1977 QUALITY ASSURANCE/QUALITY CONTROL REPORT

FOR THE CENTRAL LABORATORIES

Inorganic Determinations

The inorganic quality assurance program is based heavily on "blind" reference samples (or samples submitted to the laboratory via the district offices) and on central laboratory unknowns (or reference samples submitted as unknowns to the laboratory by the laboratory management). In either case, the analyst does not know which samples are reference samples and in the case of the blind samples the laboratory management also does not know which samples are reference samples.

The blind sample results tabulated are "first time" results. They are likely to be worse than regular water analyses would be since they have not undergone the routine quality control checks which all analyses must undergo (e.g. anion/cation balance), checks which would have caught many of the errors. The central laboratory unknown results, on the hand, are "final" results; however, since the laboratory is informed immediately (via computer) about all errors in these analyses, it is possible that these analyses are slightly better than regular analyses.

Each inorganic laboratory section also uses reference materials to monitor its daily work. Except for tables 9 and 10, no effort was made to tabulate such data here (the data is available in the laboratory sections).

The Denver Central Laboratory's participation in an EPA performance evaluation study is not tabulated here; however, except for a borderline sulfate value in which 45 mg/L was reported instead of the theoretical 41 mg/L, all values looked very good

Table 1 summarizes the blind sample results. Theoretically, 68.27% of the results should be within $\pm$ one standard deviation, 95.45% should be within $\pm$ two standard deviations, and 99.73% should be within $\pm$ three standard deviations.

Graphs 1 through 31 also depict the blind sample results. If every result reported were the theoretical result, all results would be along the 0 line; the graphs not only show visually the scatter of results summarized in table 1, but also show trends, or bias, in results.

Tables 2 and 3 are semiannual summaries of central laboratory unknowns (also called "in-house" samples). Using the tabulated results, the means for each laboratory were paired with the original multi-laboratory means of the standard reference water samples and the differences tested using a T-test. In addition, the single-laboratory standard deviations were roughly (i.e not statistically) compared with the multi-laboratory standard deviations.

Tables 4 through 6 show two duplicate analyses, one from the Atlanta Central Laboratory and one from the Denver Central Laboratory. Although other duplicate analyses were probably done in 1977, the two tabulated (from Wisconsin and from Wyoming) were the only ones reported to us.

Table 9 shows results from EPA reference material used by each laboratory's Section 2 in monitoring their work. These samples were not introduced into the laboratory as unknowns, but do give some idea of precision and accuracy of nutrient analyses. It will be noted that only the last two months worth of data have been tabulated. Data from these two months are considered indicative of the year; it is not to be implied that only the last two months were monitored.

Table 10 is a summary of trace level metal results. The "theoretical" values are multi-laboratory means, dilutions (as noted) of multi-laboratory means, or NBS values for liver bovine extract. These reference samples were not introduced into the laboratory as unknowns.

The following information is derived from the above described tables and graphs:

Calcium: Although Atlanta had one blind result which was greater than 3 standard deviations and Denver had two results greater than 3 standard deviations, the distribution of blind sample results seems not unreasonable: 77% are less than 1 standard deviation, 88% are less than 2 standard deviations, and 96% are less than 3 standard deviations. The results of the blind sample analyses show a positive bias; however, this bias is not evident on the results of the central laboratory unknown analyses. Duplicate analyses of samples sent to Denver and Atlanta appear excellent.

Magnesium: Results are generally excellent. All blind sample results are under 2 standard deviations; however, they do show a positive bias. This bias is not evident in the central laboratory unknown results.

Sodium: Except for one Atlanta result in which 90 mg/L was originally reported instead of 17 mg/L (analyst incorrectly indicated a dilution) results appear generally excellent.

Potassium: Results generally excellent.

Fluoride: Results generally appear excellent; however, Atlanta shows a negative bias and Denver a positive bias in the central laboratory unknown results (with a less than 5% chance that the bias is random) when compared to the multi-laboratory SRS results.

Chloride: The blind sample results show a wide scatter. Only 46% of the results are within $\pm$ 1 standard deviation and three results were greater than $\pm$ 3 standard deviations (Atlanta reported 190 mg/L instead of 122 mg/L and 160 mg/L instead of 142 mg/L - the latter due to a keypuncher misreading the analysts handwriting - and Denver reported 10 mg/L instead of 13 mg/L). The central laboratory unknown and duplicate results appear excellent.

Sulfate: Except for two blind sample results, over 3 standard deviations (Denver reported 130 mg/L instead of 101 mg/L and Atlanta reported 350 mg/L instead of 420 mg/L), results are generally excellent.

Bicarbonate (alkalinity): The one Atlanta blind sample result greater than 3 standard deviations (28 mg/L reported instead of 107 mg/L) is believed due to a bottle mix-up prior to sample submission rather than to an error in analyses. Although no other blind results are outside 3 standard deviations, only 59% are within 1 standard deviation. Central laboratory unknown and duplicate results are generally excellent.

pH: pH was not determined on blind samples. Both Denver and Atlanta show a positive bias in the central laboratory unknown results compared to the original multi-laboratory results with a less than 5% chance that the bias is random. There is a serious error in the "duplicate" pH values reported by Denver to Wyoming.

Boron: Very few blind samples were analyzed for boron. Results from the central laboratory unknowns showed significant negative bias with a less than 5% chance that the bias from either lab was random.

Solids, residue on evaporation at 180°C: Except for one Atlanta blind sample result over 3 standard deviations (446 mg/L reported instead of 387 mg/L), blind results appear excellent, although with a possible slight negative bias. Although other results are also generally excellent, Denver shows a negative bias in the central laboratory unknown results (with a less than 5% chance that the bias is random).

Specific conductance: The blind sample results show an extremely wide scatter with a positive bias. Only 28% of the results were less than 1 standard deviation and only 67% were less than 3 standard deviations. The central laboratory unknown results are generally excellent; however, Atlanta shows a statiscally significant positive bias (with a less than 5% chance of the bias being random).

Aluminum: Results are generally excellent.

Antimony: No blind sample results and very few central laboratory unknown results are available.

Arsenic: Results are generally excellent.

Barium: Except for two blind results reported by Denver (300 µg/L reported instead of 600 µg/L and 100 µg/L reported instead of 784 µg/L), blind results are generally excellent. The results from the central laboratory unknowns, especially Denver's, appear to have greater single-laboratory standard deviations than would be expected when compared to the multi-laboratory standard deviation data.

Beryllium: Atlanta reported one blind sample result which is 4 standard deviations and another almost 3 standard deviations. The Denver blind sample results are all under 2 standard deviations, but show a negative bias. The Denver results from the central laboratory unknowns also showed significant negative bias (with a less than 5% chance of the bias being random).

Cadmium: There appears to be a negative bias, especially in Atlanta, in blind sample results with one Atlanta result -4.4 standard deviations. Both labs show significant negative bias in the central laboratory unknown results (with a less than 5% chance that the bias is random).

Chromium: Although 95% of the blind sample results are less than 2 standard deviations and all are less than 3 standard deviations, only 57% of the blind results are under one standard deviation. The central laboratory unknown results show greater single-laboratory standard deviations than would be expected from the multi-laboratory standard deviation and Atlanta shows a negative bias (with less than 5% chance that the bias is random).

Cobalt: Results are generally excellent. However, Denver shows a negative bias both in the blind results and the central laboratory unknown results.

Copper: Although Atlanta reported one value which was 3.9 standard deviations and another which was 10 standard deviations (in the latter case, 26 µg/L was reported instead of 270 µg/L and appears to be a dilution error), 87% of the blind sample results were less than 1 standard deviation and appear excellent. The central laboratory unknown results show greater single-laboratory standard deviations than would be expected from the multi-laboratory standard deviation.

Iron: Except for one Atlanta result reported as 370 µg/L instead of 237 µg/L and one Denver result reported as 70 instead of 372, the blind sample results appeared excellent with 64% less than 1 standard deviation; they do seem to show a slight positive bias. The central laboratory unknown results are also good, but Denver shows a greater single-laboratory standard deviation than would be expected, especially in the first half of the year. The "duplicate" total iron value reported by Atlanta to Wisconsin indicates a possible error made.

Lead: Results are generally excellent, although Denver shows a negative bias in the central laboratory unknown results (with a less than 5% chance that the bias is random).

Lithium: Although 81% of the blind sample results are less than one standard deviation, Atlanta reported one result which was -4.2 standard deviations and another which was -13.6 standard deviations (40 µg/L reported instead of 174 µg/L in the latter case). Central laboratory unknown results appeared generally excellent.

Manganese: Except for one Denver blind sample result reported as 140 µg/L instead of 23 µg/L, results were generally excellent. Single-laboratory standard deviations for the central laboratory unknowns seem to be somewhat greater than would be expected from the multi-laboratory results and Atlanta shows a significant negative bias (with a less than 5% chance that the bias is random).

Mercury: The mercury blind sample results show a wide scatter with only 21% less than one standard deviation; the blind results also show a definite negative bias. The central laboratory unknown results also are negatively biased with a less than 5% chance that the low results in Denver are due to a random effect.

Molybdenum: The Denver blind sample results show a negative bias with one Denver result -4.4 standard deviations. The central laboratory unknown results also show a negative bias with a less than 5% chance that the bias is random in the Denver laboratory.

Nickel: Results appear generally very good; however, both Atlanta and Denver show a statistically significant negative bias (with a less than 5% chance that the bias is random) in the central laboratory unknown results.

Selenium: Results are generally excellent although the blind sample results from the second half of the year seem to have a slight positive bias.

Silver: Although only 47% of the blind sample results are less than one standard deviation, the results seem generally very good; an exception is the Denver blind sample result in which 92 µg/L was reported instead of 3.1 µg/L.

Strontium: Results are generally excellent.

Zinc: Although Atlanta shows a statistically significant negative bias in the central laboratory unknown results, results appear generally excellent.

Nitrogen and phosphorus species: Results of the central laboratory unknown results for nitrite plus nitrate appeared generally excellent. Similarly, the "duplicate" analyses of the Wisconsin and Wyoming samples and the daily analyses of the solutions prepared from the EPA ampules seemed generally excellent for the nutrients.

Trace metal concentrations (graphite furnace): Results are generally very good.

In addition to the tabulated data described above and to the daily quality control analyses of reference samples conducted routinely by the section, the laboratories participated in a number of studies conducted by LeRoy Schroder in developing and examining the stability of new reference samples.

For example, ERA purchased samples were analyzed in duplicate in both laboratories. As well as major ions and trace metals, the following are of interest: Denver reported a mean of 230 mg/L and Atlanta a mean of 228 mg/L for a sample with a theoretical COD of 238 mg/L; Denver reported a mean of 4.4 mg/L and Atlanta a mean of 4.7 mg/L for a theoretical phosphorus of 4.5 mg/L; Denver reported a mean of 9.4 mg/L and Atlanta a mean of 11.5 mg/L for a theoretical Kjeldahl nitrogen of 10.7 mg/L; Denver reported a mean of 8.6 mg/L and Atlanta 8.0 mg/L for a theoretical ammonia of 8.1 mg/L; Denver reported a mean of .16 mg/L and Atlanta a mean of .18 mg/L for a theoretical cyanide of .20 mg/L; and Atlanta reported a mean of 104 mg/L for a theoretical 96 mg/L suspended solids. This data and the rest of the data in this study is summarized in Schroder's memo of 5/11/77.

The study involving analyses of the EPA "Demand" ampules (reported by memo 8/11/77) indicated the following:

	Atlanta		Denver	
Theoretical value	Relative deviation	Bias	Relative Deviation	Bias
15.4 mg/L COD	± 15%	+ 4%	± 25%	+ 36%
115.5 mg/L COD	± 8%	- 1%	± 6%	+ 5%

As noted in the memo, the positive bias shown by Denver indicates a possible problem (the bias was + 5 mg/L for both the high and low COD).

Radiochemical analyses

Radiochemical analyses are performed only by the Denver Central Laboratory. The radiochemical section participates regularly in the EPA quality assurance crosscheck program.

Table 7 shows data from the "duplicate" samples sent from Wyoming. Data for dissolved and suspended gross alpha and beta radioactivity are tabulated.

Results from the EPA reference crosscheck program are included in table 11. Gross beta radioactivity, radium-226, strontium-89, strontium-90, and tritium results are summarized.

Table 12 lists analyses of uranium and alpha and beta radioactivity for subsamples of a natural water sample. These subsamples were submitted during a two month period as unknowns along with the inorganic central laboratory unknowns. The mean, standard deviation, and relative deviation (coefficient of variation) is shown.

Different cells and different instruments are calibrated and used for radium-226. Table 13 summarizes calibration crosschecks using a variety of instruments and cells. As well as expressing the precision in terms of relative deviation (as is done in the table), the precision between .04 and 13 pCi/L of Ra-226 may also be expressed as:

$$S = .05X + .026 \text{ (correlation coefficient = .999)}$$

where S = single laboratory standard deviation

X = concentration of Ra-226, pCi/L.

Tables 14 and 15 lists results from samples analyzed for dissolved and suspended gross alpha and beta radioactivity on two different instruments. The data from dissolved gross alpha radioactivity analyses indicate that the differences vary linearlly with the concentration. Between 1 and 300 µg/L:

$$D = .096\ M + 2.86 \text{ (correlation coefficient = .91)}$$

where D = difference between two analyses, and

M = mean concentration of gross alpha radioactivity, µg/L as U-natural.

There is little linear correlation, on the other hand, between the concentration levels and differences for suspended gross alpha radioactivity. The percent difference $(\frac{\text{difference}}{\text{mean}} \times 100$ percent) does seem to average between 20 and 25 percent over the range of .6 to 25 µg/L (as U natural). The differences for dissolved and suspended gross beta radioactivity also show poor linear correlations with their concentration levels. The average percent difference appears to be about 20 percent for dissolved gross beta up to about 6 pCi/L (as Cs-137) and to be about 10 percent for suspended gross beta up to about 15 pCi/L.

Organic analyses

Quality assurance and quality control activities in 1977 seem limited and rather sporadic in both laboratories. The Denver Central Laboratory does regularly run duplicate analyses of bottom material samples.

Table 8 shows "duplicate" general organic analyses from both labs.

Tables 17 and 18 show data from Atlanta analyses of spiked "whole" water and bottom material samples. The original data had not been provided so concentration levels are not included.

Table 19 shows data from Denver analyses of organophosphorus spiked bottom materials. An analysis of variance of the original data (parathion and dursban were not included in the analysis of variance since results were confounded with interference problems) showed significantly lower

recovery for malathion than for the other insecticides. There was no significant difference in recoveries from the two columns (OV-101 and OV-210) in this case. Since this is so, and since most of the bias's appear negative, the common practice of taking the lower result tends to increase the bias of the results.

Table 20 lists "duplicate" insecticide analyses of bottom material samples. Data is very limited, but the differences noted seem to be unrelated to the concentration. Zeros are not tabulated since Atlanta did not report their zero blanks to us.

Table 21 lists "duplicate" analyses for polychlorinated biphenyls with all except two samples analyzed in the Denver Central Laboratory. There seems to be a weak linear relationship (correlation coefficient <.7) between the difference of "duplicates" and their concentration in the range between 1 and 100 µg/kg. This relationship may be expressed as:

$$D = .268\ M + .93$$

where D = difference between two analyses, and
M = mean concentration of suspended gross PCB, µg/Kg.

The deviation about the line is $\pm$ 9.2. This line and its deviation, plotted in graph 32, could possibly be used as a starting point to look at future duplicates since they should fall in this range (however, it should be kept in mind that the correlation coefficient of the line is <.7).

In addition to the tabulated data, a few other organic quality assurance and quality control activities should be mentioned. In Schroder's memo of 5/11/77, mentioned previously, the following results were tabulated on the ERA samples: Denver reported a mean of .130 mg/L and Atlanta a mean of .200 mg/L for a sample with a theoretical phenol of .235 mg/L. Denver reported a mean of 38 mg/L for a theoretical oil and grease value of 38 mg/L; and Denver reported a mean of 106 mg/L for a theoretical organic carbon of 94. mg/L. The Denver phenol results indicate a possible problem with this determination.

The EPA conducted study (reported by EPA in June) indicated that Denver had a 75 percent recovery of PCB's from bottom sediments, and thus a negative bias. John Wilson's subsequent work in July indicated a 101 percent recovery of PCB's.

General summary

The majority of inorganic parameters were adequately monitored with reference materials. The positive and negative bias's noted can and should be caught much earlier. Rather than a hand tabulation or plotting of the data, I recommend an addition to the SRS and blind samples computer programs which would plot each lab's values, probably on a monthly basis.

It should be pointed out, incidentally, that in most cases the statistically significant positive or negative bias's are not very great in terms of

concentration. They indicate trends which should be watched, but do not imply that the lab's data is invalid.

The specific conductance blind sample values show significant serious scatter. Although it is possible that there is a problem with stability of the reference material, it seems strange that this would be true on all of the blinds and not on the original reference samples from which they are composed.

Likewise, the positive pH bias exhibited by both laboratories in the central laboratory unknown results could be attributed to a change in the reference material. However, it would seem unlikely that every reference sample had changed and every unknown mean in Denver and Atlanta is greater (admittedly, sometimes only slightly) than the multi-laboratory value.

The poor mercury results, on the other hand, may well be attributed to reference sample instability. Numerous studies have shown that acid alone does not adequately preserve mercury. A switch to a dichromate/acid combination has been recommended and, if and when this change is made, it is to be expected that better mercury values will be obtained for reference material and natural water samples.

The negative bias shown for boron may be a method bias. Greg Darlington will, in the near future, examine past standard reference sample round-robin data more thoroughly to see if this bias is noticeable.

It is possible that the fact that the central laboratories do not normally do extractions on chromium accounts for the fact that all Cr blind sample results are under 3 standard deviations, but only 57 percent are under 1 standard deviation.

The use of quality control charts in the sections is highly recommended. One type of control chart that can be used where adequate reference material is not available is to do an analysis of a sample and then do an analysis of a 1/2 dilution. Although I feel this does have a number of drawbacks which I won't go into here, it can be used to get an indication of laboratory bias (if both the original concentration and the 1/2 dilution fall within the normal analytical operating ranges). This technique would not work well for a method such as turbidity, but could probably be used advantageously for most inorganic, radiochemical, and organic determinations.

It was originally intended that the submission of replicate subsamples (tabulated in table 12) for radiochemical analyses be continued throughout the year, but somehow this submission was stopped after a couple of months. It would certainly be desirable to continue this program.

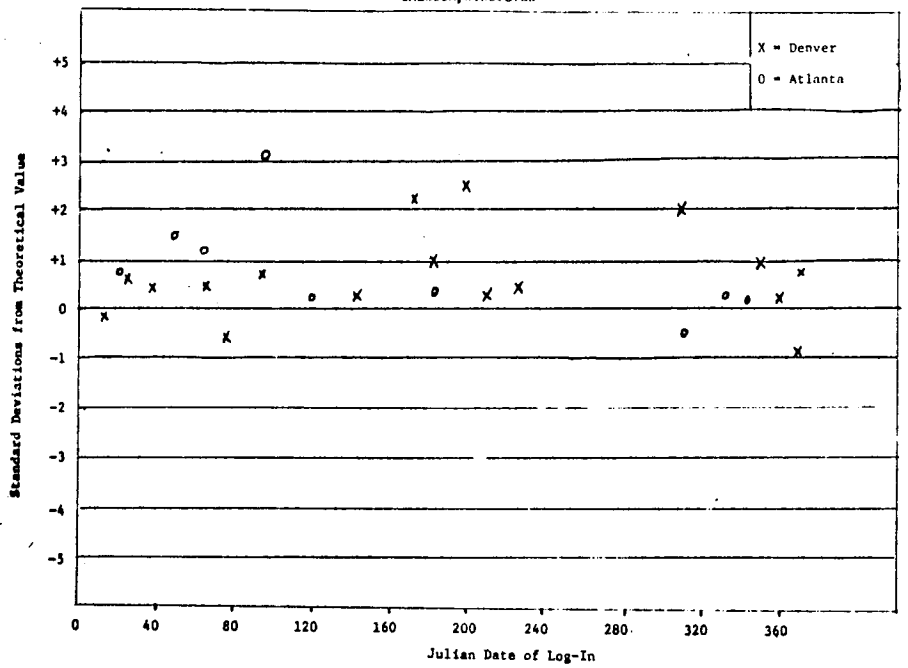
Likewise a similar type of program could be used for the organic analyses. Although progress has been made in developing adequate organic quality control and quality assurance programs, certainly much more work remains to be done. The submission of replicate subsamples to the laboratory as unknowns (as is done in the radiochemical analyses) would certainly be a place to start.

