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Oscar Experiment High-Density Network Data Report

Event 2 April 13, 1981

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December 1984

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DATA REPORT
Event 2 - April 13, 1981

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Richland, Washington 99352

PREFACE

This report is one of a series of four reports that summarize data taken by Pacific Northwest Laboratory at the high-density network component of the Oxidation and Scavenging Characteristics of April Rains (OSCAR) experiment in April 1981. Four storm events were studied during the experiment, and a separate report has been prepared for each event:

- PNL-5152, Pt. 1. Event 1 - April 8-9, 1981
- PNL-5152, Pt. 2. Event 2 - April 13, 1981
- PNL-5152, Pt. 3. Event 3 - April 16-17, 1981
- PNL-5152, Pt. 4. Event 4 - April 21-23, 1981

The OSCAR experiment was a cooperative project, and reports from other participants are noted in the introduction.

SUMMARY

The OSCAR (Oxidation and Scavenging Characteristics of April Rains) experiment, conducted during April 1981, was a cooperative field investigation of wet removal in cyclonic storm systems. The high-density component of OSCAR was located in northeast Indiana and included sequential precipitation chemistry measurements on a 100 by 100 km network, as well as airborne air chemistry and cloud chemistry measurements, surface air chemistry measurements, and supporting meteorological measurements.

Four separate storm events were studied during the experiment. This report summarizes data taken by Pacific Northwest Laboratory (PNL) during the second storm event, April 13. The report contains the high-density network precipitation chemistry data, cloud chemistry data from the PNL DC3 aircraft, and meteorological data for the event, including standard National Weather Service products and radar and rawinsonde data from the network.

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SECTION 1

INTRODUCTION

The Oxidation and Scavenging Characteristics of April Rains (OSCAR) experiment, conducted during April 1981, was a cooperative field investigation of wet removal by cyclonic storms. The design and operational aspects of the experiment have been described in detail in an earlier report⁽¹⁾, and a brief summary is given below. This report is one of a series of four volumes that present data collected at the high-density network during each of the four OSCAR storm events. This particular report covers the April 13, 1981, storm event.

The report is divided into three sections: meteorological data, precipitation chemistry data, and aircraft data. It should be noted that the report is limited in scope to data collected by Pacific Northwest Laboratory (PNL) participants in the experiment. Other relevant data collected at the high density network are being/have been reported elsewhere and include: Brookhaven National Laboratory (BNL) surface air chemistry and aircraft data,^(a) Argonne National Laboratory (ANL) aerosol data,⁽²⁾ and hydrogen-peroxide measurements made by G. Kok.⁽³⁾

The primary design requirement for OSCAR was to characterize, in as much detail as possible, the physicochemical and dynamical features of selected cyclonic (or "frontal") storm systems as they traversed the eastern portion of the North American continent. The formal objectives of the study were:

- To assess spatial and temporal variability of precipitation chemistry in cyclonic storm systems and to test the adequacy of existing networks to characterize this variability
- To provide a comprehensive, high-resolution data base for prognostic, regional deposition model development

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(a) Benkovitz, C. M. et al. Oxidation and Scavenging Characteristics of April Rains Data Report. Report in preparation by Atmospheric Sciences Division of Brookhaven National Laboratory, Upton, Long Island, New York for U.S. Environmental Protection Agency.

- To provide a comprehensive, high-resolution data base for prognostic, regional deposition model development
- To develop increased understanding of the transport, dynamical, and physicochemical mechanisms that combine to make up the composite wet-removal process, and to identify source areas responsible for deposition at receptor sites.

The OSCAR field experiment was designed to maximize the attainment of these goals, within the practical and financial limitations imposed. Two complementary, sequentially operated precipitation chemistry networks formed the foundation of the experiment. Spatial and temporal resolution were the primary factors considered in network design. A nested high-density and intermediate-density network design was chosen to allow both regional coverage over the MAP3S/RAINE geographical region, and intensive measurements over a limited area to resolve wet-removal mechanisms in cyclonic storms. The networks are depicted schematically in Figures 1.1 and 1.2. The high-density network consisted of 47 stations in a 110 by 110 km area in northeast Indiana/northwest Ohio.

Additional measurements in support of the two networks characterized surface and aloft air chemistry, cloud chemistry, and meteorological variables. The April operational period for OSCAR was chosen so that most precipitation would be rain rather than snow and the storm systems would still be more cyclonic rather than convective in nature.

FIGURE 1.1. DSCAR Intermediate-Density Sampling Station and High-Density Network Position

FIGURE 1.2. Organization of the OSCAR High-Density Precipitation Chemistry Network. Numbers indicate Sampling Site Locations. Site 62 Coincided with the Surface Air Chemistry Site. The Weather Radar and Rawinsonde Were Located at FWA (Fort Wayne Airport).

SECTION 2

METEOROLOGICAL DATA

The second event of the OSCAR experiment occurred on April 13, 1981, for the high-density network. Surges of precipitation, however, crossed the high-density network on April 11, 12, and 14 as well. Most of the intermediate-density network sites north of the Ohio River also received precipitation from these cells.

Surface weather maps covering the high-density network region are shown for 3 hour intervals during the precipitation chemistry sampling period and for longer intervals prior to and following the sampling period (Figures 2.1 through 2.14). Constant level charts for 850 mb and 700 mb at 12-hour intervals are shown for the period of sample collection (Figures 2.15 through 2.20). A sequence of radar echo photographs from the Fort Wayne, Indiana (FWA), National Weather Service office portray the series of precipitation cells that passed over the high-density network on the 13th (Figures 2.21 through 2.24). A single temperature and moisture profile was constructed from rawinsonde data taken at FWA during the sampling period (Figure 2.25). Plots of hourly and total precipitation amounts over the network are also included (Figures 2.26 through 2.32). Constant-level back trajectories have been constructed to provide indications of the origins of air parcels arriving at FWA during different stages of the event (Figures 2.33 through 2.34).

