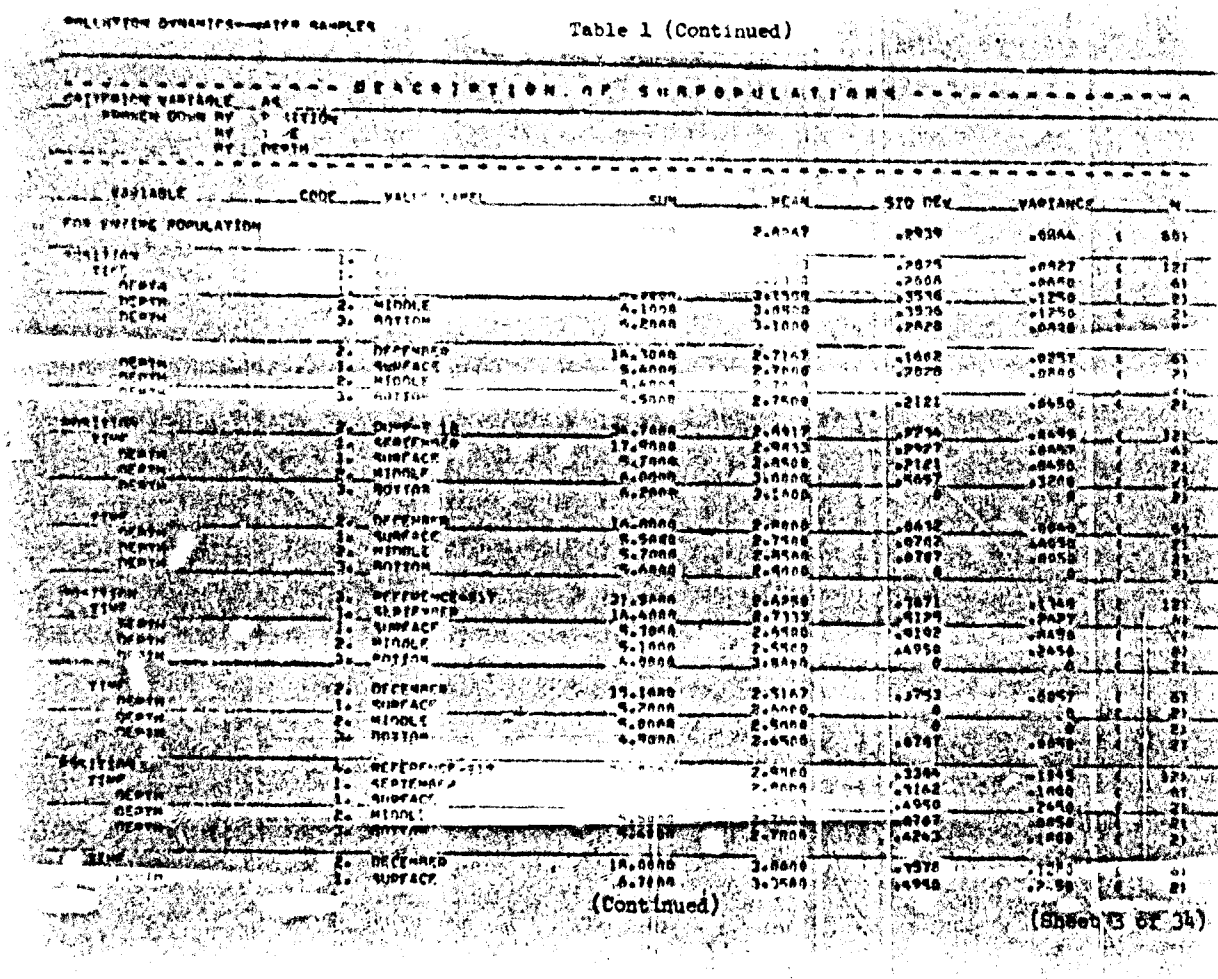
Table 1 (Continued)

	2. MIDDLE	9.7000	1.1400	.0191	.0056	4	21
DEPTH	3. BOTTOM	9.3040	1.1400	.0707	.0056	4	21
POSITION	3. DOWNWIND	13.0000	1.0011	.0548	.0092	4	121
TIME	1. SEDIMENTED	8.5000	1.0000	.3468	.1717	2	61
DEPTH	1. SURFACE	8.6000	1.0000	.0	.0	2	21
DEPTH	2. MIDDLE	1.7000	1.0000	.0191	.0056	4	21
DEPTH	3. BOTTOM	9.4000	1.0000	.0	.0	4	21
TIME	2. DECEMBER	8.4040	1.0033	.1472	.0217	2	61
DEPTH	1. SURFACE	9.9000	1.0000	.0183	.0056	4	21
DEPTH	2. MIDDLE	9.1000	1.0000	.0707	.0056	4	21
DEPTH	3. BOTTOM	1.9000	1.0000	.0707	.0056	4	21

TOTAL CASES = 84

(Continued)

Table 1 (Continued)



(Continued)

(Sheet 13 of 34)

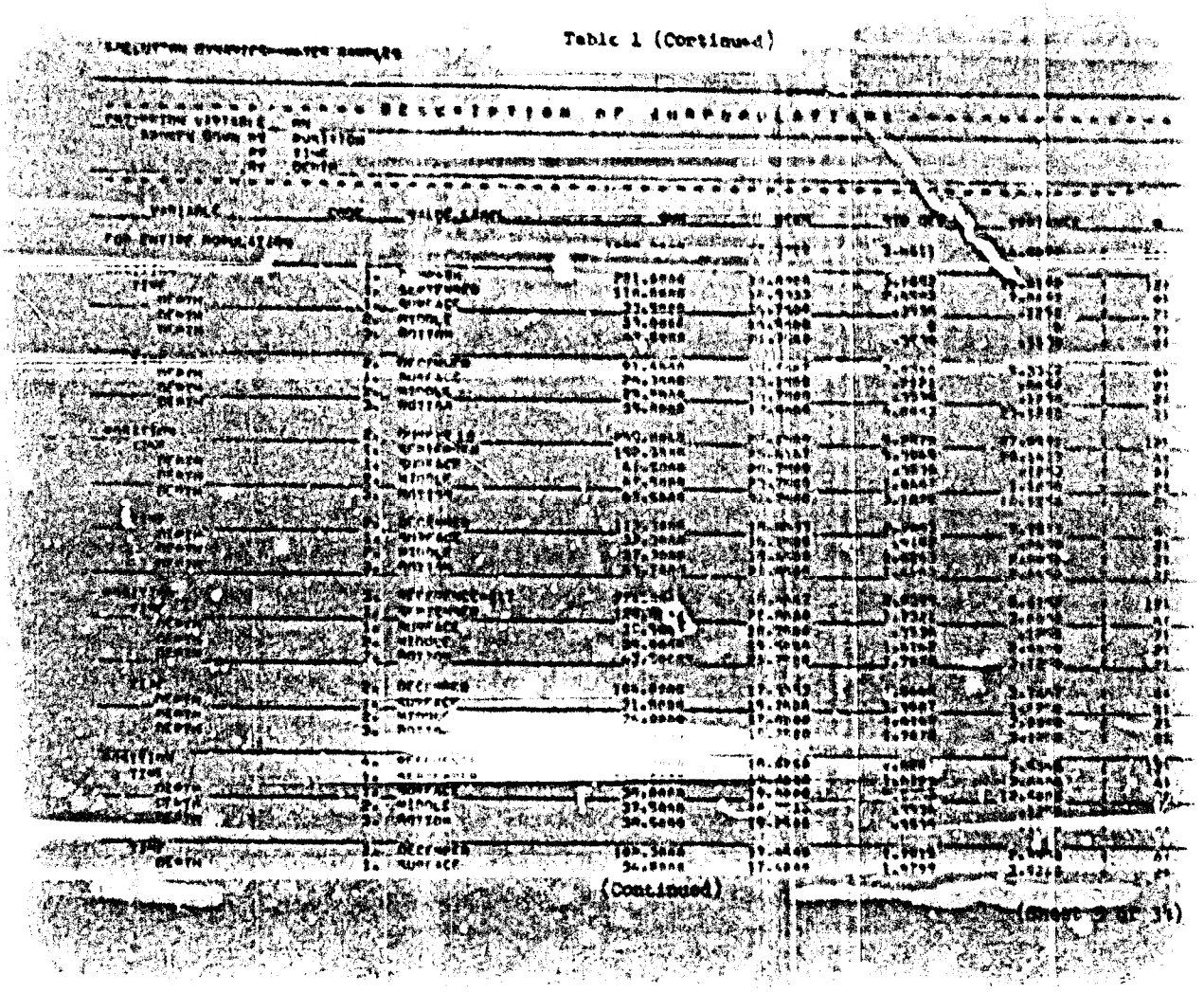
Table 1 (Continued)

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	4.6000	2.3000	.7414	.5500	21
DEPTH	3.	BOTTOM	9.7000	2.4250	.6797	.4620	79
SALINITY	5.	DRAWDOWN	31.7000	2.8818	.1376	.0190	121
TIME	2.	SEPTEMBER	14.9000	2.4167	.2144	.0137	84
DEPTH	1.	SURFACE	5.4000	2.7000	0	0	21
DEPTH	2.	MIDDLE	5.7000	2.7143	.2121	.0450	21
DEPTH	3.	BOTTOM	5.8000	2.7619	.1414	.0200	21
TIME	2.	DECEMBER	16.8000	2.8000	.1673	.0280	61
DEPTH	1.	SURFACE	5.4000	2.7000	0	0	21
DEPTH	2.	MIDDLE	5.4000	2.7000	.2828	.0800	21
DEPTH	3.	BOTTOM	5.8000	2.9000	.1414	.0200	21

MORE CASES W... 66

(Continued)

Table 1 (Continued)



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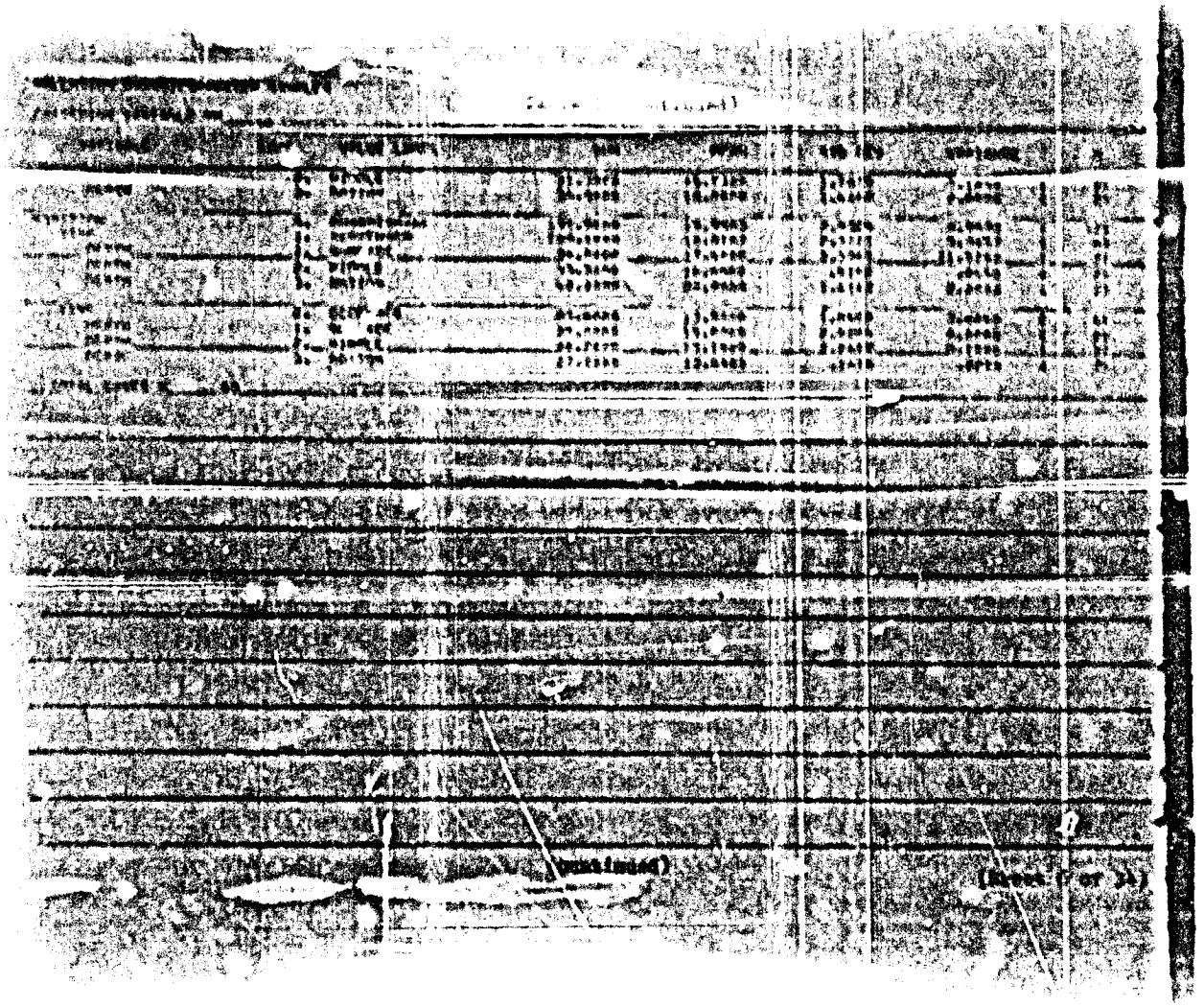
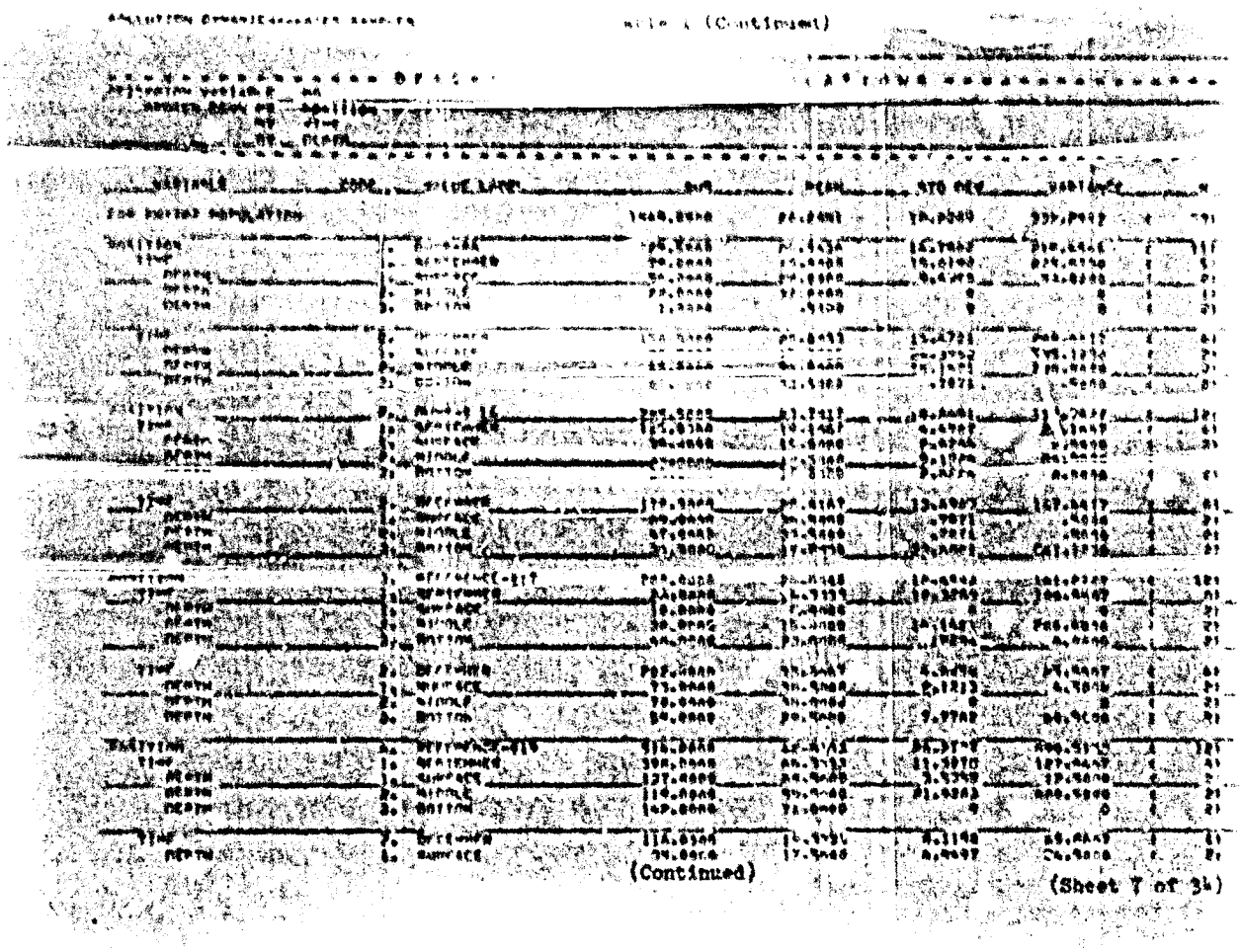
(Sheet 2 of 3)





(Continued)

(Sheet 7 of 34)

Table 1 (Continued)

(Continued)

... DESCRIPTION OF SUBPOPULATIONS ...

... (Nitrate)

... by ... position
... time

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE		N
FOR ENTIRE POPULATION			1363.4000	32.7762	9.1887	84.4045	1	841
POSITION	1.	DECEMBER	871.7000	32.4417	8.2378	67.8287	1	121
TIME	1.	SEPTEMBER	149.8000	18.1000	1.4017	3.4449	1	61
DEPTH	1.	SURFACE	39.7000	18.1500	2.6749	8.1250	1	21
DEPTH	2.	MIDDLE	34.9000	17.4500	2.8143	8.2450	1	21
DEPTH	3.	BOTTOM	38.9000	19.1000	1.2728	1.6200	1	21
TIME	2.	DECEMBER	181.9000	26.0714	5.4114	11.4372	1	93
DEPTH	1.	SURFACE	60.5000	25.2500	.9574	.1250	1	21
DEPTH	2.	MIDDLE	60.1000	25.0500	5.4447	29.6450	1	21
DEPTH	3.	BOTTOM	51.1000	25.5500	.2121	.0450	1	21
POSITION	2.	[illegible]	374.9000	27.0147	4.3484	18.9762	1	121
TIME	1.	SEPTEMBER	114.8000	19.1333	0.1744	17.0970	1	61
DEPTH	1.	SURFACE	38.6000	19.3000	1.4142	2.0000	1	21
DEPTH	2.	MIDDLE	34.7000	17.3500	.6498	.2450	1	21
DEPTH	3.	BOTTOM	47.4000	23.7000	3.8778	15.0200	1	21
TIME	2.	DECEMBER	[illegible]	26.4839	.6993	.4893	1	93
DEPTH	1.	SURFACE	[illegible]	[illegible]	.6547	.4250	1	21
DEPTH	2.	MIDDLE	[illegible]	[illegible]	.6998	.4250	1	21
DEPTH	3.	BOTTOM	[illegible]	[illegible]	.6998	.4250	1	21
POSITION	3.	[illegible]	373.7000	28.4385	4.6191	19.1478	1	121
TIME	1.	SEPTEMBER	114.8000	19.1333	0.2819	.0970	1	61
DEPTH	1.	SURFACE	33.6000	16.8000	.1414	.0200	1	21
DEPTH	2.	MIDDLE	33.3000	16.6500	.2778	.0450	1	21
DEPTH	3.	BOTTOM	47.9000	23.9500	0.6667	14.8450	1	21
TIME	2.	DECEMBER	158.9000	26.4833	.4167	.1737	1	61
DEPTH	1.	SURFACE	51.9000	25.9500	.0707	.0050	1	21
DEPTH	2.	MIDDLE	51.4000	25.7000	.0707	.0050	1	21
DEPTH	3.	BOTTOM	53.5000	26.7500	.0707	.0050	1	21
POSITION	4.	REFERENCE-DIV	267.1000	22.2583	4.4919	20.1811	1	121
TIME	1.	SEPTEMBER	108.3000	18.0500	3.1491	10.0470	1	61
DEPTH	1.	SURFACE	37.3000	17.8500	1.4849	2.2050	1	21
DEPTH	2.	MIDDLE	42.1000	21.0500	.0990	.0050	1	21
DEPTH	3.	BOTTOM	69.9000	34.9500	0.7879	0.1250	1	21
TIME	2.	DECEMBER	158.9000	26.4833	.4761	.0961	1	61
DEPTH	1.	SURFACE	51.1000	25.5500	.0990	.0050	1	21

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(Sheet 10 of 34)

Table 1 (Continued)