TABLE 1.--BLIND SAMPLE SUMMARY

Determination	Percent of "blind" results which are ≤1 standard deviations	≤2 standard deviations	≤3 standard deviations
Aluminum	85	100	100
Arsenic	75	96	100
Barium	53	89	89
Beryllium	58	88	94
Bicarbonate (alkalinity)	59	82	95
Cadmium	82	86	95
Calcium	77	88	96
Chloride	46	77	88
Chromium	57	95	100
Cobalt	63	89	100
Copper	87	91	91
Fluoride	80	96	100
Iron	64	91	91
Lead	88	100	100
Lithium	81	86	90
Magnesium	72	100	100
Manganese	76	90	95
Mercury	21	54	79
Molybdenum	58	84	95
Nickel	83	100	100
Potassium	85	96	100
Selenium	75	100	100
Silica	92	96	100
Silver	44	88	94
Sodium	81	96	96
Solids, residue on evaporation at 180°C	72	96	96
Specific Conductance	28	44	67
Strontium	90	100	100
Sulfate	57	92	92
Zinc	88	96	100

BLIND SAMPLES

1. CALCIUM, DISSOLVED



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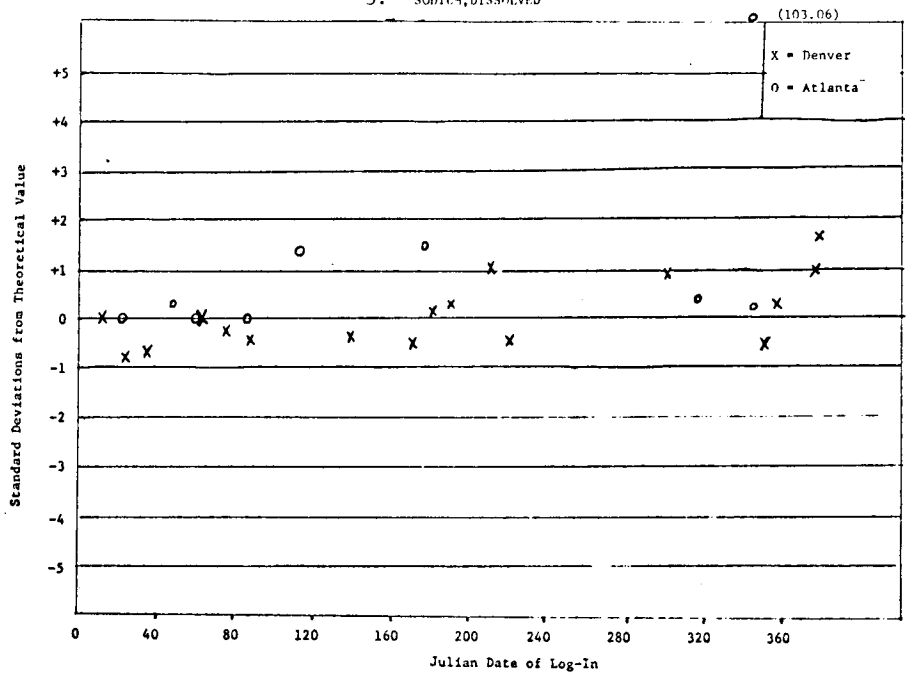
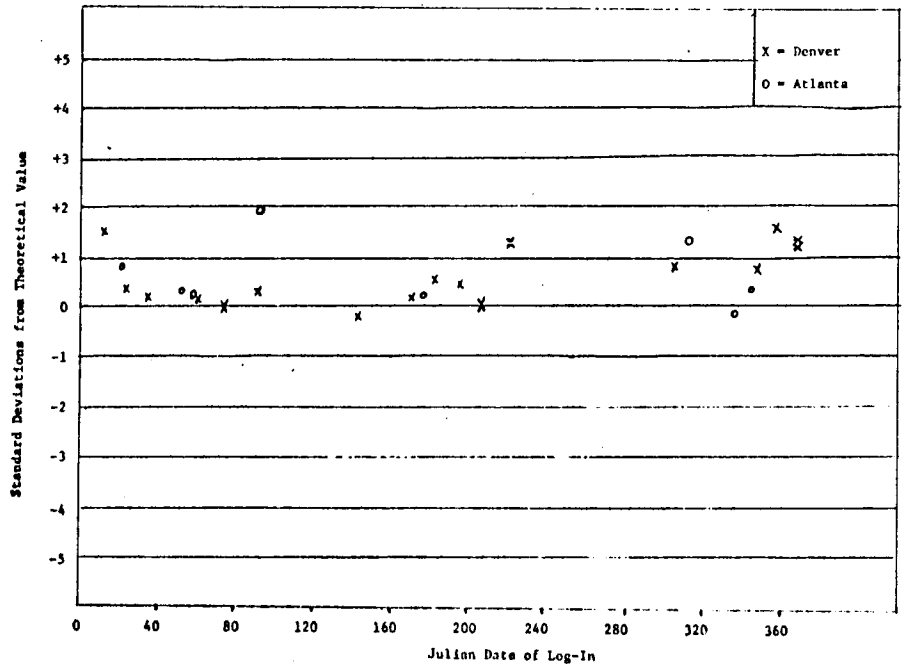


2. MAGNESIUM, DISSOLVED



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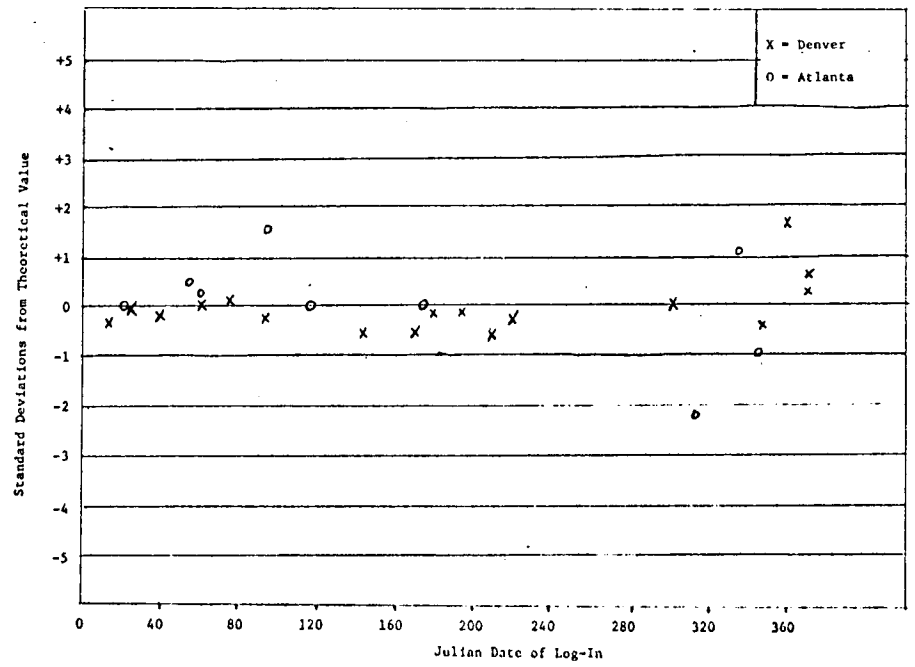
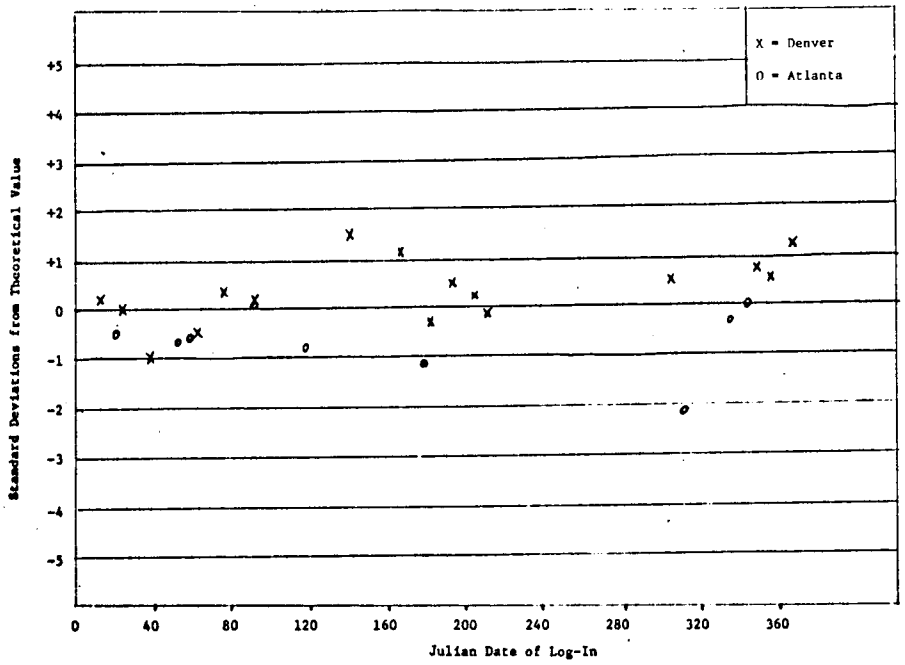
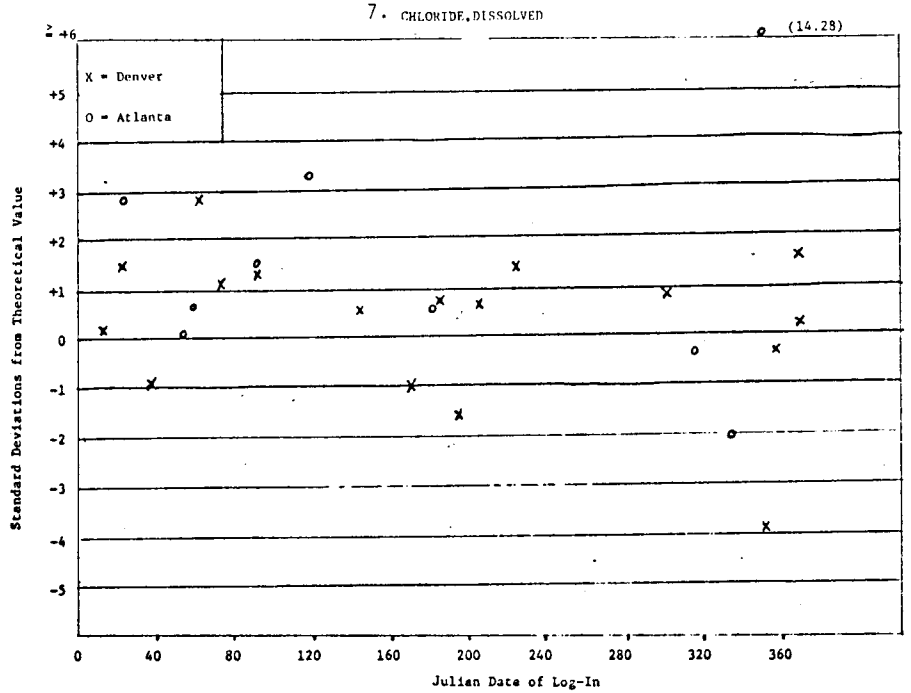


5. FLUORIDE, DISSOLVED

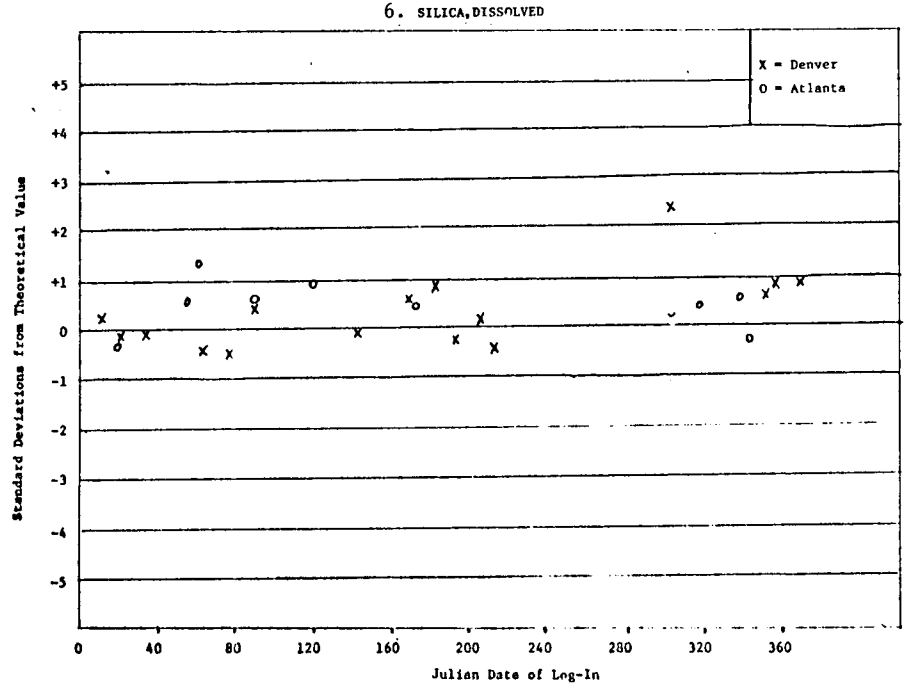


7. CHLORIDE, DISSOLVED

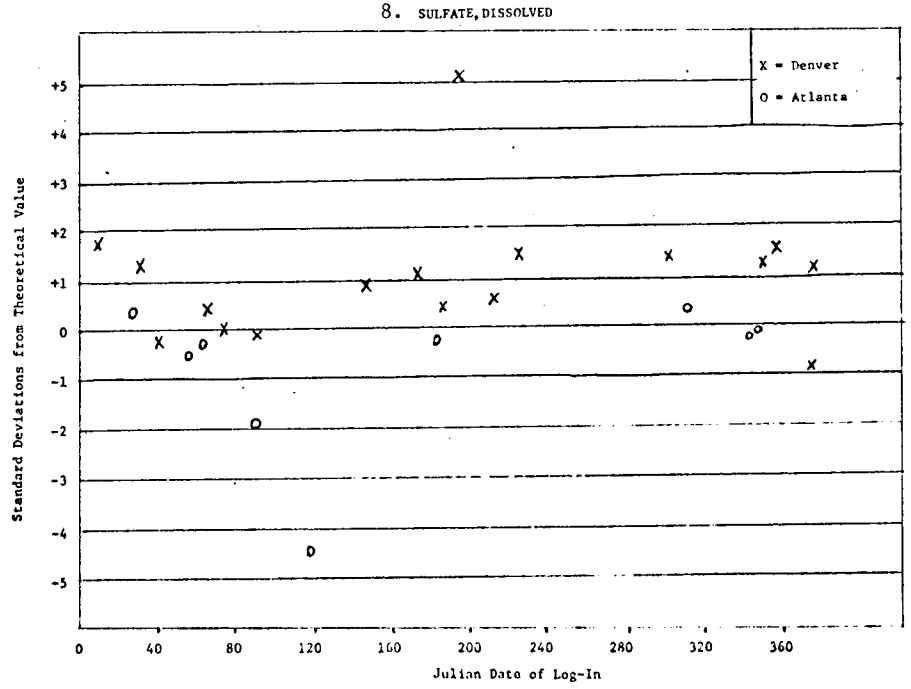


12

6. SILICA, DISSOLVED



8. SULFATE, DISSOLVED



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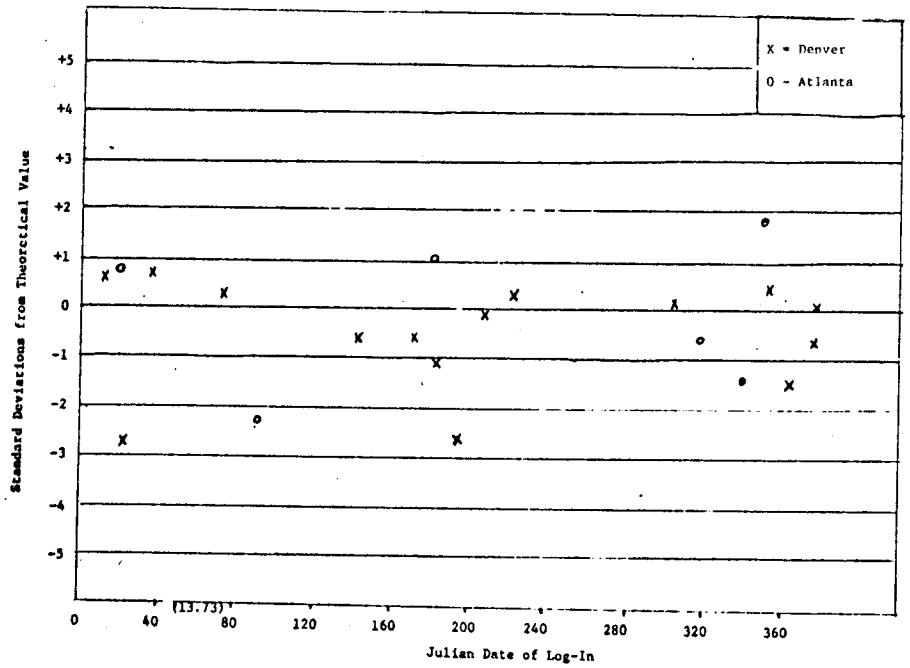
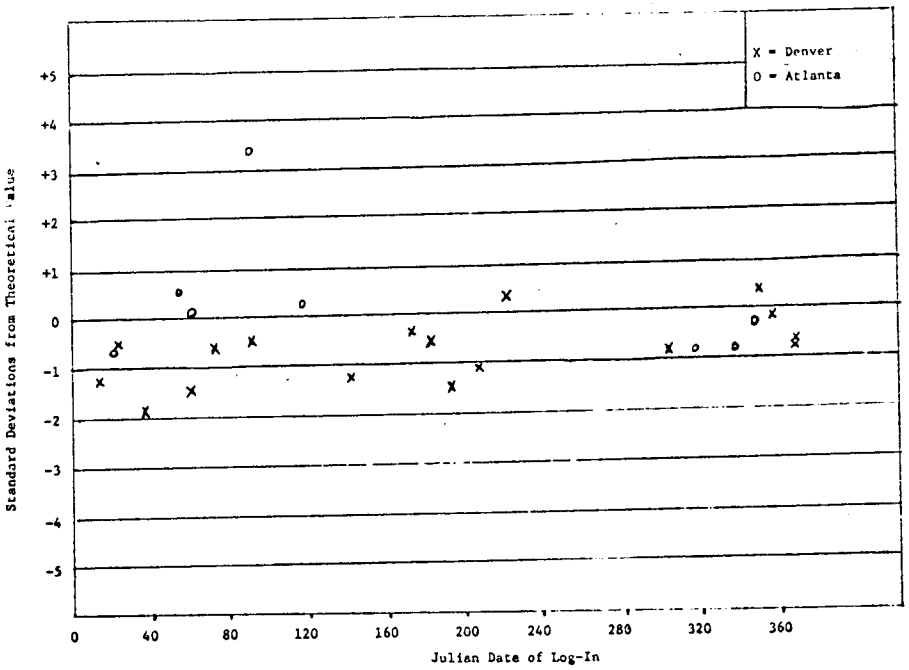
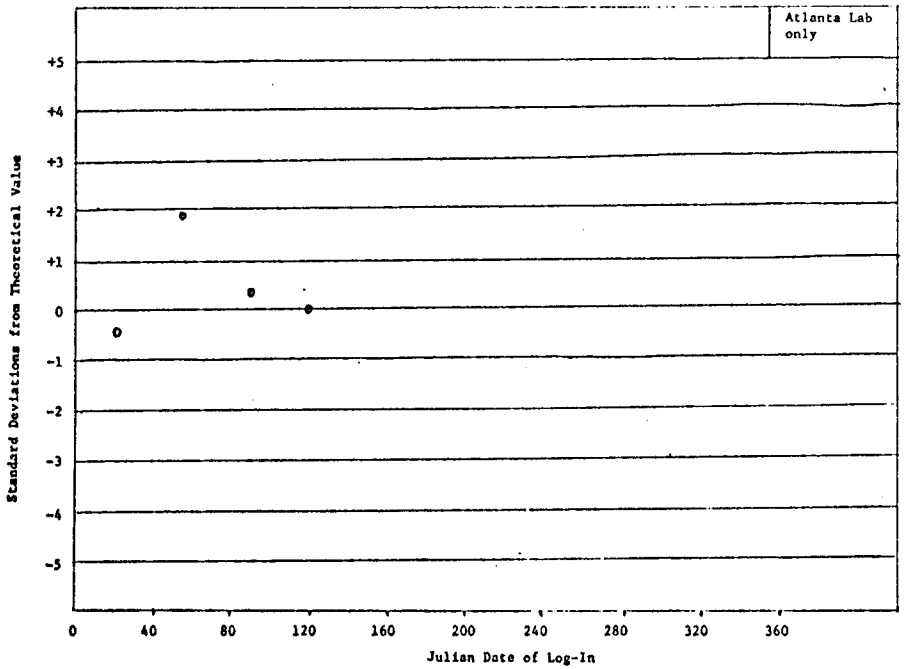