From April 11 to April 15, a series of complex weather systems traversed the eastern United States north of 36 deg N. latitude. During this period, there were four rather well-defined precipitation areas that moved over the intermediate-density network. The first moved from Missouri to New Jersey between 1200 Greenwich Mean Time (GMT), April 11 and 1200 GMT, April 12. The second passed from Iowa to the Atlantic between 0000 GMT, April 12 and 0600 GMT, April 13. The third, which moved from Illinois to western Pennsylvania between 0600 GMT, April 13 and 0000 GMT, April 14, was the one sampled at the high-density network. This precipitation surge was of shorter duration and lesser extent than the other three. The fourth, which featured

heavy thunderstorms, accompanied the occlusion and cold front that crossed the northeast states from Minnesota to the east coast between 1200 GMT, April 13 and 0000 GMT, April 15.

On April 11 at 1200 GMT, (Figure 2.1) a cold front extended from a low north of New England across the Great Lakes to a small low in western Kansas. A warm front had moved northward during the night across Illinois, Indiana and Ohio and was stationary on an east-west line from western New York through Iowa to the low in Kansas. Periods of precipitation associated with this frontal zone occurred in the Fort Wayne area on April 11. A Bermuda-type high pressure area extended into the southeastern states and another high was centered south of western Hudson Bay. The Kansas low was forecast to develop and move eastward. The decision was made to sample this expected storm, and a preliminary alert was given to some western stations of the intermediate-density network that evening.

By 0000 GMT, April 12, the two fronts had merged and extended along the St. Lawrence River Valley through the lower Great Lakes to Chicago and westward. A trough had formed through eastern New England, New Jersey, and westward through West Virginia to Indiana. Showers were occurring both north and south of the front and thunderstorms were occurring in the vicinity of the trough, but the decision was made to await the development of the low center in Kansas before activating the intermediate-density network.

By 0600 GMT, April 12, the front had moved southward and extended from New Jersey westward to the small low in Kansas. The trough had merged with the east-west front. The high pressure area centered over western James Bay continued to force the front southward. A new stationary front extended southeastward to northwest Nebraska from a low in Montana.

At 1200 GMT, April 12 (Figure 2.2), the old stationary front now extended from a very shallow low in Maryland, westward through northern Ohio and Indiana to the weak low in central Kansas. The stationary front from the low center in western Canada angled southeast toward the low in Kansas. Scattered showers and thundershowers occurred along the first mentioned front as it drifted southward across the high-density network at about 1500 GMT on the 12th. Only small and spotty precipitation areas showed on the FWA radar after the frontal

passage. No sampling of this precipitation event occurred at the high-density network. This area of precipitation had moved on eastward by 0000 GMT, April 13 (Figures 2.3, 2.4). Following its passage the precipitation collectors were set out on the high-density network at 2100 GMT (afternoon, local time) on the 12th.

From 0300 to 0900 GMT, April 13, the front slipped south to a position from northern North Carolina through southern Indiana to the weak Kansas low (Figures 2.5 to 2.7). An area of showers and thundershowers in the frontal zone was moving toward Indiana from Illinois. The high pressure area to the north had moved east and was now north of New England. A lobe from this high pressure cell extended south along the East Coast, and high pressure persisted over the southeast and Gulf states. A weak low had recently formed in South Dakota on the front from the Canadian low.

By 1200 GMT, April 13, the cold front from the Canadian low angled across Minnesota and was approaching the stationary front located in northern Missouri through Indiana to North Carolina (Figure 2.8). The Canadian high was centered north of Maine with a lobe still extending southward to North Carolina. Site operators in the western portion of the intermediate-density network were alerted at this time because the cold front from Minnesota southward was expected to trigger the development and movement of a more active frontal system out of the Kansas low. The area of rain and thundershowers moving along the stationary front from the west had nearly reached the high-density network at this time.

Precipitation occurred intermittently over the high-density network after 1200 GMT on the 13th (Figures 2.27-2.29). Aircraft sampling commenced about 1500 GMT (Figure 2.9) after thunderstorms had moved east of FWA. Areas of showers continued to approach FWA from the west; however, the sampling aircraft had difficulty in locating coherent precipitation areas along its sampling track. As seen in Figures 2.29 and 2.30, precipitation was very light over the network between 1600 and 1900 GMT.

The gradient at 850 mb and 700 mb increased over northern Indiana between 1200 GMT on the 13th and 0000 GMT on April 14 (Figures 2.15 to 2.18). During that period the trough at upper levels had sharpened as it moved eastward. The

rawinsonde wind profile provides details of the speed and direction shear at 1647 GMT, April 13 (Figure 2.25). The sounding also shows that moist air was confined to the lowest kilometer or so, and that a strong temperature inversion was present in that layer.

By 1800 GMT, April 13 (Figure 2.10), the ridge had pushed the eastern portion of the east-west front to South Carolina. Across Ohio and Indiana this front had begun to move north as a warm front that extended west to Iowa. There it was soon to become part of a more complex frontal system. By 2100 GMT (Figure 2.11), it had joined the cold front from Canada that had reached Iowa from the west. The intermediate-density network operators were instructed to begin sampling as precipitation from this system reached each station in its movement eastward.

Aircraft sampling terminated about 1830 GMT, April 13, as a thunderstorm approached FWA from the southwest. Radar echo photographs (Figures 2.22 and 2.23) for 1329 GMT to 1915 GMT on the 13th show the spotty nature of the precipitation activity in the vicinity of the high-density network. The radar echo southwest of FWA at 1831 GMT (Figure 2.23), showed some embedded cells of Level 4 precipitation intensity, indicating at least moderate rain. This area of precipitation continued to enlarge as it approached FWA (Figure 2.24). The southern portion of the network received precipitation from this cell and the NWS office at FWA reported a brief heavy thunderstorm at 2023 GMT. Figure 2.21 shows the FWA weather radar 230-km range in relation to the high-density network.

The warm front moved over the Fort Wayne network from the southwest between 2100 GMT April 13 and 0000 GMT on the 14th (Figures 2.11, 2.12). Precipitation ceased over the network at about 2200 GMT, April 13 (Figures 2.24, 2.31 and 2.32), and most of the network collectors were picked up late on the 13th. Total precipitation amounts over the high-density network up to this time are shown in Figure 2.26. Amounts ranged between 1 and 35 mm, demonstrating the convective nature of the precipitation. The collectors along the northern boundary of the network (sites 11-16) were not recovered until the following day (April 14). These sites received considerable precipitation (34

to 59 mm) from the showers and thundershowers which accompanied the cold frontal passage early on the morning (local time) of the 14th.