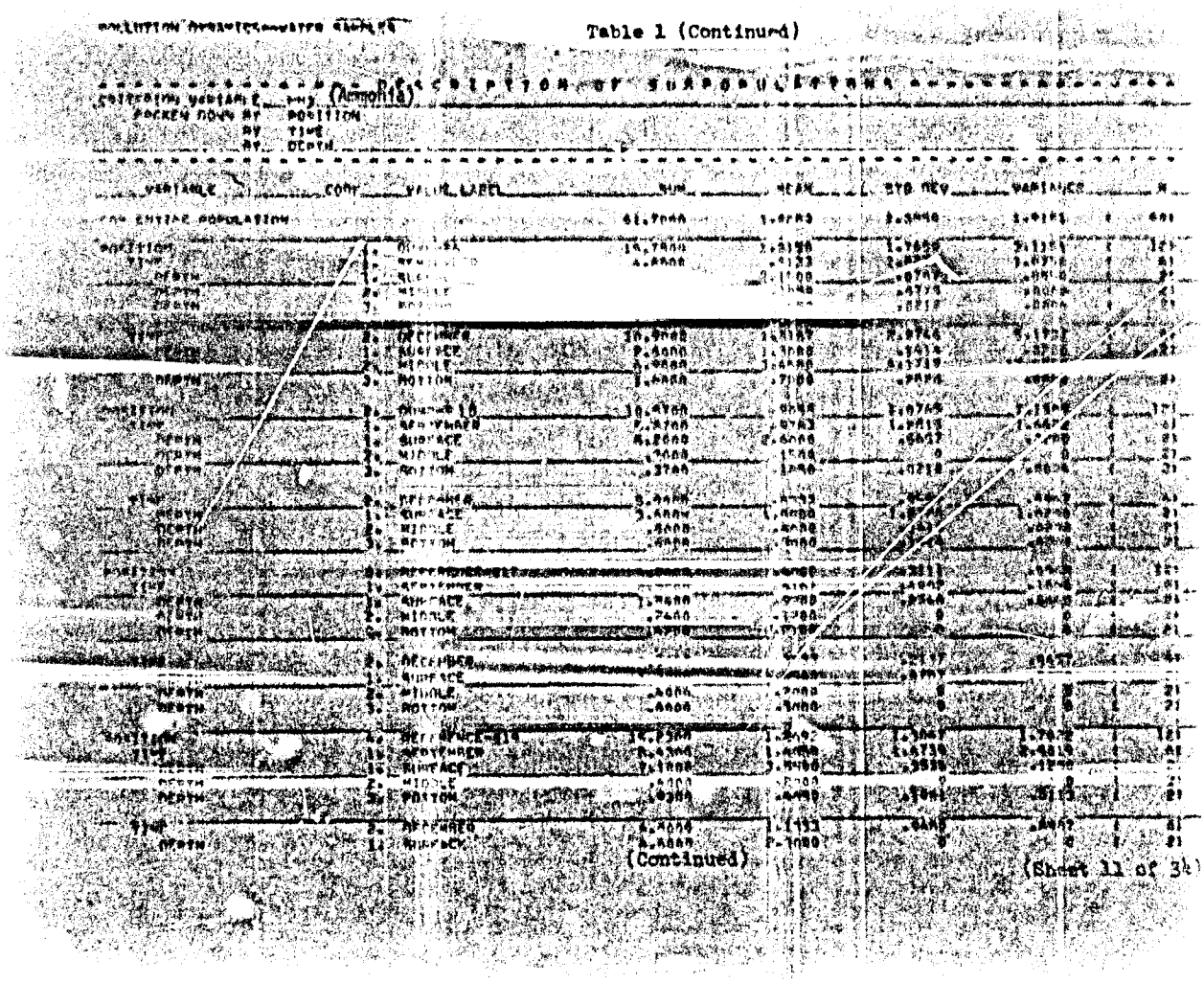

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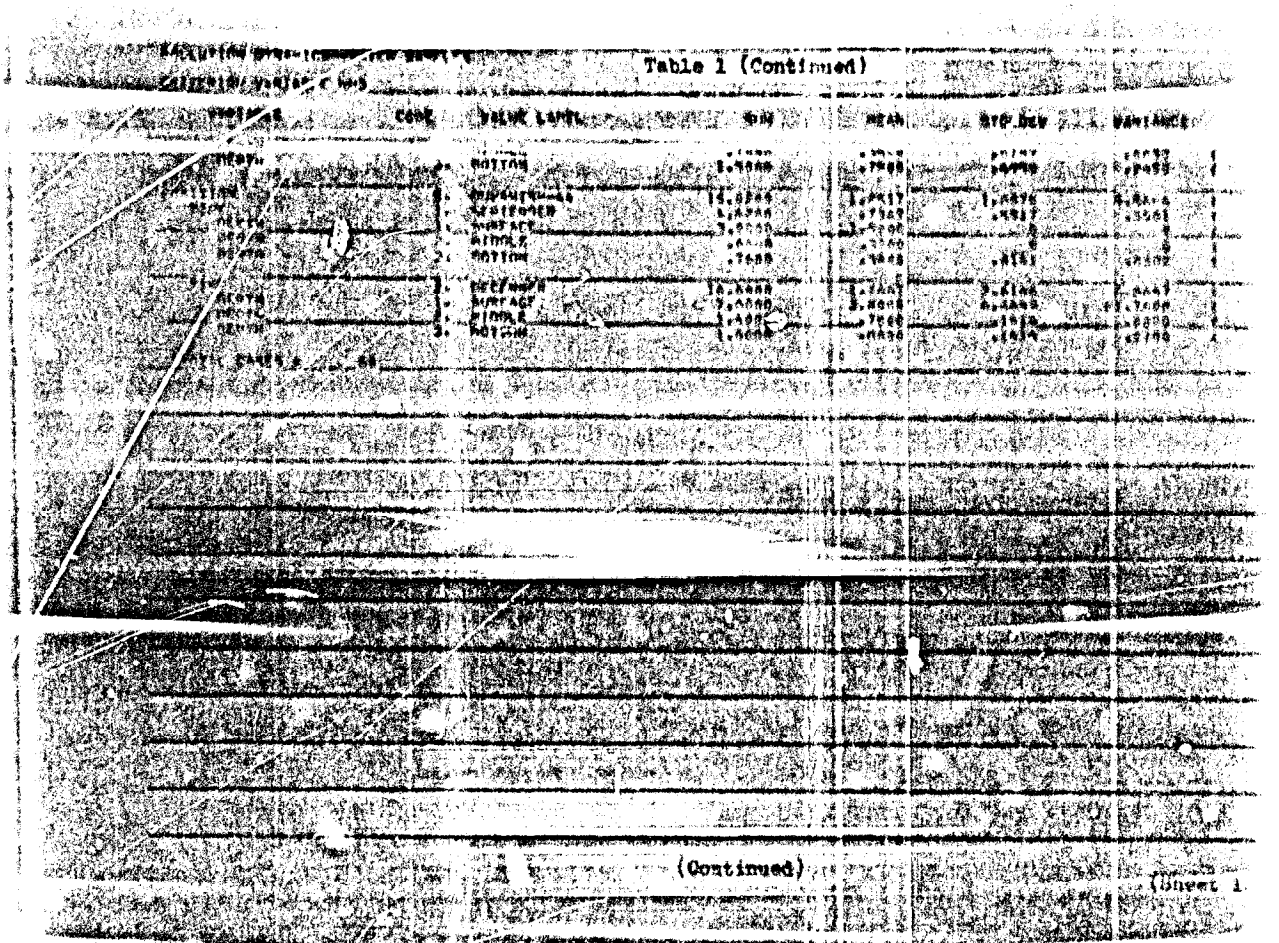
Table 1 (Continued)



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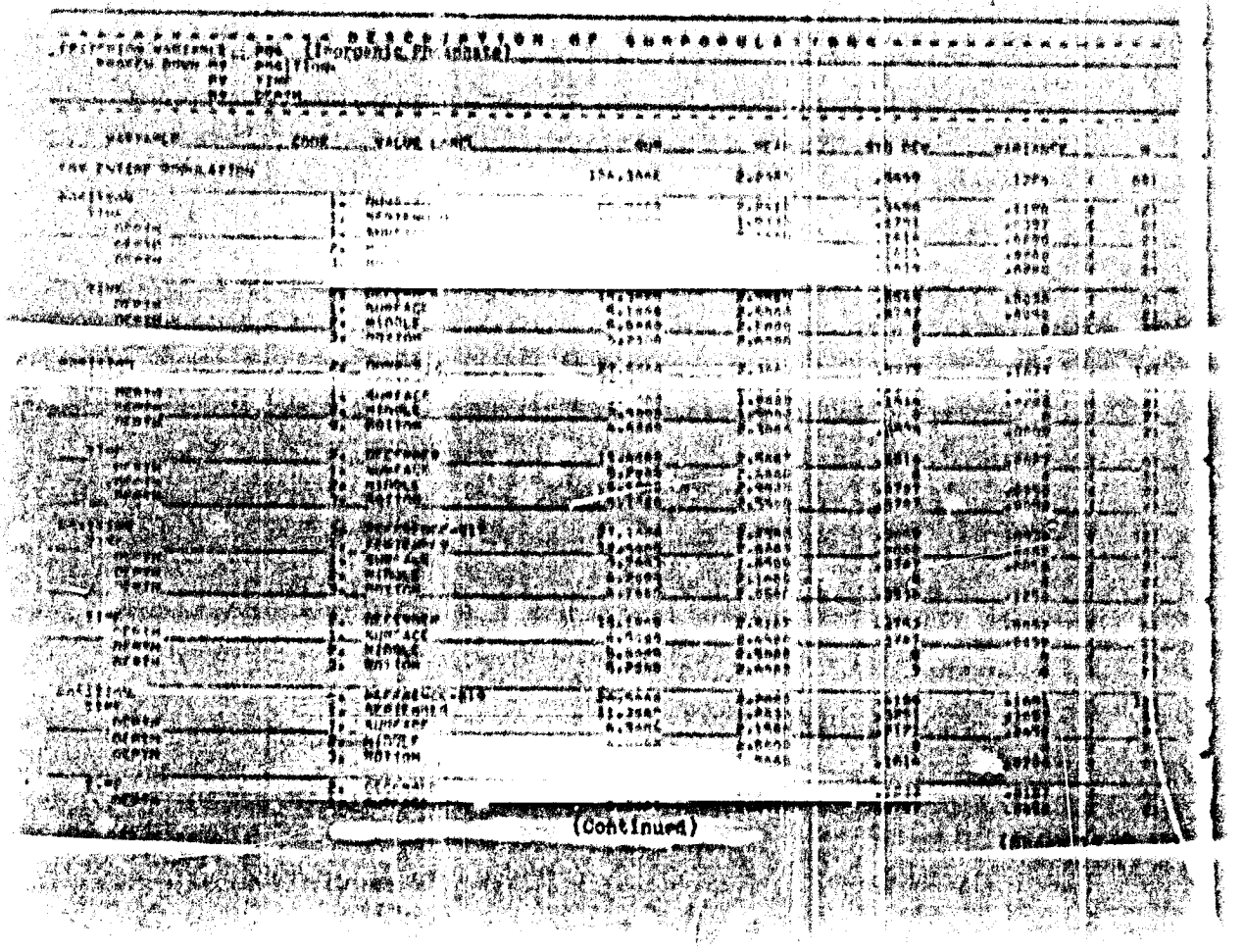


(Continued)

CRITERION VARIABLE / SUB

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	21
DEPTH	3.	BOTTOM	44.9000	2.4158	.0747	.0056	21
POSITION	5.	[illegible]	96.7000	2.1543	.3948	.1559	121
TIME	1.	[illegible]	31.9000	1.8167	.1632	.0267	63
DEPTH	1.	[illegible]	5.3000	1.4158	.2121	.0450	21
DEPTH	2.	MIDDLE	5.0000	2.5000	0	0	21
DEPTH	3.	BOTTOM	5.0000	2.5000	0	0	21
TIME	2.	[illegible]	15.3000	2.5500	.0540	.0029	63
DEPTH	1.	[illegible]	5.0000	2.5000	0	0	21
DEPTH	2.	MIDDLE	5.1000	2.5500	.0707	.0050	21
DEPTH	3.	BOTTOM	5.0000	2.5000	0	0	21

TOTAL CASES = 168

(Continued)

DESCRIPTION OF SUBPOPULATIONS

POPULATION VARIABLE - S1 (Receive Climate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE		MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION		2757.9000	45.9650	6.5283	42.6110	60
POSITION	1.	DUMP-EA	531.1000	44.2583	6.8612	60.8913	12
TIME	1.	SEPTEMBER	234.9000	39.1500	5.9386	35.2458	6
DEPTH	1.	SURFACE	89.9000	44.9500	4.5962	21.1250	2
DEPTH	2.	MIDDLE	68.7000	34.3500	5.6061	31.3050	2
DEPTH	3.	BOTTOM	76.3000	38.1500	2.3335	5.4450	2
TIME	2.	DECEMBER	296.2000	49.3667	.9070	.8230	6
DEPTH	1.	SURFACE	98.6000	49.3000	.8192	.8450	2
DEPTH	2.	MIDDLE	99.2000	49.6000	.8660	.7500	2
DEPTH	3.	BOTTOM	98.4000	49.2000	1.2678	3.2050	2
POSITION	2.	DUMP-E10	554.5000	46.2167	5.4868	31.2176	12
TIME	1.	SEPTEMBER	258.0000	43.0000	3.0175	18.2667	6
DEPTH	1.	SURFACE	91.3000	45.6500	.3787	.8050	2
DEPTH	2.	MIDDLE	79.3000	39.6500	.2121	.8450	2
DEPTH	3.	BOTTOM	90.6000	45.3000	4.0811	36.9800	2
TIME	2.	DECEMBER	306.4000	48.7667	1.0065	3.6967	6
DEPTH	1.	SURFACE	101.9000	50.9500	5.7477	16.4450	2
DEPTH	2.	MIDDLE	102.4000	51.2000	1.6556	5.4200	2
DEPTH	3.	BOTTOM	100.1000	50.0500	.2121	.0450	2
POSITION	3.	REFERENCE-E17	592.1000	46.4692	8.7177	32.6011	13
TIME	1.	SEPTEMBER	247.3000	41.2167	6.0852	16.8817	6
DEPTH	1.	SURFACE	81.4000	40.7000	.1414	.0200	2
DEPTH	2.	MIDDLE	83.5000	41.7500	1.4849	8.8050	2
DEPTH	3.	BOTTOM	82.4000	41.2000	2.7981	20.8800	2
TIME	2.	DECEMBER	344.8000	49.2571	.4899	.7748	7
DEPTH	1.	SURFACE	102.1000	51.0500	.4778	.4050	2
DEPTH	2.	MIDDLE	100.9000	50.4500	.0707	.0050	2
DEPTH	3.	BOTTOM	101.4000	50.7000	1.4071	3.9800	2
POSITION	4.	REFERENCE-E19	574.4000	47.8667	4.7896	70.3867	12
TIME	1.	SEPTEMBER	259.4000	43.2333	8.6297	98.4333	6
DEPTH	1.	SURFACE	97.3000	48.6500	6.1519	37.8050	2
DEPTH	2.	MIDDLE	99.2000	49.6000	1.1314	1.2800	2
DEPTH	3.	BOTTOM	61.9000	30.9500	1.6263	2.6450	2
TIME	2.	DECEMBER	314.8000	52.4667	1.7119	2.9367	6
DEPTH	1.	SURFACE	109.1000	54.5500	.6364	.4050	2

(Continued)

POLLUTION DYNAMICS—WATER SAMPLES

DESCRIPTION VARIABLE 51

Table 1 (Continued)

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
DEPTH	2.	MIDDLE	184.5000	52.2500	1.0607	1.1250	(2
DEPTH	3.	BOTTOM	182.7000	51.1000	9	.8	(2
POSITION	5.	DOWNSTREAM	543.7000	65.1083	4.2540	40.9990	(12
TIME	1.	SEPTEMBER	231.4000	38.5333	3.1399	9.8667	(6
DEPTH	1.	SURFACE	73.6000	36.8000	3.4770	13.5200	(2
DEPTH	2.	MIDDLE	85.2000	42.6000	1.7071	1.4450	(2
DEPTH	3.	BO	72.6000	36.3000	.0707	.0050	(2
TIME	2.		308.3000	51.3833	1.9136	1.7297	(6
DEPTH	1.		93.5000	46.7500	.6485	.7250	(2
DEPTH	2.	MIDDLE	102.6000	51.2100	.2828	.0800	(2
DEPTH	3.	BOTTOM	184.5000	52.2500	.3536	.1250	(2

VALID CASES = 60

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE PH
RANKED DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	
FOR ENTIRE POPULATION			1029.2000	8.0413	.3694	.1365	6
POSITION	1.	CENTRAL DISPOSAL	287.4000	8.0944	.2516	.1463	6
TIME	1.	SEPTEMBER	107.0000	8.0050	.2449	.1488	6
DEPTH	1.	TOP--10CM	47.4000	8.7714	.1784	.0298	6
DEPTH	2.	BOTTOM--25CM	54.6000	8.0250	.3049	.0930	6
TIME	2.	DECEMBER	105.6000	8.4000	.2280	.0520	6
DEPTH	1.	TOP--10CM	52.3000	8.5375	.1695	.0284	6
DEPTH	2.	BOTTOM--25CM	53.3000	8.4429	.2728	.0741	6
POSITION	2.	WEST REFERENCE	117.8000	7.9429	.0919	.0052	6
TIME	1.	SEPTEMBER	58.8000	7.9560	.0930	.0086	6
DEPTH	1.	TOP--10CM	29.4000	7.9500	.0577	.0033	6
DEPTH	2.	BOTTOM--25CM	29.4000	7.9500	.1261	.0167	6
TIME	2.	DECEMBER	59.0000	7.9250	.0463	.0021	6
DEPTH	1.	TOP--10CM	29.5000	7.9250	.0500	.0025	6
DEPTH	2.			7.9250	.0548	.0025	6
POSITION	3.			7.9429	.2473	.0612	6
TIME	1.			7.9375	.0744	.0055	6
DEPTH	1.	TOP--10CM	29.2000	7.9000	.0516	.0047	6
DEPTH	2.	BOTTOM--25CM	29.5000	7.9750	.0500	.0025	6
TIME	2.	DECEMBER	58.1000	7.9875	.3593	.1291	6
DEPTH	1.	TOP--10CM	29.1000	7.9750	.4573	.2092	6
DEPTH	2.	BOTTOM--25CM	30.0000	7.9000	.2160	.0467	6
POSITION	4.	FRINGE DISPOSAL	584.0000	8.2150	.2748	.0781	6
TIME	1.	SEPTEMBER	244.8000	8.1997	.2643	.0728	6
DEPTH	1.	TOP--10CM	134.0000	8.3750	.2271	.0516	6
DEPTH	2.	BOTTOM--25CM	138.4000	8.0442	.2814	.0792	6
TIME	2.	DECEMBER	321.2000	8.4917	.2835	.1004	6
DEPTH	1.	TOP--10CM	154.9000	8.6722	.2041	.0591	6
DEPTH	2.	BOTTOM--25CM	162.3000	8.7429	.3076	.0946	6

TOTAL CASES = 160
MISSING CASES = 10 OR 6.3 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE EM
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			-46618.0000	-102.1860	93.7372	2834.7828	1511
POSITION	1.	CENTRAL DISPOSAL	-6884.0000	-109.0635	78.7125	936.1613	211
TIME	1.	SEPTEMBER	-4475.0000	-105.8808	38.7868	947.8571	151
DEPTH	1.	TOP--10CM	-2055.0000	-293.5714	21.7338	472.6190	71
DEPTH	2.	BOTTOM--25CM	-2370.0000	-296.2500	18.4290	1474.7857	80
TIME	2.	DECEMBER	-2159.0000	-323.6875	18.9544	395.5625	140
DEPTH	1.	TOP--10CM	-2529.0000	-315.6250	24.7591	618.2679	80
DEPTH	2.	BOTTOM--25CM	-2654.0000	-331.7500	14.2383	203.9286	80
POSITION	2.	WEST DIFFERENCE	-1944.0000	-268.7500	82.9196	6875.6667	145
TIME	1.	SEPTEMBER	-1448.0000	-198.0000	57.4698	3316.2857	81
DEPTH	1.	TOP--10CM	-800.0000	-172.5000	71.4559	5001.6667	41
DEPTH	2.	BOTTOM--25CM	-750.0000	-167.5000	40.5166	2401.6667	41
TIME	2.	DECEMBER	-[illegible]	-[illegible]	99.1448	1735.1429	64
DEPTH	1.	TOP--10CM	-[illegible]	-[illegible]	48.2781	1402.2500	32
DEPTH	2.	BOTTOM--25CM	-[illegible]	-[illegible]	34.7311	1208.3906	32
POSITION	3.	EAST DIFFERENCE	-4884.0000	-305.2500	74.4808	5576.2917	144
TIME	1.	SEPTEMBER	-2035.0000	-244.3751	67.1585	4510.2679	81
DEPTH	1.	TOP--10CM	-955.0000	-238.7500	63.2328	3972.9167	40
DEPTH	2.	BOTTOM--25CM	-1080.0000	-270.0000	77.4597	5960.0000	40
TIME	2.	DECEMBER	-2850.0000	-355.3680	38.4819	1481.9286	63
DEPTH	1.	TOP--10CM	-1375.0000	-343.7500	38.4817	1512.2500	40
DEPTH	2.	BOTTOM--25CM	-1475.0000	-368.7500	39.7596	1580.7500	40
POSITION	4.	PRIMARY DISPOSAL	-9718[illegible].0000	-[illegible].8798	62.6716	3928.8463	883
TIME	1.	SEPTEMBER	-[illegible]744.0000	-[illegible].1588	68.4817	3466.4385	481
DEPTH	1.	TOP--10CM	-4268.0000	-267.1429	38.4656	903.8746	241
DEPTH	2.	BOTTOM--25CM	-5004.0000	-263.4737	43.9340	1930.3743	241
TIME	2.	DECEMBER	-[illegible]979.0000	-[illegible].8707	28.4818	804.8168	402
DEPTH	1.	TOP--10CM	-7984.0000	-379.3332	25.9375	672.7576	241
DEPTH	2.	BOTTOM--25CM	-8031.0000	-374.6758	30.4998	960.9402	241

TOTAL CASES = 1660
MISSING CASES = 0 OR 0.0 PCT.