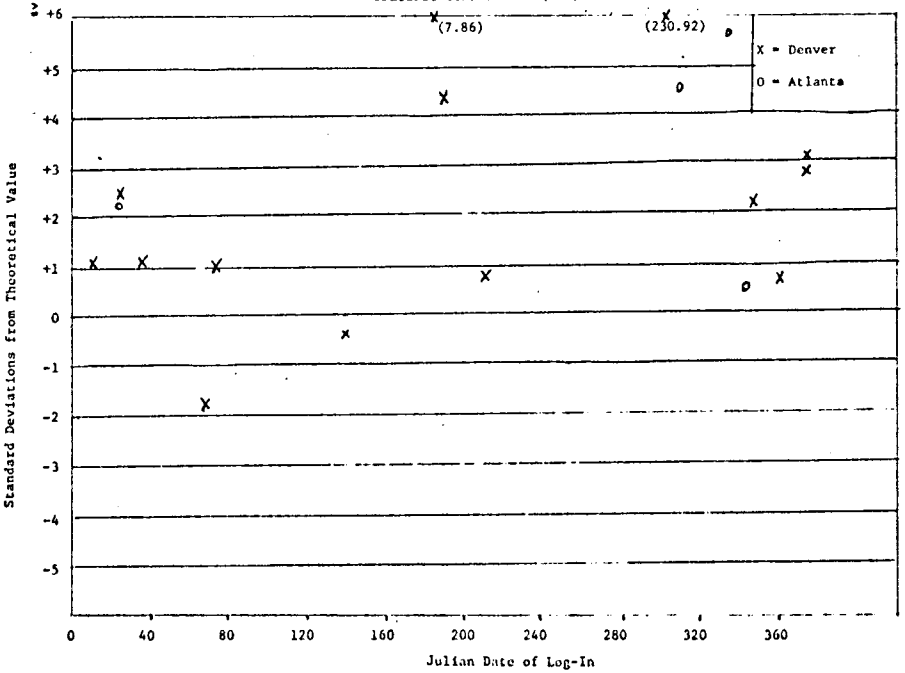
11. RESIDUE DISSOLVED @ 180°C



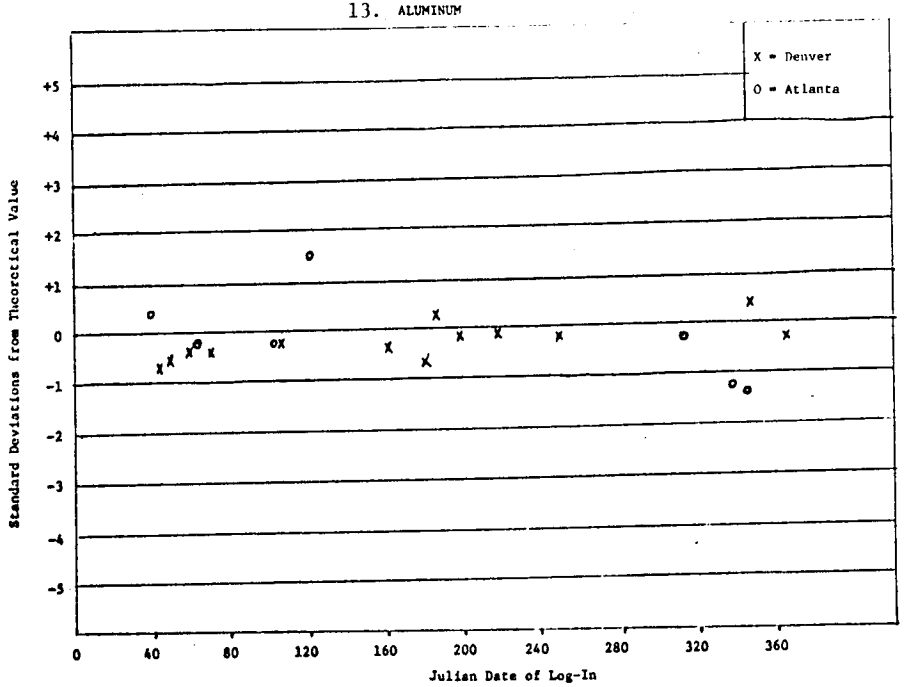
10. BORON DISSOLVED



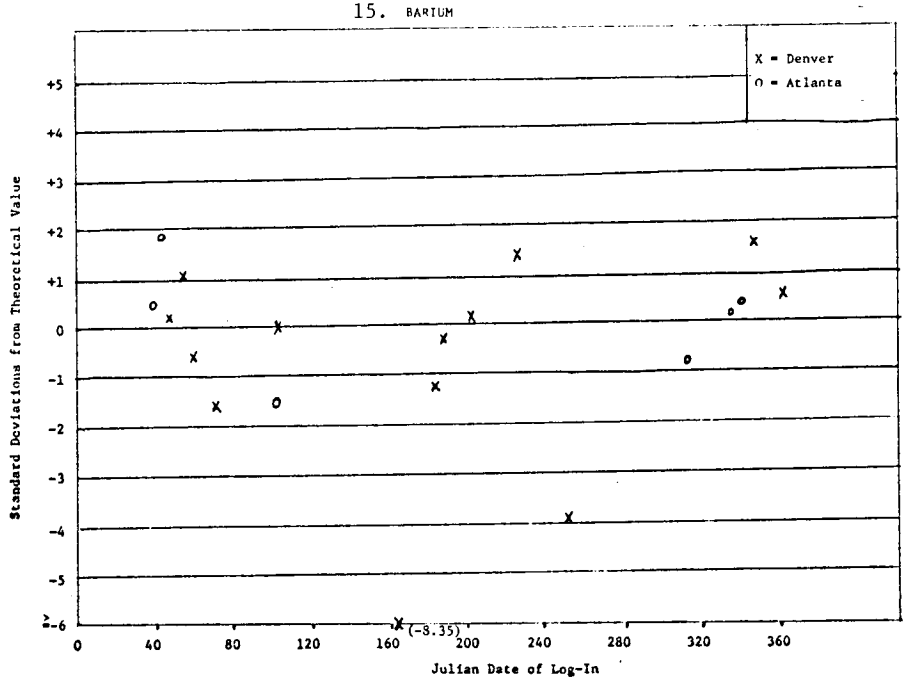
12. SPECIFIC CONDUCTANCE (LAB)



13. ALUMINUM



15. BARIUM



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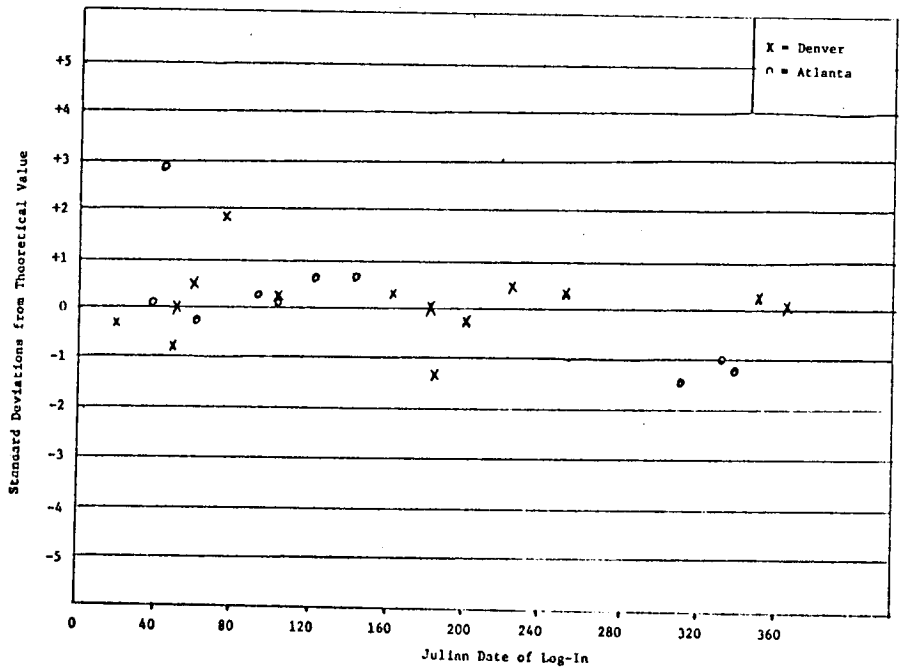
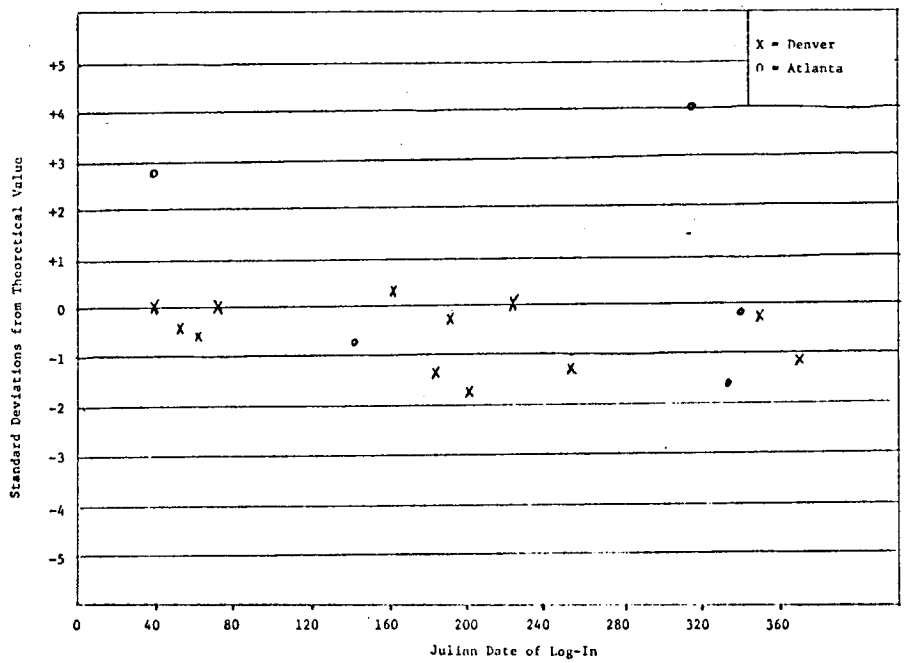


16. BERYLLIUM



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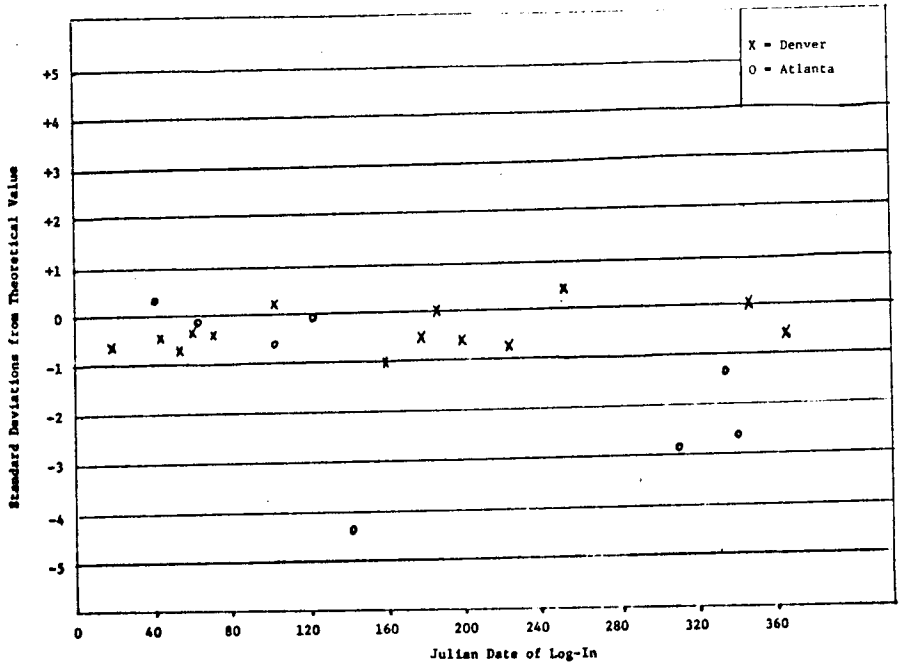
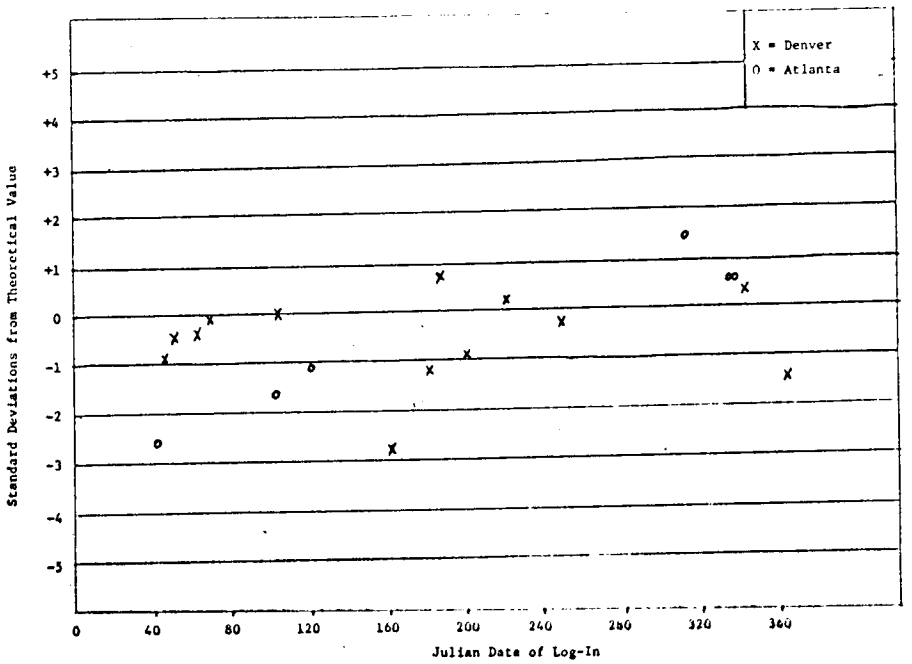


19. COBALT



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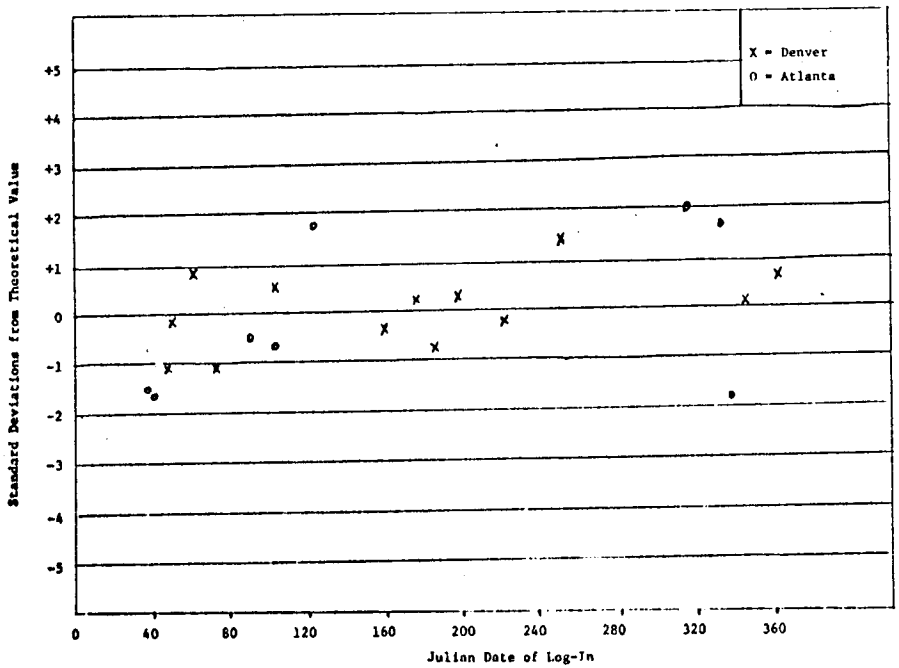
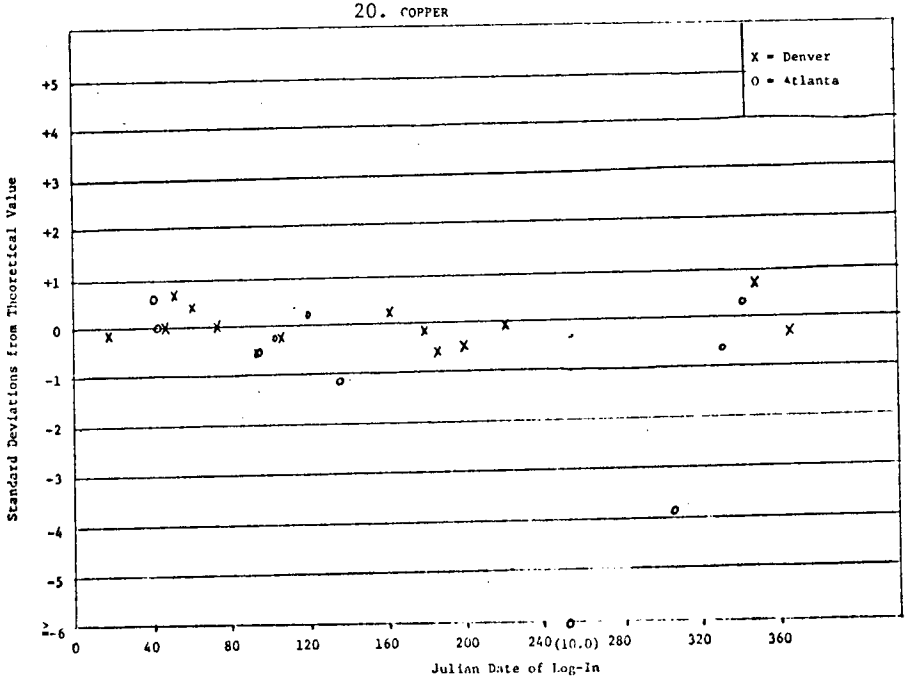
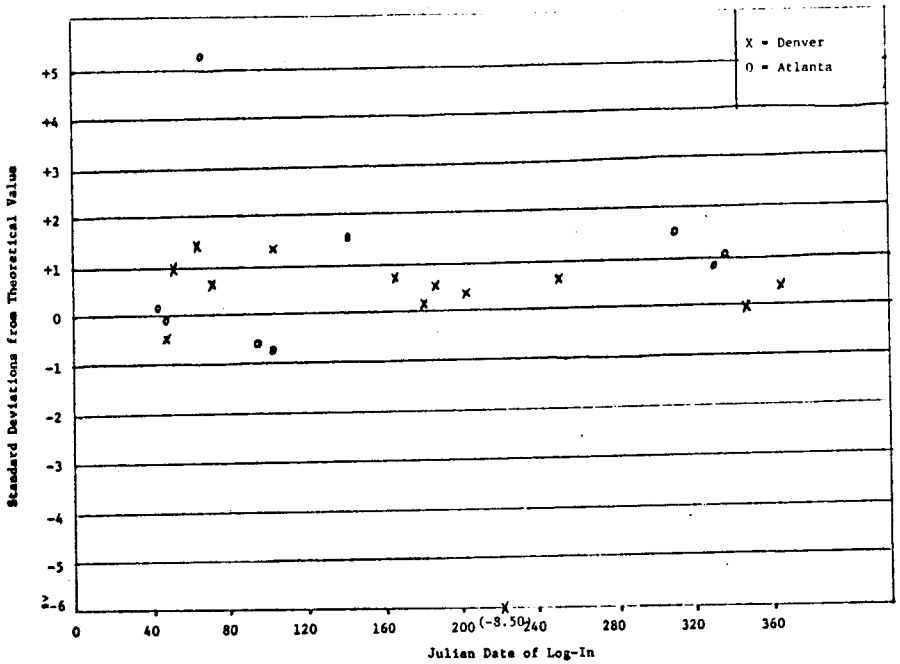
18. CHROMIUM