At 0000 GMT, (Figure 2.12), April 14 the occluded type front extended from James Bay to Wisconsin, the cold front from Wisconsin to Oklahoma and westward, and the warm front angled southeast through the high-density network into Ohio then southward to South Carolina. The ridge of high pressure persisted along the east coast. There were areas of rain in northeast Ohio, Iowa and southern Minnesota. Scattered thundershowers occurred mostly in the warm sector from Iowa to Ohio.

At about 0600 GMT on the 14th the cold front passed Chicago. Showers and thunderstorms occurred in a line to the rear of the cold front southwestward into Oklahoma and over much of the intermediate-density network in western New York and Pennsylvania in the vicinity of the warm front. Shortly after 0900 GMT the cold front passed FWA with substantial showers, but precipitation soon ended there. Along the northern tier of high-density network sites, which were not picked up until morning (local time) of April 14, hourly rainfall rates of 20 mm/h had occurred during the cold frontal precipitation.

At 1200 GMT, April 14, the cold front reached from Lake Huron to western Kentucky and southwestward. The cold front was overtaking the warm front which had been slowed by the large high off the New England coast. The warm front extended from Detroit, Michigan to Georgia and then eastward over the Atlantic. Rain had reached central New York, eastern Pennsylvania and Maryland. Strong west to northwest flow was occurring on the back side of the upper trough at 850 mb and 700 mb over Indiana, Illinois, and in the cold air mass following the frontal system (Figures 2.19, 2.20).

By 1800 GMT, the occluding frontal system had progressed into western Pennsylvania with the warm front extending from central Pennsylvania to North Carolina and southward. Rain had reached the easternmost intermediate-density network stations by about 1500 GMT on the 14th.

Figure 2.13 is a record of the sequential 6-hourly positions of the occluding frontal system as it moved on to the Appalachian Mountains during the hours 0000-1800 GMT, April 14.

At 0000 GMT, April 15 (Figure 2.14), the frontal system had become completely occluded and extended from Vermont-New Hampshire to New Jersey and then southwest through western North Carolina. Three hours later the front had cleared the coast leaving the MAP3S region under mostly clear skies and rising pressure.

Constant level 24-hour back trajectories have been calculated for 1000 ft (305 m) above ground level (AGL), (Figure 2.33), for air parcels arriving at the FWA high-density network at the following times from the corresponding air mass sources:

April 13/1800 GMT	Prefrontal air
April 14/0000 GMT	Prefrontal air
April 14/0900 GMT	Warm sector air
April 14/1200 GMT	Post cold frontal air

The two prefrontal low-level back trajectories show air parcels arriving in the Fort Wayne area at 1800 GMT, April 13 and 0000 GMT, April 14. Each trajectory has origins well to the east of Indiana. The first commences in eastern Pennsylvania and the second in northern Virginia. Following the warm frontal passage at FWA the air in the warm sector is calculated to have come from the lower Mississippi River valley south of Memphis, Tennessee. In the air behind the cold front, the parcels at 305 m AGL, that arrived at FWA at about 1200 GMT April 14, had a probable source in southern Ontario.

Two 24-hour back trajectories were calculated for the 850 mb level (Figure 2.34). Flow arriving over FWA at 0000 GMT, April 14, in advance of the frontal system, had a probable source region in southwestern Arkansas and a track similar to that of the warm sector trajectory at the 305-m level. A rather flat upper air gradient over Minnesota at 1200 GMT, April 13 (see Figure 2.15), produced a slow and meandering start on the 850-mb post-frontal trajectory. The calculated air parcel route starts in Wisconsin, then curves through northern Illinois to arrive at the high-density network area at 1200 GMT, April 14.

FIGURE 2.1. Synoptic Weather Map for 1200 GMT, April 11, 1981.

FIGURE 2.2. Synoptic Weather Map for 1200 GMT, April 12, 1981.

FIGURE 2.3. Synoptic Weather Map for 2100 GMT, April 12, 1981.

FIGURE 2.4. Synoptic Weather Map for 0000 GMT, April 13, 1981.

FIGURE 2.5. Synoptic Weather Map for 0300 GMT, April 13, 1981.

FIGURE 2.6. Synoptic Weather Map for 0600 GMT, April 13, 1981.

FIGURE 2.7. Synoptic Weather Map for 0900 GMT, April 13, 1981.

FIGURE 2.8. Synoptic Weather Map for 1200 GMT, April 13, 1981.

FIGURE 2.9. Synoptic Weather Map for 1500 GMT, April 13, 1981.

FIGURE 2.10. Synoptic Weather Map for 1800 GMT, April 13, 1981.

FIGURE 2.11. Synoptic Weather Map for 2100 GMT, April 13, 1981.

FIGURE 2.12. Synoptic Weather Map for 0000 GMT, April 14, 1981.

FIGURE 2.13. Time Series of Superimposed Frontal System Positions for the Period 0000-1800 GMT, April 14, 1981.

FIGURE 2.14. Time Series of Superimposed Frontal System Positions; for the Period 0000-0600 GMT, April 15, 1981.

FIGURE 2.15. 850-millibar Chart for 1200 GMT, April 13, 1981.

FIGURE 2.17. 850-millibar Chart for 0000 GMT, April 14, 1981.

FIGURE 2.18. 700-millibar Chart for 0000 GMT, April 14, 1981.

FIGURE 2.20. 700-millibar Chart for 1200 GMT, April 14, 1981.

FIGURE 2.21. High-Density Network Boundary and the 230 km Range (50 km range marks) of the Fort Wayne Weather Radar.

FT. WAYNE WEATHER RADAR - OSCAR EVENT 2, APRIL 1981

13/1329 Z

13/1344 Z

13/1450 Z

13/1525 Z

13/1600 Z

13/1650 Z

FIGURE 2.22. Fort Wayne Radar Precipitation Echoes for 1329 GMT to 1650 GMT, April 13, 1981.