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE -- MWRED
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			39916.0000	995.8742	60.9823	3448.0252	[illegible]
POSITION	1.	CENTRAL DISPOSAL	9984.0000	249.4790	77.6496	6033.0034	4
TIME	1.	SEPTEMBER	4170.0000	261.1875	98.8569	9732.0292	[illegible]
DEPTH	1.	TOP--1SCM	2178.0000	247.2500	34.9623	1305.6250	[illegible]
DEPTH	2.	BOTTOM--2SCM	2841.0000	265.1250	73.9979	5471.[illegible]	[illegible]
TIME	2.	DECEMBER	5905.0000	364.5625	89.8784	8078.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	2284.0000	244.6250	88.4047	7814.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	3621.0000	327.6250	184.9000	11840.[illegible]	[illegible]
POSITION	2.	NEAR REFERENCE	3969.0000	244.3125	58.2348	3381.[illegible]	[illegible]
TIME	1.	SEPTEMBER	1419.0000	221.3750	19.8611	394.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	879.0000	218.2500	21.1719	447.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	948.0000	236.8000	17.9820	1613.[illegible]	[illegible]
TIME	2.	DECEMBER	2550.0000	261.2500	79.6663	6347.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	1170.0000	244.3750	183.8509	33786.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	1431.0000	277.7500	87.4971	7654.[illegible]	[illegible]
POSITION	3.	EAST REFERENCE	5404.0000	337.7500	49.7688	2474.[illegible]	[illegible]
TIME	1.	SEPTEMBER	2357.0000	307.2188	108.1419	11692.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	991.0000	265.7500	77.4731	6000.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	474.0000	154.6788	114.8479	13428.[illegible]	[illegible]
TIME	2.	DECEMBER	1741.0000	348.2000	94.0701	8836.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	1129.0000	342.2500	45.0955	2035.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	622.0000	207.3333	37.8642	1434.[illegible]	[illegible]
POSITION	4.	FRINGE DISPOSAL	23919.0000	598.4625	69.8851	4882.[illegible]	[illegible]
TIME	1.	SEPTEMBER	11431.0000	543.4714	66.4284	4413.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	5430.0000	724.0933	87.6943	7688.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	5681.0000	252.4174	84.8724	7202.[illegible]	[illegible]
TIME	2.	DECEMBER	12084.0000	762.0947	45.3141	2053.[illegible]	[illegible]
DEPTH	1.	TOP--1SCM	6373.0000	797.8417	39.1209	1534.[illegible]	[illegible]
DEPTH	2.	BOTTOM--2SCM	5711.0000	259.5909	59.0391	3489.[illegible]	[illegible]

TOTAL CASES = 160
MISSING CASES = 4 OR 2.5 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE = WHIN
BROKEN DOWN BY = POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			449.3900	3.2530	2.4242	5.8761	1 1381
POSITION	1.	CENTRAL DISPOSAL	.0000	4.2738	2.2781	7.4738	1 341
TIME	1.	SEPTEMBER	.0000	3.4008	1.6959	2.1194	1 141
DEPTH	1.	TOP--10CM	35.4000	4.4435	1.4827	3.0293	1 81
DEPTH	2.	BOTTOM--20CM	24.5000	3.3125	.6482	.1959	1 81
TIME	2.	DECEMBER	58.7000	4.0546	1.8966	10.8744	1 141
DEPTH	1.	TOP--10CM	34.2000	4.0971	1.9980	24.0759	1 3
DEPTH	2.	BOTTOM--20CM	31.8000	4.4628	2.4877	8.7972	1 71
POSITION	2.	NEAR REFERENCE	6.7000	.4470	.4532	.3944	1 151
TIME	1.	SEPTEMBER	4.4700	.4970	.5972	.3660	1 91
DEPTH	1.	TOP--10CM	3.0000	.7500	.9774	.9498	1 41
DEPTH	2.	BOTTOM--20CM	1.5000	.3675	.0788	.0481	1 41
TIME	2.	DECEMBER	2.2300	.1857	.2177	.0474	1 72
DEPTH	1.	TOP--10CM	1.4000	.4667	.2194	.0481	1 31
DEPTH	2.	BOTTOM--20CM	.8600	.2150	.1310	.0179	1 41
POSITION	3.	EAST REFERENCE	5.1000	.3643	.2878	.0814	1 141
TIME	1.	SEPTEMBER	3.4000	.4250	.1897	.0195	1 81
DEPTH	1.	TOP--10CM	2.1000	.5250	.1121	.0170	1 41
DEPTH	2.	BOTTOM--20CM	.5100	.1275	.0577	.0016	1 41
TIME	2.	DECEMBER	1.7000	.1214	.0769	.0059	1 61
DEPTH	1.	TOP--10CM	1.1000	.2750	.0431	.0046	1 41
DEPTH	2.	BOTTOM--20CM	.6000	.1500	.0577	.0033	1 41
POSITION	4.	FRINGE DISPOSAL	339.7000	3.9157	2.1345	5.4449	1 921
TIME	1.	SEPTEMBER	185.9000	3.9553	2.1316	5.4365	1 471
DEPTH	1.	TOP--10CM	82.5000	3.8810	1.9235	3.7305	1 231
DEPTH	2.	BOTTOM--20CM	103.4000	4.3100	2.4913	7.0996	1 241
TIME	2.	DECEMBER	173.7000	3.8418	2.3628	9.5028	1 451
DEPTH	1.	TOP--10CM	84.2000	3.8273	2.2844	5.2153	1 221
DEPTH	2.	BOTTOM--20CM	89.5000	3.8913	2.4844	6.1682	1 231

TOTAL CASES = 1381
MISSING CASES = 7.00 4.4 PCT.

(Continued)

POLLUTION DYNAMICS--SEDIMENT [illegible]

CRITERION VARIABLE /SAMP
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			2500.0000	16.1613	10.1652	103.3319	155
POSITION	1.	CENTRAL DISPOSAL	645.0000	11.9444	7.1208	17.1494	54
TIME	1.	SEPTEMBER	810.0000	13.5000	9.4756	11.1133	60
DEPTH	1.	TOP--10CM	1[illegible]4.0000	12.[illegible]00	7.0041	8.7447	[illegible]
DEPTH	2.	BOTTOM--25CM	116.0000	15.[illegible]500	6.[illegible]747	14.[illegible]143	[illegible]
TIME	2.	DECEMBER	789.0000	14.[illegible]125	6.[illegible]187	23.[illegible]489	[illegible]
DEPTH	1.	TOP--10CM	101.0000	12.[illegible]750	6.[illegible]289	14.[illegible]781	[illegible]
DEPTH	2.	BOTTOM--25CM	126.0000	15.[illegible]500	9.[illegible]867	87.[illegible]286	[illegible]
POSITION	2.	WEST DIFFERENCE	194.0000	6.[illegible]448	2.[illegible]918	[illegible]	[illegible]
TIME	1.	SEPTEMBER	72.0000	[illegible]	2.[illegible]84	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	40.0000	10.[illegible]000	1.[illegible]142	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	32.0000	[illegible]	3.[illegible]417	[illegible]	[illegible]
TIME	2.	DECEMBER	82.0000	10.[illegible]500	1.[illegible]273	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	44.0000	11.[illegible]000	[illegible]	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	37.0000	[illegible]	[illegible]	[illegible]	[illegible]
POSITION	3.	EAST DIFFERENCE	207.0000	18.[illegible]429	10.[illegible]949	[illegible]	[illegible]
TIME	1.	SEPTEMBER	150.0000	19.[illegible]750	14.[illegible]043	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	90.0000	14.[illegible]500	3.[illegible]742	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	120.0000	[illegible]	20.[illegible]187	[illegible]	[illegible]
TIME	2.	DECEMBER	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	[illegible]0.0000	10.[illegible]000	[illegible]	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	99.0000	16.[illegible]500	[illegible]	[illegible]	[illegible]
POSITION	4.	PRIME DISPOSAL	1691.0000	17.[illegible]794	11.[illegible]420	[illegible]	[illegible]
TIME	1.	SEPTEMBER	881.0000	17.[illegible]375	[illegible]	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	327.0000	13.[illegible]958	[illegible]	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	534.0000	22.[illegible]500	17.[illegible]328	[illegible]	[illegible]
TIME	2.	DECEMBER	837.0000	17.[illegible]333	[illegible]	[illegible]	[illegible]
DEPTH	1.	TOP--10CM	328.0000	13.[illegible]667	[illegible]	[illegible]	[illegible]
DEPTH	2.	BOTTOM--25CM	504.0000	21.[illegible]000	[illegible]	[illegible]	[illegible]

TOTAL CASES = 155

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE ARIN
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	K
FOR ENTIRE POPULATION			3711.0000	98.1941	34.6574	1194.2110	6 Ta
POSITION	1.	CENTRAL DISPOSAL	855.0000	97.0000	50.9693	2599.6296	(15
TIME	1.	SEPTEMBER	995.0000	97.0000	54.9693	2595.6296	(15
DEPTH	1.	TOP--10CM	439.0000	94.1000	55.1302	3044.9571	(9
DEPTH	2.	BOTTOM--25CM	471.0000	99.7790	54.7790	2477.8929	(7
POSITION	2.	WEST REFERENCE	331.0000	95.0000	2.7795	59.0000	(6
TIME	1.	SEPTEMBER	331.0000	95.0000	2.7795	59.0000	(6
DEPTH	1.	TOP--10CM	161.0000	96.3333	10.5948	110.3333	(3
DEPTH	2.	BOTTOM--25CM	170.0000	93.6667	8.1101	37.9333	(3
POSITION	3.	EAST REFERENCE	1525.0000	98.4839	23.6831	560.8495	(7
TIME	1.	SEPTEMBER	1525.0000	98.4839	23.6831	560.8495	(7
DEPTH	1.	TOP--10CM	795.0000	99.3750	8.9394	91.0000	(3
DEPTH	2.	BOTTOM--25CM	730.0000	97.3333	24.1758	885.1429	(4
POSITION	4.	OUTSIDE DISPOSAL	1171.0000	97.1957	31.9372	1019.9431	(46
TIME	1.	SEPTEMBER	1171.0000	97.1957	31.9372	1019.9431	(46
DEPTH	1.	TOP--10CM	597.0000	91.8462	25.8978	670.7436	(42
DEPTH	2.	BOTTOM--25CM	1214.0000	93.7879	37.9321	1440.3397	(33

TOTAL CASES = 348
MISSING CASES = 86 OR 83.9 PCT.

(Continued)

Table 1 (Continued)

CRITERION VARIABLE... MIXED
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

DESCRIPTION OF SUBPOPULATIONS

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			88.3200	.5113	1.3982	1.9551	(147)
POSITION	1.	CENTRAL DISPOSAL	5.[illegible]	.1498	.1547	.0240	(30)
TIME	1.	SEPTEMBER	1.4100	.0881	.0951	.0090	(16)
DEPTH	1.	TOP--10CM	1.0100	.1262	.1268	.0156	(8)
DEPTH	2.	BOTTOM--25CM	.4000	.0500	.0220	.0005	(8)
TIME	2.	DECEMBER	4.4400	.2775	.1481	.0219	(16)
DEPTH	1.	TOP--10CM	2.2100	.2762	.1059	.0112	(8)
DEPTH	2.	BOTTOM--25CM	2.2300	.2788	.1115	.0124	(8)
POSITION	2.	WEST REFERENCE	3.6500	.2281	.1143	.0130	(16)
TIME	1.	SEPTEMBER	.6400	.0925	.0719	.0065	(8)
DEPTH	1.	TOP--10CM	.3600	.0700	.0299	.0009	(4)
DEPTH	2.	BOTTOM--25CM	.3000	.0750	.0100	.0001	(4)
TIME	2.	DECEMBER	3.0100	.3738	.0943	.0089	(8)
DEPTH	1.	TOP--10CM	1.7200	.4300	.0173	.0003	(4)
DEPTH	2.	BOTTOM--25CM	1.7700	.4425	.0685	.0047	(4)
POSITION	3.	EAST REFERENCE	31.4200	2.0013	3.9687	15.6660	(15)
TIME	1.	SEPTEMBER	10.0200	2.5775	5.5056	30.3115	(8)
DEPTH	1.	TOP--10CM	1.6000	.4000	.1479	.0219	(4)
DEPTH	2.	BOTTOM--25CM	17.4200	4.3550	9.7638	95.3270	(4)
TIME	2.	DECEMBER	19.5000	1.7727	1.8147	1.8216	(7)
DEPTH	1.	TOP--10CM	3.9000	1.3000	.8660	.8750	(3)
DEPTH	2.	BOTTOM--25CM	9.4000	2.1500	1.2583	1.5833	(4)
POSITION	4.	FARFIELD DISPOSAL	30.3000	.6181	.4019	.4341	(49)
TIME	1.	SEPTEMBER	10.4100	.2169	.2884	.0832	(48)
DEPTH	1.	TOP--10CM	3.2800	.1367	.1377	.0190	(24)
DEPTH	2.	BOTTOM--25CM	7.1300	.2972	.3789	.1436	(24)
TIME	2.	DE[illegible]	[illegible]	.4286	.9545	.7339	(48)
DEPTH	1.	[illegible]	[illegible]	.2137	.2137	.0457	(24)
DEPTH	2.	[illegible]	[illegible]	.6709	1.1248	1.2748	(22)

TOTAL CASES = 147
MISSING CASES = 3 OR 1.9 PCT.

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE MGTH
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE
FOR ENTIRE POPULATION			401.0000	5.2078	11.0818	121.6252
POSITION	1.	CENTRAL DISPOSAL	38.0000	2.9333	1.9449	[illegible]
TIME	1.	SEPTEMBER	38.0000	2.5333	1.2659	1.6026
DEPTH	1.	TOP--10CM	20.0000	2.5000	1.4142	2.0000
DEPTH	2.	BOTTOM--25CM	18.0000	2.6714	1.1339	1.2857
POSITION	2.	WEST REFERENCE	53.0000	7.5714	4.4241	19.5857
TIME	1.	SEPTEMBER	53.0000	7.5714	4.4241	19.5857
DEPTH	1.	TOP--10CM	26.0000	5.5000	2.6833	4.3333
DEPTH	2.	BOTTOM--25CM	27.0000	9.8000	7.8102	61.0000
POSITION	3.	EAST REFERENC	142.0000	20.2900	38.6749	961.8714
TIME	1.	SEPTEMBER	142.0000	20.2900	38.6749	961.8714
DEPTH	1.	TOP--10CM	34.0000	8.5000	3.7321	13.9333
DEPTH	2.	BOTTOM--25CM	[illegible]	32.0000	49.7161	[illegible]
POSITION	4.	FRINGE DISPOSAL	148.0000	3.1489	2.5085	6.2979
TIME	1.	SEPTEMBER	148.0000	3.1489	2.5029	6.2979
DEPTH	1.	TOP--10CM	60.0000	3.0000	2.1741	4.7304
DEPTH	2.	BOTTOM--25CM	79.0000	3.2917	2.8018	7.8953

TOTAL CASES = 146
(MISSING CASES = 83 OR 51.4 PCT.)

(Continued)

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS

CONDITION VARIABLE COSTC
SCORES DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD. DEV.	VARIANCE	
FOR ENTIRE POPULATION			17286.7800	78.5717	21.7973	946.7116	1 1041
POSITION	1.	CENTRAL DISPOSAL	3934.8800	77.1737	17.1814	295.2413	1 321
TIME	1.	NORTHWARD	1888.8000	68.6909	8.5781	73.5813	1 181
SCORE	1.	TOP--10CM	586.0000	72.5610	9.8139	96.2913	1 81
DEPTH	2.	BOTTOM--25CM	918.7000	84.7000	6.8071	75.0714	1 81
TIME	2.	SOUTHWARD	1134.0000	71.1810	21.7107	337.9314	1 160
SCORE	1.	TOP--10CM	594.0000	74.2500	14.1497	200.2143	1 81
DEPTH	2.	BOTTOM--25CM	564.0000	68.8810	8.4644	71.7143	1 81
POSITION	2.	WEST REFERENCE	1942.0000	78.3710	43.1213	1859.4510	1 161
TIME	1.	NORTHWARD	1032.0000	128.0000	81.3688	3263.6210	1 80
SCORE	1.	TOP--10CM	641.0000	160.2500	76.7168	5882.2500	1 41
DEPTH	2.	BOTTOM--25CM	389.0000	97.2500	22.6938	514.9167	1 41
TIME	2.	SOUTHWARD	910.0000	113.7500	8.3852	70.2143	1 81
SCORE	1.	TOP--10CM	438.0000	109.5000	6.0553	36.6667	1 41
DEPTH	2.	BOTTOM--25CM	472.0000	118.0000	10.6992	114.4667	1 41
POSITION	3.	EAST REFERENCE	1[illegible].0000	77.1429	24.1784	584.2857	1 63
TIME	1.	NORTHWARD	676.7000	77.1778	28.5748	1042.9321	1 [illegible]
SCORE	1.	TOP--10CM	[illegible].0000	[illegible].7500	6.1892	47.5917	1 [illegible]
DEPTH	2.	BOTTOM--25CM	237.7000	59.4250	6.2119	38.9583	1 41
TIME	2.	SOUTHWARD	874.0000	84.5000	13.2773	[illegible]	1 [illegible]
SCORE	1.	TOP--10CM	379.0000	94.7500	8.4391	284.9167	1 41
DEPTH	2.	BOTTOM--25CM	295.0000	74.3750	7.8322	245.9167	1 41
POSITION	4.	FORMER DISPOSAL	8744.8800	76.7017	11.8699	140.8[illegible]	1 441
TIME	1.	NORTHWARD	3184.0800	80.9778	11.4978	141.5778	1 441
SCORE	1.	TOP--10CM	1709.0000	71.2083	11.0179	121.4511	1 241
DEPTH	2.	BOTTOM--25CM	1597.0000	65.7917	12.4936	154.6449	1 241
TIME	2.	SOUTHWARD	5440.0000	72.7643	11.8344	140.0118	1 441
SCORE	1.	TOP--10CM	1758.0000	73.2500	10.4476	109.1522	1 241
DEPTH	2.	BOTTOM--25CM	1737.0000	72.3667	12.1719	148.1649	1 241

TOTAL CASES = 160

(Sheet 25 of 3)

Table 1 (Continued)

POPULATION DYNAMICS--SEDIMENT SAMPLES

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE S (Free Sulfide)
Breaking Down BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			8.4524	.0568	.0420	.0018	149
POSITION	1.	CENTRAL DISPOSAL	.0074	.0101	.0081	.0000	741
TIME	1.	BEGINNER	.0014	.0101	.0091	.0000	141
DEPTH	1.	TOP--10CM	.0054	.0101	.0081	.0000	81
DEPTH	2.	BO		.0101	.0081	.0000	81
TIME	2.			.0061	.0067	.0000	141
DEPTH	1.			.0061	.0067	.0000	81
DEPTH	2.	BOTTOM--25CM	.0007	.0061	.0083	.0000	81
POSITION	2.	WEST REFERENCE	.0044	.0103	.0094	.0000	141
TIME	1.	BEGINNER	.0044	.0100	.0	.0	41
DEPTH	1.	TOP--10CM	.0044	.0100	.0	.0	41
DEPTH	2.	BOTTOM--25CM	.0000	.0100	.0	.0	41
TIME	2.	BEGINNER	.0000	.0100	.0	.0	41
DEPTH	1.	TOP--10CM	.0039	.0095	.0088	.0000	41
DEPTH	2.	BOTTOM--25CM	.0017	.0083	.0083	.0000	41
POSITION	3.	EAST REFERENCE	8.4278	.4017	2.8194	8.0078	141
TIME	1.	BEGINNER	.0000	.0100	.0	.0	41
DEPTH	1.	TOP--10CM	.0000	.0100	.0	.0	41
DEPTH	2.	BOTTOM--25CM	.0000	.0100	.0	.0	41
TIME	2.	BEGINNER	8.4278	2.4394	2.8194	8.0078	81
DEPTH	1.	TOP--10CM	.4508	.2195	.2106	.0444	81
DEPTH	2.	BOTTOM--25CM	8.1479	2.0369	6.0397	(8.0)E5	41
POSITION	4.	PAILAR DISPOSAL	.1184	.0512	.0084	.0000	141
TIME	1.	BEGINNER	.0454	.0203	.0078	.0000	141
DEPTH	1.	TOP--10CM	.0189	.0013	.0038	.0000	141
DEPTH	2.	BOTTOM--25CM	.0265	.0105	.0019	.0000	241
TIME	2.	BEGINNER	.0731	.0313	.0174	.0001	441
DEPTH	1.	TOP--10CM	.0578	.0524	.0104	.0001	241
DEPTH	2.	BOTTOM--25CM	.0153	.0104	.0013	.0000	241

TOTAL CASES = 160

(Continued)

(Sheet 26 of 34)

DECOMPOSITION OF SUBPOPULATIONS

CRITERION VARIANCE, DF1 (Coarse fraction 1)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	F	N
FOR ENTIRE POPULATION			922.0000	5.7500	4.0580	24.4898		160
POSITION	1.	CENTRAL DIAGONAL	143.0000	4.4688	2.4784	6.1417	8	32
TIME	1.	DEEP--MUCH	69.0000	4.3125	1.4821	2.1964	4	16
DEPTH	1.	TOP--EACH	43.0000	5.3750	1.4580	2.1143	1	8
DEPTH	2.	BOTTOM--PSCM	27.0000	3.3750	1.3025	1.6964	7	8
TIME	2.	DEEP--MUCH	74.0000	4.6250	3.0375	10.6458	1	16
DEPTH	1.	TOP--EACH	40.0000	5.0000	4.7258	22.3333	1	8
DEPTH	2.	BOTTOM--PSCM	34.0000	4.2500	3.2404	10.5000	1	8
POSITION	2.	WEST OFFSHORE	115.0000	7.1875	4.2987	18.4958	1	16
TIME	1.	DEEP--MUCH	74.0000	9.2500	2.9277	8.5714	1	8
DEPTH	1.	TOP--EACH	57.0000	7.1250	3.3048	10.9167	1	8
DEPTH	2.	BOTTOM--PSCM	41.0000	5.1250	2.7538	7.5536	1	8
TIME	2.	DEEP--MUCH	54.0000	6.7500	3.1288	9.7976	1	8
DEPTH	1.	TOP--EACH	29.0000	3.6250	.9988	.9982	1	8
DEPTH	2.	BOTTOM--PSCM	25.0000	3.1250	1.8359	3.4643	1	8
POSITION	3.	EAST OFFSHORE	134.0000	8.3750	4.2918	18.4253	1	16
TIME	1.	DEEP--MUCH	93.0000	11.6250	3.1348	11.6107	1	8
DEPTH	1.	TOP--EACH	55.0000	6.8750	4.0311	16.2500	1	8
DEPTH	2.	BOTTOM--PSCM	38.0000	4.7500	1.8257	3.3331	1	8
TIME	2.	DEEP--MUCH	41.0000	5.1250	4.1499	17.2679	1	8
DEPTH	1.	TOP--EACH	27.0000	3.3750	1.0607	1.1250	1	8
DEPTH	2.	BOTTOM--PSCM	14.0000	1.7500	.7071	.5000	1	8
POSITION	4.	[illegible]	[illegible]	[illegible]	2.4599	6.0536	1	16
TIME	1.	[illegible]	[illegible]	[illegible]	2.0743	4.3036	1	8
DEPTH	1.	[illegible]	[illegible]	[illegible]	2.4715	6.1071	1	8
DEPTH	2.	BOTTOM--PSCM	291.0000	8.3750	2.4599	6.0536	1	8
TIME	2.	DEEP--MUCH	291.0000	8.3750	4.8124	23.1696	1	8
DEPTH	1.	TOP--EACH	85.0000	3.4417	2.2215	[illegible]	1	8
DEPTH	2.	BOTTOM--PSCM	146.0000	4.1750	4.9994	25.0424	1	8