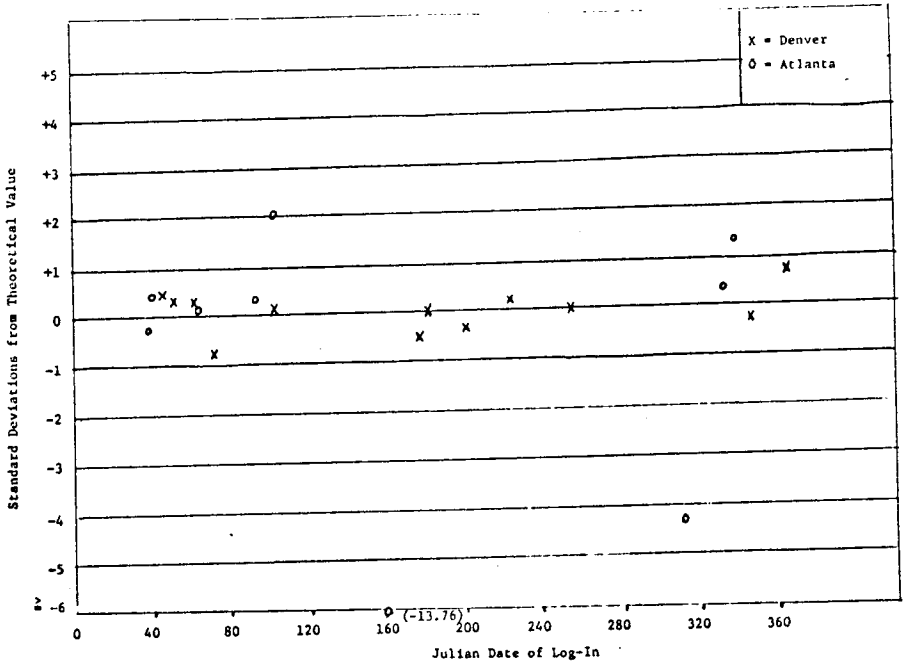
20. COPPER



21. IRON



23. LITHIUM



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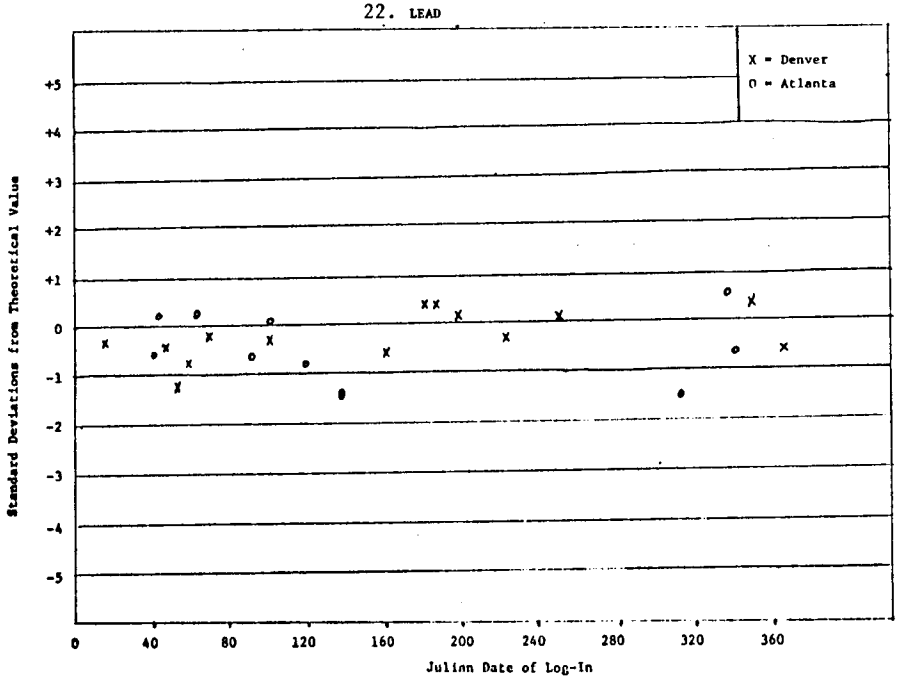
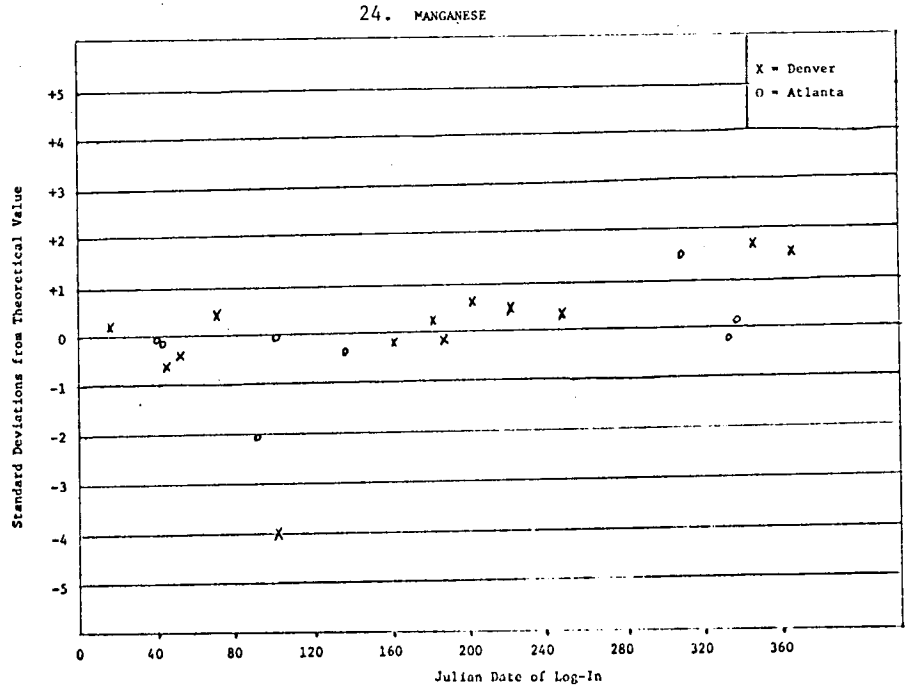
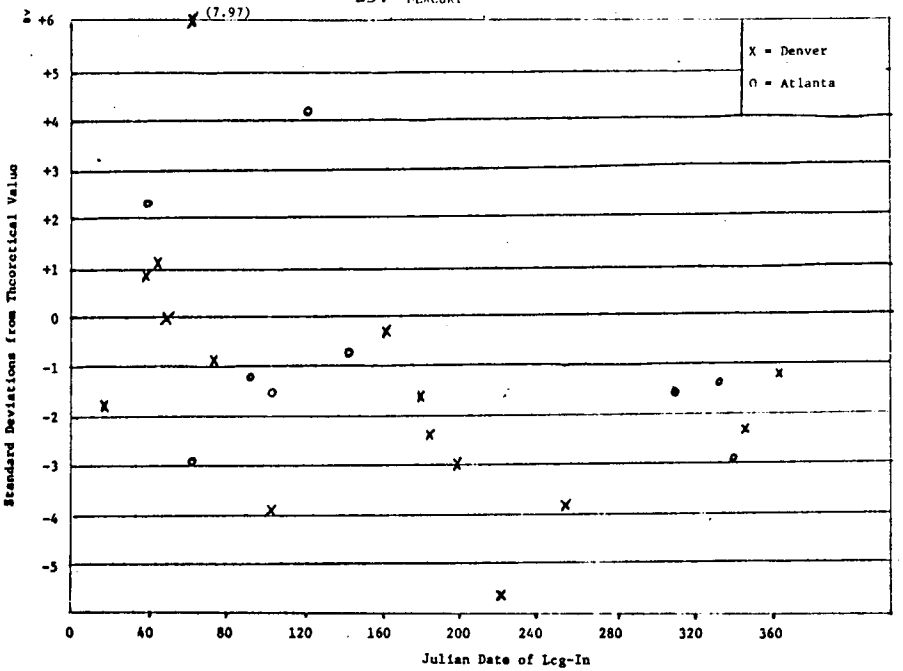
22. LEAD