FT. WAYNE WEATHER RADAR - OSCAR EVENT 2, APRIL 1981

13/1712 Z

13/1737 Z

13/1800 Z

13/1831 Z

13/1845 Z

13/1915 Z

FIGURE 2.23. Fort Wayne Radar Precipitation Echoes for 1712 GMT to 1915 GMT, April 13, 1981.

FT. WAYNE WEATHER RADAR - OSCAR EVENT 2, APRIL 1981

13/1945 Z

13/2015 Z

13/2044 Z

13/2102 Z

13/2131 Z

13/2200 Z

FIGURE 2.24. Fort Wayne Radar Precipitation Echoes for 1945 GMT to 2200 GMT, April 13, 1981.

FIGURE 2.25. Rawinsonde Profile of Temperature and Moisture for 1647 GMT, April 13, 1981, at Fort Wayne, Indiana.

FIGURE 2.26. Precipitation over the High-Density Network from 1100 GMT to 2200 GMT, April 13. Right Side Shows Precipitation Amounts (mm) at Each Network Site. Left Side Shows Contours of the Data (contour levels every 5 mm).

FIGURE 2.27. Hourly Precipitation Amounts (mm) Over the High-Density Network for 1100-1200 (left) and 1200-1300 (right) GMT, April 13. "-" Indicates No Precipitation, and "x" Indicates Missing Data.

FIGURE 2.28. Hourly Precipitation Amounts (mm) Over the High-Density Network for 1300-1400 (left) and 1400-1500 (right) GMT, April 13. "-" Indicates No Precipitation, and "x" Indicates Missing Data.

FIGURE 2.29. Hourly Precipitation Amounts (mm) Over the High-Density Network for 1500-1600 (left) and 1600-1700 (right) GMT, April 13. "-" Indicates No Precipitation, "T" Indicates Trace Amount, and "x" Indicates Missing Data.

FIGURE 2.30. Hourly Precipitation Amounts (mm) Over the High-Density Network for 1700-1800 (left) and 1800-1900 (right) GMT, April 13. "-" Indicates No Precipitation, and "x" Indicates Missing Data.

FIGURE 2.31. Hourly Precipitation Amounts (mm) Over the High-Density Network for 1900-2000 (left) and 2000-2100 (right) GMT, April 13. "-" Indicates No Precipitation, and "x" Indicates Missing Data.

FIGURE 2.32. Hourly Precipitation Amounts (mm) Over the High-Density Network for 2100-2200 GMT, April 13. "-" Indicates No Precipitation, and "x" Indicates Missing Data.

FIGURE 2.33. Composite of Four 24-hour Back Trajectories from Fort Wayne at 305 m (1000 ft) AGL. April 13-14, 1981.

FIGURE 2.34. Composite of Two 24-hour Back Trajectories from Fort Wayne at 850 mb. April 13-14, 1981.

SECTION 3

PRECIPITATION CHEMISTRY DATA

Precipitation samples for chemical analysis were collected at the 47 sites of the OSCAR intensive network as shown in Figure 1.2. Each site was outfitted with a standard weighing rain gauge and an automatic sequential bulk collector (ASBC). Details on collector design and construction and of sampling and handling procedures may be found in the overview report.⁽¹⁾ The ASBC consisted of a 1000 cm² funnel, tubing, and a box containing a manifold of nine collector bottles, or stages. As precipitation occurred, the stages filled in sequence, and, except for the last stage (which was allowed to overflow if necessary), were sealed by hollow floating balls. The first eight stages each contained 67 ml of sample, or about 0.7 mm of precipitation. The ninth stage was much larger (1130 ml), giving a total rainfall capacity of 16.7 mm. All sample contact surfaces in the collector were polyethylene or polystyrene.

Since the ASBC funnels were not automatically exposed, the collectors were deployed as close as possible to the predicted onset of precipitation so as to minimize dry deposition. In the case of event 2, the preraingfall exposure time averaged 17 hours.

Soon after the event, the collectors were returned to the central staging area and the stages separated, identified, sealed, and stored at refrigerator temperature. The samples were shipped by air freight to the PNL precipitation chemistry laboratory for chemical analysis. The event 4 samples arrived at the laboratory within a few days of the storm.

Complete location, rainfall, and chemical analysis results for each site are listed in Appendix A. An examination of the chemical stability of the samples during the period of analysis is presented in the data report for event 4.⁽⁴⁾ The following subsections describe the chemical and rainfall results graphically and statistically.

INDIVIDUAL SITE DATA

Figures 3.1 through 3.3 show, for all sites, concentrations of the major ionic species [SO_4^{--} , H^+ (from pH), NO_3^- , NH_4^+ , Ca^{++}] and rainfall rate versus stage number. Each figure shows results from sites in each north-south "column" of sites (see Figure 1.2). The rainfall rates are stage averages, using stage start and end times derived from the stage volumes and rain gauge chart records.

Figures 3.4 through 3.6 show the same concentration and rainfall data, but plotted versus time (on April 13, 1981). The concentrations are still stage averages, but now the horizontal lengths of the segments reflect the actual time taken for the stages to fill. The rainfall rates here are not stage averages, but are real-time rates determined from rain gauge chart records. Thus the time segments of the rainfall rate curves (plotted within Figures 3.5a-g) do not necessarily coincide with those of the concentrations.

These two groups of figures show the trends of chemistry and rainfall through the course of the event, but in slightly different ways. The stage plots show changes with increasing rainfall amount in constant increments (up to stage 9), while the time plots demonstrate time and rainfall rate trends and the time span of precipitation for each site.

SPATIALLY AVERAGED DATA

Figures 3.7 through 3.9 show volume-weighted concentrations for the stages, averaged over all the active sites. These concentrations, C_j , were calculated using

$$C_j = \frac{\sum_i c_{ji} v_{ji}}{\sum_i v_{ji}} \quad (3.1)$$

where i = site number

j = stage number

c_{ji} = corresponding species concentrations

v_{ji} = stage rain volumes.

The weighted averages, incidentally, are the same as the arithmetic averages for all stages except the "last" stage (usually the ninth) since all the volumes are the same.