TOTAL CASES = 160

(Continued)

POPULATION DYNAMICS--[illegible] (Continued)

CRITERION VARIABLE [illegible] (Coarse [illegible]
BROKEN DOWN BY [illegible]SITION
BY [illegible]IME
BY DEPTH

POPULATIONS

VARIABLE	CODE	VALUE LABEL	S	MEAN	STD DEV	VARIANCE	
FOR ENTIRE POPULATION			1754.7000	10.9[illegible]94	7.0853	50.2016	(160
POSITION	1.	[illegible] DIFFOSA	301.6000	9.4[illegible]25	4.8356	23.3831	(32
TIME	1.	SEPTEMBER	171.6000	8.[illegible]50	3.1845	10.1413	(16
DEPTH	1.	TOP--25CM	82.0000	10.[illegible]10	3.0209	9.1138	(8
DEPTH	2.	BOTTOM--25CM	54.6000	7.4[illegible]20	2.4429	8.8771	(8
TIME	2.	[illegible]	142.0000	10.[illegible]59	4.1087	37.3167	(36
DEPTH	1.	[illegible]	84.5000	10.[illegible]10	4.6087	41.8714	(8
DEPTH	2.	[illegible]	57.4000	9.5[illegible]00	6.1644	38.0000	(8
POSITION	2.	WEST DIFFOSA	[illegible]	[illegible]	4.9617	24.6183	(15
TIME	1.	SEPTEMBER	130.5000	16.3[illegible]29	8.2951	39.8284	(8
DEPTH	1.	TOP--25CM	69.4000	17.3[illegible]00	8.0848	65.3667	(4
DEPTH	2.	BOTTOM--25CM	61.5000	15.3[illegible]50	4.9448	24.4692	(4
TIME	2.	DECEMBER	[illegible]	14.1[illegible]56	3.4228	11.1058	(9
DEPTH	1.	TOP--25CM	65.0000	16.2[illegible]00	2.3629	[illegible]	([illegible]
DEPTH	2.	BOTTOM--25CM	[illegible]	16.5[illegible]00	5.0000	28.0000	([illegible]
POSITION	3.	EAST DIFFERENCE	93.0000	6.8[illegible]25	2.6949	9.2498	(16
TIME	1.	SEPTEMBER	48.0000	6.8[illegible]00	2.9039	10.8471	(8
DEPTH	1.	TOP--25CM	25.0000	6.7[illegible]81	2.2818	6.9918	(8
DEPTH	2.	BOTTOM--25CM	23.0000	6.7[illegible]00	2.6388	6.9167	(8
TIME	2.	DECEMBER	[illegible]	6.[illegible]50	2.8789	10.[illegible]29	(7
DEPTH	1.	[illegible]	[illegible]	5.[illegible]00	1.7321	3.0000	(3
DEPTH	2.	BOTTOM--25CM	22.0000	8.7[illegible]00	4.5735	23.9167	(8
POSITION	4.	EAST DIFFOSA	1094.2000	11.3[illegible]79	7.8401	61.4476	(96
TIME	1.	SEPTEMBER	633.2000	11.1[illegible]83	7.4583	55.6965	(48
DEPTH	1.	TOP--25CM	300.1000	8.3[illegible]75	5.0347	27.6233	(24
DEPTH	2.	BOTTOM--25CM	333.1000	13.8[illegible]96	8.3754	70.1643	(24
TIME	2.	DECEMBER	561.0000	[illegible].5[illegible]71	8.2764	68.4787	(48
DEPTH	1.	TOP--25CM	295.0000	8.7[illegible]92	4.6262	21.3690	(24
DEPTH	2.	BOTTOM--25CM	252.6000	14.[illegible]67	10.[illegible]029	100.6830	(24

TOTAL CASES [illegible] 160

(Continued)

Table 1 (continued)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE OIL (Coarse fraction 3)
SHOWN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			[illegible]	19.4519	9.4548	89.4308	1581
POSITION	1.	CENTRAL DISPOSAL	609.7000	19.0531	11.2482	124.5219	32)
TIME	1.	SEPTEMBER	311.7000	19.4813	8.1616	147.9043	16)
DEPTH	1.	TOP--10CM	144.9000	18.6125	11.0002	121.0041	8)
DEPTH	2.	BOTTOM--25CM	166.8000	20.1500	5.9359	104.2086	8)
TIME	2.	DECEMBER	298.0000	18.6250	10.6348	113.1033	16)
DEPTH	1.	TOP--10CM	149.2000	18.6250	11.5348	133.1250	8)
DEPTH	2.	BOTTOM--25CM	148.8000	18.6250	10.4680	109.4107	8)
POSITION	2.	WEST REFERENCE	368.2000	23.0125	13.0591	104.8598	16)
TIME	1.	SEPTEMBER	202.2000	25.2750	9.7877	381.5514	8)
DEPTH	1.	TOP--10CM	76.5000	17.4563	4.3842	19.2547	4)
DEPTH	2.	BOTTOM--25CM	130.6000	32.6500	77.2830	744.3633	4)
TIME	2.	DECEMBER	166.0000	20.7500	3.9438	15.5536	8)
DEPTH	1.	TOP--10CM	84.6000	22.8000	3.5598	12.6461	4)
DEPTH	2.	BOTTOM--25CM	79.0000	19.7500	4.5000	20.2500	4)
POSITION	3.	EAST REFERENCE	109.6000	6.8500	3.8716	14.9733	16)
TIME	1.	SEPTEMBER	48.6000	6.0750	1.9213	3.6914	8)
DEPTH	1.	TOP--10CM	23.8000	5.9500	.5888	.3508	4)
DEPTH	2.	BOTTOM--25CM	24.8000	6.2000	2.7979	7.8233	4)
TIME	2.	DECEMBER	60.8000	7.6000	5.2984	28.1429	8)
DEPTH	1.	TOP--10CM	31.0000	7.7500	5.1881	26.9167	4)
DEPTH	2.	BOTTOM--25CM	29.0000	7.2500	6.3966	40.9167	4)
POSITION	4.	FRINGE DISPOSAL	2056.8000	21.4258	6.5064	42.3335	96)
TIME	1.	SEPTEMBER	1073.8000	22.3708	6.8102	46.3791	48)
DEPTH	1.	TOP--10CM	601.7000	25.1542	6.6990	44.8235	24)
DEPTH	2.	BOTTOM--25CM	470.1000	19.5875	5.8124	33.7838	24)
TIME	2.	DECEMBER	983.0000	20.4792	6.1174	37.3613	48)
DEPTH	1.	TOP--10CM	436.0000	22.4167	6.5134	42.4275	24)
DEPTH	2.	BOTTOM--25CM	[illegible]	18.5417	5.1074	26.0851	24)

TOTAL CASES = [illegible]

Table 1 (Continued)

DESCRIPTION OF SUBPOPULATIONS (Coarse Fraction A)

CRITERION VARIABLE CF4
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			[illegible]	19.6346	8.0784	65.2689	(159)
POSITION	1.	[illegible]	[illegible]	15.8410	7.8372	61.4213	(32)
TIME	1.	[illegible]	[illegible]	[illegible]	6.5116	42.4081	(16)
DEPTH	1.	TOP--10CM	[illegible]	[illegible]	5.7696	33.7851	(8)
DEPTH	2.	BOTTOM--25CM	[illegible]	16.[illegible]	7.9026	56.2446	(8)
TIME	2.	DECEMBER	251.0000	18.1015	8.9682	80.4292	(16)
DEPTH	1.	TOP--10CM	138.0000	17.2500	8.8093	79.357	(8)
DEPTH	2.	BOTTOM--25CM	153.0000	19.1250	9.5385	90.992	(8)
POSITION	2.	WEST REFERENCE	[illegible]	18.[illegible]	5.2273	30.4151	(16)
TIME	1.	SEPTEMBER	140.0000	17.5000	5.1712	9.742	(8)
DEPTH	1.	TOP--10CM	72.0000	18.0000	5.8803	15.056	(4)
DEPTH	2.	BOTTOM--25CM	68.0000	17.0000	7.4596	7.0735	(4)
TIME	2.	DECEMBER	153.0000	19.1250	5.0909	8.5536	(8)
DEPTH	1.	TOP--10CM	77.0000	19.2500	1.8930	3.583	(4)
DEPTH	2.	BOTTOM--25CM	82.0000	20.5000	4.2032	17.666	(4)
POSITION	3.	EAST REFERENCE	106.1000	6.6312	2.6091	6.8035	(16)
TIME	1.	SEPTEMBER	45.1000	5.6375	1.6975	2.8798	(8)
DEPTH	1.	TOP--10CM	17.0000	4.2500	1.0801	1.1667	(4)
DEPTH	2.	BOTTOM--25CM	28.1000	7.0250	1.0178	1.0358	(4)
TIME	2.	DECEMBER	60.0000	7.5000	3.1598	9.9886	(8)
DEPTH	1.	TOP--10CM	[illegible]	[illegible]	2.4498	6.0000	(4)
DEPTH	2.	BOTTOM--25CM	33.0000	8.2500	3.7749	14.2500	(4)
POSITION	4.	PRIOR DISPOSAL	2085.2000	21.9496	7.0427	49.5685	(95)
TIME	1.	SEPTEMBER	1360.2000	22.6700	7.2765	52.9427	(60)
DEPTH	1.	TOP--10CM	576.90[illegible]	25.0826	5.1844	26.8197	(23)
DEPTH	2.	BOTTOM--25CM	483.3000	20.1375	8.2255	67.6590	(24)
TIME	2.	DECEMBER	1028.0000	21.3542	6.8481	46.8868	(48)
DEPTH	1.	TOP--10CM	554.0000	23.0833	5.6254	31.6449	(24)
DEPTH	2.	BOTTOM--25CM	471.0000	19.6250	7.5978	57.7228	(24)

TOTAL CASES = 160
MISSING CASES = 1.00 (A [illegible])

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

Table 1 (Continued)

FILE ACCRESS (CREATION DATE = 09/22/77)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE : SILT
BROKEN DOWN BY : POSITION
BY : TIME
BY : DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD. DEV	VARIANCE	F
FOR ENTIRE POPULATION			6954.8000	43.4675	16.3287	266.4277	1
POSITION	1.	[illegible]		40.4563	21.5844	465.9762	[illegible]
TIME	1.	SEPTEMBER		41.4500	21.8727	441.0833	[illegible]
DEPTH	1.	TOP--10CM		44.3750	17.4838	305.8836	[illegible]
DEPTH	2.	BOTTOM--25CM	3911.8000	48.9750	24.0197	624.7919	[illegible]
TIME	2.	DECEMBER	3543.0000	48.9425	22.6759	514.1958	[illegible]
DEPTH	1.	TOP--10CM	3871.0000	48.3750	23.4788	538.0343	[illegible]
DEPTH	2.	BOTTOM--25CM	3083.0000	47.3500	23.6885	550.7857	[illegible]
POSITION	2.	WEST REFERENCE	903.5000	35.2100	8.6849	72.0725	[illegible]
TIME	1.	SEPTEMBER	265.5000	33.1875	9.1308	83.3678	[illegible]
DEPTH	1.	TOP--10CM	137.2000	34.3000	9.2961	86.3800	[illegible]
DEPTH	2.	BOTTOM--25CM	128.3000	32.0750	10.2393	104.8425	[illegible]
TIME	2.	DECEMBER	638.0000	37.5300	7.8513	61.6439	[illegible]
DEPTH	1.	TOP--10CM	141.0000	35.2500	8.8815	78.9167	[illegible]
DEPTH	2.	BOTTOM--25CM	157.5000	39.3500	7.3955	54.6250	[illegible]
POSITION	3.	EAST REFERENCE	1611.3000	61.9731	15.4494	238.6565	[illegible]
TIME	1.	SEPTEMBER	530.8000	66.3500	10.7944	116.5429	[illegible]
DEPTH	1.	TOP--10CM	261.8000	65.4500	12.3954	153.6547	[illegible]
DEPTH	2.	BOTTOM--25CM	269.0000	72.4500	4.6429	20.0967	[illegible]
TIME	2.	DECEMBER	1080.5000	60.0278	19.3083	372.6984	[illegible]
DEPTH	1.	TOP--10CM	474.3000	56.5000	15.1514	235.0667	[illegible]
DEPTH	2.	BOTTOM--25CM	255.0000	63.7500	24.4722	598.4167	[illegible]
POSITION	4.	FENCE DISPOSAL	3761.1000	59.6127	11.7271	137.5442	[illegible]
TIME	1.	SEPTEMBER	1861.1000	58.4406	11.3332	128.4447	[illegible]
DEPTH	1.	TOP--10CM	969.8000	60.6062	11.2924	127.5158	[illegible]
DEPTH	2.	BOTTOM--25CM	892.3000	56.7625	11.0324	121.7177	[illegible]
TIME	2.	DECEMBER	1921.0000	60.0313	12.1978	148.7848	[illegible]
DEPTH	1.	TOP--10CM	955.0000	59.7917	11.3673	129.2156	[illegible]
DEPTH	2.	BOTTOM--25CM	966.0000	60.3750	13.2181	174.6174	[illegible]

TOTAL CASES = 160

(Continued)

POLLUTION DYNAMICS--SEDIMENT SAMPLES

CRITERION VARIABLE CLAY

BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	F	N
FOR ENTIRE POPULATION			555.6000	3.5145	5.5491	30.7921		158)
POSITION	1.	CENTRAL DISPOSAL	79.4000	2.4813	4.4843	19.3977		32)
TIME	1.	SEPTEMBER	41.4000	2.5875	4.0808	23.8145		16)
DEPTH	1.	TOP--10CM	.4000	.0500	.1414	.0200		8)
DEPTH	2.	BOTTOM--25CM	41.0000	5.1250	6.0244	36.2936		8)
TIME	2.	DECEMBER	38.0000	2.3750	4.0311	16.2500		16)
DEPTH	1.	TOP--10CM	12.0000	1.5000	2.0702	4.2857		8)
DEPTH	2.	BOTTOM--25CM	26.0000	3.2500	5.3452	28.5714		8)
POSITION	2.	WEST PEFFERENCE	57.3000	3.3118	5.7395	33.0934		16)
TIME	1.	SEPTEMBER	37.3000	4.6625	3.8095	14.5178		8)
DEPTH	1.	TOP--10CM	14.6000	3.6500	3.4599	11.9500		4)
DEPTH	2.	BOTTOM--25CM	22.7000	5.6750	5.5305	6.6492		4)
TIME	2.	DECEMBER	14.0000	2.0000	4.1851	16.8571		8)
DEPTH	1.	TOP--10CM	14.0000	3.5000	5.6862	32.3333		4)
DEPTH	2.	BOTTOM--25CM	.2.0000	.5000	1.0000	1.0000		4)
POSITION	3.	EAST PEFFERENCE	154.9000	9.6812	9.6425	92.9778		16)
TIME	1.	SEPTEMBER	78.9000	9.8625	11.0874	121.1627		8)
DEPTH	1.	TOP--10CM	61.3000	15.3250	13.8787	192.6892		4)
DEPTH	2.	BOTTOM--25CM	17.6000	4.4000	3.8771	15.1373		4)
TIME	2.	DECEMBER		9.5000	8.8316	78.0000		8)
DEPTH	1.	TOP--10CM		13.2000	11.2953	127.5833		4)
DEPTH	2.	BOTTOM--25CM	71.0000	5.7500	4.1110	16.9167		4)
POSITION	4.	FRINGE DISPOSAL	268.0000	2.8511	4.6721	20.4040		94)
TIME	1.	SEPTEMBER	134.0000	2.9965	4.7104	18.5794		47)
DEPTH	1.	TOP--10CM	49.3000	2.1435	4.4341	19.6972		23)
DEPTH	2.	BOTTOM--25CM	86.7000	3.7696	4.1139	16.9240		23)
TIME	2.	DECEMBER	132.0000	2.7500	4.8532	23.5532		48)
DEPTH	1.	TOP--10CM	108.0000	4.5000	1574	37.9130		24)
DEPTH	2.	BOTTOM--25CM	24.0000	1.0000	1.9560	3.8261		24)

TOTAL CASES = 160
MISSING CASES = 2 OR 1.2 PCT.

(Continued)

Table 1 (Continue

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE POA (Inorganic Phosphate)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1811.7000	13.1283	18.1441	329.2[illegible]	138
POSITION	1.	CENTRAL DISPOSAL	449.9000	20.4545	25.7596	663.8[illegible]	23
TIME	1.	SEPTEMBER	431.0000	10.7857	23.6046	811.[illegible]	14
DEPTH	1.	TOP--10CM	215.4000	29.9250	19.3529	374.[illegible]	8
DEPTH	2.	BOTTOM--25CM	215.6000	[illegible]	39.1094	1529.[illegible]	6
TIME	2.	DECEMBER	18.9000	3.8778	3.3719	11.3[illegible]	9
DEPTH	1.	TOP	[illegible]	4.3430	3.7293	13.9[illegible]	5
DEPTH	2.	[illegible]	[illegible]	3.2750	3.1019	10.9025	4
POSITION	2.	[illegible]	[illegible]	2.6415	2.2262	4.[illegible]	13
TIME	1.	SEPTEMBER	18.7000	2.6714	1.1608	1.3[illegible]	7
DEPTH	1.	TOP--10CM	6.6000	2.2000	.5196	.2[illegible]	3
DEPTH	2.	BOTTOM--25CM	12.1000	3.0250	1.4549	2.12[illegible]	4
TIME	2.	DECEMBER	18.5000	3.0833	3.1090	10.1697	6
DEPTH	1.	TOP--10CM	13.5000	4.5000	4.1301	18.7[illegible]	3
DEPTH	2.	BOTTOM--25CM	5.0000	1.6667	.8083	.6533	3
POSITION	3.	EAST REFERENCE	59.2000	3.9467	6.6175	43.7812	15
TIME	1.	SEPTEMBER	36.2000	5.1714	9.7345	94.7969	7
DEPTH	1.	TOP--10CM	3.4000	1.1333	.1215	.1013	3
DEPTH	2.	BOTTOM--25CM	32.8000	8.2000	12.6883	160.9933	4
TIME	2.	DECEMBER	23.0000	2.8750	1.8745	3.5134	8
DEPTH	1.	TOP--10CM	11.5000	2.9000	1.7108	2.9267	4
DEPTH	2.	BOTTOM--25CM	11.4000	2.8500	2.2958	5.2700	4
POSITION	4.	FRINGE DISPOSAL	1249.4000	14.1409	17.3534	301.1403	87
TIME	1.	SEPTEMBER	1034.3000	22.0915	17.4609	305.1469	47
DEPTH	1.	TOP--10CM	621.4000	27.0000	21.6981	470.7209	23
DEPTH	2.	BOTTOM--25CM	417.3000	17.3875	10.6241	112.9548	24
TIME	2.	DECEMBER	211.1000	5.2775	12.1422	147.4326	40
DEPTH	1.	TOP--10CM	139.5000	6.9750	16.8310	283.3514	20
DEPTH	2.	BOTTOM--25CM	71.6000	3.5800	3.6341	13.2049	20

TOTAL CASES = 160
MISSING CASES = 22 OR 13.7 PCT.

(Continued)

Table 1 (Concluded)

DESCRIPTION OF SUBPOPULATIONS

CRITERION VARIABLE NH4 (Ammonia)
BROKEN DOWN BY POSITION
BY TIME
BY DEPTH

VARIABLE	CODE	VALUE LABEL	SUM	MEAN	STD DEV	VARIANCE	N
FOR ENTIRE POPULATION			1078.6000	7.9902	13.0342	169.9904	(135)
POSITION	1.	CENTRAL DISPOSAL	357.9000	17.8950	12.7143	161.6456	(20)
TIME	1.	SEPTEMBER	152.4000	15.2400	9.4376	89.0844	(10)
DEPTH	1.	TOP--10CM	80.2000	13.3667	10.3303	106.7147	(6)
DEPTH	2.	BOTTOM--25CM	72.6000	18.1500	9.8524	97.0900	(4)
TIME	2.	DECEMBER	205.1000	20.5100	15.2780	233.1121	(10)
DEPTH	1.	TOP--10CM	131.3000	26.2600	18.4823	109.8743	(5)
DEPTH	2.	BOTTOM--25CM	73.8000	14.7600	10.2237	732.1833	(5)
POSITION	2.	WEST REFERENCE	31.0700	2.3900	P.8715	R.2470	(13)
TIME	1.	SEPTEMBER	3.6700	.9243	.9589	.9630	(7)
DEPTH	1.	TOP--10CM	1.0400	.3467	.1553	.0241	(3)
DEPTH	2.	BOTTOM--25CM	2.6300	.6575	.2337	.0544	(4)
TIME	2.	DECEMBER	27.4000	4.5667	3.0303	9.1877	(6)
DEPTH	1.	TOP--10CM	14.2000	6.4000	3.1575	9.9700	(3)
DEPTH	2.	BOTTOM--25CM	8.2000	2.7333	1.7039	2.9033	(3)
POSITION	3.	EAST REFERENCE	49.9000	3.7769	2.1491	9.8230	(13)
TIME	1.	SEPTEMBER	3.4000	.4943	.4256	.1811	(7)
DEPTH	1.	TOP--10CM	.5800	.1933	.0757	.0057	(3)
DEPTH	2.	BOTTOM--25CM	2.8200	.7050	.4471	.1996	(4)
TIME	2.	DECEMBER	[illegible]	5.4001	R.1394	8.5771	(6)
DEPTH	1.	TOP	[illegible]	[illegible]	.2944	.0867	(3)
DEPTH	2.	BOT	[illegible]	[illegible]	3.1038	9.6333	(3)
POSITION	4.	FOR	[illegible]	7.1966	13.0456	194.4789	(87)
TIME	1.	SEPTEMBER	187.9300	3.9985	11.8791	141.1135	(47)
DEPTH	1.	TOP--10CM	119.7400	5.2061	14.4247	278.9819	(23)
DEPTH	2.	BOTTOM--25CM	68.1900	2.8412	3.8738	15.0096	(24)
TIME	2.	DECEMBER	451.9200	11.2980	15.2606	232.8863	(40)
DEPTH	1.	TOP--10CM	257.4000	13.5474	19.4550	382.3982	(19)
DEPTH	2.	BOTTOM--25CM	194.5200	9.7626	10.8406	100.8144	(21)

TOTAL CASES = 160
MISSING CASES = 25.00 15.6 PCT.