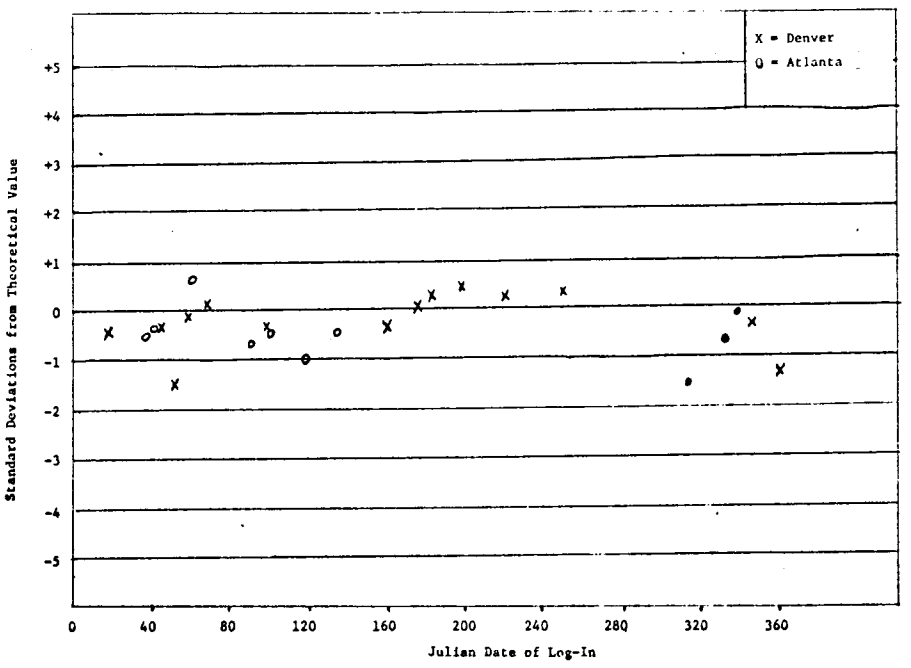
24. MANGANESE



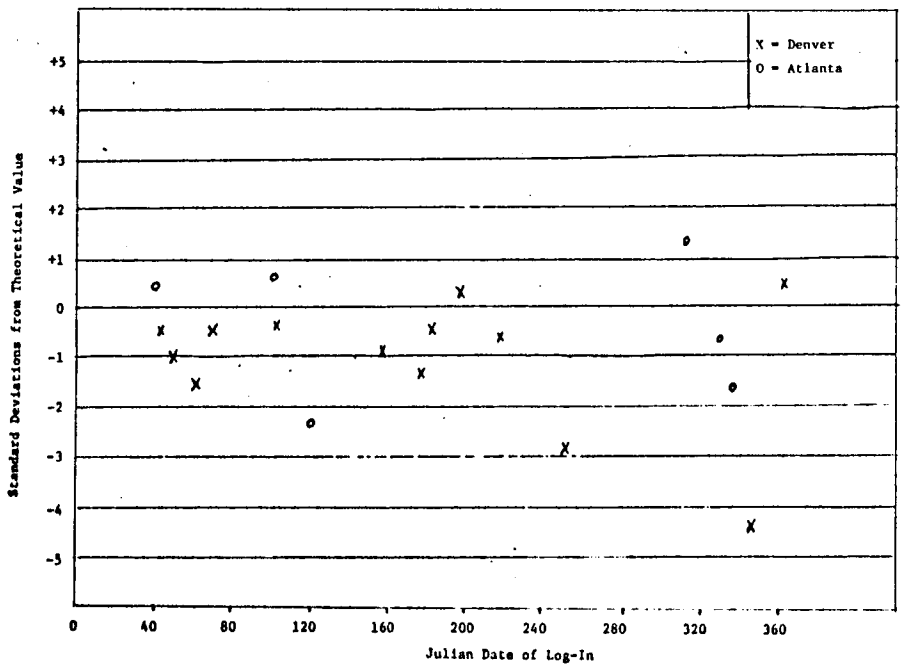
25. MERCURY



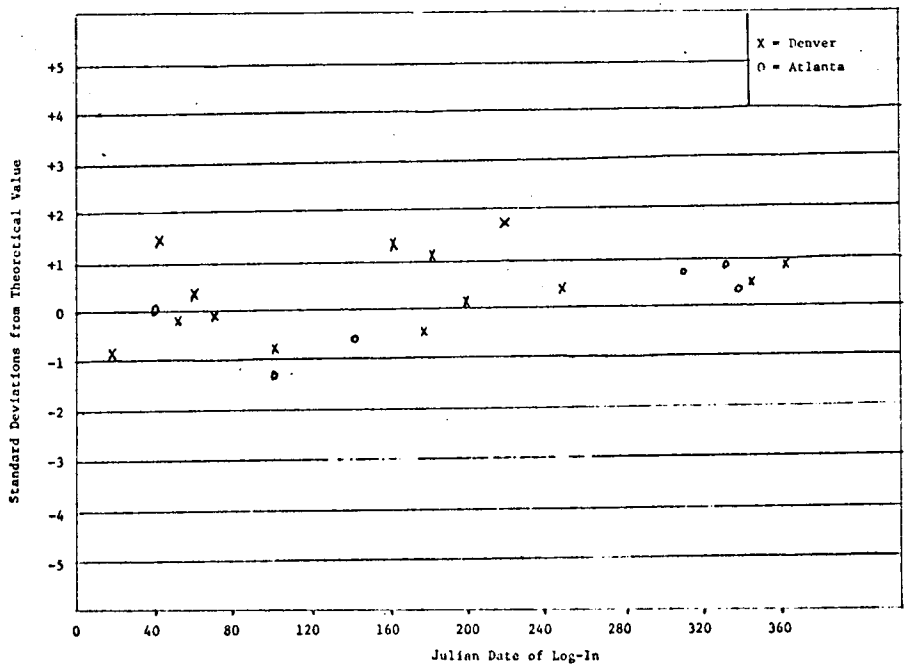
27. NICKEL



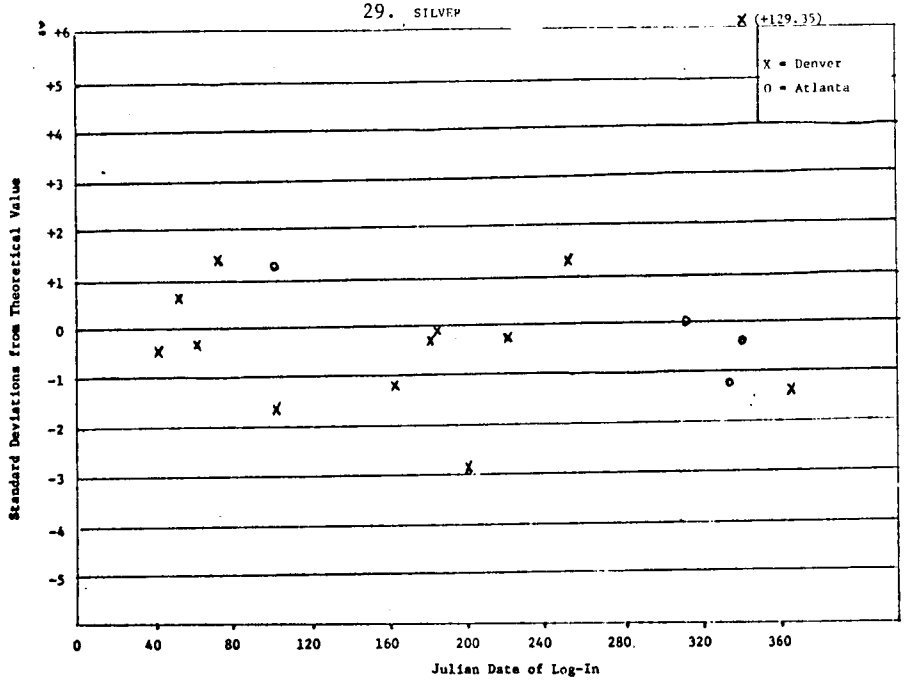
26. MOLYBDENUM



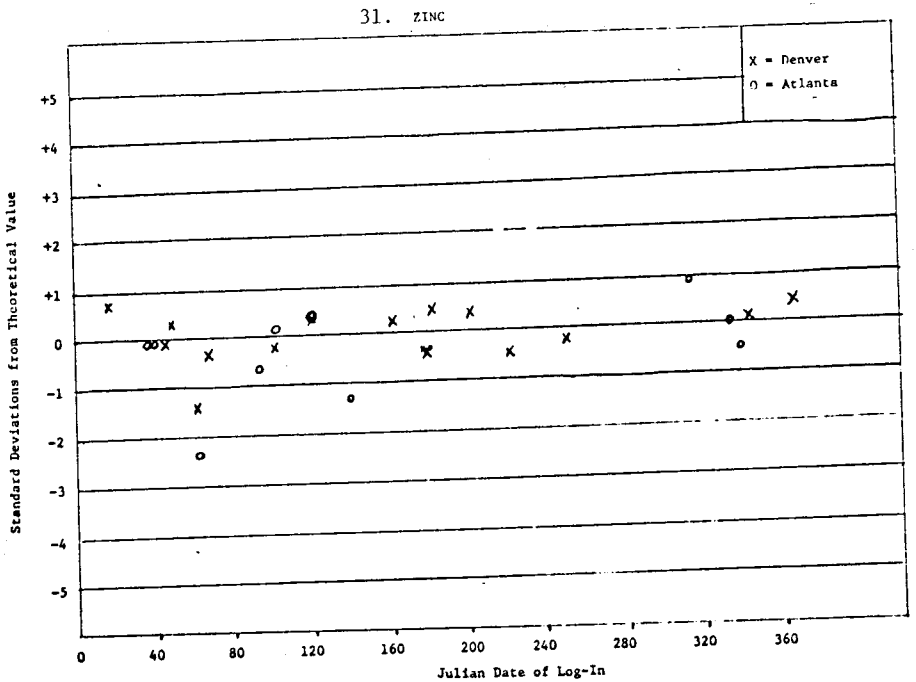
28. SELENIUM



29. SILVER



31. ZINC



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30. STRONTIUM, DISSOLVED

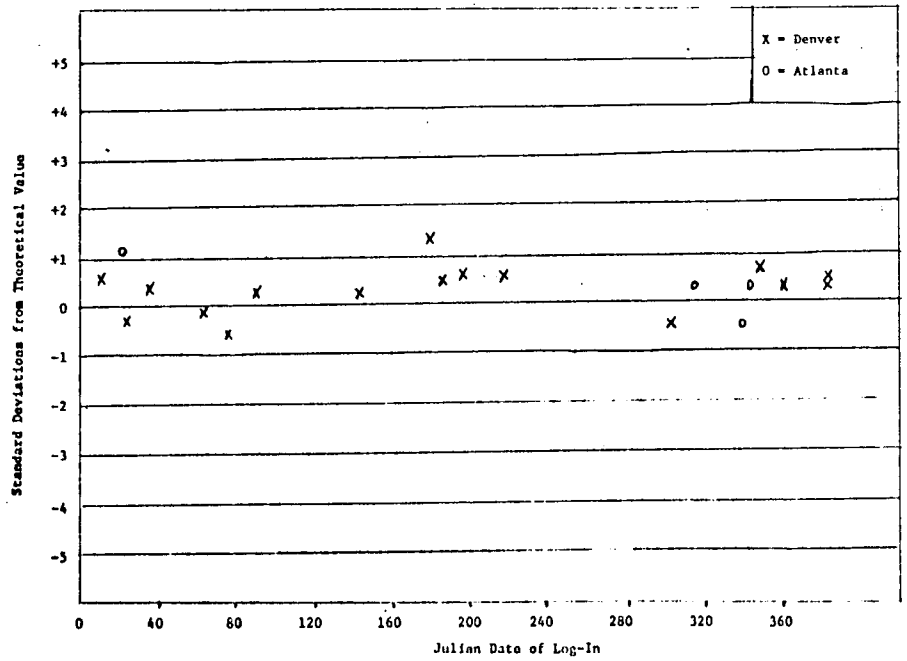

TABLE 2.--1/77-6/77

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Aluminum (µg/)	84 ± 26	10			100.0 ± 20.0						49 d
											t
	190 ± 27	13	177.0 ± 27.9	23	170.7 ± 31.3	15			188.8 ± 15.5	8	56 d
			194.0 ± 28.4	10	178.3 ± 24.0	6			217 ± 15.0	4	t
	318 ± 35	14	317.5 ± 26.5	20	314.0 ± 34.0	10	320.0	2	321.3 ± 20.0	8	59 d
			328.0 ± 21.5	10	335.0 ± 34.2	4	320.0	2	325.0 ± 10.0	4	t
	373 ± 59	13	352.9 ± 70.4	21	327.3 ± 87.8	11			381.0 ± 28.1	10	57
			383.0 ± 39.2	10	364.3 ± 25.7	7			426.7 ± 28.9	3	
	396 ± 85	15	369.1 ± 37.0	11	413.3 ± 25.2	3			352.5 ± 24.9	8	52 d
									396.7 ± 29.4	6	t
	597 ± 147	11			596.7 ± 32.2	3					48 d
	792 ± 65	15	761.6 ± 30.2	19	772.5 ± 9.6	4	790.0 ± 20.0	3	750.8 ± 31.8	12	53 d
			765.0 ± 57.6	12	713.3 ± 55.1	3	796.7 ± 23.1	3	775.0 ± 59.6	6	t
Antimony (µg/L)	20.3 ± .6	3	17.8 ± 3.2	12	18.4 ± 1.5	5			17.4 ± 4.1	7	59 d
Arsenic (µg/L)	5.4 ± 1.3	11	5.1 ± 1.3	21	5.00 ± 1.7	11			5.20 ± .8	10	57 d
			5.0 ± 1.6	5	6.00	2			4.33 ± 1.5	3	t
	9.1 ± 3.7	15	1.04 ± 1.6	11	10.0 ± 1.0	3			10.5 ± 1.8	8	52 d
									10.0 ± 1.8	6	t
	14.3 ± 4.9	12	14.3 ± 3.3	22	14.5 ± 4.0	14			14.0 ± 1.8	8	56 d
			14.3 ± 2.1	7	15.0 ± 2.6	3			13.8 ± 1.7	4	t
	18.1 ± 2.6	11			16.0 ± 6.0	3					49 d
	20.2 ± 2.7	9	21.6 ± 3.0	21	22.6 ± 3.2	11	23.0	2	20.0 ± 1.8	8	59 d
			19.1 ± 2.4	8	20.0	2	18.0	2	4.3 ± 1.5	4	t
	55.5 + 12.8	24	55.1 ± 8.7	19	59.0 ± 5.2	4	55.3 ± 8.1	3	53.8 ± 9.9	12	53 d
			52.8 ± 12.6	12	58.3 ± 6.0	3	55.7 ± 10.1	3	48.5 ± 15.8	6	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Barium (µg/L)	100 ± 50	10	113 ± 34	23	120 ± 41	15			100 ± .0	8	56 d
			157 ± 53	7	175 ± 50	4			133 ± 58	3	t
	260 ± 80	15	236 ± 50	11	267 ± 58	3			225 ± 46	8	52 d
									250 ± 55	6	t
	570 ± 110	12			533 ± 58	3					48 d
	560 ± 50	14	542 ± 51	19	545 ± 52	11			538 ± 52	8	59 d
			533 ± 52	6	550	2			525 ± 51	4	t
	760 ± 70	11	700 ± 117	17	725 ± 96	4			692 ± 127	13	53 d
			675 ± 205	8	733 ± 58	3			640 ± 261	5	t
	790 ± 60	10	790 ± 44	21	791 ± 54	11			790 ± 32	10	57 d
			757 ± 54	7	725 ± 50	4			800 ± 0	3	t
Beryllium (µg/L)	11 ± 3	10	8.2 ± 3.7	19	7.4 ± 4.5	11			9.4 ± 1.8	8	59 d
			10.0 ± .0	8	10.0 ± .0	4			10.0 ± .0	4	t
	18 ± 4	12	19.1 ± 3.0	11	20.0 ± 0.0	3			18.8 ± 3.5	8	52 d
									18.3 ± 4.0	3	t
	30 ± 6	6	30.0 ± 0.0	23	30.0 ± 0.0	15			30.0 ± 0.0	8	56 d
			31.1 ± 3.3	9	30.0 ± 0.0	6			33.3 ± 5.8	3	t
	42 ± 11	5	41.8 ± 7.3	17	42.5 ± 5.0	4			41.5 ± 8.0	13	53 d
			41.0 ± 3.2	10	40.0 ± 0.0	3			41.4 ± 3.8	7	t
	62 ± 12	6	62.5 ± 4.4	20	64.0 ± 5.2	10			61.0 ± 3.2	10	57 d
			61.0 ± 3.2	10	60.0 ± 0.0	7			63.3 ± 5.8	3	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Bicarbonate (mg/L)	24.5 ± 2.5	20	24.9 ± 2.0	102	24.8 ± 1.5	44	24.8 ± 3.4	26	24.9 ± 2.0	32	54
	32.6 ± 3.8	21	32.6 ± 3.0	94	31.6 ± 1.7	38	35.9 ± 4.2	21	31.5 ± 2.0	35	58
	72.7 ± 5.7	22	73.1 ± 4.5	17	68.8 ± 1.7	4	73.8 ± 3.3	4	74.8 ± 4.8	9	51
	122 ± 3.5	19	120.2 ± 4.0	103	118.9 ± 3.2	42	119.0 ± 4.2	20	122.0 ± 4.0	41	55
Boron (µg/L)			4.3 ± 11.3	7	5.0 ± 12.2	6	0	1			58 d
	23 ± 14	6	16.1 ± 10.5	13	20.0 ± 18.3	4			14.3 ± 5.4	9	51 d
	50 ± 29	8	27.9 ± 12.0	91	29.7 ± 17.0	41			26.4 ± 4.8	50	55 d
	340 ± 41	9	320.2 ± 21.8	80	323.7 ± 28.5	43			316.2 ± 7.9	37	54 d
Cadmium (µg/L)	2.7 ± 1.2	22	2.55 ± .52	11	3.00 ± 0.0	3			2.38 ± .52	8	52 d
									<10	6	t
	4.6 ± 1.0	17			4.0 ± 1.0	3					49 d
	4.4 ± .9	21	4.43 ± .75	21	4.55 ± .82	11	5.5	2	4.00 ± .00	8	59 d
					3.75 ± 1.26	4	6.5	2	<10	4	t
	6.6 ± 2.1	19	5.76 ± .70	21	5.82 ± .75	11			5.70 ± .67	10	57 d
					5.43 ± .79	7			<10	3	t
	9.9 ± 1.8	19	9.26 ± .96	23	9.60 ± .74	15			8.63 ± 1.06	8	56 d
					9.50 ± .55	6			10.0 ± 0.0	3	t
	12.4 ± 3.6	21	11.53 ± 1.26	19	11.50 ± .58	4	13.33 ± .58	3	11.08 ± 1.16	12	53 d
			11.08 ± 1.44	13	11.33 ± .58	3	13.33 ± .58	3	10.0 ± 0.0	7	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Calcium (mg/L)	11.6 ± .7	21	11.0 ± .9	100	11.1 ± 1.0	38	10.6 ± .9	21	11.3 ± .6	41	58 d
	25.2 ± 1.5	24	25.1 ± .7	18	24.6 ± .6	5	25.2 ± .5	4	25.2 ± .8	9	51 d
	36.0 ± 1.8	22	35.1 ± 1.4	113	35.1 ± 1.8	43	34.6 ± .8	20	35.2 ± 1.1	50	55 d
	113 ± 6	22	112 ± 5	108	114 ± 5	45	110 ± 3	26	112 ± 5	37	54 d
Chloride (mg/L)	1.71 ± .70	21	1.78 ± .33	99	1.84 ± .24	38	1.92 ± .58	20	1.68 ± .15	41	58 d
	8.69 ± 1.1	26	8.51 ± .58	17	8.67 ± .33	4	8.67 ± 1.21	4	8.36 ± .12	9	51 d
	48.9 ± 1.9	24	49.5 ± 2.2	12	49.6 ± .8	42	49.3 ± .9	20	49.4 ± .32	50	55 d
	186 ± 7	23	190 ± 5	107	191 ± 3	44	190 ± 2	26	189 ± 7	37	54 d
Chromium (µg/L)	6.2 ± 1.2	17	4.8 ± 4.5	11	4.3 ± 5.8	3			5.0 ± 5.4	8	52 d
									5.0 ± 5.5	6	t
	10.0 ± 1.2	14	12.0 ± 4.8	21	13.9 ± 6.1	11			10.0 ± 0	10	57 d
			13.0 ± 4.8	10	14.3 ± 5.4	7			10.0 ±	3	t
	14.9 ± 3.7	14			12.3 ± 2.9	3					49 d
	19.3 ± 4.5	20	18.0 ± 4.8	20	17.8 ± 7.9	4	20.0 ± 0	3	17.7 ± 4.4	13	53 d
			19.2 ± 4.9	10	20.0 ± 10.0	3	20.0 ± 0	3	18.6 ± 3.8	7	
	30.3 ± 6.5	15			28.0 ± 6.2	3					48 d
	30.3 ± 5.2	20	28.5 ± 5.7	21	27.2 ± 7.8	11	30.0	2	30.0 ± 0	8	59 d
			30.0 ± 6.7	8	27.5 ± 9.6	4	35.0	2	20.0 ± 0	4	t
	39.2 ± 9.9	19	37.5 ± 7.0	21	36.7 ± 8.6	13			38.8 ± 3.5	8	56 d
			36.7 ± 5.0	9	35.0 ± 5.5	6			40. ± 0	3	t

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Cobalt (µg/L)	3.8 ± 1.3	8	3.4 ± 1.0	11	3.7 ± .6	3			3.3 ± 1.2	8	52 d
									<50	6	t
	5.1 ± .6	8			4.7 ± .6	3					49 d
	5.8 ± .7	9	5.7 ± .8	21	5.7 ± .9	11	6.5	2	5.5 ± .5	8	59 d
					6.3 ± 1.5	4			<50	4	t
	7.7 ± .8	7	7.4 ± 1.1	21	7.2 ± 1.2	11			7.6 ± 1.1	10	57 d
					7.3 ± .8	7			<50	3	t
	9.1 ± 3.2	9	9.6 ± 1.5	19	10.0 ± 2.2	4	10.7 ± .6	3	9.2 ± 1.3	12	53 d
					10.3 ± 2.3	3			<50	7	t
	11.7 ± 1.4	7	11.0 ± 1.9	23	11.5 ± 1.5	15			10.3 ± 2.4	8	56 d
					11.2 ± 1.7	6			<50	3	t
	13.6 ± 1.8	8			12.7 ± .6	3					48 d
Copper (µg/L)	79 ± 8	23	79.6 ± 3.4	11	82.0 ± 2.0	3			78.8 ± 3.5	8	52 d
									80.0 ± 0.0	6	t
	196 ± 8	19	199 ± 11	22	201 ± 13	14			196 ± 5	8	56 d
			199 ± 8	8	198 ± 11	5			200 ± 0	3	t
	227 ± 13	19			223 ± 6	3					48 d
	239 ± 17	19	237 ± 8	21	239 ± 9	11	235	2	235 ± 5	8	59 d
			234 ± 11	10	238 ± 17	4	230	2	232 ± 5	4	t
	320 ± 14	21	317 ± 19	21	313 ± 25	11			321 ± 10	10	57 d
			320 ± 31	10	317 ± 37	7			327 ± 6	3	t
	385 ± 19	19			390 ± 0	3					49 d
	443 ± 20	21	440 ± 33	19	440 ± 8	4	473 ± 84	3	431 ± 11	10	53 d
			397 ± 116	13	437 ± 6	3	430 ± 0	3	366 ± 157	7	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Fluoride (mg/L)	.78 ± .08	19	.78 ± .09	112	.73 ± .05	42	.80 ± .02	20	.82 ± .11	50	55 d
	.92 ± .07	17	.92 ± .09	99	.86 ± .07	38	.90 ± .06	20	.98 ± .07	41	58 d
	.92 ± .13	17	.91 ± .07	17	.90 ± .08	4	.90 ± .00	4	.92 ± .08	9	51 d
	1.03 ± .14	19	1.02 ± .08	107	.98 ± .08	44	1.01 ± .03	26	1.08 ± .06	37	54 d
Iron (µg/L)	40 ± 13	22	44.3 ± 11.2	21	40.0 ± 0.0	11	40	2	51 ± 16	8	59 d
			95.0 ± 49.0	10	55.0 ± 17	4	120	2	122 ± 19	4	t
	79 ± 21	18			73 ± 6	3					48 d
	87 ± 16	16			87 ± 6	3					49 d
	270 ± 20	24	250 ± 55	11	247 ± 6	3			251 ± 65	8	52 d
									330 ± 102	6	t
	343 ± 25	23	368 ± 84	21	380 ± 117	11			355 ± 14	10	57 d
			347 ± 47	10	346 ± 18	7			350 ± 95	3	t
	630 ± 42	24	605 ± 70	17	615 ± 10	4	623 ± 21	3	597 ± 101	13	53 d
			701 ± 272	10		3			784 ± 361	7	t
	844 ± 66	23	836 ± 186	23	868 ± 27	15			775 ± 317	8	56 d
			866 ± 70	9	877 ± 81	6			843 ± 412	3	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Lead (µg/L)	11.1 ± 7.1	21	8.6 ± 2.7	11	8.3 ± 1.2	3			8.8 ± 3.1	8	52 d
									<100	6	t
	19.6 ± 14.4	19	12.9 ± 2.5	23	13.8 ± 2.0	15			11.1 ± 2.4	8	56 d
					15.3 ± 3.6	6			<100	3	t
	20.0 ± 7.3	18	17.7 ± 2.9	21	17.6 ± 4.0	11			17.8 ± 1.0	10	57 d
					17.3 ± 3.6	7			<100	3	t
	16.8 ± 4.8	18	21.0 ± 2.5	19	22.2 ± 2.3	11	18.5	2	20.0 ± 1.2	8	59 d
					22.3 ± 1.3	4	19.5	2	<100	4	t
	24.1 ± 5.8	13			26.0 ± 1.0	3					49 d
	41.3 ± 9.7	21	37.2 ± 3.9	19	40.3 ± 3.0	4	38.3 ± 3.2	3	35.9 ± 3.8	12	53 d
					39.3 ± .6	3	39.7 ± 2.5	3	<100	7	t
	47.5 ± 6.8	14			46.7 ± 2.1	3					48 d
Lithium (µg/L)	56 ± 5	12	56.8 ± 4.8	19	55.5 ± 5.2	11			58.8 ± 3.5	8	59 d
			52.5 ± 7.1	8	47.5 ± 5.0	4			57.5 ± 5.0	4	t
	52 ± 5	8			60.0 ± 0.0	3					48 d
	86 ± 7	10	86.4 ± 5.1	11	90.0 ± 0.0	3			85.0 ± 5.4	8	52 d
									86.7 ± 5.2	6	t
	110 ± 5	8			120 ± 0	3					49 d
	163 ± 8	6	163 ± 5	20					162 ± 4	9	57 d
			145 ± 14	10					160 ± 10	3	t
	218 ± 15	10	206 ± 31	19	215 ± 6	4	210	2	203 ± 37	13	53 d
			206 ± 16	10	183 ± 6	3			216 ± 5	7	t
	338 ± 13	6	336 ± 8	23	335 ± 8	15			340 ± 5	8	56 d
			305 ± 17	10	293 ± 5	6			322 ± 13	4	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Magnesium (µg/L)	2.02 ± .18	21	1.92 ± .23	100	1.96 ± .24	38	1.88 ± .33	21	1.91 ± .14	41	58 d
	6.57 ± .61	24	6.45 ± .25	18	6.60 ± .28	5	6.27 ± .29	4	6.44 ± .19	9	51 d
	13.7 ± .7	23	13.6 ± .5	113	13.5 ± .6	43	13.4 ± .5	20	13.8 ± .4	50	55 d
	59.5 ± 2.0	22	59.6 ± 1.4	108	60.2 ± 1.3	45	59.4 ± 1.4	26	59.1 ± 1.2	37	54 d
Manganese (µg/L)	36 ± 7	20	33.6 ± 5.0	18	30.0 ± 0.0	3			35.0 ± 5.4	8	52 d
									38.3 ± 4.1	6	t
	60 ± 7	22	56.1 ± 9.4	23	54.0 ± 10.6	15			60.0 ± 5.4	8	56 d
			61.0 ± 3.2	10	61.7 ± 4.1	6			60.0 ± 0.0	4	t
	104 ± 7	21	101 ± 6	21	101 ± 7	11			102 ± 4	10	5 d
			102 ± 6	10	101 ± 7	7			103 ± 6	3	t
	158 ± 10	22	156 ± 7	21	157 ± 9	11	150	2	156 ± 5	8	59 d
			156 ± 8	10	152 ± 10	4	150	2	162 ± 5	4	t
	162 ± 12	19			163 ± 15	3					49 d
	204 ± 12	20	195 ± 41	20	190 ± 8	4	200 ± 10	3	196 ± 51	13	53 d
			203 ± 12	3	193 ± 6	3	193 ± 6	3	210 ± 12	7	t
	261 ± 13	19			250 ± 17	3					48 d
Mercury (µg/L)	.62 ± .23	14	.40 ± .26	20	.40 ± .12	10	.50	2	.38 ± .41	8	59 d
			.76 ± .51		.50	2			.90 ± .61	4	t
	.62 ± .10	14	.55 ± .19	11	.43 ± .12	3			.60 ± .20	8	52 d
									.53 ± .15	6	t
	.68 ± .19	10			.47 ± .12	3					49 d

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Mercury (cont.) (µg/L)	1.67 ± .35	11	1.77 ± .45	23	1.77 ± .54	15			1.76 ± .26	8	56 d
					1.73 ± .40	3			1.40 ± .22	4	t
	2.08 ± .26	14	1.99 ± .43	20	2.20 ± .41	4	1.90 ± .26	3	1.95 ± .47	13	53 d
			2.08 ± .86	10	2.63 ± .76	3			1.84 ± .84	7	t
	2.25 ± .38	10	2.23 ± .47	21	2.28 ± .44	11			2.18 ± .52	10	57 d
			2.18 ± .33	5	2.00	2			2.30 ± .26	3	t
Molybdenum (µg/L)	2.0 ± .7	5	1.7 ± .9	19	2.3 ± 1.0	9	1.5	2	1.1 ± .4	8	59 d
			2.0 ± 1.0	7	3.0 ± 0.0	3			1.2 ± .5	4	t
	10.2 ± 2.6	4	8.3 ± 1.1	10	10.0	2			7.9 ± .6	8	52 d
									9.5 ± 1.2	6	t
	38.4 ± 9.3	5	31.6 ± 3.6	17	33.5	2	3.67 ± 4.7	3	30.1 ± 2.3	12	53 d
			31.8 ± 4.0	11	32.0	2	36.0	2	30.6 ± 2.5	7	t
	31.0 ± 3.9	6	29.7 ± 2.2	21	30.4 ± 2.5	13			28.6 ± 1.3	8	56 d
			28.5 ± 1.7	8	29.2 ± 1.6	5			27.3 ± 1.2	3	t
	39.2 ± 3.3	6	39.6 ± 3.1	21	39.7 ± 2.2	11			39.4 ± 4.0	10	57 d
			37.9 ± 2.8	10	39.1 ± 2.1	7			35.0 ± 2.0	3	t
Nickel (µg/L)	5.5 ± 2.3	14	5.00 ± .89	11	4.67 ± .58	3			5.13 ± .99	8	52 d
									<50	6	t
	7.8 ± 4.2	12			6.67 ± 1.15	3					49 d
	10.2 ± 2.9	14	10.5 ± .8		10.4 ± .8	11	11.0	2	10.4 ± .9	8	59 d
					12.2 ± 2.6	4	11.0	2	<50	5	t

[a] = number of laboratories.
[b] = number of results.
* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Nickel (cont.) (µg/L)	11.3 + 5.8	12	11.1 ± 1.9		10.8 ± 2.1	11			11.5 + 1.7	10	57 d
					10.0 ± 2.4	7			<50	3	t
	13.0 ± 4.7	12			10.3 ± .6	3					48 d
	13.5 ± 9.6	14	8.00 ± 1.98	23	8.87 ± 1.81	15			6.38 ± 1.06	8	56 d
					10.00 ± 2.45	6			<50	3	t
	21.7 ± 7.6	15	20.6 ± 2.7	19	20.8 ± 2.2	4	23.7 ± 1.5	3	19.8 ± 2.7	12	53 d
Nitrite as N (mg/L)							0.01 ± 0.01	4			51 d
							.07 ± .02	22			58 d
			.14 ± .01	79	.13 ± .00	9	.16 ± .01	20	.13 ± .01	50	55 d
			.20 ± .04	63			.23 ± .00	26	.18 ± .04	37	54 d
Nitrite + Nitrate as N (µg/L)			.14 ± .02	60	.14 ± .01	38	.16 ± .02	22			58 d
			.23 ± .03	89	.21 ± .02	19	.22 ± .01	20	.24 ± .03	50	55 d
			.45 ± .05	17	.40 ± .01	4	.43 ± .03	4	.48 ± .04	9	51 d
			1.83 ± .11	107	1.83 ± .05	44	1.77 ± .18	26	1.86 ± .08	37	54 d
Nitrate as N (µg/L)							.08 ± .01	22			58 d
	.13 ± .06	21	.09 ± .03	77	.07 ± .01	8	.06 ± .01	20	.10 ± .03	49	55 d
	.46 ± .11	22					.42 ± .03	4			51 d
	1.64 ± .16	18	1.63 ± .15	62			1.57 ± .19	26	1.68 ± .10	36	54 d