Figures 3.10 through 3.12 are corresponding plots showing spatially averaged major ion concentrations and precipitation rate versus time. The averages are calculated using

$$c(t)' = \frac{\sum_i \bar{c}_i(t') \bar{r}_i(t')}{\sum_i \bar{r}_i(t')} \quad (3.2)$$

where

$\bar{c}_i(t')$ = concentration of the species at site i and time t'

$\bar{r}_i(t')$ = precipitation rate at site i and time t' .

The overbar indicates that 0.05-hour time averages of the $\bar{c}_i$ and $\bar{r}_i$ were used in the calculations. The time t' used in the averaging is time from the onset of precipitation at each site.

The considerable range of rainfall rates and times of rainfall, seen in Figures 3.5, results in clear differences between the accumulated-rainfall spatial averages (Figures 3.7 to 3.9) and the time-since-precipitation-start spatial averages (Figures 3.10 through 3.12). This is particularly apparent in the rainfall rate results (Figures 3.8 and 3.11). It should also be noted that the time scale on Figures 3.10 through 3.12 is terminated at 3-hours (since precipitation starts), whereas many sites' rainfall occurred over much longer periods.

Figures 3.13 through 3.15 show ratios of selected species for site-composite stages. Of particular note is the general increase of the sulfate/nitrate ratio with time, up to near the end of the event, which may indicate a change in the relative importance of removal mechanisms during the event.

Simple statistics for single stages and all stages combined are listed in Table 3.1. The number of sites, N, is less than 47 for the single stage statistics and less than 423 for the combined statistics because of missing values for certain species (see Appendix A for reasons for missing values), and because some sites had less than 9 stages of rainfall (see Figure 3.1). Listed are minima, maxima, arithmetic means and standard deviations and geometric means and standard deviations for concentrations. Stages 3 through 8 are not listed because the results for these stages follow the general trends shown by the preceding figures, and the statistical variability exhibited by stage 2. Stage 1 and 9 statistics reflect the event beginning and ending situations, the latter being influenced by the much larger stage volume and subsequently longer time averaging. The stage 9 values have lower variances probably because of the much larger averaging time resulting from the large stage volume and the lower likelihood of dryfall contamination. The "ALL" row does not show this feature because the treatment of all the sites includes all the stages, rather than the composites of all the stages for each site.

Similar statistical calculations were performed on the event average (volume-weighted mean of all stages) concentration data; the results of these are listed in Table 3.2. Since some (or all) stage concentrations from certain sites are missing for various reasons (see Appendix A), those sites whose event average for a species represents less than 80% of the total precipitation collected at the sites were not included in the summary statistics. The average fraction of the total precipitation represented by the averages for each species is listed as "chem coverage."

SCATTER PLOTS AND SPECIES CORRELATIONS

To demonstrate the relationships among species concentrations for individual observations, scatter plots are shown for the major species in Figures 3.16 through 3.19. Presented are plots for stage 1, stage 2, and all stages combined from all sites. The regression relationships shown differ greatly between stages 1 and 2, but for stages following stage 1, they are quite uniform. Figures 3.20 through 3.23 are plots of weighted average

TABLE 3.1. OSCAR High-Density Network Event 2 Statistics for Single Stages and All Stages Combined. Units are: $\mu\text{mho}/\text{cm}$ for conductivity; $\mu\text{eq}/\text{l}$ for H^+ , anion sum, and cation sum; $\mu\text{mol}/\text{l}$ for all other species.

Species	Stage	N	Min	Max	Arithmetic		Geometric		
					Mean	S.D.	Mean	S.D.	
SO ₄ ⁼⁼	1	40	25.0	190.0	82.4	36.3	75.5	1.5	
		2	40	18.0	110.0	44.0	20.7	40.1	1.5
		9	21	11.0	48.0	26.4	10.1	24.4	1.5
		ALL	317	2.7	190.0	36.7	27.0	29.1	2.0
NO ₃ ⁻	1	40	42.0	210.0	109.6	34.4	104.2	1.4	
		2	40	26.0	150.0	58.0	25.4	53.8	1.5
		9	21	9.8	46.0	24.9	10.0	23.0	1.5
		ALL	317	4.2	210.0	43.5	34.4	33.2	2.1
Cl ⁻	1	40	12.0	35.0	23.7	6.0	22.9	1.3	
		2	40	4.3	62.0	16.7	10.7	14.3	1.7
		9	21	3.3	21.0	11.1	4.5	10.2	1.5
		ALL	316	1.4	62.0	13.5	9.1	10.7	2.0
Anion Sum		40	104.0	624.0		298.2	110.3	279.7	1.4
		40	76.8	432.0		162.7	76.2	149.0	1.5
		21	38.3	156.2		88.7	33.3	82.7	1.5
		ALL	316	11.8	624.0		130.7	95.1	103.4
Conductivity		40	27.0	140.0		63.3	23.9	59.5	1.4
		39	18.0	86.0		39.3	15.8	36.6	1.4
		21	11.0	44.0		26.0	8.6	24.5	1.4
		ALL	310	3.3	140.0		33.0	19.6	28.2
H ⁺		40	8.3	173.8		72.7	36.1	62.6	1.8
		39	21.4	104.7		54.6	19.5	51.4	1.4
		21	22.9	67.6		42.7	12.1	41.0	1.3
		ALL	314	4.6	173.8		48.0	24.3	42.4
NH ₄ ⁺	1	40	35.0	210.0	108.5	43.8	100.2	1.5	
		40	25.0	140.0		52.2	22.0	48.7	1.4
		21	4.1	37.0		21.7	8.6	19.6	1.7
		ALL	317	0.9	210.0		39.1	36.1	26.1
Na ⁺	1	40	8.2	41.0	23.0	9.5	21.1	1.5	
		40	1.7	64.0		18.1	12.5	14.3	2.1
		21	2.0	21.0		10.7	5.0	9.4	1.7
		ALL	317	0.9	83.0		13.9	11.9	9.8
Ca ⁺⁺	1	40	8.1	67.0	20.3	11.1	18.3	1.5	
		40	2.5	37.0		9.1	6.5	7.8	1.7
		21	0.8	5.8		2.6	1.4	2.3	1.8
		ALL	315	0.3	67.0		6.5	7.8	4.0
Mg ⁺⁺	1	40	3.4	22.0	8.2	4.1	7.4	1.5	
		40	0.7	14.0		4.0	2.6	3.4	1.8
		21	0.5	3.3		1.7	0.8	1.5	1.6
		ALL	315	0.2	22.0		3.1	3.2	2.0
Cation Sum	1	40	103.4	482.4	265.1	84.5	252.4	1.4	
		39	71.9	395.9		151.7	67.4	140.3	1.5
		21	31.5	130.2		84.3	28.6	79.2	1.4
		ALL	314	10.5	482.4		121.5	84.0	96.7