Table 2

Concentrations of Trace Metals and Nutrients in Water

Sample No.*	Depth m	Suspended Solids mg/l	Arsenic µg/l	Manganese µg/l	Mercury ng/l	Nitrate µg/l-N	Ammonia µg/l-N	Phosphate µg/l-P	Reactive Silicate mg/l-Si
September 1976									
Disposal Area									
6-1-S	2	1.7	2.9	16.5	35	282	30.5	67.9	1.36
6-2-S	2	1.7	3.4	17.0	21	232	29.9	60.0	1.37
6-1-M	47	0.5	3.3	16.5	--	270	1.8	60.0	1.01
6-2-M	47	1.0	2.8	16.5	22	218	3.4	52.0	.88
6-1-D	57	1.5	3.3	21.5	<10	255	1.7	57.0	1.03
6-2-D	57	1.5	2.9	22.0	<10	280	1.3	60.0	1.13
10-1-S	2	2.0	2.7	20.5	17	215	41.6	60.0	1.14
10-2-S	2	2.0	3.0	21.0	21	201	31.0	56.0	1.15
10-1-M	50	1.0	2.6	23.0	13	277	2.1	60.0	1.10
10-2-M	50	1.0	3.4	24.5	26	287	2.1	60.0	1.10
10-1-D	60	2.0	3.1	29.5	21	368	30.0	76.0	1.39
10-2-D	60	2.0	3.1	34.0	17	295	2.8	65.0	1.18
West Reference Site									
17-1-S	2	1.1	2.0	19.0	<10	229	15.0	58.0	1.14
17-2-S	2	1.2	3.3	18.5	<10	233	10.4	55.0	1.15
17-1-M	51	0.8	2.2	20.5	25	281	1.7	63.0	1.14
17-2-M	51	1.3	2.9	18.5	<10	296	1.7	64.0	1.20
17-1-D	61	1.0	3.0	23.0	25	336	2.9	69.7	1.33
17-2-D	61	1.0	3.0	20.5	21	229	2.9	54.0	0.98
East Reference Site									
19-1-S	2	1.9	3.3	21.5	71	246	45.6	63.0	1.25
19-2-S	2	1.7	2.6	16.5	66	275	53.0	70.7	1.49
19-1-M	39	0.5	2.7	19.0	75	290	2.8	62.0	1.37
19-2-M	39	0.8	2.8	18.5	44	299	2.8	63.0	1.42
19-1-D	49	1.0	2.4	19.0	71	185	7.6	43.0	0.84
19-2-D	49	1.0	3.0	19.5	71	219	5.5	50.0	0.90

(Continued)

* First digit indicates station location, second digit indicates cast, letter indicates depth location, surface, middle, deep.

Table 2 (Continued)

Sample No.	Depth m	Suspended Solids mg/l	Arsenic µg/l	Manganese µg/l	Mercury ng/l	Nitrate µg/l-N	Ammonia µg/l-N	Phosphate µg/l-P	Reactive Silicate mg/l-Si
				Duwamish River Mouth					
44-1-S	2	1.3	2.8	19.8	21	219	21.3	54.0	1.11
44-2-S	2	1.3	2.8	1.0	.5	139	20.3	46.0	0.96
44-1-M	39	0.5	3.0	16.0	16	21[illegible]	[illegible]	58.6	1.17
44-2-M	39	0.8	2.7	17.3	22	[illegible]	[illegible]	60.0	1.22
44-1-D	49	1.3	2.9	21.0	<10	21[illegible]	[illegible]	60.3	1.21
44-2-D	49	1.3	2.7	19.0	<10	261	[illegible]	60.3	1.21
				December 19[illegible]					
				Disposal Area					
6-1-S	2	0.4	[illegible]			380	16.9	78.0	1.39
6-2-S	2	0.4	[illegible]			[illegible]	19.[illegible]	80.0	1.42
6-1-M	49	0.6	2.[illegible]	14.8	34	367	6.4	77.8	1.38
6-2-M	49	1.0	2.7	15.0	14	476	89.[illegible]	78.0	1.41
6-1-D	59	1.3	2.9	21.3	33	357	6.7	80.0	1.[illegible]
6-2-D	59	0.6	2.6	14.5	34	361	2.3	80.0	1.[illegible]
10-1-S	2	[illegible].9	2.8	15.5	34	361	12.3	80.0	1.36
10-2-S	2	1.[illegible]	2.7	16.8	35	350	37.0	81.0	1.41
10-1-M	49	1.1	2.9	19.8	33	366	3.5	76.0	1.47
10-2-M	49	1.5	[illegible].9	17.5	34	375	6.4	79.0	1.42
10-1-D	59	0.5	2.[illegible]	20.7	34	366	2.9	77.8	1.41
10-2-D	59	1.[illegible]	2.8	23.0	<10	373	5.6	80.0	1.40
				West Reference Site					
17-1-S	2	0.7	2.[illegible]	[illegible]	[illegible]	[illegible]	10.1	77.0	1.42
17-2-S	2	0.6	2.0	[illegible]	[illegible]	[illegible]	2.7	76.0	1.45
17-1-M	56	1.0	2.5	16.0	[illegible]	3[illegible]	2.[illegible]	78.0	1.42
17-2-M	56	1.2	2.5	19.0	35	373	9.[illegible]	79.0	1.42
17-1-D	66	2.0	2.5	18.0	24	374	4.[illegible]	80.0	1.43
17-2-D	66	2.3	2.4	20.[illegible]	[illegible]	[illegible]	3.9	80.0	1.[illegible]

(Continued)

Table 2 (Concluded)

Station No.	Depth m	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Phosphate µg/l-P	Reactive Silicate mg/l-Si
43-1-S	2	1.5	3.0	15.5	14	307	32.0	81.[illegible]	1.62
43-2-S	2	1.5	3.2	16.5	21	376	21.[illegible]	81.0	1.55
[illegible]	47	1.3	2.7	17.0	19	370	5.[illegible]	76.0	1.49
43-2-M	47	1.0	2.0	16.5	13	379	4.2	77.0	1.45
[illegible]	5[illegible]	[illegible]7	[illegible]8	[illegible]7.0	21	380	[illegible].3	75.0	[illegible].46
43-2-B	5[illegible]	1.0	[illegible].2	[illegible]7.2	16	377	[illegible].7	[illegible]7.0	1.[illegible]6
				Duwamish River Mouth					
44-1-S	2	1.2	2.9	13.0	13	556	90.4	78.0	1.38
44-2-S	2	1.3	2.9	17.0	24	369	7.1	77.0	1.41
44-1-M	18	1.0	2.9	11.5	23	366	11.3	77.8	1.43
44-2-M	18	1.1	2.5	14.7	<10	370	7.8	80.0	1.45
44-1-B	28	1.0	2.9	13.7	34	373	9.7	79.0	1.46
44-2-B	28	0.9	2.7	13.5	12	371	12.3	81.0	1.48

Table 3

Elliott Bay Sediment pH, Eh, and Free and Total Sulfide Concentrations

Sample No.*	pH	Eh	[illegible] Free Sulfide**	[illegible] Total Sulfide	December 1976 pH	Eh	Free Sulfide**	Total Sulfide†
1-1-T	7.2	-330	$<3.2 \times 10^{-13}$	38.4	7.0	-270	3.2×10^{-11}	
1-2-T		-330	1.6×10^{-12}		7.0	-320	5.1×10^{-13}	
1-1-B			5.1×10^{-11}		7.0	-270	3.2×10^{-10}	
1-2-B	6.8	-330	1.3×10^{-10}		7.0	-320	1.6×10^{-11}	
2-1-T	7.1	-270	5.1×10^{-1}		6.9	-310	6.4×10^{-11}	
2-2-T	6.8	-320	3.2×10^{-12}		6.7	-300	2.5×10^{-11}	
2-1-B			$<3.2 \times 10^{-13}$		6.9	-300	5.1×10^{-13}	
2-2-B	7.2	-200	$<3.2 \times 10^{-13}$		7.1	-310	6.4×10^{-13}	
3-1-T			3.2×10^{-9}		6.7	-330	5.1×10^{-11}	500
3-2-T	6.5	-320	1.6×10^{-10}		6.7	-330	2.5×10^{-10}	
3-1-B			8.1×10^{-12}		7.2	-360	6.4×10^{-11}	27.5
3-2-B	6.8	-330	$<3.2 \times 10^{-13}$		7.1	-310	2.5×10^{-10}	
4-1-T	6.9				6.7	-300	$[illegible] \times 10^{-11}$	
4-2-T					6.8	-290	1.6×10^{-10}	
4-1-B							2.5×10^{-10}	
4-2-B						-290	1.6×10^{-10}	
5-1-T	6.7	-225	$<3.2 \times 10^{-13}$		6.6	-300	6.4×10^{-12}	
5-2-T			6.4×10^{-9}		6.5	-320	3.2×10^{-13}	
5-1-B	6.8	-275	$<3.2 \times 10^{-13}$				1.6×10^{-9}	
5-2-B			5.1×10^{-1}		6.6	-300	5.1×10^{-13}	
6-1-T	7.0	-260	$<3.2 \times 10^{-13}$		6.4	-330	3.2×10^{-13}	1166
6-2-T			$<3.2 \times 10^{-13}$		6.6	-300	1.2×10^{-10}	
6-1-B	7.1	-330	$<3.2 \times 10^{-13}$		6.4	-310	1.6×10^{-11}	
6-2-B	6.6	-240	3.2×10^{-12}		6.9	-310	8.1×10^{-12}	104
7-1-T	6.6	-300	$<3.2 \times 10^{-13}$		6.7	-300	1.3×10^{-10}	
7-2-T	6.6	-285	$<3.2 \times 10^{-13}$		6.8	-330	5.1×10^{-10}	
7-1-B	6.8	-325	4.0×10^{-10}		6.7	-305	1.6×10^{-10}	
7-2-B	7.1	-320	1.3×10^{-10}		7.2	-310	2.0×10^{-10}	

(Continued)

* Note: First digit indicates station location, second digit indicates section of core, top or bottom.

** Concentrations measured in milligrams per litre.

† Concentrations measured in micrograms per gram (wet weight).

Table 3 (Continued)

Sample No.	September 1976 pH	Eh	Free Sulfide**	Total Sulfide†	December 1976 pH	Eh	Free Sulfide**	Total Sulfide†
			Disposal Site (Continued)					
8-1-T	6.4	-270	<3.2 x 10^{-13}		6.6	-310	6.4 x 10^{-10}	
8-2-T	6.5	[illegible]	[illegible]		6.2	-355	1.0 x 10^{-9}	
8-1-B	6.4	[illegible]	[illegible]		6.1	-340	5.1 x 10^{-9}	
8-2-B	6.5	-295	1.3 x 10^{-12}		6.2	-350	2.5 x 10^{-10}	
9-1-T	6.5	-285	5.1 x 10^{-13}		6.1	-287	6.4 x 10^{-10}	
9-2-T	6.6	-275	<3.2 x 10^{-13}		6.3	-340	8.1 x 10^{-10}	
9-1-B	6.5	-300	<3.2 x 10^{-13}		6.7	-294	3.2 x 10^{-11}	
9-2-B	6.9	-280	<3.2 x 10^{-13}		7.5	-305	2.0 x 10^{-10}	
10-1-T	6.7	-300	6.8 x 10^{-11}		6.6	-230	5.1 x 10^{-12}	
10-2-T	7.1	-300	1.0 x 10^{-12}		6.6	-320	4.0 x 10^{-11}	
10-1-B	6.2	-260	2.0 x 10^{-12}		6.6	-335	<3.2 x 10^{-13}	
10-2-B	6.8	-280	1.6 x 10^{-11}		6.6	-350	<3.2 x 10^{-13}	
11-1-T	6.7	-280	1.3 x 10^{-10}		6.3	-320	1.3 x 10^{-12}	
11-2-T	6.8	-290	2.0 x 10^{-10}	870	6.5	-340	1.6 x 10^{-10}	
11-1-B	7.0	-305	2.0 x 10^{-10}		6.5	-230	2.0 x 10^{-11}	
11-2-B	7.0	-305	2.0 x 10^{-10}		6.4	-320	5.1 x 10^{-11}	
12-1-T	6.5	-350	5.1 x 10^{-13}		6.5	-340	1.6 x 10^{-10}	
12-2-T	6.5	-250	<3.2 x 10^{-13}		6.3	-350	3.2 x 10^{-12}	
12-1-B	6.8	-280	<3.2 x 10^{-13}		6.3	-340	5.0 x 10^{-11}	
12-1 B	6.6	-320	<3.2 x 10^{-13}		6.4	-305	2.0 x 10^{-10}	118.4
13-1-T	7.0	[illegible]	[illegible]	16.6	6.6	-307	3.2 x 10^{-10}	
13-2-T	6.7	[illegible]	[illegible]		6.5	-340	8.1 x 10^{-11}	
13-1-B	7.3				[illegible]	[illegible]	1.6 x 10^{-10}	
13-2-B	[illegible]					[illegible]	1.0 x 10^{-10}	972.8
14-1-T	7.0	-310	1.6 x 10^{-12}		6.6	-290	1.6 x 10^{-10}	
14-2-T	6.7	-300	<3.2 x 10^{-13}		6.8	-300	6.4 x 10^{-11}	
14-1-B	7.2	-260	<3.2 x 10^{-13}		6.9	-280	5.1 x 10^{-11}	44.8
14-2-B	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	
15-1-T	6.7	-320	1.0 x 10^{-9}		6.7	-350	4.0 x 10^{-12}	
15-2-T	6.4	-310	<3.2 x 10^{-13}		[illegible]	-340	4.0 x 10^{-12}	
15-1-B	7.0	-240	<3.2 x 10^{-13}		6.6	-350	<3.2 x 10^{-13}	
15-2-B	6.8	-195	<3.2 x 10^{-13}		6.7	-375	1.0 x 10^{-12}	

(Continued)

Table 3 (Concluded)

Sample No.	September 1976 pH	Eh	Free Sulfide**	Total Sulfide†	December 1976 pH	Eh	Free Sulfide**	Total Sulfide†
Disposal Site (Continued)								
16-1-T	6.7	-300	[illegible]		6.7	-[illegible]	8.1 x 10^{-10}	
16-2-T	6.7	-290	2.6 x 10^{-9}		7.3	-364	6.4 x 10^{-9}	
16-1-B	7.1	-260	[illegible]		7.0	-335	4.0 x 10^{-10}	
16-2-B	6.6	-2[illegible]			6.8	-344	5.1 x 10^{-10}	
West Reference Site								
17-1-T	7.3	-100	<3.2 x 10^{-13}		7.3	-301	6.4 x 10^{-10}	
17-2-T	7.3	-180	<3.2 x 10^{-13}		7.4	-365	1.0 x 10^{-9}	
17-1-B	7.3	-200	<3.2 x 10^{-13}		7.4	-320	6.4 x 10^{-10}	23.0
17-2-B	7.3	-240	<3.2 x 10^{-13}		7.4	-310	4.0 x 10^{-10}	64.0
18-1-T	7.4	-170	[illegible]	9.9	7.4	-270	1.0 x 10^{-9}	
18-2-T	7.5	-270	[illegible]		7.3	-275	8.1 x 10^{-10}	
18-1-B	7.5	-170	[illegible]	[illegible]	7.4	-[illegible]	1.0 x 10^{-11}	20.8
18-2-B	7.5	-190	<3.2 x 10^{-13}		7.3	-285	1.0 x 10^{-11}	
East Reference Site								
19-1-T	7.3	-220	<3.2 x 10^{-13}		7.0	-303	6.4 x 10^{-11}	
19-2-T	7.3	-160	<3.2 x 10^{-13}		6.8	-309	1.3 x 10^{-8}	166.4
19-1-B	7.3	-180	<3.2 x 10^{-13}		7.2	-345	1.3 x 10^{-8}	
19-2-B	7.4	-240	<3.2 x 10^{-13}		7.6	-325	5.1 x 10^{-10}	
20-1-T	7.2	-275	3.2 x 10^{-13}	67.2	7.8	-390	6.4 x 10^{-7}	
20-2-T	7.4	-300	3.2 x 10^{-13}	[illegible]	7.5	-322	6.4 x 10^{-9}	
20-1-B	7.4	-360	3.2 x 10^{-13}		7.7	-409	7.1 x 10^{-6}	
20-2-B	7.4	-300	3.2 x 10^{-13}		7.5	-355	8.1 x 10^{-6}	

Table 4

Concentration of [illegible] in Elliott Bay Sediments

Sample No. *	Concentration ** (ppm)	[illegible] (ppm)
[illegible]		[illegible]
	55.7 ± 1.1	
1-2-T	10.0 ± 0.91	18.1 ± 0.89
	37.5 ± 1.1	
[illegible]	[illegible]	[illegible]
	66.6 ± 1.2	
1-2-B	14.4 ± 0.91	10.5 ± 0.79
	16.9 ± 1.1	
2-1-T	9.6 ± 1.1	7.7 ± 0.85
2-2-T	9.7 ± 1.0	17.7 ± 1.1
2-1-B	12.6 ± 0.[illegible]	17.7 ± 1.3
	13.3 ± 1.1	
2-2-B	20.6 ± 1.1	29.7 ± 1.0
3-1-T	16.4 ± 1.3	11.8 ± 1.0
	45.2 ± 1.2	
3-2-T	18.9 ± 1.0	14.3 ± 0.79
	[illegible] ± 0.[illegible]	
3-1-B		33.8 ± 1.2
3-2-B	9.8 ± 0.79	41.0 ± 1.0
	12.1 ± 0.85	
4-1-T	12.9 ± 0.90	26.1 ± 1.2
4-2-T	13.4 ± 0.87	10.3 ± 0.93
4-1-B	12.9 ± 0.65	27.0 ± 0.95
	23.9 ± 0.84	
4-2-B	28.1 ± 0.70	13.4 ± 1.1
	45.[illegible] ± 0.99	
5-1-T	[illegible] ± [illegible]	18.0 ± 1.1
5-2-T	10.5 ± 0.81	20.5 ± 1.1
5-1-B	13.1 ± 0.85	8.6 ± 0.80
5-2-B	10.[illegible] ± 0.81	27.0 ± 1.5
6-1-T	13.0 ± 1.0	17.3 ± 1.0
6-2-T	10.7 ± 0.86	11.0 ± 0.88
6-1-B	7.4 ± 0.70	25.0 ± 0.[illegible]
6-2-B	9.1 ± 1.1	14.3 ± 0.86

(Continued)

* Note: first digit of sample number indicates station location, second digit indicates core number, and letter indicates section of core, top or bottom.

** Concentrations measured in microgram per gram ± 1 standard deviation.

(Sheet 1 of 3)

Table 4 (Continued)

Sample No.	Concentration September 1976	December 1976
	Disposal Site (Continued)	
7-1-T	11.6 ± 0.87	9.4 ± 0.75
7-2-T	9.4 ± 0.75	9.6 ± 1.3
7-1-B	15.5 ± 1.0	12.9 ± 0.77
7-2-B	17.3 ± 0.87	13.4 ± 0.87
8-1-T	[illegible] ± 0.80	14.6 ± 1.1
8-2-T		8.9 ± 0.80
8-1-B		15.5 ± 1.2
8-2-B	9.5 ± 0.81	17.9 ± 1.1
9-1-T	13.7 ± 0.82	21.5 ± 0.75
9-2-T	12.8 ± 0.90	9.2 ± 0.78
9-1-B	5.9 ± 0.74	32.3 ± 1.3
	11.1 ± 0.61	
9-2-B	15.9 ± 0.93	18.8 ± 0.85
10-1-T	[illegible] ± 1.1	21.4 ± 1.4
10-2-T	[illegible]	12.2 ± 0.92
10-1-B	[illegible]	15.8 ± 0.71
10-2-B	12.8 ± 1.0	15.9 ± 0.87
11-1-T	[illegible]	13.4 ± 0.84
11-2-T	13.0 ± 0.85	9.6 ± 0.91
11-1-B	18.2 ± 1.1	17.6 ± 0.97
11-2-B	17.0 ± 1.2	9.2 ± 0.83
12-1-T	8.2 ± 0.74	12.6 ± 0.82
12-2-T	8.0 ± 0.53	16.2 ± 0.87
	7.3 ± 0.62	
12-1-B	23.9 ± 0.96	16.8 ± 0.84
12-2-B	9.4 ± 0.61	10.9 ± 0.82
13-1-T	16.8 ± 0.67	10.2 ± 0.82
13-2-T	11.7 ± 0.76	13.6 ± 0.95
13-1-B	5.3 ± 0.64	20.5 ± 0.82
	5.3 ± 0.85	
13-2-B	83.7 ± 0.64	11.5 ± 0.81
	23.3 ± 0.93	
14-1-T		13.2 ± 0.73
14-2-T		9.7 ± 0.87
14-1-B	[illegible] ± 0.80	40.0 ± 1.0
14-2-B	24.8 ± 1.0	16.1 ± 0.81

(Continued)

Table 4 (Concluded)

Sample No.	Concentration, September 1976	December 1976
	Disposal Site (Continued)	
15-1-T	11.8 ± 0.89	12.0 ± 0.90
15-2-T	11.7 ± 0.99	12.8 ± 0.77
15-1-B	20.6 ± 0.92	9.6 ± 0.72
15-2-B	13.1 ± 0.72	13.6 ± 1.0
16-1-T	11.5 ± 0.75	12.2 ± 0.92
	11.0 ± 0.88	
16-2-T	11.2 ± 0.73	11.6 ± 0.81
	11.5 ± 0.92	
16-1-B	15.9 ± 0.64	14.4 ± 0.94
	20.2 ± 0.91	
16-2-B	[illegible]	17.4 ± 0.87
17-1-T		11.3 ± 0.73
17-2-T	9.1 ± 0.68	9.4 ± 0.75
17-1-B	7.9 ± 0.67	10.1 ± 0.81
17-2-B	3.5 ± 0.35	8.2 ± 0.66
18-1-T	11.4 ± 0.80	14.3 ± 0.86
	13.5 ± 0.61	
18-2-T	9.9 ± 0.74	11.0 ± 0.77
	10.4 ± 0.52	
18-1-B(1)†	13.1 ± 0.66	9.6 ± 0.72
	13.5 ± 0.61	
18-1-B(2)		11.4 ± 0.80
18-1-B(3)		9.5 ± 0.71
18-1-B(4)		13.2 ± 0.73
18-1-B(5)		2.7 ± 0.19
18-1-B(6)		11.5 ± 0.75
18-2-B	7.7 ± 0.54	8.7 ± 0.70
	6.5 ± 0.41	
	Past Reference Site	
19-1-T		16.3 ± 0.98
19-2-T	[illegible]	22.3 ± 1.0
19-1-B	17.7 ± 1.5	18.9 ± 0.85
19-2-B	15.7 ± 1.0	16.2 ± 0.89
20-1-T	11.6 ± 0.70	15.0 ± 0.98
	16.1 ± 1.6	
20-2-T	10.3 ± 0.67	25.5 ± 0.89
	14.0 ± 1.1	
20-1-B	[illegible]	11.4 ± 0.86
20-2-B	[illegible]	13.4 ± 0.80

† Six aliquots of same sample.