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
pH	7.57 ± .19	23	7.72 ± .16	76	7.64 ± .13	38	7.7	2	7.81 ± .14	36	58 d
	7.53 ± .12	23	7.67 ± .16	81	7.67 ± .11	44	7.42 ± .21	4	7.70 ± .18	33	54 d
	7.95 ± .14	27			8.12 ± .10	4					51 d
	8.33 ± .10	24	8.40 ± .12	84	8.38 ± .09	42			8.42 ± .14	42	55 d
Potassium (mg/L)	.92 ± .15	23	.90 ± .09	100	.98 ± .06	38	.85 ± .07	21	.86 ± .06	41	58 d
	2.39 ± .30	22	2.34 ± .12	113	2.45 ± .07	43	2.25 ± .09	20	2.28 ± .08	50	55 d
	3.84 ± .38	25	3.85 ± .10	18	3.88 ± .08	5	3.78 ± .10	4	3.87 ± .11	9	51 d
	7.69 ± .53	21	7.60 ± .75	108	7.64 ± 1.13	45	7.56 ± .25	26	7.58 ± .22	37	54 d
Selenium (µg/L)	3.5 ± .9	11	2.71 ± 1.45 2.67 ± .52	21 6	2.00 ± .63 2.50	11 2	5.00	2	3.13 ± 1.64 2.75 ± .50	8 4	59 d t
	5.4 ± 2.4	10	5.19 ± 1.54 6.00 ± 1.22	21 5	5.09 ± 2.02 5.5	11 2			5.30 ± .82 6.33 ± 1.53	10 3	57 d t
	3.9 ± 1.5	7	4.73 ± 1.1	11	6.00 ± 1.00	3			4.25 ± .71 4.00 ± .63	8 6	52 d t
	7.3 ± 1.3	9	7.87 ± 2.10 7.71 ± 3.86	23 7	7.73 ± 2.22 10.33 ± .58	15 3			8.13 ± 1.96 5.75 ± 4.19	8 4	56 d t
	15.5 ± 10.9	6			16.00 ± 2.65	3					49 d
	36.6 ± 14.2	8	35.8 ± 10.3 40.8 ± 7.0	20 10	37.5 ± 12.1 41.3 ± 12.4	4 3	38.3 ± 5.8	3	34.6 ± 11.0 40.6 ± 4.8	13 7	53 d t

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Silica (mg/L)	6.48 ± .19	19	6.72 ± .73	99	6.85 ± .18	38	6.48 ± .58	20	6.70 ± 1.03	41	58 d
	6.99 ± .80	14	7.08 ± .33	112	7.28 ± .20	42	6.97 ± .33	20	6.95 ± .34	50	55 d
	10.7 ± 1.0	15	10.6 ± .5	17	11.0 ± 0.0	4	11.0 ± 0.0	4	10.3 ± .5	9	51 d
	11.2 ± 0.7	13	11.4 ± .5	107	11.7 ± .5	44	11.2 ± .5	26	11.1 ± .5	37	54 d
Silver (µg/L)	2.2 ± .4	13	2.32 ± .75	19	2.36 ± .81 2.25 ± .5	11 4			2.25 ± .71 <10	8 4	59 d t
	4.2 ± 1.9	16	3.91 ± .83	11	3.33 ± .58	3			4.13 ± .83 <10	8 6	52 d t
	5.0 ± 1.3	11	5.05 ± .86	21	5.09 ± .83 4.71 ± .76	11 7			5.00 ± .94 <10	10 3	57 d t
	6.3 ± 1.0	11			6.33 ± 1.15	3					49 d
	8.0 ± 2.5	16	8.44 ± 1.09	16	8.25 ± .50	4			8.50 ± 1.24	12	53 d
	10.1 ± 1.2	14			9.67 ± 1.15	3					48 d
	15.3 ± 4.9	14	13.8 ± 4.0	23	13.6 ± 4.3 11.8 ± 5.7	15 6			14.2 ± 3.6 <10	8 3	56 d t
Sodium (µg/L)	3.22 ± .24	21	3.21 ± .16	100	3.33 ± .12	38	3.33 ± .12	21	3.16 ± .09	41	58 d
	23.3 ± 1.6	24	23.3 ± .7	18	23.8 ± .4	5	23.5 ± 1.0	4	22.9 ± .3	9	51 d
	36.8 ± 1.4	23	36.4 ± .6	113	36.2 ± .6	43	36.4 ± .5	20	36.7 ± .6	50	55 d
	144 ± 5	23	146 ± 5	107	149 ± 4	45	140 ± 2	26	148 ± 4	36	54 d

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable.

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Solids, residue on evaporation at 180°C (mg/L)	61.0 ± 5.2	20	61.3 ± 21.7	10	61.5 ± 6.2	38	61.5 ± 6.2	21	57.6 ± 10.8	42	58 d
	201.2 ± 9.5	19	188.2 ± 7.6	17	192.5 ± 11.8	4	187.8 ± 4.0		186.6 ± 6.5	9	51 d
	266.6 ± 5.0	17	268.6 ± 7.6	112	271.0 ± 9.7	42	266.1 ± 5.7	20	267.5 ± 5.4	50	55 d
	1161 ± 48	20	1157 ± 25	107	1170 ± 34	44	1151 ± 14	26	1147 ± 7	37	54 d
Solids, ROE at 105°C (mg/L)									51.6 ± 28.9	5	58 d
Specific conductance (µmhos/cm at 25°C)	96.5 ± 3.9	22	97.1 ± 3.7	95	98.1 ± 2.2	38	94.5 ± 5.3	21	98.0 ± 2.5	36	58 d
	305.2 ± 9.7	23	306.8 ± 5.6	17	309.2 ± 1.5	4	305.8 ± 3.3	4	306.1 ± 7.3	9	51 d
	467.7 ± 15.7	23	469.3 ± 6.6	106	469.6 ± 4.9	42	470.2 ± 8.3	20	468.6 ± 7.1	44	55 d
	1632 ± 42	21	1652 ± 61	105	1643 ± 19	44	1676 ± 114	26	1644 ± 26	35	54 d
Strontium (µg/L)	69 ± 3	11	78 ± 21	61	85 ± 24	37			68 ± 8	24	58 d
	236 ± 33	7	249 ± 16	12	260 ± 20	4			244 ± 12	8	51 d
	355 ± 25	10	368 ± 25	68	372 ± 25	42			363 ± 24	26	55 d
	1430 ± 130	11	1382 ± 86	62	1379 ± 99	43			1390 ± 46	19	54 d

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable..

TABLE 2.--1/77-6/77 (Cont.)

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	All central laboratories	#[b]	Atlanta	#[b]	Albany	#[b]	Denver	#[b]	SRWS* No.
Sulfate (mg/L)	13.5 ± 2.2	18	14.1 ± 1.7	99	13.7 ± .6	38	12.3 ± 1.6	20	15.7 ± 1.8	41	58 d
	56.9 ± 9.5	21	55.1 ± 2.1	112	53.7 ± 1.4	42	55.1 ± 2.4	20	56.2 ± 1.7	50	55 d
	68.9 ± 2.6	18	68.5 ± 1.7	17	67.0 ± 1.4	4	69.8 ± 1.0	4	68.7 ± 1.9	9	51 d
	537 ± 20	20	540 ± 13	107	542 ± 10	44	549 ± 4	26	531 ± 14	37	54 d
Zinc (µg/L)	36 ± 7	18	34 ± 5	21	34 ± 5	11			35 ± 5	10	57 d
			39 ± 3	10	39 ± 4	7			40 ± 0	3	t
	173 ± 10	22	164 ± 5	11	163 ± 6	3			165 ± 5	8	52 d
									187 ± 46	6	t
	187 ± 20	21	187 ± 8	23	185 ± 9	15			189 ± 4	8	56 d
			181 ± 14	10	177 ± 18	6			187 ± 5	4	t
	336 ± 16	22	329 ± 13	21	326 ± 17	11	335	2	331 ± 6	8	59 d
			323 ± 13	10	310 ± 8	4	330	2	332 ± 5	4	t
	345 ± 18	20			330 ± 17	3					49 d
	432 ± 26	20			430 ± 17	3					48 d
	738 ± 74	23	696 ± 5	20	742 ± 46	4	717 ± 21	3	678 ± 156	13	53 d
			718 ± 20	13	703 ± 29	3	713 ± 23	3	727 ± 11	7	t

[a] = number of laboratories.

[b] = number of results.

* = d = dissolved, t = total or total recoverable.

TABLE 3.--7/77-12/77

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Aluminum (µg/L)	74 ± 19	16	72 ± 25	18	83 ± 26	7	64 ± 23	11	61 d
			43 ± 35	6	50	1	42 ± 39	5	t
	190 ± 43	13	185 ± 43	27	198 ± 34	13	173 ± 34	14	56 d
			199 ± 38	12	185 ± 34	6	213 ± 40	6	t
	318 ± 35	14	346 ± 6	25	364 ± 43	11	333 ± 79	14	59 d
			310 ± 23	9	324 ± 23	5	293 ± 38	4	t
	373 ± 59	13	380 ± 24	20	379 ± 28	8	381 ± 22	12	57 d
			390 ± 24	9	400	2	387 ± 21	7	t
Antimony (µg/L)	4.5 + 1.3	4			4.5 ± 0.6	6			61 d
	20.3 ± .6	3	18.4 ± 4.4	23	19.7 ± 0.5	9	17.6 ± 5.6	14	59 d
							21.0 ± 1.8	3	t
Arsenic (µg/L)	2.5 ± .9	15	1.9 ± 1.1	18	1.6 ± .5	7	2.2 ± 1.3	11	61 d
							1.2 ± .8	5	t
	5.4 ± 1.3	11	4.1 ± 1.3	20	2.9 ± 1.1	8	4.8 ± .6	12	57 d
							4.4 ± 1.7	7	t
	14.3 ± 4.9	12	11.9 ± 3.2	26	9.8 ± 2.3	13	13.9 ± 2.5	13	56 d
							13.3 ± 1.5	6	t
	20.2 ± 2.7	9	17.4 ± 4.5	25	14.6 ± 3.7	11	19.6 ± 3.9	14	59 d
							23.0 ± 4.1	4	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS no.*
Barium (µg/L)	100 ± 50	10	141 ± 75	27	131 ± 48	13	150 ± 94	14	56 d
			168 ± 135	10	150 ± 58	4	180 ± 174	6	t
	200 ± 30	18	172 ± 75	18	200 ± 0	7	155 ± 93	11	61 d
			250 ± 187	6	100	1	280 ± 192	5	t
	560 ± 50	14	580 ± 82	25	582 ± 41	11	579 ± 105	14	59 d
			522 ± 67	9	540 ± 55	5	500 ± 82	4	t
	790 ± 60	10	810 ± 64	20	788 ± 35	8	825 ± 75	12	57 d
			775 ± 46	8	800	2	767 ± 52	6	t
Beryllium (µg/L)	10 ± 5	11	6.7 ± 5.9	18	10.0± 0.0	7	4.6 ± 6.9	11	61 d
			3.3 ± 5.2	6	10.0± 0.0	1	2.0 ± 4.5	5	t
	11 ± 3	10	8.8 ± 5.1	24	10.0± 0.0	11	7.9 ± 6.9	13	59 d
			7.8 ± 4.4	9	10.0± 0.0	5	5.0 ± 5.8	4	t
	30 ± 6	6	30.0 ± 3.9	27	30.8± 2.8	13	29.3 ± 4.8	14	56 d
			26.7 ± 4.9	12	30.0± 0.0	6	23.3 ± 5.2	6	t
	62 ± 12	6	64.2 ± 5.1	19	70.0± 0.0	8	60.0 ± 0.0	11	57 d
			62.0 ± 6.3	10	66.7± 5.8	3	60.0 ± 5.8	7	t

[a] = number of laboratories.

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Bicarbonate (mg/L)	24.5 ± 2.5	20	25.2 ± 1.4	30	25.3 ± 1.9	13	25.1 ± .8	17	54
	32.6 ± 3.8	21	31.8 ± 2.0	99	31.7 ± 2.8	44	31.9 ± 1.1	55	58
	85.5 ± 7.0	22	85.3 ± 5.0	12	86.2 ± 5.3	6	84.5 ± 5.1	6	62
	122.0 ± 3.5	19	119.3 ± 4.0	44	117.6 ± 4.4	21	120.9 ± 2.9	23	55
	193.4 ± 13.3	29	197.0 ± 4.9	73	195.2 ± 5.7	33	198.5 ± 3.6	40	60
Boron (µg/L)	35 ± 30	10	12.9 ± 13.8	7	11.7 ± 14.7	6	20.0	1	62 d
	50 ± 29	8	29.5 ± 10.8	42	28.4 ± 15.7	19	30.4 ± 3.7	23	55 d
	340 ± 41	9	328 ± 17	30	331 ± 24	13	325 ± 10	17	54 d
	324 ± 40	12			329 ± 42	29			60 d
Bromide (mg/L)	.362 ± .079	4			.37 ± .05	6			60
Cadmium (µg/L)	2.4 ± .6	24	2.1 ± .6	18	2.3 ± .5	7	1.9 ± .7	11	61 d
					2.0	1	<10	5	t
	4.4 ± .9	21	4.3 ± .8	25	4.6 ± .7	11	4.1 ± .8	14	59 d
				9	3.8 ± 1.1	5	<10	4	t
	6.6 ± 2.1	19	5.5 ± .8	20	5.3 ± 1.0	8	5.6 ± .5	12	57 d
				10	6.0 ± 1.0	3	<10	7	t
	9.9 ± 1.8	19	8.9 ± 1.0	27	9.2 ± 1.2	13	8.6 ± .8	14	56 d
			9.0 ± 1.5	11	8.0 ± 2.4	5	9.8 ± .4	6	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Calcium (mg/L)	11.6 ± .7	21	11.8 ± .5	98	11.9 ± .5	43	11.7 ± .5	55	58 d
	26.7 ± 1.4	26	26.6 ± .8	12	27.0 ± .9	6	26.2 ± .4	6	62 d
	36.0 ± 1.8	22	36.0 ± 1.2	43	36.8 ± .9	21	35.3 ± 1.0	22	55 d
	72.4 ± 3.0	35	73.3 ± 2.2	73	73.8 ± 1.4	33	72.9 ± 2.6	40	60 d
	113 ± 6	22	116.2 ± 4.9	29	117.7 ± 4.8	13	115.00 ± 5.2	16	54 d
Chloride (mg/L)	1.71 ± .70	21	1.77 ± .27	99	1.74 ± .33	44	1.79 ± .21	55	58 d
	8.76 ± 2.22	25	7.97 ± .30	12	7.80 ± .26	6	8.13 ± .25	6	62 d
	48.9 ± 1.9	24	49.6 ± 2.7	44	50.0 ± 1.3	21	49.3 ± 3.5	23	55 d
	58.0 ± 1.7	30	57.7 ± 2.1	73	56.9 ± 1.4	33	58.3 ± 2.3	40	60 d
	186 ± 7	23	190.3 ± 4.2	30	190.8 ± 2.8	13	190.0 ± 5.0	17	54 d
Chromium	10.0 ± 1.2	14	9.2 ± 4.9	20	9.9 ± 5.1	8	8.8 ± 5.0	12	57 d
			11.8 ± 6.1	10	13.3 ± 5.8	3	11.1 ± 6.6	7	t
	14.9 ± 3.0	23	11.2 ± 7.3	18	13.4 ± 2.9	7	9.8 ± 9.0	11	61 d
			15.8 ± 10.2	6	20.0	1	15.0 ± 11.8	5	t
	30.3 ± 5.2	20	30.6 ± 6.3	25	29.2 ± 6.4	11	31.6 ± 6.2	14	59 d
			35.6 ± 11.3	9	32.0 ± 8.4	5	40.0 ± 14.1	4	t
	39.2 ± 9.9	19	38.6 ± 8.0	27	35.3 ± 8.6	13	41.6 ± 6.4	14	56 d
			32.6 ± 9.5	11	28.3 ± 9.8	6	37.8 ± 6.7	5	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Cobalt (µg/L)	4.8 ± 1.3	15	4.1 ± 2.1	18	4.7 ± 2.1	7	3.6 ± 2.0	11	61 d
			26.5 ± 25.8	6	5.0	1	30.8 ± 26.3	5	t
	5.8 ± .7	9	4.9 ± 1.3	25	5.4 ± 1.1	11	4.6 ± 1.3	14	59 d
					5.0 ± 1.4	5	<5.0	4	t
	10.0 ± 1.2	14	7.1 ± 1.0	20	6.8 ± .9	8	7.3 ± .9	12	57 d
					6.3 ± .6	3	<50	7	t
	11.7 ± 1.4	7	11.4 ± 1.2	27	11.6 ± 1.4	13	11.1 ± 1.0	14	56 d
					50.0 ± 83.9	5		6	t
Copper (µg/L)	110 ± 5	25	96.5 ± 31.2	18	111.4 ± 3.8	7	86.9 ± 37.3	11	61 d
			85.0 ± 45.9	6	110	1	80.0 ± 49.5	5	t
	196 ± 8	19	206.3 ± 55.1	27	196.2 ± 7.7	13	215.7 ± 76.2	14	56 d
			217.3 ± 41.5	11	210.0 ± 25.5	5	223.3 ± 53.2	6	t
	239 ± 17	19	231.6 ± 14.3	25	234.6 ± 15.7	11	229.3 ± 13.3	14	59 d
			226.7 ± 15.8	9	228.0 ± 8.4	5	225.0 ± 23.8	4	t
	320 ± 14	21	321.5 ± 13.1	20	328.8 ± 12.5	8	316.7 ± 11.5	12	57 d
			328.0 ± 9.2	10	326.7 ± 5.8	3	328.6 ± 10.7	7	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Fluoride (mg/L)	.78 ± .08	19	.77 ± .10	44	.69 ± .05	21	.84 ± .06	23	55 d
	.80 ± .06	25	.78 ± .09	12	.72 ± .08	6	.83 ± .05	6	62 d
	.84 ± .10	27	.84 ± .14	73	.75 ± .05	33	.92 ± .13	40	60 d
	.92 ± .07	17	.92 ± .10	99	.83 ± .06	44	.99 ± .06	55	58 d
	1.03 ± .14	19	.99 ± .10	30	.89 ± .05	13	1.06 ± .05	17	54 d
Iodide (mg/L)	.0540 ± .0043	4			.0480 ± .045	5			60
Iron (µg/L)	40 ±13	22	44.4 ± 7.1	25	43.6 ± 6.7	11	45.0 ± 7.6	14	59 d
			51.1 ± 27.6	9	44.0 ±11.4	5	60.0 ±40.8	4	t
	93 ±17	23	84.4 ± 28.3	18	90.0 ±10.0	7	80.9 ±35.6	11	61 d
			116.7 ± 130.3	6		1	108.0 ±143.8	5	t
	343 ±25	23	354.7 ± 8.3	19	351.3 ±13.5	8	357.3 ±16.2	11	57 d
			334.0 ± 15.1	10	343.3 ± 5.8	3	330.0 ±16.3	7	t
	844 ±66	23	858.2 ± 19.1	27	864.6 ±23.8	13	852.1 ±11.4	14	56 d
			882.5 ± 69.4	12	883.3 ±79.4	6	881.7 ±65.6	6	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Lead (µg/L)	10.6 ± 3.9	20	9.8 ± 4.7	18	12.3 ± 5.3	7	8.3 ± 3.7	11	61 d
					9.0	1	<100	5	t
	19.6 ± 14.4	19	12.8 ± 2.1	27	14.1 ± 2.2	13	11.64 ± 1.01	14	56 d
					14.0 ± 3.6	5	<100	6	t
	20.0 ± 7.3	18	17.7 ± 2.9	20	16.3 ± 4.2	8	18.7 ± 1.2	12	57 d
					13.7 ± 2.3	3	<100	7	t
	16.8 ± 4.8	18	20.5 ± 2.9	25	22.6 ± 3.1	11	18.9 ± 1.2	14	59 d
					19.2 ± 3.6	5	<100	4	t
Lithium	32 ± 4	14	28.9 ± 8.3	18	28.6 ± 3.8	7	29.1 ± 10.4	11	61 d
			25.0 ± 12.2	6	30.0	1	24.0 ± 13.4	5	t
	56 ± 5	12	55.2 ± 5.1	25	53.6 ± 5.1	11	56.4 ± 5.0	14	59 d
			50.0 ± 5.0	9	48.0 ± 4.5	5	52.5 ± 5.0	4	t
	163 ± 8	6	164.0 ± 5.0	20	161.3 ± 3.5	8	165.8 ± 5.2	12	57 d
			147.0 ± 12.5	10	136.7 ± 5.8	3	151.4 ± 12.2	7	t
	338 ± 13	6	338.9 ± 10.1	27	338.5 ± 5.6	13	339.3 ± 13.3	14	56 d
			325.8 ± 25.8	12	316.7 ± 32.0	6	335.0 ± 15.2	6	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Magnesium (mg/l)	2.02 ± .18	21	1.94 ± .14	97	1.94 ± .09	43	1.94 ± .17	54	58 d
	6.74 ± .25	26	6.86 ± .29	12	6.63 ± .15	6	7.08 ± .21	6	62 d
	13.7 ± .7	23	13.75 ± .72	44	13.90 ± .30	21	13.61 ± .94	23	55 d
	15.4 ± 1.0	31	15.64 ± .75	73	15.64 ± .55	33	15.65 ± .89	40	60 d
	59.5 ± 2.0	22	60.21 ± 1.70	29	60.92 ± .95	13	59.63 ± 1.96	16	54 d
Manganese (µg/L)	60 ± 7	22	59.6 ± 11.9	27	56.9 ± 14.9	13	62.1 ± 8.0	14	56 d
			63.3 ± 6.5	12	61.7 ± 4.1	6	65.0 ± 8.4	6	t
	40 ± 6	23	75.0 ±151.4	18	41.4 ± 3.8	7	96.4 ±194.1	11	61 d
			85.0 ±121.6	6	40.0	1	94.0 ±133.7	5	t
	104 ± 7	21	109.0 ± 14.5	20	110.0 ± 21.4	8	108.3 ± 8.4	12	57 d
			104.0 ± 7.0	10	106.7 ± 5.8	3	102.9 ± 7.6	7	t
	158 ± 10	22	155.8 ± 8.3	24	154.6 ± 6.9	11	156.9 ± 9.5	13	59 d
			148.9 ± 10.5	9	156.0 ± 5.5	5	140.0 ± 8.2	4	t
Mercury (µg/L)	.62 ± .23	14	.38 ± .22	25	.46 ± .16	11	.31 ± .24	14	59 d
							.33 ± .38	4	t
	1.97 ± .37	15	1.47 ± .55	18	1.69 ± .19	7	1.33 ± .66	11	61 d
							1.22 ± .69	5	t
	1.67 ± .35	11	1.70 ± .31	27	1.82 ± .35	13	1.60 ± .24	14	56 d
							1.60 ± .13	6	t
	2.25 ± .38	10	1.99 ± .24	20	2.08 ± .22	8	1.93 ± .25	12	57 d
							2.04 ± .45	7	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Molybdenum (µg/L)	2.0 ± .7	5	1.9 ± .6	25	2.4 ± .5	11	1.6 ± .5	14	59 d
			1.9 ± .8	9	2.0 ± .0	5	1.8 ± 1.3	4	t
	31.0 ± 3.9	6	28.3 ± 3.1	27	28.3 ± 4.0	13	28.2 ± 2.3	14	56 d
			27.2 ± 3.1	12	27.0 ± 2.5	6	27.3 ± 3.9	6	t
	39.2 ± 3.3	6	37.3 ± 2.9	20	37.0 ± 3.7	8	37.4 ± 2.3	12	57 d
			37.6 ± 2.7	10	39.3 ± 4.5	3	36.9 ± 4.5	7	t
	43.4 ± 9.5	10	40.4 ±12.0	18	43.3 ±10.5	7	38.6 ±13.0	11	61 d
			32.2 ±16.6	6	34.0	1	31.8 ±18.6	5	t
Nickel (µg/L)	5.1 ± 2.5		3.7 ± 1.8	18	5.1 ± 1.4	7	2.7 ± 1.4	11	61 d
					5	1	<50	5	t
	13.5 ± 9.6		7.6 ± 2.3	27	8.6 ± 2.7	13	6.6 ± 1.2	14	56 d
					10.2 ± 2.0	6	<50	6	t
	10.2 ± 2.9		9.2 ± 1.9	25	9.6 ± 2.7	11	8.9 ± 1.3	14	59 d
					10.8 ± 2.3	5	<50	4	t
	11.3 ± 5.8		11.1 ± 2.3	20	11.4 ± 2.6	8	10.9 ± 2.3	12	57 d
					11.3 ± 4.6	3	<50	7	t
Nitrite as N (mg/L)			.00 ± .00	7	.00 ± .00	6	.00	1	62 d
					.01 ± .03	22			60 d
							.13 ± .02	23	55 d
							.20 ± .01	17	54 d
Nitrate & Nitrate as N (mg/L)			.00 ± .00	7	.00 ± .00	6	.00	1	62 d
			.22 ± .03	36	.17 ± .12	43			58 d
			1.87 ± .07		.20 ± .02	13	.34 ± .03	23	55 d
					1.82 ± .07	13	1.90 ± .06	16	54 d
									60 d