TABLE 3.2. OSCAR High-Density Network Event 2 Statistics for Site Event Data. Chem coverage is the fraction of the precipitation for which chemistry data for the corresponding species was available; sites with chem coverage less than 0.80 were not included in the statistics. N is the number of sites used for each species. Units are: mm for precipitation, $\mu\text{mho}/\text{cm}$ for conductivity; $\mu\text{eq}/\ell$ for H^+ , anion sum, and cation sum; $\mu\text{mol}/\ell$ for other species.

Species	N	Min	Max	Arithmetic		Geometric		Chem Coverage	
				Mean	S.D.	Mean	S.D.	Mean	S.D.
Precip.	37	3.6	22.4	9.5	4.9	8.3	1.7		
Conduc.	37	15.4	65.3	30.3	10.2	30.1	1.5	0.99	0.02
SO_4^{--}	37	14.1	84.0	32.6	13.6	31.9	1.6	1.00	0.00
NO_3^-	37	19.0	94.5	38.3	14.4	38.0	1.5	1.00	0.00
Cl^-	37	5.1	37.4	12.2	5.9	11.8	1.6	1.00	0.02
An. Sum	37	54.4	299.9	115.8	46.4	114.2	1.5	1.00	0.02
H^+	37	21.9	78.1	44.6	12.6	44.7	1.4	1.00	0.01
NH_4^+	37	14.0	93.4	33.9	14.3	33.1	1.6	1.00	0.00
Na^+	37	3.2	43.8	11.8	7.6	10.7	1.8	1.00	0.00
Ca^{++}	37	2.6	17.6	5.6	3.1	5.3	1.6	1.00	0.00
Mg^{++}	37	0.8	11.7	2.7	1.8	2.5	1.8	1.00	0.00
Cat. Sum	37	55.0	277.1	107.8	41.3	106.6	1.5	1.00	0.01

concentrations (cf. eq. 3.1) for each stage including all sites. The stage numbers are shown as the data points exhibiting the trend of the relationships with accumulated rainfall during the event.

The scatter is quite large for stage 1 for the species pairs that include H^+ and NH_4^+ . Stage 1 in these cases contributes essentially all the outliers to the all-stage plots. Sulfate and nitrate, however, have strong positive correlations for all stages, possibly reflecting their common long-range sources. The relationship between the two (i.e., the slope of the regression line) does change as the event progresses, however, as was seen in the ratio Figure 3.15. The site-composite plots for the stages include considerable smoothing of the variations over the sites, and demonstrate the strong positive

correlations among the major species that are normally observed for multiple events at one site. These plots also show that gross spatial variations in species relationships were not a feature of this event.

SPATIAL DISTRIBUTIONS

In this subsection, the precipitation chemistry data for the April 13 storm are examined for spatial patterns in concentration and deposition. The location of the high-density network in northeastern Indiana was largely chosen because of the absence of strong pollutant sources on or near the network, with the hope that wet deposition would be relatively uniform across the network. For the April 13 storm, some interesting patterns do appear in the spatial distribution of the precipitation chemistry. Unfortunately, the absence of aircraft air chemistry measurements for this event make it difficult to relate the precipitation chemistry to spatial patterns of pollutant precursors.

Figures 3.24 through 3.28 show the spatial distributions of total sulfur, NO_3^- , H^+ , NH_4^+ , and Ca^{++} concentrations over the network for the entire storm event. The spatial distributions of event total deposition for the same five species are shown in Figures 3.29 through 3.33. A strong feature in the concentration distributions is the high concentrations at sites 74 and 75 at the southern border of the network. These two sites had the lowest precipitation amounts on the network (see Figure 2.26), and the higher concentrations are typical of the usual inverse relation between scavenging ratio and precipitation. The total depositions at these two sites are not particularly high. Another feature is the area of both low concentrations and low depositions along the northern border of the network. The lower depositions are partially explained by the fact that this area was not affected by the second of the two precipitation periods of the storm (see Figures 2.27 through 2.32).

Figures 3.34 through 3.38 shown the spatial distributions of the five ions in the first collector stage. The sulfur concentration shows a clear pattern, increasing from north to south. This pattern also appears less strongly in the other ions' distributions. The pattern suggests that a significant variation in air chemistry existed over the network.

The overall variability in the patterns is substantial. The geometric standard deviations for the major ions averages 1.5 (see Table 3.2). Besides possible variations in air chemistry over the network, the convective activity associated with the event would be expected to contribute strongly to the variability in wet deposition.

(Note: The contour lines shown in Figures 3.24 through 3.38 were drawn by a relatively unsophisticated contouring algorithm that utilized a simple $1/r^3$ weighting to interpolate between the sites. The contours have been presented simply to display any dominant spatial patterns in the data (or the lack of them) and are not intended to be a rigorous analysis of the spatial distributions of the data.)

FIGURE 3.1. Sulfate and H^+ (from pH) Versus Stage Number.
a) - g) show Site Columns, North-South, as
Defined by Figure 1.2.

FIGURE 3.1a.

FIGURE 3.1b.

FIGURE 3.1c.

FIGURE 3.1d.

FIGURE 3.1e.

FIGURE 3.1f.

FIGURE 3.1g.

FIGURE 3.2. Precipitation Rate and Nitrate Versus Stage Number
a) - g) Show Site Columns, North-South, as
Defined by Figure 1.2

FIGURE 3.2a.

FIGURE 3.2b.

FIGURE 3.2c.

FIGURE 3.2d.

FIGURE 3.2e.

FIGURE 3.2f.

FIGURE 3.2g.