Concentration of Chromium in Elutriate Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	77 ± 1.4	65 ± 1.7
1-2-T	81 ± 1.6	55 ± 0.8
1-1-B	68 ± 1.4	78 ± 1.2
1-2-B	[illegible]	64 ± 1.3
2-1-T	63 ± 1.3	64 ± 1.3
2-2-T	86 ± 1.7	78 ± 1.2
2-1-B	64 ± 1.0	91 ± 1.4
2-2-B	59 ± 0.9	70 ± 1.4
3-1-T	55 ± 0.8	74 ± 1.1
3-2-T	81 ± 1.6	71 ± 1.1
3-1-B	84 ± 1.3	61 ± 1.2
3-2-B	74 ± 1.5	73 ± 1.8
4-1-T	82 ± 1.6	74 ± 1.1
4-2-T	69 ± 1.4	75 ± 1.5
4-1-B	46 ± 1.2	64 ± 1.3
4-2-B	74 ± 1.5	73 ± 1.8
5-1-T	59 ± 0.9	109 ± 1.6
5-2-T	60 ± 0.9	76 ± 1.1
5-1-B	54 ± 0.8	59 ± 0.9
5-2-B	83 ± 1.3	85 ± 1.7
6-1-T		74 ± 1.5
6-2-T		68 ± 1.4
6-1-B		82 ± 1.2
6-2-B	70 ± 1.1	58 ± 0.9
7-1-T	84 ± 1.3	71 ± 1.1
7-2-T	81 ± 0.8	68 ± 1.4
7-1-B	68 ± 1.0	64 ± 1.0
7-2-B	61 ± 1.2	62 ± 1.2
8-1-T	59 ± 0.9	69 ± 1.4
8-2-T	64 ± 1.0	65 ± 1.3
8-1-B	77 ± 1.5	62 ± 1.2
8-2-B	67 ± 1.3	67 ± 1.3
9-1-T	83 ± 1.7	65 ± 1.0
9-2-T	89 ± 1.3	79 ± 1.6
9-1-B	70 ± 1.4	68 ± 1.0
9-2-B	78 ± 1.6	65 ± 1.0

(Continued)

* Note: First digit [illegible] station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 1 standard deviation.

Table 5 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
10-1-T		105 ± 2.1
10-2-T	[illegible]	59 ± 1.2
10-1-B	58 ± 0.9	69 ± 1.0
10-2-B	64 ± 1.3	76 ± 1.1
11-1-T	83 ± 1.3	68 ± 1.4
11-2-T	76 ± 0.8	80 ± 1.6
11-1-B	67 ± 1.3	73 ± 1.5
11-2-B	77 ± 1.4	60 ± 1.2
12-1-T	[illegible]	86 ± 1.3
12-2-T	[illegible]	82 ± 1.6
12-1-B	60 ± 1.2	68 ± 1.4
12-2-B	58 ± 1.2	65 ± 1.0
13-1-T	59 ± 0.9	76 ± 1.5
13-2-T	63 ± 1.3	69 ± 1.0
13-1-B	30 ± 0.8	64 ± 1.0
13-2-B	64 ± 1.3	68 ± 1.0
14-1-T	71 ± 1.1	71 ± 1.1
14-2-T	63 ± 0.6	77 ± 1.2
14-1-B	68 ± 1.0	116 ± 1.7
14-2-B	75 ± 1.1	82 ± 1.2
15-1-T	62 ± 0.6	76 ± 1.1
15-2-T	69 ± 1.0	59 ± 0.9
15-1-B	56 ± 0.8	69 ± 1.0
16-2-B	65 ± 1.0	76 ± 1.1
16-1-T	86 ± 1.3	66 ± 1.0
16-2-T	89 ± 1.3	76 ± 1.5
16-1-B	71 ± 1.1	74 ± 1.1
16-2-B		71 ± 1.1
	West Reference Site	
17-1-T	152 ± 1.5	117 ± 1.2
17-2-T	265 ± 2.7	[illegible]
17-1-B	124 ± 1.2	131 ± 1.3
17-2-B	69 ± 0.7	115 ± 1.2

(Continued)

Table 5 (Concluded)

Sample No.	Concentration	
	September 1976	December 1976
	West Reference Site (Continued)	
18-1-T	110 ± 1.1	102 ± 1.5
18-2-T	112 ± 1.7	105 ± 1.6
18-1-B(1)†	95 ± 1.4	88 ± 1.3
18-1-B(2)		109 ± 1.1
18-1-B(3)		114 ± 1.7
18-1-B(4)		135 ± 1.4
18-1-B(5)		160 ± 1.6
18-1-B(6)		122 ± 1.2
18-2-B	101 ± 1.5	111 ± 1.7
19-1-T	92 ± 1.4	91 ± 1.4
19-2-T	86 ± 0.9	96 ± 1.0
19-1-B	87 ± 0.9	64 ± 1.3
19-2-B	95 ± 1.4	79 ± 1.2
20-1-T	100 ± 1.5	106 ± 1.6
20-2-T	81 ± 1.2	86 ± 1.3
20-1-B	89 ± 1.3	81 ± 1.5
20-2-B	101 ± 1.0	73 ± 1.5

† Six aliquots of

Table 6

Concentration of Manganese in Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T		201 ± 72
1-2-T		192 ± 16
1-1-B	256 ± 43	252 ± 36
1-2-B	276 ± 13	244 ± 40
2-1-T	238 ± 28	231 ± 22
2-2-T	246 ± 35	287 ± 53
2-1-B	313 ±134	327 ± 53
2-2-B	248 ± 15	305 ± 41
3-1-T	238 ± 75	267 ± 7
3-2-T	262 ± 95	276 ± 10
3-1-B	179 ± 19	223 ± 33
3-2-B	289 ± 15	248 ± 28
4-1-T	254 ± 52	339 ± 41
		307 ± 95
4-2-T	245 ± 15	260 ± 13
4-1-B	239 ± 16	201 ± 52
4-2-B		303 ± 76
5-1-T	[illegible]	297 ± 29
5-2-T	[illegible]	331 ± 35
5-1-B	267 ± [illegible]	233 ± 28
5-2-B	269 ± 14	331 ± 16
6-1-T	300 ± 42	405 ± 74
6-2-T	248 ± 20	236 ± 17
6-1-B	147 ± 51	441 ± 31
6-2-B	116 ± 20	256 ± 21
7-1-T	221 ± 98	255 ± 23
7-2-T	272 ± 69	243 ± 21
7-1-B	240 ± 21	270 ± 35
7-2-B	301 ± [illegible]	230 ± 65
8-1-T	241 ± 13	299 ± 37
8-2-T	225 ± 39	244 ± 43
8-1-B	287 ± 33	243 ± 13
8-2-B	230 ± 3*	339 ± 77

(Continued)

* Note: First digit of sample number indicates station location, second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 95% confidence intervals.

Table 6 (Continued)

Sample No.	Concentration	
	September 1976	December 1976
	Disposal Site (Continued)	
9-1-T	207 ± 44	314 ± 120
9-2-T	267 ± 38	254 ± 28
9-1-B	233 ± 21	161 ± 28
9-2-B	255 ± 72	188 ± 30
10-1-T	275 ± 41	356 ± 51
10-2-T	269 ± 56	262 ± 14
10-1-B	274 ± 44	268 ± 26
10-2-B	219 ± 44	290 ± 50
11-1-T		314 ± 36
11-2-T	223 ± 19	213 ± 46
11-1-B	244 ± 60	552 ±170
11-2-B	400 ± 33	260 ± 22
12-1-T	194 ± 20	241 ± 34
12-2-T	236 ±100	235 ± 17
12-1-B	230 ± 31	262 ± 25
12-2-B	216 ± 63	268 ± 77
		259 ± 29
13-1-T	177 ± 11	266 ± 31
13-2-T	258 ± 33	259 ± 19
13-1-B	321 ± 49	226 ± 48
13-2-B	167 ± 41	323 ± 48
14-1-T	249 ± 42	234 ± 71
14-2-T	237 ± 13	263 ± 23
14-1-B	225 ± 31	186 ± 62
14-2-B	160 ± 25	---
15-1-T	229 ± 18	251 ± 19
15-2-T	219 ± 73	298 ± 17
15-1-B	383 ± 17	296 ± 60
15-2-B	223 ± 15	268 ± 23
16-1-T	242 ± 43	293 ± 84
16-2-T	261 ± 54	253 ± 20
16-1-B	171 ± 6	---
16-2-B	269 ± 37	233 ± 38
	West Reference Site	
17-1-T	190 ± 27	236 ± 14
17-2-T	234 ± 47	222 ± 20
17-1-B	222 ± 52	251 ± 92
17-2-B	252 ± 92	193 ± 70

(Continued)

Table 6 (Concluded)

Sample No.	Concentration	
	September 1976	December 1976
18-1-T	214 ± 28	447 ± 99
18-2-T	235 ± 32	274 ± 35
18-1-B(1)†	241 ± 58	231 ± 40
(2)		224 ± 32
(3)		221 ± 12
(4)		350 ± 11
(5)		225 ± 25
(6)		243 ± 59
18-2-B	231 ±110	218 ± 27
East Reference Site		
19-1-T	283 ± 22	321 ± 31
19-2-T	324 ± 72	309 ± 21
19-1-B	266 ± 18	
19-2-B	210 ±107	251 ± 36
20-1-T	244 ± 84	287 ± 20
20-2-T	232 ± 49	218 ± 29
20-1-B	198 ± 12	187 ± 47
20-2-B	268 ± 25	194 ± 16

† Six aliquots of same sample

Table 7

Concentration of Mercury in Elliott Bay Sediment:

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	0.68	0.19
1-2-T	0.04	1.2
1-1-B	1.1	0.32
1-2-B	0.06	1.5
2-1-T	0.16	0.23
2-2-T	0.14	0.27
2-1-B	0.21	1.2
2-2-B	1.3	
3-1-T	0.22	0.22
3-2-T	0.25	0.23
3-1-B	0.73	2.3
3-2-B	0.18	4.2
4-1-T	0.15	0.27
4-2-T	0.06	0.33
4-1-B	0.46	3.6
4-2-B	1.1	2.0
5-1-T	0.25	0.23
5-2-T	0.19	0.34
5-1-B	0.30	0.13
5-2-B	0.26	0.52
6-1-T	0.11	0.66
6-2-T	0.03	0.15
6-1-B	0.03	0.40
6-2-B		0.16
7-1-T	0.12	0.15
7-2-T	0.09	0.16
7-1-B	0.07	0.12
7-2-B	0.06	0.22

(Continued)

* Note: First digit of sample number indicates station location; second digit indicates cast number, and letter indicates section of core, top or bottom.

** Concentrations measured in micrograms per gram ± 20% analytical error.

Table 7 (Continued)

Sample No.	Concentration September 1976	December 1976
Disposal Site (Continued)		
8-1-T	0.19	0.26
8-2-T	0.15	0.22
8-1-B	0.08	0.71
8-2-B	0.05	0.29
9-1-T		0.32
9-2-T		0.24
9-1-B	0.05	0.59
9-2-B	0.06	
10-1-T	0.05	0.44
10-2-T	0.14	0.12
10-1-B	0.03	0.32
10-2-B	0.03	0.37
11-1-T	0.05	0.26
11-2-T	0.12	0.28
11-1-B	0.09	0.41
11-2-B	0.07	0.23
12-1-T	0.06	0.25
12-2-T	0.04	0.29
12-1-B	0.15	0.15
12-2-B	0.13	0.08
13-1-T	0.18	0.25
13-2-T	0.06	0.12
13-1-B	0.02	0.26
13-2-B	0.25	0.33
14-1-T	0.04	0.21
14-2-T	0.09	0.65
14-1-B	0.12	0.57
14-2-B	0.16	1.3
15-1-T	0.04	0.20
15-2-T	0.04	0.33
15-1-B	0.08	0.38
15-2-B		0.16

(Continued)

Table 7 (Concluded)

Sample No.	Concentration, December 1976	
Disposal Site (Continued)		
16-1-T	0.04	0.42
16-2-T	0.05	0.26
16-1-B	0.12	0.33
16-2-B	0.07	0.42
West Reference Site		
17-1-T	0.08	0.32
17-2-T	0.06	0.29
17-1-B	0.07	0.40
17-2-B	0.07	0.43
18-1-T	0.09	0.32
18-2-T	0.13	0.29
18-1-B(1)†	0.09	0.25
18-1-B(2)		0.50
18-1-B(3)		0.42
18-1-B(4)		0.62
18-1-B(5)		1.2
18-1-B(6)		0.56
18-2-B	0.07	0.37
East Reference Site		
19-1-T	0.42	1.1
19-2-T	0.58	
19-1-B	0.54	1.2
19-2-B	0.41	1.8
20-1-T	0.38	1.2
20-2-T	0.22	1.6
20-1-B	0.53	4.0
20-2-B	0.38	1.6

† Six aliquots of the same sample.

Table 8

Particle Size Distribution and Percent Water in Elliott Bay Sediments

Sample No.*	CF1** >2mm	CF2 1-2mm	[illegible]	[illegible]	[illegible]	[illegible] .125mm	Silt† 0.002~.05mm	Clay <.002mm	% H_2O
					September 1970				
					Disposal Site				
1-1-T	1	1	7	25	14	13	43	0	36
1-2-T	1	0	2	6	26	20	40	0	40
1-1-B	1	1	8	21	19	9	39	3	31
1-2-B	2	1	2	6	15	21	42	12	40
2-1-T	0	0	1	8	37	27	51	0	37
2-2-T	0	0	1	6	24	23	45	0	38
2-1-B	0	0	1	5	19	20	39	7	36
2-2-B	1	2	0	20	23	10	40	0	37
3-1-T	1	1	1	5	25	2	47	17	46
3-2-T	0	1	2	6	10	10	71	1	46
3-1-B	10	4	9	24	20	11	25	0	33
3-2-B	0	1	2	14	24	19	34	0	40
4-1-T	0	0	1	4	13	25	55	1	42
4-2-T	0	0	0	3	18	29	50	0	42
4-1-B	0	1	6	13	11	14	56	0	40
4-2-B	0	3	2	8	11	14	56	9	40
5-1-T	0	0	2	13	28	26	26	5	33
5-2-T	0	1	2	9	34	27	29	0	37
5-1-B	1	1	2	[illegible]	[illegible]	30	34	6	41
5-2-B	0	1	1	4	[illegible]	29	37	3	35
6-1-T	1	1	2	12	23	21	47	0	44
6-2-T	2	1	2	9	29	24	33	0	[illegible]
6-1-B	0	1	2	9	34	24	25	5	32
6-2-B	1	1	2	8	32	25	23	7	36

(Continued)

* Note: First digit of sample indicates station number, second digit indicates cast number, and letter indicates section of core; top or bottom.

** Numbers indicate per cent retained in sieves for coarse fraction of sediment.

† Numbers indicate per cent of sediment in the size ranges indicated as determined by pipette analyses.

Table 8 (Continued)

Sample No.*	CF1** >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt+ 0.002-.05mm	Clay <.002mm	% H_2O
7-1-T	0	1	3	14	35	13	31	0	38
7-2-T	0	1	5	8	10	9	68	0	41
7-1-B	4	1	1	5	9	15	69	0	46
7-2-B	0	0	2	8	9	7	70	3	46
8-1-T	3	1	1	9	29	26	34	21	35
8-2-T	0	0	1	7	32	28	34	0	35
8-1-B	0	1	1	6	28	30	34	1	36
8-2-B	1	1	2	8	23	28	25	1	39
9-1-T	1	1	2	9	26	20	49	0	40
9-2-T	1	1	2			27	31	0	39
9-1-B	0	1	2			31	27	11	36
9-2-B	2	1	3			36	34	1	39
10-1-T	0	1	2	5	10	11	72	0	39
10-2-T	1	1	4	10	30	11	69	0	44
10-1-B	0	1	2	9	27	21	32	8	35
10-2-B	0	1	5	12	39	20	27	0	41
11-1-T	0	1	3	10	8	8	72	0	47
11-2-T	1	1	5	13	26	15	44	0	41
11-1-B	4	0	1	9	7	10	60	10	44
11-2-B	1	0	2	6	6	8	87	0	40
12-1-T	0	1	1	2	30	26	27	12	39
12-2-T	2	1	2	8	25	29	26	8	33
12-1-B	13	0	3	12	20	21	38	0	42
12-2-B	1	1	2	7	26	21	40	0	42
13-1-T	0	2	8	21	20	20	29	0	36
13-2-T	0	4	2	10	26	23	44	0	40
13-1-B	7	3	16	37	0	4	16	13	26
13-2-B	9	3	11	23	14	9	25	0	27
14-1-T	1	1	2	8	29	35	33	0	43
14-2-T	0	0	1	7	28	23	33	2	39
14-1-B	0	1	4	15	19	21	37	3	35
14-2-B	1	2	7	21	21	17	23	9	30

Table 8 (Continued)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt 0.002-.05mm	Clay <.002mm	% H.O
16-1-T	0	0	2	8	30	22	31	1	40
16-2-T	1	1	2	9	19	12	46	0	48
[illegible]	1	3	14	27	[illegible]	10	21	[illegible]	[illegible]
16-2-B	1	1	4	9	18	24	50	0	37
16-1-T	0	0	4	4	20	22	45	0	46
16-2-T	0	0	1	8	23	16	52	0	42
[illegible]	0	1	3	14	20	11	49	0	[illegible]
16-2-B	1	1	3	10	16	11	59	0	43
					West Reference Site				
12-1-T	2	2	5	27	13	10	36	5	31
12-2-T	2	3	4	21	18	10	30	3	27
12-1-B	3	4	4	14	20	10	28	3	29
12-2-B	3	2	7	21	22	10	25	2	26
18-1-T	2	1	2	9	16	10	48	0	40
18-2-T	2	3	6	12	23	10	33	0	33
18-1-B	2	2	3	9	16	10	47	0	35
18-2-B	3	2	4	19	23	10	29	0	33
					East Reference Site				
[illegible]	1	1	2	7	15	8	48	18	49
19-2-T	1	1	3	6	6	7	67	17	61
[illegible]	1	1	3	8	6	7	72	3	43
19-2-B	1	1	2	7	4	8	76	0	33
20-1-T	2	1	2	[illegible]	[illegible]	5	76	3	49
20-2-T	2	2	2	[illegible]	[illegible]	5	69	3	44
20-1-B	4	2	2	8	11	7	67	3	37
20-2-B	1	1	1	4	6	6	76	4	41

Sample No.	GR >2mm	SA 2-.05mm	SI .05-.002mm	CL <.002mm	[illegible]	[illegible]	Silt+ Clay 0.002-.05mm	Clay <.002mm	% H_2O
					December 1976 Disposal Site				
1-1-T	0	0	1	1	19	25	45	7	37
1-2-T	2	1	0	1	11	33	46	5	39
1-1-B	0	1	1	1	21	21	46	0	41
1-2-B	0	1	1	1	16	50	55	0	33
2-1-T	0	1	1	1	27	31	37	0	33
2-2-T	0	1	1	1	29	33	37	0	27
2-1-B	1	1	1	1	21	31	42	0	39
2-2-B	1	2	1	1	1	1	42	0	38
3-1-T	0	0	1	1	1	1	33	8	31
3-2-T	0	1	1	1	1	37	47	2	33
3-1-B	4	2	12	37	36	1	22	0	33
3-2-B	2	1	1	37	39	17	46	0	37
4-1-T	1	1	1	1	1	1	52	0	41
4-2-T	0	0	1	1	1	37	46	0	40
4-1-B	0	1	1	17	16	17	46	4	37
4-2-B	0	1	1	12	17	30	45	1	38
5-1-T	0	1	2	12	11	17	52	1	37
5-2-T	1	1	1	5	6	12	73	1	46
5-1-B	0	1	2	12	25	22	41	0	33
5-2-B	0	0	2	2	3	13	85	0	45
6-1-T	2	3	1	2	5	0	73	8	46
6-2-T	0	1	3	12	30	23	31	0	32
6-1-B	0	1	0	2	3	1	86	0	51
6-2-B	0	1	2	6	29	33	29	0	32
7-1-T	0	1	2	12	36	27	27	2	36
7-2-T	0	0	1	7	51	9	30	2	39
7-1-B	1	1	1	7	22	31	32	6	34
7-2-B	0	1	1	17	17	21	43	0	38