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Nitrate as N (mg/L)	.021 ± .021	17	.01	2	.01	1	.01	1	62 d
	.13 ± .06	21					.11 ± .03	23	55 d
	1.64 ± .16	18					1.70 ± .06	16	54 d
pH	7.53 ± .12	23	7.64 ± .14	30	7.55 ± .13	13	7.71 ± .10	17	54
	7.54 ± .19	23	7.74 ± .14	99	7.70 ± .13	43	7.76 ± .15	56	58
	7.99 ± .23	27	8.05 ± .11	12	8.03 ± .10	6	8.07 ± .11	6	62
	8.33 ± .10	24	8.42 ± .09	44	8.42 ± .07	21	8.42 ± .11	23	55
	8.30 ± .11	34	8.42 ± .10	43	8.38 ± .06	33	8.45 ± .11	40	60
Phosphorus	.344 ± .032	22	.32 ± .016	7	.32 ± .01	6	.35	1	62 d
Potassium	.92 ± .15	23	.94 ± .09	98	1.00 ± .09	43	.89 ± .05	55	58 d
	2.39 ± .30	22	2.37 ± .13	44	2.46 ± .12	21	2.29 ± .08	23	55 d
	4.37 ± .41	23	4.47 ± .26	12	4.27 ± .10	6	4.67 ± .20	6	62 d
	5.23 ± .58	35	5.22 ± .27	73	5.15 ± .30	33	5.27 ± .22	40	60 d
	7.69 ± .53	21	7.57 ± .30	30	7.71 ± .37	13	7.46 ± .18	17	54 d

[a] = number of laborators

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Selenium (µg/L)	3.5 ± .9	11	2.8 ± 1.5	25	3.4 ± .7	11	2.4 ± 1.9	14	59 d
							3.3 ± .5	4	t
	5.4 ± 2.4	10	7.3 ± 1.3	20	7.1 ± .6	8	7.3 ± 1.7	12	57 d
							7.4 ± 2.9	7	t
	7.3 ± 1.3	9	8.3 ± 1.8	27	8.8 ± 1.1	13	7.9 ± 2.2	14	56 d
							8.7 ± 3.6	6	t
	8.4 ± 2.8	16	9.9 ± 3.7	18	10.6 ± 1.1	7	9.5 ± 4.6	11	61 d
							12.2 ± 13.7	5	t
Silica (mg/L)	6.48 ± .49	19	6.86 ± .25	99	6.80 ± .17	44	6.91 ± .30	55	58 d
	6.99 ± .80	14	7.30 ± .31	44	7.30 ± .15	21	7.30 ± .41	23	55 d
	10.3 ± 1.3	18	10.83 ± .58	12	10.67 ± .52	6	11.00 ± .63	6	62 d
	11.2 ± 1.2	21	11.49 ± .58	72	11.13 ± .42	32	11.78 ± .53	40	60 d
	11.2 ± .7	13	11.60 ± .62	30	11.92 ± .28	13	11.35 ± .70	17	54 d
Silver (µg/L)	2.2 ± .4	13	2.2 ± .5	25	2.4 ± .7	11	2.0 ± .0	14	59 d
					2.2 ± .5	5	<10	4	t
	6.6 ± 1.2	18	4.5 ± 1.8	18	5.0 ± 1.3	7	4.2 ± 2.0	11	61 d
					6.0	1	<10	5	t
	5.0 ± 1.3	11	4.8 ± 1.8	20	5.0 ± .9	8	4.6 ± .5	12	57 d
					5.3 ± 1.2	3		7	t
	15.3 ± 4.9	14	12.0 ± 4.7	27	12.0 ± 4.1	13	12.0 ± 5.4	14	56 d
			21.0 ± 19.4	12	12.8 ± 6.8	6	29.2 ± 25.0	6	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Sodium (mg/L)	3.22 ± .24	21	3.30 ± .17	98	3.40 ± .11	43	3.23 ± .17	55	58 d
	22.0 ± .9	25	22.1 ± .3	12	22.0 ± .01	6	22.2 ± .4	6	62 d
	36.8 ± 1.4	23	36.7 ± 1.1	44	35.8 ± .4	21	37.6 ± .8	23	55 d
	74.3 ± 2.5	35	73.9 ± 3.4	73	71.8 ± 2.1	33	75.6 ± 3.3	40	60 d
	144 ± 5	23	146.9 ± 4.7	29	146.9 ± 4.8	13	146.9 ± 4.8	16	54 d
Solids, residue on evaporation at 180°C (mg/L)	61 ± 5.2	20	58.1 ± 5.6	98	60.3 ± 4.9	43	56.4 ± 5.5	55	58 d
	189.3 ± 7.9	19	186.1 ± 7.3	12	188.5 ± 6.6	6	183.7 ± 7.7	6	62 d
	266.6 ± 5.0	17	267.2 ± 8.0	44	270.7 ± 9.4	21	264.0 ± 4.9	23	55 d
	518.2 ± 15.9	27	509.3 ± 7.8	73	513.8 ± 8.7	33	505.7 ± 4.4	40	60 d
	1161 ± 48	20	1160.3 ±24.6	30	1182.3 ± 22.5	13	1143.5 ± 5.3	17	54 d
Solids, RUE at 105°C (mg/L)							71.4 ±12.2	7	58 d
Specific conductance µmhos/cm at 25°C	96.5 ± 3.9	22	96.8 ± 4.0	100	99.1 ± 2.2	44	95.1 ± 4.2	56	58
	300.6 ± 8.3	27	305.2 ± 4.5	12	308.7 ± 1.7	6	301.7 ± 3.3	6	62
	467.7 ± 15.7	23	468.6 ± 5.5	44	469.2 ± 3.2	21	468.0 ± 7.0	23	55
	800.3 ± 18.8	30	803.6 ±11.5	72	809.6 ± 8.6	33	798.5 ±11.3	39	60
	1631 ± 42	21	1629.0 ±20.7	30	1630.0 ± 19.2	13	1628.3 ±22.4	17	54

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable

TABLE 3.--7/77-12/77--Continued

MEAN CONCENTRATION ± STANDARD DEVIATION

Constituent	SRWS	#[a]	Both central laboratories	#[b]	Atlanta	#[b]	Denver	#[b]	SRWS* no.
Strontium (µg/L)	69 ± 3	11	64 ± 30	83	62 ± 14	43	67 ± 40	40	58 d
	269 ± 46	11			230 ± 27	7			61 d
	258 ± 28	11	241 ± 47	7	235 ± 48	6	280	1	62 d
	355 ± 25	10	366 ± 25	36	362 ± 22	20	371 ± 27	16	55 d
	523 ± 38	10	512 ± 34	58	495 ± 17	33	534 ± 38	25	60 d
	1430 ± 130	11	1443 ± 60	21	1348 ± 51	13	1450 ± 76	8	54 d
Sulfate (mg/L)	13.5 ± 2.2	18	13.7 ± 1.9	99	13.8± .9	44	13.7 ± 2.4	55	58 d
	56.9 ± 9.5	21	55.0 ± 2.5	44	53.5± 2.3	21	56.3 ± 2.0	23	55 d
	59.7 ± 4.2	22	61.1 ± 1.9	12	61.5± 1.5	6	60.7 ± 2.3	6	62 d
	144 ± 8	27	144.9 ± 6.3	72	143.9± 5.0	33	145.6 ± 7.2	39	60 d
	537 ± 20	20	536.0 ± 10.4	30	535.4± 9.7	13	536.5 ± 11.2	17	54 d
Vanadium (µg/L)	3.4 ± 1.8	5	2.3 ± .8	5	2.6± 1.1	4	.9	1	62 d
	10.3 ± 4.5	3			7.8± 1.8	18			60 d
Zinc (µg/L)	36 ± 7	18	34 ± 5	19	34 ± 5	8	35 ± 5	11	57 d
			39 ± 3	10	40 ± 0	3	39 ± 4	7	t
	44 ± 9	24	52 ± 36	18	41 ± 4	7	58 ± 45	11	61 d
			67 ± 70	6	40	1	72 ± 85	5	t
	187 ± 20	21	189 ± 8	27	186 ± 10	13	192 ± 4	14	56 d
			188 ± 11	12	180 ± 9	6	195 ± 8	6	t
	336 ± 16	22	328 ± 15	25	319 ± 9	11	334 ± 16	14	59 d
			318 ± 20	9	318 ± 4	5	318 ± 33	4	t

[a] = number of laboratories

[b] = number of results

* = d = dissolved. t = total or total recoverable.

TABLE 4.--Duplicate Analyses: Major Ions and Physcial Determinations

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (mg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (mg/L)	Wisc. FR-35/12E/ 26-0202 (mg/L)	"1 std. dev. range" (mg/L)	"2 std. dev. range" (mg/L)	Wyo. 445546 104382719 (mg/L)	Wyo. 445546 104382720 (mg/L)	"1 std. dev. range" (mg/L)	"2 std. dev. range" (mg/L)
Calcium, dissolved	12.6 110	7 8	17 23	19	19	18-20	16-22	84	82	76-90	70-96
Magnesium, dissolved	22.0 35.6	5 17	20 17	10	9.5	9.2-10	8.8-11	39	39	32-46	26-52
Sodium, dissolved	3.44	9	26	1.4	1.7	1.4-1.7	1.3-1.8	4.7	4.6	4.0-4.7	3.6-5.1
Potassium, dissolved	0.8 5.2	14 11	15 32	.7	.7	.6-.8	.5-.9	2.4	2.4	2.1-2.7	1.9-2.9
Alkalinity as $CaCO_3$	96 154	8 9	19 24	75	77	70-82	64-88	180	180	164-196	148-212
Chloride, dissolved	1.7	16	7	.9	1.3	.9-1.3	.7-1.5	2.8	2.7	2.3-3.2	1.9-3.6
Fluoride, dissolved	0.78	12	3(112 replicates	.1	.0	.0-.1	.1	.9	.9	.8-1.0	.7-1.1
Sulfate, dissolved	13 68.7	13 4	7 3	6.3	6.9	5.7-7.5	4.9-8.3	190	190		
Silica, dissolved	17.4	7	5	13	14	13-14	12-15	22	22	20-24	19-25
Solids, residue at 180°C, dissolved	62.9 525.2	11 4	18 19	93	98	80-106	74-117	460	464	444-480	425-499
Solids, residue at 105°C, dissolved								465	480		

TABLE 4.--Duplicate Analyses: Major Ions and Physcial Determinations (Cont.)

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (mg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (mg/L)	Wisc. FR-35/12E/ 26-0202 (mg/L)	"1 std. dev. range" (mg/L)	"2 std. dev. range" (mg/L)	Wyo. 445546 104382719 (mg/L)	Wyo. 445546 104382720 (mg/L)	"1 std. dev. range" (mg/L)	"2 std. dev. range" (mg/L)
Solids, residue at 105°C, suspended								2	4		
Specific Conductance	1250[a]	2	29					674[a]	674[a]	661-687[a]	647-701[a]
pH	7.71[b]	.16[c]	43	---	---	---	---	6.4[b]	7.3[b]		
Color, total recoverable	---	---	---	0[d]	0[d]			---	---	---	---
Turbidity	---	---	---	0[e]	0[e]			---	---	---	---

[a] Results n µmhos/cm at 25°C.

[b] Standard pH units.

[c] "Standard deviation" in standard pH units.

[d] Platinum-cobalt units.

[e] Nephlometric turbidity units.

TABLE 5.--Duplicate Analyses: Nutrients

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (mg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (mg/L)	Wisc. FR-35/12E/ 26-0202 (mg/L)	"1 std. dev. range" (mg/L)	"2 std. dev. range" (mg/L)	Wyo. 445546 104382719 (mg/L)	Wyo. 445546 104382720 (mg/L)	"1 std. dev. range" (mg/L)	"2 std dev. range" (mg/L)
Nitrogen, nitrite plus nitrate as N, dissolved	0.46	4	15	---	---	---	---	0.21	0.22	0.21-0.22	0.20-.23
total	.46	>4		0.35	0.36	0.34-0.37	0.33-0.38	---	---	---	---
Nitrogen, ammonia as N, dissolved	.22	17[a]	2 (99 replicates)	---	---	---	---	.03	.04	.03-.04	.02-.05
total	.22	>17[a]		.00	.01	.00-.01	00.-.01	---	---	---	---
Nitrogen, ammonia plus organic as N, dissolved	.38	18[a]	2 (110 replicates)	---	---	---	---	.21	.17	.16-.22	.12-.26
total	.38	>18[a]		.16	.07	.09-.14	.07-.16	.16	.21	.15-.22	.12-.25
Phosphorus, orthophosphate as P, dissolved	.05	20[a]	2 (44 replicates)	.01	.01	.01	.01	---	---	---	---
Phosphorus, as P dissolved	.197	12[a]	1 (110 replicates)	.01	.02	.01-.02	.01-.02	.01	.01	.01	.01
total	.197	>12[a]	---	.01	.01	.01	.01	---	---	---	---

[a] Relative deviation is based on analyses of artificial samples prepared in a deionized water matrix; it is expected that the relative deviation will be larger for analysis of natural water samples.

TABLE 6.--Duplicate Analyses: Trace Constituents

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (µg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (µg/L)	Wisc. FR-35/12E/ 26-0202 (µg/L)	"1 std. dev. range" (µg/L)	"2 std. dev. range" (µg/L)	Wyo. 445546 104382719 (µg/L)	Wyo. 445546 104382720 (µg/L)	"1 std. dev. range" (µg/L)	"2 std dev. range" (µg/L)
Aluminum, dissolved	75	23	4	---	---	---	---	0	10	0-10	0-10
total rec	75	>23		10	20	10-20	10-20	---	---	---	---
Arsenic, dissolved	4.3	58	3	---	---	---	---	0	0		
total	4.3	>58		1	2	1-2	1-2	---	---	---	---
Barium, dissolved	162	38	16	---	---	---	---	200	200	100-300	100-300
Cadmium, dissolved	2.5	22	6	---	---	---	---	0	0		
total rec	2.5	>22		0	0			---	---	---	---
Chromium, hexa-valent, dissolved	8	25	3	0	0			---	---	---	---
Chromium, dissolved	22	27	10	---	---	---	---	0	0		
total rec	22	>27	>10	<10	20	0-20	---	---	---	---	---
Cobalt, dissolved	5	20	5	---	---	---	---	---	---	---	---
total rec	5	>20		0	0			---	---	---	---
Copper, dissolved	25	23	5	---	---	---	---	0	0		
total rec	25	>23		2	1	1-2	1-2	---	---	---	---
Iron, dissolved	118	13	2 (40 replicates)	60	50	50-60	40-70	1900	1900	1800-2000	1700-2100
	991	6	2 (39 replicates)								
total rec	118	>13		100	40	60-80	50-90	---	---	---	---
	991	> 6									

TABLE 6.--Duplicate Analyses: Trace Constituents (Cont.)