FIGURE 3.3. Ammonium and Calcium Versus Stage Number.
a) - g) Show Site Columns, North-South,
as Defined by Figure 1.2

FIGURE 3.3a.

FIGURE 3.3b.

FIGURE 3.3c.

FIGURE 3.3d.

FIGURE 3.3e.

FIGURE 3.3f.

FIGURE 3.3g.

FIGURE 3.4. Sulfate and H^+ (from pH) Versus Time (April 13, 1981).
a) - g) Show Site Columns, North-South, as Defined
by Figure 1.2.

FIGURE 3.4a.

FIGURE 3.4b.

FIGURE 3.4c.

FIGURE 3.4d.

FIGURE 3.4e.

FIGURE 3.4f.

FIGURE 3.4g.

FIGURE 3.5. Precipitation Rate and Nitrate Versus Time (April 13, 1982).
a) - g) Show Site Columns, North-South, as Defined by
Figure 1.2.

FIGURE 3.5a.

FIGURE 3.5c.

FIGURE 3.5d.

FIGURE 3.5e.

FIGURE 3.5f.

FIGURE 3.5g.

FIGURE 3.6. Ammonium and Calcium Versus Time (April 13, 1981).
a) - g) Show Site Columns, North-South, as
Defined by Figure 1.2.

FIGURE 3.6a.

FIGURE 3.6b.

FIGURE 3.6c.

FIGURE 3.6d.

FIGURE 3.6e.

FIGURE 3.6f.

FIGURE 3.6g.

FIGURE 3.7. All-Site (Spatial) Volume-Weighted Average H^+ (from pH) and Sulfate Versus Stage Number

FIGURE 3.8. All-Site (Spatial) Volume-Weighted Average for Precipitation Rate and Nitrate Versus Stage Number

FIGURE 3.9. All-Site (Spatial) Volume-Weighted Average for Ammonium and Calcium Versus Stage Number

FIGURE 3.10. All-Site (Spatial) Volume-Weighted Average for H⁺ (from (from pH) and Sulfate Versus Time (see Equation 3.2)

FIGURE 3.11. All-Site (Spatial) Volume-Weighted Average for Precipitation Rate and Nitrate Versus Time (see Equation 3.2)

FIGURE 3.12. All-Site (Spatial) Volume-Weighted Average for Ammonium and Calcium Versus Time (see Equation 3.2)

FIGURE 3.13. Sulfate/Ammonium Ratio Versus Stage Number.
Data from Figures 3.7 and 3.9.

FIGURE 3.14. Nitrate/Ammonium Ratio Versus Stage Number.
Data from Figures 3.8 and 3.9.

FIGURE 3.15. Sulfate/Nitrate Ratio Versus Stage Number.
Data from Figures 3.7 and 3.8.

FIGURE 3.16. Species-Pair Plots for Sulfate and H^+ (from pH)

FIGURE 3.16b.

FIGURE 3.16c.

FIGURE 3.17. Species-Pair Plots for Nitrate and Sulfate

FIGURE 3.17a.

FIGURE 3.17b.

FIGURE 3.17c.

FIGURE 3.18. Species-Pair Plots for Nitrate and H^+ (from pH)

FIGURE 3.18a.

FIGURE 3.18b.

FIGURE 3.18c.

FIGURE 3.19. Species-Pair Plots for Sulfate and Ammonium

FIGURE 3.19a.

FIGURE 3.19b.

FIGURE 3.19c.

FIGURE 3.20. Weighted Stage Averages for All Sites for Sulfate and H^+ (from pH). Data Points are Stage Numbers.

FIGURE 3.21. Weighted Stage Averages for All Sites for Nitrate and Sulfate. Data points are stage numbers.

FIGURE 3.22. Weighted Stage Averages for All Sites for Nitrate and H^+ (from pH). Data points are stage numbers.

FIGURE 3.23. Weighted Stage Averages for All Sites for Sulfate and Ammonium. Data points are stage numbers.

FIGURE 3.24. Spatial Distribution of Event SO_4^{2-} Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol/l}$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $20 \mu\text{mol/l}$).

FIGURE 3.25. Spatial Distribution of Event NO_3^- Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol/l}$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = 20 $\mu\text{mol/l}$).

FIGURE 3.26. Spatial Distribution of Event H^+ Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol/l}$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $20 \mu\text{mol/l}$).

FIGURE 3.27. Spatial Distribution of Event NH_4^+ Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol}/\ell$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $20 \mu\text{mol}/\ell$).

FIGURE 3.28. Spatial Distribution of Event Ca^{++} Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol}/\ell$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $5 \mu\text{mol}/\ell$).

FIGURE 3.29. Spatial Distribution of Event SO_4^{--} Deposition Across the Network. Right-hand side shows deposition in $\mu\text{mol/m}^2$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $150 \mu\text{mol/m}^2$).

FIGURE 3.30. Spatial Distribution of Event NO_3^- Deposition Across the Network. Right-hand side shows deposition in $\mu\text{mol}/\text{m}^2$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = $150 \mu\text{mol}/\text{m}^2$).

FIGURE 3.31. Spatial Distribution of Event H^+ Deposition Across the Network. Right-hand side shows deposition in $\mu\text{mol}/\text{m}^2$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = 150 $\mu\text{mol}/\text{m}^2$).

FIGURE 3.32. Spatial Distribution of Event NH_4^+ Deposition Across the Network. Right-hand side shows deposition in $\mu\text{mol}/\text{m}^2$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = 150 $\mu\text{mol}/\text{m}^2$).

FIGURE 3.33. Spatial Distribution of Event Ca^{++} Deposition Across the Network. Right-hand side shows deposition in $\mu\text{mol}/\text{m}^2$ (x's indicate sites with missing or incomplete data). Left-hand side shows the data contoured (contour interval = 25 $\mu\text{mol}/\text{m}^2$).

FIGURE 3.34. Spatial Distribution of First Collector Stage SO_4^{--} Concentration Across the Network. Right-hand shows concentration in $\mu\text{mol}/\ell$ (x's indicate sites with missing data). Left-hand side shows the data contoured (contour interval = $30 \mu\text{mol}/\ell$).