(Continued)

Table 8 (Continued)

Sample No.	CF1 >2mm	CF2 1-2mm	CF3 0.5-1mm	CF4 0.25-0.5mm	CF5 0.125-0.25mm	CF6 0.063-0.125mm	Silt* .002-.05mm	Clay <.002mm	% H_2O
8-1-T	0	1	1	9	27	21	41	0	30
8-2-T	0	1	1	6	25	21	26	10	39
8-1-B	0	0	2	9	24	23	33	0	38
8-2-B	1	1	2	7	27	20	39	0	42
9-1-T	0			23	20	16	32	1	37
9-2-T	0	1			21	21	34	0	38
9-1-B	1	1	9			11	37	0	29
9-2-B	2	2	10				22	2	30
10-1-T	1	1	2	7	8	9	80	0	40
10-2-T	2	3	10	25	21	13	25	0	30
[illegible]	2	3	6	20	26	11	32	0	[illegible]
10-2-B	1	1	2	12	16	12	41	15	39
11-1-T	0	0	2	7	4	7	73	6	41
11-2-T	0	0	2	6	20	22	48	2	36
11-1-B	0	0	1	5	5	11	84	0	45
11-2-B	1	1	3	6	31	16	35	5	35
12-1-T	1	1	2	14	29	26	32	0	34
12-2-T	0	1	2	4	17	25	16	17	35
12-1-B	0	0	1	4	13	24	68	1	36
12-2-B	1	1	1	4	14	3[illegible]	36	1	36
13-1-T	0	0	1	4	23	22	37	5	39
13-2-T	0	1	2	9	15	22	51	0	38
13-1-B	3	1	4	24	21	12	35	0	30
13-2-B	0	1	2	7	8	28	34	8	36
14-1-T	2	2	4	12	12	11	38	0	36
14-2-T	0	0	1	5	15	28	46	2	41
14-1-B	3	3	11	27	23	15	13	4	27
14-2-B	3	4	14	24	17	12	34	0	32
15-1-T	2	2	3	8	25	16	30	20	46
15-2-T	1	1	3	13	30	19	37	0	41
15-1-B	0	1	2	6	23	29	36	3	33
15-2-B	1	1	2	6	23	25	43	0	37

(Continued)

Sample No.	Cl >2mm	Cl 1-2mm	Cl 0.5-1mm	Cl 0.25-0.5mm	Cl 0.125-0.25mm	Cl 0.06	Cl <0.125mm	Silt 0.002-.05mm	Clay <.002mm	% H_2O
[illegible]	0	1	2	6	26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16-2-T	0	1	1	7	21	[illegible]	[illegible]	29	19	39
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16-2-B	0	0	3	10	16	[illegible]	19	53	0	37
					West Reference Site					
17-1-T	1	1	3	16	22	[illegible]	19	39	0	34
17-2-T	1	1	3	10	27	[illegible]	18	22	12	28
17-1-B	2	1	3	15	20	[illegible]	19	39	2	31
17-2-B	1	1	3	17	26	[illegible]	26	30	0	30
18-1-T	1	1	3	18	20	[illegible]	18	39	1	37
18-2-T	1	1	2	13	19	[illegible]	22	41	1	31
18-1-B	0	2	5	23	16	[illegible]	16	40	0	31
18-2-B	0	1	2	11	17	[illegible]	27	48	0	37
					East Reference Site					
19-1-T	2	1	1	4	3	[illegible]	4	60	27	40
19-2-T	1	1	1	4	4	[illegible]	5	75	10	39
19-1-B	5	0	1	2	2	[illegible]	5	82	3	39
19-2-B	2	1	1	[illegible]	[illegible]	[illegible]	5	84	2	43
20-1-T	18	4	4	[illegible]	[illegible]	[illegible]	7	50	0	46
20-2-T	17	2	3	[illegible]	[illegible]	[illegible]	[illegible]	40	16	46
20-1-B	10	4	4	12	16	[illegible]	12	22	11	41
20-2-B	5	3	4	9	8	[illegible]	11	57	1	[illegible]

Table 5

Arsenic Concentration in Interstitial Water
from Elliott Bay Sediments, September 1976

Sample No.*	Concentration**
Disposal Site	
1-1-T	34 ± 6.5
1-2-T	69 ± 6.1
1-1-B	39 ± 5.4
1-2-B	59 ± 6.5
2-1-T	
2-2-T	56 ± 5.9
2-1-B	42 ± 5.9
2-2-B	60 ± 5.2
3-1-T	± 5.1
3-2-T	± 6.2
3-1-B	7.5
3-2-B	5.9
4-1-T	41 ± 6.2
4-2-T	32 ± 6.5
4-1-B	
4-2-B	34 ± 5.3
5-1-T	37 ± 4.6
5-2-T	44 ± 4.9
5-1-B	35 ± 4.6
5-2-B	34 ± 5.3
6-1-T	73 ± 11.7
6-2-T	173 ± 33.2
6-1-B	361 ± 30.2
6-2-B	
7-1-T	62 ± 2.8
7-2-T	40 ± 6.0
7-1-B	51 ± 5.1
7-2-B	70 ± 6.3

(Continued)

* Note: First digit is base number indicating station location, second digit indicates test number in cases where more than one of core [illegible]

** [illegible]

Table 9 (Continued)

Sample No.	Disposal Site (Continued)	Concentration
8-1-T		22 ± 9.1
8-2-T		[illegible] ± 31.7
8-1-B		[illegible] ± 26.9
8-2-B		[illegible] ± 29.7
9-1-T		27 ± 9.8
[illegible]		13 ± 1.3
9-1-B		32 ± 8.6
9-2-B		[illegible] ± 26.2
10-1-T		[illegible] ± 0.0
10-2-T		14 ± 3.4
10-1-B		7 ± 0.7
10-2-B		29 ± 5.3
11-1-T		[illegible] ± 5.3
11-2-T		[illegible] ± 5.5
11-1-B		[illegible] ± 6.0
11-2-B		[illegible] ± 6.0
12-1-T		[illegible] ± 5.4
12-2-T		[illegible] ± 6.9
12-1-B		[illegible] ± 5.9
12-2-B		[illegible] ± 5.4
13-1-T		[illegible] ± 5.8
13-2-T		[illegible] ± 5.3
13-1-B		[illegible] ± 4.6
13-2-B		[illegible] ± 4.7
14-1-T		[illegible] ± 5.3
14-2-T		[illegible] ± 6.6
14-1-B		[illegible] ± 3.7
14-2-B		[illegible] ± 4.5
15-1-T		[illegible] ± 4.4
15-2-T		
15-1-B		
15-2-B		31 ± 5.2
16-1-T		[illegible] ± 4.8
16-2-T		[illegible] ± 5.0
16-1-B		[illegible] ± 5.0
16-2-B		[illegible] ± 5.0

(Continued)

(Sheet [illegible] of 3)

Table [illegible] (Concluded)

Sample No.	Concentration
[illegible] Site	
17-1-T	67 ± 4.8
17-2-T	
17-1-B	66 ± 5.0
17-2-B	
18-1-T	46 ± 4.8
18-2-T	56 ± 5.3
18-1-B	48 ± 4.6
18-2-B	60 ± 4.5
[illegible] Site	
19-1-T	70 ± 4.9
19-2-T	
19-1-B	66 ± 5.0
19-2-B	56 ± 4.5
20-1-T	59 ± 4.7
20-2-T	60 ± 4.8
20-1-B	48 ± 4.1
20-2-B	62 ± 4.6

Manganese Concentration in Interstitial Water from Elliott Bay Sediments

Sample No.*	Concentration** September 1976	December 1976
	Disposal Site	
1-1-T	3.8 ± 1.3	3.0 ± 1.6
1-2-T	1.3 ± 1.5	4.0 ± 1.3
	1.8 ± 1.7	
1-1-B	1.8 ± 1.0	3.1 ± 0.1
1-2-B	8.3 ± 3.0	3.8 ± 1.3
2-1-T		2.5 ± 0.3
2-2-T	5.4 ± 1.9	3.1 ± 0.9
2-1-B	9.5 ± 2.4	4.6 ± 1.8
2-2-B	2.7 ± 1.3	2.8 ± 1.0
3-1-T		7.1 ± 2.7
3-2-T		
3-1-B	[illegible]	0.33± 0.62
3-2-B	4.4 ± 2.2	1.1 ± 0.3
4-1-T	9.6 ± 8.2	2.6 ± 0.8
4-2-T	3.9 ± 3.0	4.8 ± 1.6
4-1-B	3.6 ± 1.8	1.4 ± 1.0
4-2-B	7.9 ± [illegible]	5.2 ± 1.7
5-1-T	3.6 ± 1.3	3.9 ± 1.1
5-2-T	[illegible]	3.0 ± 1.4
5-1-B	[illegible]	4.4 ± 1.4
5-2-B	[illegible]	3.6 ± 1.0
6-1-T	2.3 ± 0.7	15.6 ± 6.7
6-2-T	[illegible]	
6-1-B	[illegible]	2.7 ± 1.1
6-2-B	2.6 ± 1.6	0.78± 0.60
7-1-T	6.0 ± 3.7	2.2 ± 1.0
7-2-T	5.0 ± 4.3	1.3 ± 0.5
7-1-B	3.7 ± 0.9	5.9 ± 2.2
7-2-B	9.1 ± 1.6	6.3 ± 3.0
8-1-T	3.9 ± 1.3	1.9 ± 1.2
8-2-T	2.1 ± 1.3	2.5 ± 1.5
8-1-B	7.3 ± 3.4	4.7 ± 1.2
8-2-B	2.1 ± 0.9	3.7 ± 1.5
9-1-T	5.2 ± 3.0	
9-2-T	4.3 ± 1.3	1.8 ± 0.9
9-1-B	8.4 ± 1.8	
9-2-T	6.1 ± 2.3	2.1 ± 0.6

(Continued)

* Data [illegible] location, [illegible] ples section of core, top or bottom.

** Concentrations measured in milligrams per liter ± 95% confidence limits.

Table 10 (Continued)

Sample No.	December 1975
Disposal Site (Continued)	
10-1-T	[illegible]
10-2-T	5.4 ± 1.9
10-1-B	3.0 ± 1.5
10-2-B	3.6 ± 1.7
11-1-T	7.7 ± 2.2
11-2-T	2.8 ± 0.9
11-1-B	3.7 ± 1.1
11-2-B	3.0 ± 1.7
12-1-T	5.1 ± 1.3
12-2-T	2.2 ± 0.7
12-1-B	6.3 ± 2.3
12-2-B	8.7 ± 2.8
13-1-T	
13-2-T	
13-1-B	[illegible]
13-2-B	0.36± 0.09
14-1-T	2.9 ± 0.5
14-2-T	4.2 ± 1.8
14-1-B	3.5 ± 3.1
14-2-B	1.6 ± 1.2
15-1-T	4.0 ± 1.1
15-2-T	5.1 ± 1.7
15-1-B	[illegible]
15-2-B	[illegible]
16-1-T	7.8 ± 0.8
16-2-T	[illegible]
16-1-B	[illegible]
16-2-B	7.2 ± 1.1
West Reference Site	
17-1-T	0.29 ± 0.13
17-2-T	0.57 ± 0.21
17-1-B	0.33 ± 0.13
17-2-B	0.46 ± 0.14

(Continued)

(Sheet 2 of 3)

Table 10 (Concluded)

Sample No.	Concentration	
	September 1976	December 1976
	West Reference Site (Continued)	
18-1-T	2.0 ± 1.4	
18-2-T	0.38 ± 0.18	0.75 ± 0.12
18-1-B	0.32 ± 0.15	0.39 ± 0.12
18-2-B	0.28 ± 0.15	0.20 ± 0.13
	East Reference Site	
19-1-T		0.32 ± 0.19
19-2-T		0.60 ± 0.13
19-1-B		0.41 ± 0.13
19-2-B	0.16 ± 0.08	0.16 ± 0.04
20-1-T	0.21 ± 0.03	0.89 ± 0.78
20-2-T	0.45 ± 0.16	0.42 ± 0.10
20-1-B	0.16 ± 0.03	0.33 ± 0.15
20-2-B	0.092± 0.03	0.21 ± 0.05

Table 11

Nutrient Concentrations in Interstitial Water from Elliott Bay Sediments

Sample No.	September 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N	December 1976 Phosphate mg/l-P	Silicate mg/l-Si	Ammonia mg/l-N
			Disposal Site			
1-1-T	3.24	3.09	[illegible]	0.10	1.68	6.05
1-2-T	0.60	2.91	1.31	0.03	1.73	
1-1-B	0.16	2.99	4.97	0.35	1.54	8.61
1-2-B	0.17	1.87	2.68			13.5
2-1-T				0.09	1.13	7.08
2-2-T	0.35	2.45	1.78	0.38	4.27	21.1
2-1-B	1.02	2.86	3.84	0.04	2.27	10.7
2-2-B	0.89	1.90	1.41	0.02	0.67	2.31
3-1-T	0.68	2.09	0.31			
3-2-T	1.96	9.24	81.5			
3-1-B	0.78	4.59	0.75	0.33	1.14	3.90
3-2-B	0.64	4.06	10.0			
4-1-T	0.31	2.14	0.95	0.02	1.13	9.95
4-2-T	0.72	2.10	0.91	0.17	2.04	5.80
4-1-B	0.43	2.02	0.17	0.07	1.59	11.0
4-2-B	0.29	1.83	2.15	1.42	2.96	10.2
5-1-T	1.76	2.67	1.06	0.09	1.64	9.79
5-2-T	0.62	1.91	1.14	0.23	2.49	32.5
5-1-B	0.22					
5-2-B	0.39			1.44	2.87	50.3
6-1-T	1.45	2.55	4.92	0.24	1.67	29.9
6-2-T	0.74	2.20	4.46			
6-1-B				0.24	2.55	47.2
6-2-B				0.03	1.33	6.95
7-1-T	0.36	2.02	17.7	0.06	2.30	9.25
7-2-T	0.20	2.26	23.8	0.20	7.66	36.7
7-1-B	0.61	3.69	26.5	0.02	1.23	7.76
7-2-B	0.28	3.60	26.4			2.40
8-1-T	0.44	4.00	4.05	0.05	1.60	5.25
8-2-T	1.12	4.01	5.79	2.61	3.79	8.42
8-1-B	0.70	3.50	5.48	0.13	1.51	9.70
8-2-B	0.65	4.37	5.39	0.21	2.42	11.6
9-1-T	2.07	5.05	5.00			
9-2-T	0.40	4.46	3.13	0.10	1.37	8.40
9-1-B	0.71	3.27	4.27			
9-2-B	0.77	4.66	5.67	0.05	2.06	4.43
10-1-T	0.48	2.52	3.95	0.05	2.28	34.2
10-2-T	1.09					
10-1-B	1.36	2.16				
10-2-B	0.45	4.41	11.7			

(Continued)

Note: First digit of sample number indicates station number, second digit indicates cast number, and letter indicates section of core, top or bottom.

Table 11 (Concluded)

Sample No.	September 1976 Phosphate mg/l-P	Sil... mg/l		Nitrate N	December 1976 Silicate mg/l-Si	Ammonia mg/l-N
			Disposal Site (Continued)			
11-1-T	0.76	1.28		0.01	1.16	24.4
11-2-T	0.97	1.67				
11-1-B	0.61	1.51				
11-2-B	0.69	4.45		0.11	1.28	9.80
12-1-T	0.63	1.58	1.82			
12-2-T	0.83	1.37	1.84	0.03	4.23	5.83
12-1-B	0.72	1.48	0.72	0.11	0.70	3.00
12-2-B	1.47	1.89	1.93	0.02	1.03	3.73
13-1-T	0.35	3.72	0.54	0.09	0.95	2.71
13-2-T	0.73	1.33	0.28	0.02	0.92	11.7
13-1-B	0.22	1.73	0.36	0.05	1.45	7.52
[illegible]	0.16	1.34	0.16	0.13	1.01	10.2
14-1-T	1.25	1.63	0.24	0.13	1.46	3.25
14-2-T	0.27	1.27	0.21	0.02	0.87	3.78
14-1-B	0.46	1.24	0.49	0.03	1.24	2.60
14-2-B	0.11	1.62	0.86	0.05	1.86	5.88
15-1-T	0.49	1.58	0.19	0.04	1.11	3.68
15-2-T	0.31	1.67	0.29	0.13	1.31	87.0
15-1-B	0.41	1.80	1.35	0.01	0.84	8.46
15-2-B	0.62	1.48	1.03	0.10	1.25	13.1
16-1-T	0.03	0.88	5.28	0.10	0.86	5.37
16-2-T	0.25	1.17	0.52	0.08	3.68	8.87
16-1-B	0.15	1.27	0.96	0.15	1.26	6.67
16-2-B	0.25	1.30	1.03	0.16	0.71	0.72
			West Reference Area			
17-1-T	0.08	1.05	0.30	0.06	2.27	5.11
17-2-T	0.08	1.36	0.52	0.06	1.42	4.10
17-1-B	0.16	0.85	0.79	0.02	1.83	1.19
17-2-B	0.10	[illegible]	[illegible]	0.05	2.14	2.89
18-1-T				[illegible]	3.08	10.7
18-2-T	0.06					
18-1-B	0.05	0.92	0.61			
[illegible]	0.07	1.74	0.35	0.05	3.08	4.61
			East Reference Area			
19-1-T	0.05	0.86	0.14	0.10	3.00	6.66
19-2-T				0.01	2.74	5.22
19-1-B	0.05	1.02	0.70	0.12	2.76	4.17
19-2-B	0.00	1.21	0.53	0.03	2.74	3.08
20-1-T	0.05	1.07	0.16	0.16	2.06	4.10
20-2-T	0.03	0.90	0.28	0.05	3.24	6.76
20-1-B	0.04	1.07	0.25	0.12	2.25	3.85
20-2-B	0.01	1.30	1.33	0.04	2.42	3.98

Table 12

Significance of Temporal, Depth, ... of Variables in Kilauea Bay [illegible]

	INDEPENDENT VARIABLES											
	Time			Depth								
	1	2	3	1	2	3						
Suspended solids	$p \leq 0.01$**	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Arsenic	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Cadmium	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$	N.S.		
Mercury	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$		
Nitrate	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.		
Nitrite	N.S.	$p \leq 0.01$	N.S.	[illegible]			N.S.	N.S.	N.S.	N.S.		
[illegible]	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.				
[illegible]	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.		

Note: Time = monthly (mid September or December, 1976) Depth = sampling depth: surface, middle, or deep; Station locations: 1 = nearest site (stations 6, 7, 8; mouth of Hanapepe River (station 44), 3 = most reference site (station 17), 4 = next reference site (station 18).

** $p \leq 0.05$, 95% significance level; $p \leq 0.01$, 99% significance level; N.S. = not significant

The independent variables of time and depth are analyzed by analysis of covariance at [illegible] positions of the dependent variable, station, is analyzed by analysis of covariance with the significance of position compared by Scheffé's multicomparison test.

Table 15

Significance of Temporal, Depth, and Spatial Differences in Chemical Variables in Tijuana Salt Marsh Sediments

DEPENDENT VARIABLES*	TIME**		DEPTH			POSITION***		
	1	2,3	1	2,3	1 & 2	1 & 3	2 & 4	3 & 5	2 & 5
pH	$p \leq 0.01$†	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	N.S.
Eh	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$
H_2S (Sed)	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.05$	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.
H_2S (IW)	N.S.	N.S.	N.S.	$p \leq 0.05$	$p \leq 0.01$	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.
As (Sed)	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	$p \leq 0.05$	N.S.	$p \leq 0.01$
As (IW)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	N.S.	N.S.	N.S.	N.S.
NH_4 (Sed)	$p \leq 0.01$	N.S.	[illegible]	[illegible]	[illegible]	N.S.	[illegible]	N.S.	N.S.
NH_4 (IW)	N.S.	N.S.	$p \leq 0.05$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$
Org. C (Sed)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
Org. C (IW)	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.
Org. N (Sed)	N.S.	N.S.	$p \leq 0.01$	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.	N.S.
Org. N (IW)	N.S.	$p \leq 0.05$	$p \leq 0.01$	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.
Org. P (Sed)	N.S.	N.S.	N.S.	N.S.	$p \leq 0.01$	$p \leq 0.01$	N.S.	N.S.	N.S.
Org. P (IW)	N.S.	N.S.	N.S.	N.S.	N.S.	$p \leq 0.01$	N.S.	N.S.	N.S.
Inorganic Compounds	$p \leq 0.01$	N.S.	N.S.	N.S.	$p \leq 0.05$	$p \leq 0.01$	N.S.	$p \leq 0.05$	N.S.
Porosity	$p \leq 0.01$	$p \leq 0.01$	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* Sed = sediment, IW = interstitial water, CF = coarse fraction (mm) plants and [illegible]

** Time = sampling time: September vs. November, 1978; Depth = section of core: [illegible]

*** Position = station in marsh: [illegible]

† $p \leq$ = significance level; $p \leq 0.05$, 95% significance level; $p \leq 0.01$, 99% significance level; N.S. = not significant.