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (µg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (µg/L)	Wisc. FR-35/12E/ 26-0202 (µg/L)	"1 std. dev. range" (µg/L)	"2 std. dev. range" (µg/L)	Wyo. 445546 104382719 (µg/L)	Wyo. 445546 104382720 (µg/L)	"1 std. dev. range" (µg/L)	"2 std. dev. range" (µg/L)
Lead, dissolved	4	38	7	---	---	---	---	0	0		
total rec	4	>38		11	2	3-8	3-11	---	---	---	---
Lithium, dissolved	54	9	10	---	---	---	---	9	9	8-10	7-11
Manganese, dissolved	70.4	20	23	10	10	10	10	170	160	150-180	140-190
	256	9	34								
total rec	70.4	>20		10	10	10	10	---	---	---	---
	256	> 9									
Mercury, dissolved	.72	11	single operator	---	---	---	---	0.0	0.0		
total rec	.60	>46	15	<.5	<.5			---	---	---	---
Molybdenum, dissolved	2.0	36	5	---	---	---	---	24	24	21-27	19-29
	29.7	11	4								
total rec	2.0	>36		0	2	1	0-2	---	---	---	---
	29.7	>11									
Nickel, dissolved	5.9	37	8	---	---	---	---	---	---	---	---
total rec	5.9	>37		7	5	4-8	2-10	---	---	---	---
Selenium, dissolved	3.5	29	6	---	---	---	---	4	5	3-6	2-7
total rec	3.5	>29		0	0			---	---	---	---
Strontium, dissolved	1400	9	8	---	---	---	---	1700	1700	1500-1900	1400-2000

TABLE 6.--Duplicate Analyses: Trace Constituents (Cont.)

Constituent	Precision data from draft TWRI book 5, ch. A1 (1978)			Duplicate Set #1 Atlanta Central Laboratory				Duplicate Set #2 Denver Central Laboratory			
	At mean of (µg/L)	Relative deviation is (percent)	Based on data from (labs)	Wisc. FR-35/12E/ 33-0188 (µg/L)	Wisc. FR-35/12E/ 26-0202 (µg/L)	"1 std. dev. range" (µg/L)	"2 std. dev. range" (µg/L)	Wyo. 445546 104382719 (µg/L)	Wyo. 445546 104382720 (µg/L)	"1 std. dev. range" (µg/L)	"2 std. dev. range" (µg/L)
Silver, dissolved	3.2	14	5	---	---	---	---	---	---	---	---
total rec	3.2	>14		0	0			---	---	---	---
Vanadium, dissolved	1.7	43	2 (24 replicates)	---	---	---	---	0.0	0.0		
Zinc, dissolved	41	35	35	---	---	---	---	0	2	1	0-2
total rec	41	>35		10	10	10	10-20	---	---	---	---
Boron, dissolved	40	68	4	---	---	---	---	30	30	10-50	0-71
total rec	40	>68		0	0			---	---	---	---
Bromide, dissolved	.100 mg/L	3	single operator	---	---	---	---	0.0 mg/L	0.0 mg/L		
Cyanide, total rec.	041 mg/L	2	single operator	0.00 mg/L	0.00 mg/L			---	---	---	---
Iodide, dissolved	.34 mg/L	88	3	---	---	---	---	0.00 mg/L	0.00 mg/L		
Sulfide, total				0.0 mg/L	0.0 mg/L			0.6 mg/L	0.9 mg/L		

TABLE 7.--Duplicate Analyses: Radiochemical Determinations

Constituent	Precision from TWRI, 1977, book 5, ch. A5	Duplicate Set, Denver Central Laboratory, Wyo. 445546 104382719	Duplicate Set, Denver Central Laboratory, Wyo. 445546 104382720
Gross alpha radioactivity, dissolved (µg/L as U natural)	± 20%	11 - 465	<6.2 - 480
Gross beta radioactivity, dissolved (pCi/L as Cs-137)	± 20%	4.4	3.4
Gross alpha radioactivity, suspended (µg/L as U natural)	± 20%	<0.4	<0.4
Gross beta radioactivity, suspended (pCi/L as Cs-137)	± 20%	0.6	0.8
Potassium-40, dissolved (pCi/L as k-40)		460[a]	458[a]

[a] Values are calculated from potassium, dissolved.

TABLE 8.--Duplicate Analyses: Organic Determinations

Determination	Duplicate Set #1 Atlanta Central Laboratory		Duplicate Set #2 Denver Central Laboratory	
	Wisc. FR-35/12E/ 33-0188	Wisc. FR-35/12E/ 26-0202	Wyo. 445546 104382719	Wyo. 445546 104382720
Carbon, organic dissolved (mg/L as C)	---	---	0.2	0.0
Methylene blue active substances, total (mg/L as ABS)	0.0	0.3	---	---
Oil and grease, total (mg/L)	---	---	0.0	0.0
Phenols, total (µg/L as phenol)	0	0	---	---

TABLE 9.--Nutrients: 11/77-12/77

Determination	Theoretical value (mg/L)	Both central laboratories				Atlanta				Denver			
		Mean (mg/L)	Relative deviation (%)	Bias (%)	No. of determinations	Mean (mg/L)	Relative deviation (%)	Bias (%)	No. of determinations	Mean (mg/L)	Relative deviation (%)	Bias (%)	No. of determinations
Nitrogen, ammonia dissolved	.23	.227	± 22	- 1	75	.236	± 6	+3	28	.221	±28	- 4	47
	1.59	1.518	± 7	- 5	79	1.572	± 7	-1	28	1.488	± 8	- 6	51
Nitrogen, ammonia plus organic, dissolved	.41	.371	±19	-10	96	.420	± 8	+2	38	.338	±20	-18	58
	3.51	3.297	± 6	- 6	98	3.468	± 3	-1	38	3.189	± 5	- 9	60
Nitrogen, nitrite plus nitrate, dissolved	.11	.121	±16	+10	75	.119	±10	+8	27	.122	±18	+11	48
	.38	.407	± 8	+ 7	80	.380	± 3	-0-	27	.421	± 7	+11	53
Phosphorus, dissolved	.20					.210	± 3	+5	42				
	.66					.668	± 2	+1	44				
Phosphorus, orthophosphate, dissolved	.052	.050	±20	- 4	49	.050	± 7	-4	27	.050	±28	- 4	22
	.190	.168	±16	-12	53	.183	± 3	-4	27	.152	±21	-20	26

TABLE 10.-- Trace Metals: Low Concentrations

Constituent	Theoretical value (µg/L)	Denver Central Laboratory[a] Mean (µg/L)	Relative deviation (%)	Apparent bias (%)	No. of determinations	SRWS no.	Dilution
Cadmium	.057	.059	±22	+ 9	10	52	1/50
	.235	.246	±12	+ 5	10	49	1/20
	.339	.310	±12	- 9	23	57	1/20
	.54	.662	±11	+23	11	NBS[b]	
	2.85	2.31	±16	-19	11	52	
Chromium	.476	.373	±18	-21	11	57	1/20
	3.03	2.913	± 4	- 4	4	59	1/10
	3.18	3.608	±10	+13	6	48	1/10
	6.29	5.199	± 4	-17	10	52	
	9.53	8.965	± 9	- 6	11	57	
Cobalt	.4	.667	±16	+67	11	NBS[c]	
	5.18	5.131	±12	- 1	8	49	
	7.78	7.417	± 5	- 5	7	57	
	9.36	9.413	± 3	+ 1	10	53	
Copper	1.63	1.632	±10	<+ 1	10	52	1/50
	4.07	4.059	± 7	<- 1	11	52	1/20
	9.23	9.395	± 9	+ 2	14	48	1/25
	9.80	9.520	± 4	- 3	6	56	1/20
	19.3	18.433	± 4	- 4	14	NBS[b]	1/20
Lead	.68	1.126	±30	+66	9	NBS[b]	
	2.29	2.262	±25	-14	12	49	1/10
	11.77	6.945	± 6	-41	11	52	
	20.00	19.649	±11	- 2	7	57	

TABLE 10.-- Trace Metals: Low Concentrations (Cont.)

Constituent	Theoretical value (µg/L)	Denver Central Laboratory[a] Mean (µg/L)	Relative deviation (%)	Apparent bias (%)	No. of determinations	SRWS no.	Dilution
Nickel	1.35	.907	±32	-33	9	56	1/10
	9.31	7.024	±11	-25	14	49	
	11.73	11.788	± 5	<+ 1	10	57	
	21.42	17.248	± 5	-19	13	53	
Silver	.227	.225	±12	- 1	3	57	1/20
	.254	.222	± 7	-12	5	49	1/25
	2.19	1.870	±13	-14	12	59	
	4.54	4.779	±15	+ 5	10	57	
Zinc	1.95	2.414	±22	+24	9	57	1/20
	3.80	3.622	±22	- 5	26	56	1/50
	5.2	6.172	±20	+18	11	NBS[b]	1/50
	8.67	15.612	± 8	+80	5	48	1/50

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[a] All analyses performed using graphite furnace and atomic absorption spectrometry.

[b] Digestion of NBS (liver bovine extract) certified sample.

[c] NBS estimated value.

TABLE 11.--Radiochemical Determinations

Determination	Multi-laboratory				Denver Central Laboratory					
	Theoretical value	Mean	Standard deviation	No. of labs	Mean	Standard deviation	No. of analyses	Relative deviation	% Bias (based on theoretical value)	% Bias (based on multi-lab value)
Gross beta radioactivity, dissolved (pCi/L as Sr-90)	12	16.3	6.0	59	12.2	± 4.0	4	± 27%	+ 8%	-20%
	15	15.9	3.6	42	16.3	± .6	3	± 4%	+ 9%	+ 3%
	49	51.2	9.5	65	52.3	± 1.5	3	± 3%	+ 7%	+ 2%
Radium -226 (pCi/L)	3.5	---	---	---	3.12	.06	3	2%	-11%	---
	5.1	---	---	---	4.80	.75	3	16%	- 6%	---
Strontium -89 (pCi/L)	14	14.9	4.3	28	16.7	.6	3	± 4%	+19%	+12%
Strontium -90 (pCi/L)	10	9.2	2.2	28	9.3	.6	3	± 6%	- 7%	+ 1%
Tritium	970	1008	197	52	1123	46	3	±4%	+16%	+11%
	980	1000	172	55	927	31	3	±3%	-5%	- 7%
	1060	1098	219	50	1053	76.5	3	±7%	-1%	- 4%
	1970	1988	258	50	2117	40.4	3	±2%	+7%	+ 6%

TABLE 12.--Unknown Replicates: Gross Alpha and Beta Radioactivity and Uranium

Determination	Date submitted to laboratory										Mean + Standard Deviation	Relative Deviation
	6/11	6/17	6/22	6/30	7/7	7/14	7/19	7/26	8/3	8/9		
Gross alpha radioactivity, dissolved (µg/L as U natural)	2.7	3.6	3.6	3.5	3.4	4.6	3.5	3.5	2.3	2.5	3.32 ± .67	20%
Gross beta radioactivity, dissolved (pCi/L as Cs-137)	3.2	2.8	3.5	3.2	3.3	2.7	2.8	3.1	5.9[a]	2.9	3.06 ± .27	9%
Uranium, dissolved (µg/L as U)	2.4	1.7	1.9	2.1	2.2	2.4	2.3	3.0	2.1	2.3	2.24 ± .35	16%

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[a] Outlier, not used in computation of standard deviation.

TABLE 13.--Radium-226

Radon emanation method

Mean (pCi/L)	Relative deviation (percent)	Number of determinations
.036	58	4[c]
.088	36	5[c]
.124	27	5[d]
.221	13	5[d]
.522[a]	7	9[c]
.822	9	6[c]
1.415	9	7[c]
10.14[b]	5	5[e]
10.92	55	4[c]
12.85	5	6[f]
290	4	6[f]

[a] 0.50 pCi/L standard.

[b] 10.0 pCi/L standard.

[c] Different cell and different instrument used for each reading.

[d] Two of the five readings were made using the same cell. Instrument different in each case.

[e] All readings made using same cell. Instruments different.

[f] Two of the six readings were made using the same cell.

TABLE 14.--Duplicate Analyses of Gross α Radioactivity

Gross α, dissolved (μg/L as U natural)		Gross α, suspended (μg/L as U natural)	
Mean	Difference	Mean	Difference
1.95	.3	.6	.2
2.1	.4	.65	.3
4.9	2.8	.75	.1
6.9	5.6	1.2	.4
7.3	1.0	1.3	.2
7.75	2.7	1.6	.4
10.8	6.4	2.1	.6
13	4	2.15	.9
14	6	2.45	.3
57.5	11	3.15	.3
60	10	5.5	.6
64.5	9	14	4
69	16	22.5	5
70.9	4.4	23.2	3
135	10		
205	30		
315	30		

TABLE 15.--Duplicate Analyses of Gross β Radioactivity

Gross β, dissolved (pCi/L as Cs-137)		Gross β, dissolved (pCi/L as Cs-137)		Gross β, suspended (pCi/L as Cs-137)	
Mean	Difference	Mean	Difference	Mean	Difference
1.05	.1	5.85	.5	.45	.1
1.3	0	6.3	.3	.6	0
1.4	.2	6.5	0	.65	.1
1.4	.2	6.95	.7	.7	0
1.55	.3	8.8	1.4	.75	.1
1.65	.7	10.5	1.9	.8	.2
1.75	1.1	10.75	.3	.9	.4
1.8	.4	10.75	2.5	1.0	0
1.8	.4	11	0	1.25	.3
1.85	.1	12	0	1.4	.4
2.3	.2	14.5	5	1.75	.1
2.35	.7	15	0	2.0	0
2.4	.6	15.5	1	2.3	0
2.5	.8	18.9	.4	2.3	.2
2.55	.1	19.5	3	3.45	.3
2.75	.3	32.5	7	4.1	0
2.8	0	37	0	5.3	.6
2.9	.4	42.5	9	7.95	.5
3.1	1.6	57.5	1	13.5	1
3.3	.4	59.5	1	40	2
3.3	1.2	59.5	3		
3.35	1.1	145	10		
3.35	1.1	195	30		
3.45	.1	255	50		
3.55	.1	265	10		
3.8	1.2				
4.55	.5				
4.75	.7				
4.8	1.4				
4.9	0				
5.25	1.9				

TABLE 16.--Duplicate Analyses of Radium-226

Mean	Difference	Mean	Difference
.08	.02	.96	.02
.085	.01	1.7	.2
.095	.01	2.06	.10
.10	.00	10.25	.3
.10	.02	12.05	.9
.11	.10	14.5	1
.115	.01	14.95	1.1
.12	.02	29.9	.6
.12	.04	30	.0
.12	.04	48	2
.225	.01	242	4
.255	.09	323	4
.265	.05	350	60
.31	.00	337.5	5
.52	.06	423.5	11
.95	.02		

TABLE 17.--Insecticides, total

(Data from Atlanta Central Laboratory, 10/27/77 thru 2/7/78)

Insecticide	Bias	Based on
Diazinon, total	- 7%	17 spikes
Aldrin, total	-37%	17 spikes
Dieldrin, total	-24%	17 spikes
DDD, total	-21%	17 spikes
DDT*, total	-37%	17 spikes

*Three determinations showed a bias of >-50%, the others were <-25%.

Table 18.--Organochlorine insecticides, total in bottom material.

(Data from Atlanta Central Laboratory 10/17/77 thru 1/23/78)

Insecticide	Bias	Based on
Aldrin, total in bottom material	-14 %	7 spikes
Dieldrin, total in bottom material	-16 %	7 spikes
DDD, total in bottom material	- 6 %	7 spikes
DDT, total in bottom material	- 4 %	7 spikes
Endrin, total in bottom material	-22 %	7 spikes
Heptachlor, total in bottom material	<- 1 %	7 spikes
Heptachlor, epoxide, total in bottom material	- 9 %	7 spikes
Lindane, total in bottom material	-21 %	7 spikes

TABLE 19.--Organophosphorus Insecticides, Total in Bottom Material

Insecticide	Concentration[a], (µg/kg)	Bias, % (OV-101 column)	Bias, % (OV-210 column)	Bias, % "Result"[b]
Diazinon, total in bottom material	2.53 24.6	- 7 -10	- 4 - 5	- 9 -10
Dursban, total in bottom material	3.87 37.8	---[c] +43[c]	+ 9 - 9	--- ---
Malathion, total in bottom material	6.61 64.3	-36 -10	-50 -21	-50 -25
Methyl parathion, total in bottom material	3.37 32.9	+ 6 -12	- 3 +24	- 3 -12
Parathion, total in bottom material	3.65 35.6	-13[c] ---[c]	- 9 <- 1	--- ---
Trithion, total in bottom material	4.03 39.3	-12 - 2	-14 -10	-14 -10

[a] Concentration is mean of 3 spiked subsamples of a bottom material sample; computed from memo of 8/25/77 by W. R. White.

[b] Based on lowest value from the two columns.

[c] Interference on OV-101 column.

TABLE 20.--Duplicate Analyses* of Organochlorine Insecticides, Total in Bottom Material

Insecticide, total in bottom material	Central Laboratory	Mean (µg/kg)	Difference (µg/kg)	$\frac{\text{Difference}}{\text{Mean}} \times 100\%$
Aldrin	Denver	0.7	0	0
Chlordane	Denver	.5	1	200
	do	1	0	0
	Atlanta	2.15	1.7	79
	do	2.75	.1	4
	Denver	6	0	0
	do	17	0	0
	do	21.5	9	42
	do	75	42	56
DDD	Denver	.15	.1	67
	do	.45	.3	67
	do	.6	0	0
	do	.6	0	0
	Atlanta	.65	.4	62
	Denver	.7	.4	57
	do	1	0	0
	Atlanta	1.85	.1	5
	Denver	2.45	2.7	110
	do	3.6	.6	18
	do	4.4	0	0
	Atlanta	7.9	3.0	38
	Denver	47	2	4
DDE	Denver	.1	0	0
	do	.1	.2	200
	do	.4	0	0
	Atlanta	.45	.1	22
	Denver	.9	.4	44
	do	1.05	.1	10
	do	1.25	.1	8
	do	1.35	.3	22
	Atlanta	2.2	.4	18
	do	4.05	2.5	62
	do	14.25	2.5	18
	Denver	23	4	17
DDT	Denver	.05	.1	200
	do	.25	.1	40
	do	.35	.7	200
	do	.65	.3	46
	Atlanta	.73	.4	55
	do	2.85	3.1	109
	do	3.4	.2	6
	Denver	3.65	.5	14

TABLE 20.--Duplicate Analyses* of Organochlorine Insecticides, Total in Bottom Material (Cont.)

Insecticide, total in bottom material	Central Laboratory	Mean (µg/kg)	Difference (µg/kg)	$\frac{\text{Difference}}{\text{Mean}} \times 100\%$ (%)
Dieldrin	Denver	.1	0	0
	do	.1	0	0
	do	.15	.1	67
	do	.2	0	0
	do	.35	.1	29
	do	.4	0	0
	do	.65	.1	15
	do	.7	.6	86
	Atlanta	2.4	.8	33
	do	3.05	.9	30
	Denver	3.3	.2	6
	Atlanta	20.5	1	5
Heptachlor epoxide	Denver	.65	.1	15
Lindane	Denver	.25	.1	40
Toxaphene	Denver	44	2	4

*0 values are not included in table.

Table 21.--Duplicate analysis of PCB, total in bottom material.

Sample 1 (µg/kg)	Sample 2 (µg/kg)	Mean (µg/kg)	Difference (µg/kg)	$\frac{\text{Difference}}{\text{Mean}} \times 100\%$ (%)
Denver				
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1	1	1	0	0
1	1	1	0	0
2	0	1	2	200
2	2	2	0	0
3	4	3.5	1	29
5.2	4.1	4.65	1.1	30
6.7	4.6	5.65	2.1	37
6.2	6.6	6.4	.4	6
9	5	7	4	57
13	2	7.5	11	147
7.1	10	8.55	2.9	34
12.9	12.7	12.8	.2	2
13.6	15.2	14.4	1.6	11
15.8	13.8	14.8	2.0	14
15.8	14.0	14.9	1.8	12
12	20	16	8	50
19.0	18.7	18.85	0.3	2
21.4	16.7	19.05	4.7	26
26	26	26	0	0
16.9	37.2	27.05	20.3	75
26	52	39	26	67
49	97	73	48	66
79	80	79.5	1	1
110	76	93	34	36
110	92	101	18	18
140	140	140	0	0
218	135	176.5	83	47
680	220	450	460	102
2,400	2,100	2,250	300	13
4,000	4,200	4,100	200	5
16,000	29,000	22,500	13,000	58
34,000	38,000	36,000	4,000	11
70,000	85,000	77,500	15,000	19
Atlanta				
13.3	24.5	18.9	11.2	59
50.0	53.0	51.5	3.0	6

GRAPH 32.--PCB, TOTAL IN BOTTOM MATERIAL