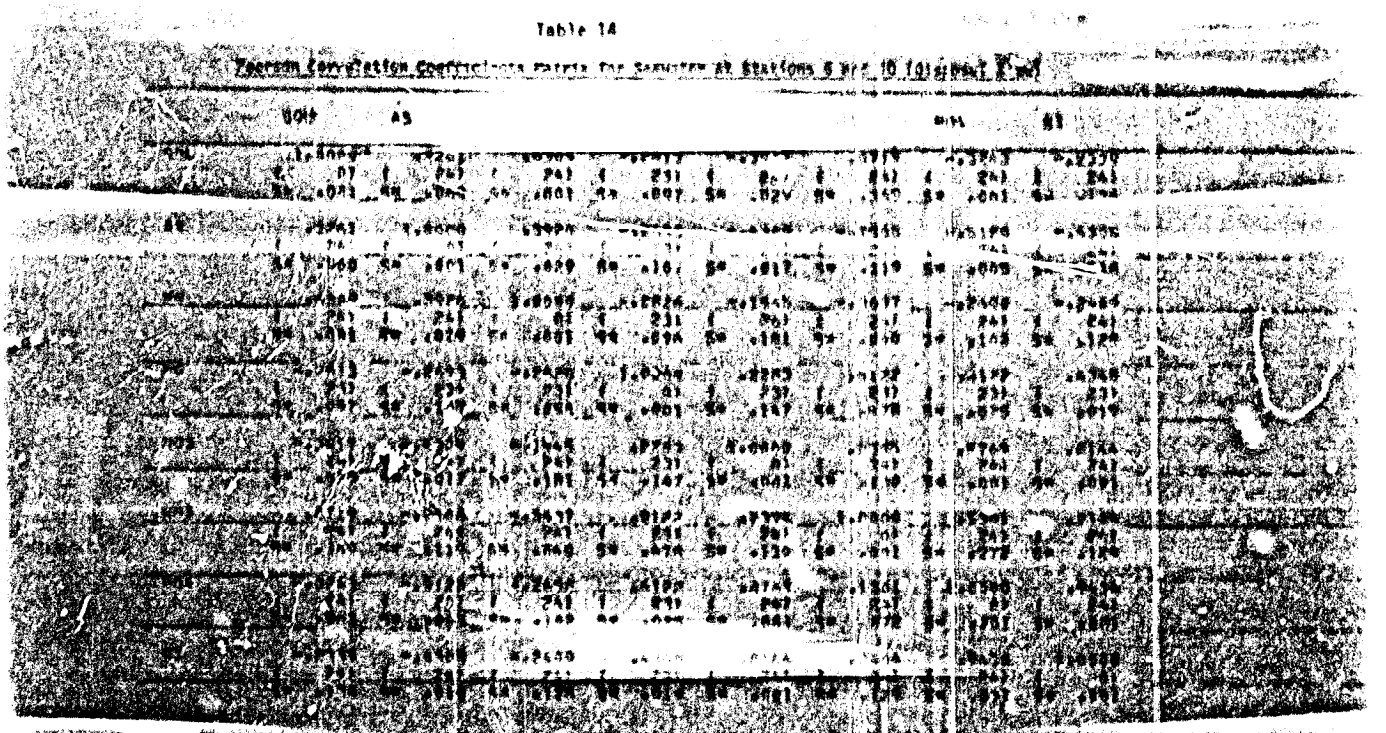
a) Analysis done only on September samples.

b) The independent variables of time and depth are analyzed by analysis of covariance at the indicated positions.

c) The independent variable position is analyzed by analysis of covariance with the significance of position [illegible] multiple comparison test.

Table 14

Pearson correlation coefficients matrix for samples at stations 5 and 10 (upper Fox)



* Data: SSC= suspended solids; NO3= nitrate, NH3= ammonia; PO4=inorganic phosphate, Chl=chlorophyll, Sil= reactive silicate.
** Matrix gives coefficients, number of points considered, and significance of coefficients.

Pearson Correlation Coefficients Matrix for [illegible] Water at Stations 17 and 33 (Reference Stations)

	SOL*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	PO4	SI
SOL	1.0000** (0) S= .001	.0??? (24) S= .371	.0401 (24) S= .393	-.1956 (24) S= .180	.3003 (24) S= .071	.3063 (24) S= .073	.4295 (24) S= .018	.3112 (24) S= .069
[illegible]	.0663 (24) S= .373	1.0000 (0) S= [illegible]	.1327 (24) S= .269	-.0461 (24) S= .425	.0326 (24) S= .440	.3415 (24) S= .0??	.0596 (24) S= .404	.1093 (24) S= .305
[illegible]	.0601 (24) S= .390	.1327 (24) S= .268	1.0000 (0) S= .001	.1855 (24) S= .193	-.4292 (24) S= .018	-.0407 (24) S= .469	-.4115 (24) S= .023	-.4513 (24) S= .011
[illegible]	-.1956 (24) S= .180	-.0461 (24) S= .425	.1855 (24) S= .193	1.0000 (0) S= .001	-.3566 (24) S= .045	.2604 (24) S= .102	-.3779 (24) S= .034	-.2213 (24) S= .149
[illegible]	.3043 (24) S= .071	.0374 (24) S= .440	-.4292 (24) S= .018	-.3566 (24) S= .045	1.0000 (0) S= .001	[illegible] (24) S= .306	.6071 (24) S= .001	.6091 (24) S= .001
[illegible]	.3063 (24) S= .073	.3415 (24) S= .05?	-.0407 (24) S= .469	.2604 (24) S= .102	-.1073 (24) S= .306	1.0000 (0) S= .001	.1160 (24) S= .299	.2374 (24) S= .131
PO4	.4295 (24) S= .018	.059? ([illegible]) S= [illegible]	[illegible]	[illegible]	.6071	.1160 (24) S= .2??	1.0000 (0) S= .001	.6071 (24) S= .001
SI	.3112 (24) S= .069	[illegible] (24) S= .305	[illegible] (24) S= .013	[illegible] (24) S= .149	.6093 (24) S= .001	.2374 (24) S= .131	.6071 (24) S= .001	1.0000 (0) S= [illegible]

* NOTE: SOL = suspended solids, NO3 = nitrate, [illegible] = ammonia, [illegible]

** Matrix gives coefficients, number of points considered, and significance of coefficients.

Pearson Correlation Coefficients Matrix for Sediments at Stations 6, 7, 10, and 11 (Mineral Mix)

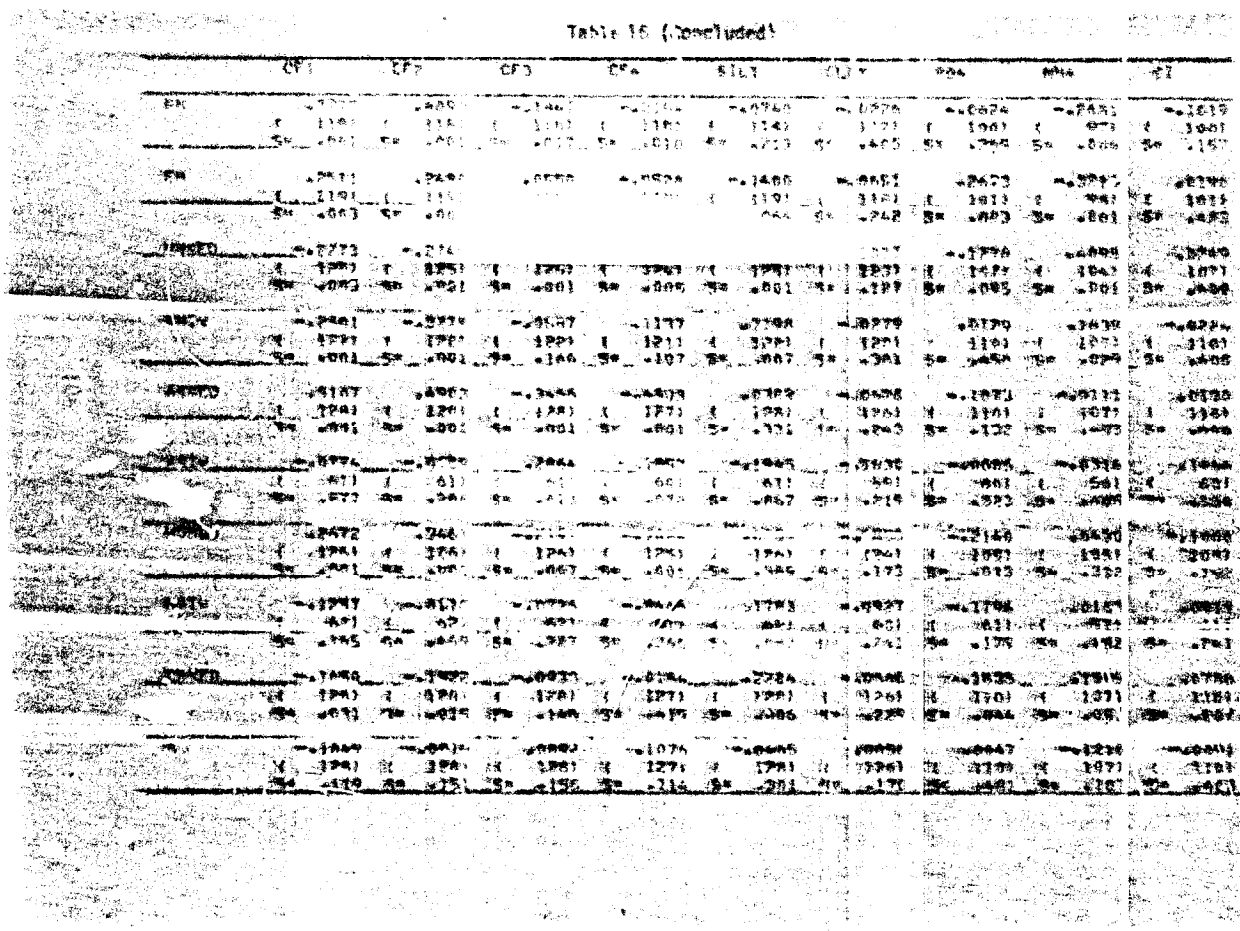
	PH	EH	MOIST	ANIW	ASSED	ASIW	MOSH	MOIW	CHSID	OR
PH	1.0000	.2510	-.1333	-.3001	.2667	.0841	.2165	-.1540	-.1867	-.2719
	(0)	(118)	(118)	(118)	(118)	(51)	(118)	(51)	(118)	(118)
	S= 0.00	S= .003	S= .075	S= .001	S= .002	S= .277	S= .009	S= .139	S= .043	S= .003
EH	.2510	1.0000	-.1500	-.2547	.2500	.2500	-.2186	.0503	-.2009	-.2974
	(118)	(0)	(118)	(118)	(118)	(51)	(118)	(51)	(118)	(118)
	S= .003	S= .000	S= .053	S= .003	S= .003	S= .039	S= .009	S= .359	S= .014	S= .001
MOIST	-.1333	-.1500	1.0000	.2500	.1500	.1500	-.2188	.0502	.1998	-.0128
	(118)	(118)	(0)	(118)	(118)	(51)	(118)	(51)	(118)	(118)
	S= .075	S= .053	S= .000	S= .006	S= .054	S= .147	S= .017	S= .364	S= .015	S= .446
ANIW	-.3001	-.2547	.2500	1.0000	-.1500	-.0000	-.2188	.0870	.0452	.0007
	(118)	(118)	(118)	(0)	(118)	(51)	(118)	(51)	(118)	(118)
	S= .001	S= .003	S= .006	S= .000	S= .054	S= .147	S= .017	S= .269	S= .314	S= .223
ASSED	.2667	.2500	-.1500	-.1500	1.0000	-.0500	.0188	.0280	-.1778	-.0552
	(118)	(118)	(118)	(118)	(0)	(51)	(118)	(51)	(118)	(118)
	S= .002	S= .003	S= .054	S= .054	S= .000	S= .361	S= .841	S= .243	S= .027	S= .277
ASIW	.0841	.2500	-.1500	-.0000	-.0500	1.0000	.0188	.0280	-.1778	-.0552
	(51)	(51)	(51)	(51)	(51)	(0)	(51)	(51)	(51)	(51)
	S= .277	S= .039	S= .147	S= .147	S= .361	S= .000	S= .896	S= .848	S= .211	S= .701
MOSH	.2165	-.2186	-.2188	-.2188	.0188	.0188	1.0000	-.0223	.0239	-.0551
	(118)	(118)	(118)	(118)	(118)	(51)	(0)	(51)	(118)	(118)
	S= .009	S= .009	S= .017	S= .017	S= .841	S= .896	S= .000	S= .877	S= .797	S= .551
MOIW	-.1540	.0503	.0502	.0870	.0280	.0280	-.0223	1.0000	.0867	.0494
	(51)	(51)	(51)	(51)	(51)	(51)	(51)	(0)	(51)	(51)
	S= .139	S= .359	S= .364	S= .269	S= .243	S= .848	S= .877	S= .000	S= .548	S= .732
CHSID	-.1867	-.2009	.1998	.0452	-.1778	-.1778	.0239	.0867	1.0000	.0494
	(118)	(118)	(118)	(118)	(118)	(51)	(118)	(51)	(0)	(118)
	S= .043	S= .014	S= .015	S= .314	S= .027	S= .211	S= .797	S= .548	S= .000	S= .221
OR	-.2719	-.2974	-.0128	.0007	-.0552	-.0552	-.0551	.0494	.0494	1.0000
	(118)	(118)	(118)	(118)	(118)	(51)	(118)	(51)	(118)	(0)
	S= .003	S= .001	S= .446	S= .223	S= .277	S= .701	S= .551	S= .732	S= .221	S= .000

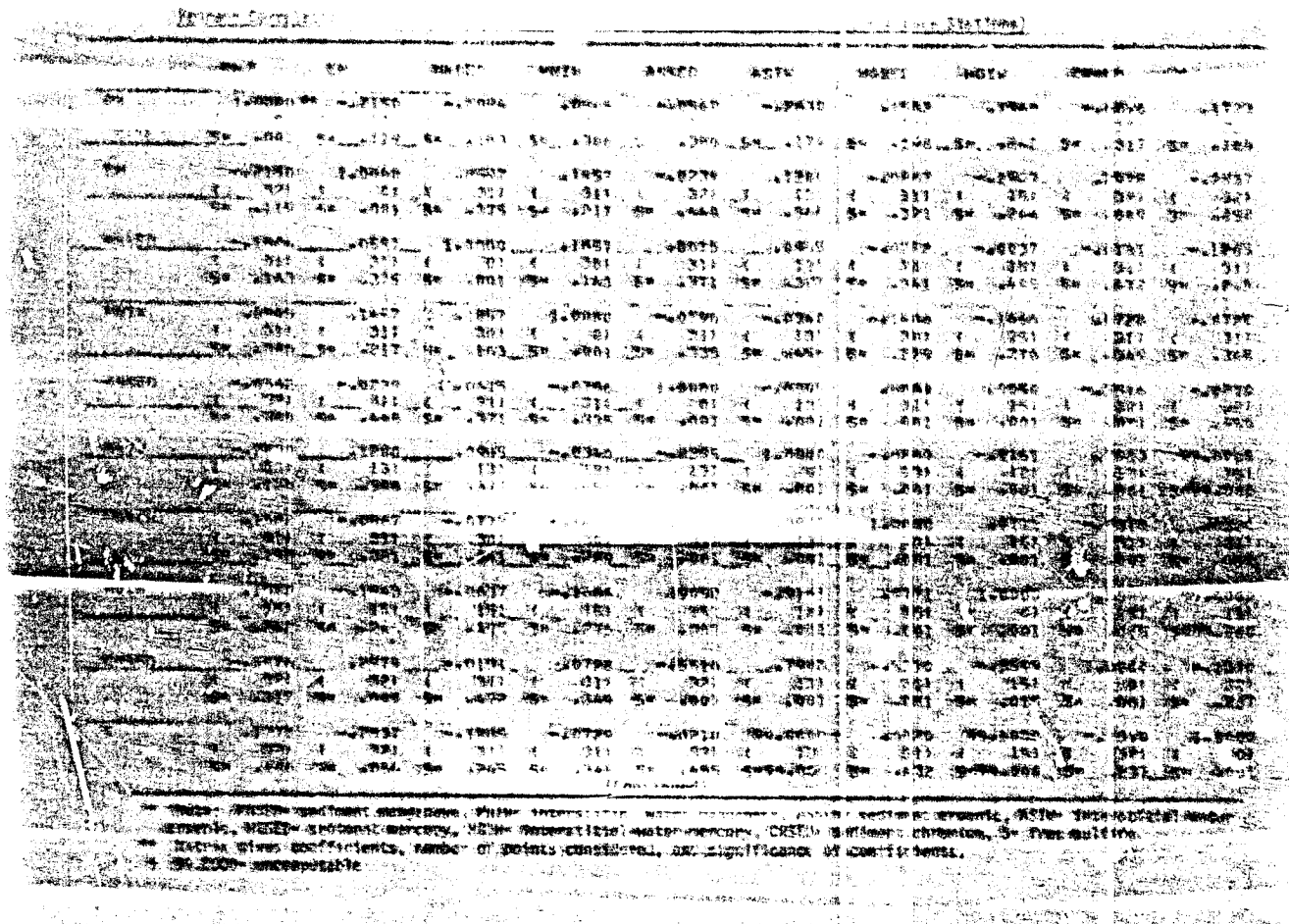
(continued)

* Note: ANSIW sediment mo... ASSED, ASIW sediment ma... ANIW, ASSED sediment ma...

** Matrix gives coefficient... ...correlation, S= two tail sig... ...coefficients.

Table 16 (concluded)





** Matrix of Pearson product moment correlations. Plant parameters: water content, ASH= total ash content, WSOL= water soluble ash content, HCL= HCl soluble ash content, WSEL= selenium content, HSEL= selenium content, WHG= mercury, WAHG= mercury, CRSE= selenium, S= true quality.
** Entries are coefficients, number of points considered, and significance of coefficients.
* .05 .001= unacceptable

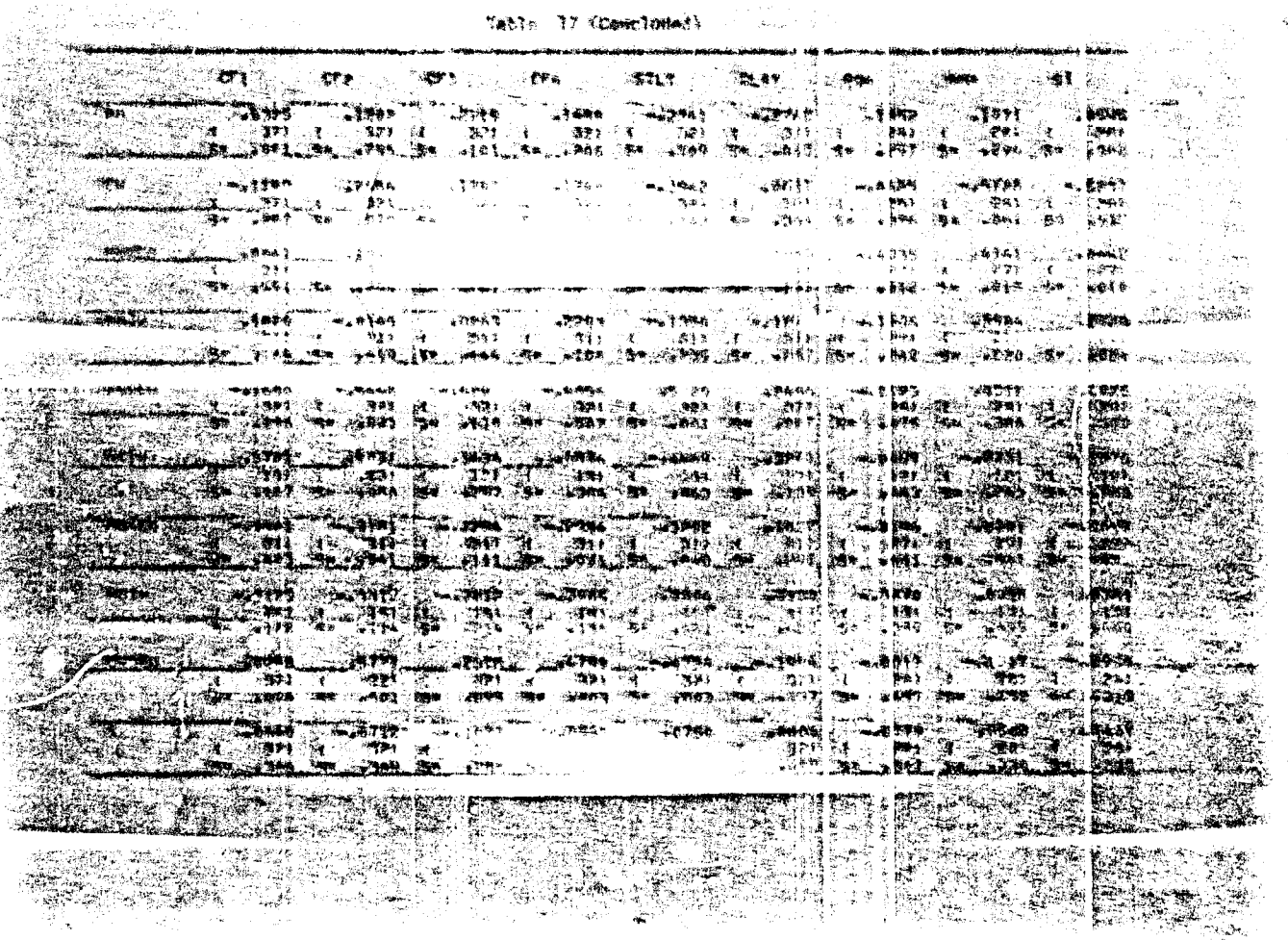


Table 18

Effect of Storage on Concentration of Arsenic in Interstitial Waters

Sample No.	Fe	Mn	As	Percent change in As concentration
	mg/l	mg/l	mg/l	
5-2-7	5.0	0.07		
5-2-8	0.0	0.0		
6-2-7	0.5	0.056		
6-2-8	0.1	0.060		
7-2-7	0.0			
8-1-7	0.1	0.044		
8-2-8	0.1	0.057		
9-2-7	0.0	0.063		
9-2-8	0.2	0.069		
11-1-7	0.0	0.015		
11-2-8	0.0	0.020		
11-2-8	0.0	0.048		
20-1-7	0.0	0.025		
20-2-8	0.1	0.013		

Note: All concentrations in mg/l.
Percent change in arsenic concentration = -78% to +231%
Mean decrease in arsenic concentration after 1 month = -56% (12 samples);
and mean increase after 6 months = +122% (2 samples).

Table 19

Sample No.	Percent recovery from 1126	from 172	Sample pH	Change in Mn (mg/l) during storage	Change in Mn (mg/l) during storage
17-2-8	98	98	6.8		
18-2-7	9	5	6.0		
19-2-7	10	9	7.7		
20-1-8	41	5	6.6		

Note: All concentrations in mg/l.