FIGURE 3.35. Spatial Distribution of First Collector Stage NO_3^- Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol}/\ell$ (x's indicate sites with missing data). Left-hand side shows the data contoured (contour interval = $30 \mu\text{mol}/\ell$).

FIGURE 3.36. Spatial Distribution of First Collector Stage: H^+ Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol/l}$ (x's indicate sites with missing data). Left-hand side shows the data contoured (contour interval = $30 \mu\text{mol/l}$).

FIGURE 3.37. Spatial Distribution of First Collector Stage NH_4^+ Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol}/\ell$ (x's indicate sites with missing data). Left-hand side shows the data contoured (contour interval = $30 \mu\text{mol}/\ell$).

FIGURE 3.38. Spatial Distribution of First Collector Stage Ca^{++} Concentration Across the Network. Right-hand side shows concentration in $\mu\text{mol/l}$ (x's indicate sites with missing data). Left-hand side shows the data contoured (contour interval = $20 \mu\text{mol/l}$).

SECTION 4

AIRCRAFT DATA

During OSCAR Event 2, relatively little aircraft sampling was done at the high-density network. The PNL Douglas DC3 made a single flight on April 13, from 1610 to 1810 GMT, and performed in-cloud sampling. The PNL Cessna 411 was not utilized during this event. The BNL Islander was utilized in support of the intermediate-density experiment, and performed sampling over W. Virginia. The DC3 aircraft and its sampling instrumentation are described in the OSCAR overview report.^[1]

The DC3 flight occurred between the two major periods of precipitation which were collected on the high-density network (1200-1600 GMT and 1900-2200 GMT, see Figs. 2.20 - 2.24). The initial portion of the flight was at an altitude of about 1000 m. During this period the aircraft attempted, without success, to locate solid low-level cloud for cloud-water collection. The aircraft then moved to 3700 m, where it was able to collect two pairs of cloud water samples, using its supercooled cloud water collectors. The location of this sampling, shown in Figure 4.1, was roughly 20 km north of the northern row of network sites. Winds at that elevation were from the southwest (250-260 degrees and 25 m/sec).

Data for the cloud water samples are summarized in Table 4.1. The samples were collected at a fairly high altitude, so it is quite likely that they do not reflect the chemistry of lower level air which would be expected to have higher pollutant loadings and a greater influence upon precipitation chemistry. Compared with the precipitation chemistry measurements, the Cl^- and Na^+ concentrations in the cloud water are relatively high, both in an absolute sense and relative to SO_4^{2-} and NO_3^- . This greater abundance of non-anthropogenic species indicates that the samples were collected from air having a relatively low pollutant loading. The low "virtual airborne sulfate concentration" (product of cloud water sulfate concentration and cloud liquid water concentration), which averaged $0.4 \mu\text{g}/\text{m}^3$ for the four samples, also supports this conclusion.

FIGURE 4.1. Aircraft Flight Tracks for the DC3 During Cloud Water Sample Collections On April 13. Dashed line shows position from 1723 to 1741 GMT; solid line shows position from 1744 to 1805 GMT. Small squares show positions at start of each time segment. "FWA" is Fort Wayne Airport, and the large (dashed) square outlines the high-density network (see Figure 1.2).

TABLE 4.1. Cloud Water Samples Collected on April 13 by the PNL
DC3 Aircraft

Collection Time (GMT)	Alt. (m)	Temp. (°C)	Liq. Water (g/m ³)	Sample Vol. (ml)	pH	Cond	Ion Bal.	SO ₄ ²⁻	NO ₃ ⁻	Cl ⁻	Anion Sum	H ⁺	NH ₄ ⁺	Na ⁺	K ⁺	Ca ⁺⁺	Mg ⁺⁺	Cation Sum
1723-1742	3700	-3	0.20	52.	ISA	ISA	ISA	41.0	20.0	12.0	114.0	ISA	23.0	12.0	11.0	4.7	1.6	ISA
1726-1741	3700	-3	0.22	36.	5.64	6.0	0.04	16.0	21.0	11.0	64.0	2.3	24.0	15.0	10.0	5.5	2.0	66.3
1744-1803	3700	-4	0.22	60.	4.93	10.0	-0.06	20.0	25.0	15.0	80.0	11.7	27.0	16.0	7.7	5.1	1.5	75.6
1747-1805	3700	-4	0.24	68.	4.43	14.0	0.14	17.0	25.0	5.7	64.7	37.2	27.0	4.0	3.5	1.0	0.5	74.7

Notes:

1. Units, unless noted, are $\mu\text{eq/L}$ for H^+ , Anion Sum, Cation Sum, and $\mu\text{mol/L}$ for other species
2. ISA means insufficient sample for the analysis
3. Ion balance is $2 (\text{Cations} - \text{Anions}) / (\text{Cations} + \text{Anions})$
4. On all samples, PO_4^{3-} was below the detection limit ($0.2 \mu\text{mol/L}$)
5. Samples were collected with the supercooled cloud water collectors

5.0 REFERENCES

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4. Dana, M. T., Easter, R. C., and Thorp, J. M. OSCAR Experiment High-Density Network Data Report. Event 4 - April 22-23, 1981. PNL-5152, Pt. 4, prepared for U.S. Environmental Protection Agency by Pacific Northwest Laboratory, Richland, Washington, 1984.

APPENDIX A

DATA TABULATIONS

APPENDIX A

DATA TABULATIONS

OSCAR intensive network site locations are shown in Figure 1.2 and detailed in Table A.1.

Complete precipitation chemistry and rainfall data for Event 2 are listed in Table A.2. Each page contains data from one of the 47 sites. The collection efficiency is the total rainfall collected by the sequential collector, divided by the total rainfall measured by the accompanying weighing rain gauge. For sites where the collector overflowed, and thus collection efficiency was impossible to compute, "OVF" is printed. "START" is the day and time of the start of filling of each stage, "DT" is the duration of each stage, and "R-RATE" is the rainfall rate (stage volume/DT). "ION BAL" is the ion balance check, given by

$$(\text{Cation Sum} - \text{Anion Sum}) / 0.5(\text{Cation Sum} + \text{Anion Sum})$$

(difference of ion totals divided by the mean). The AVG figures are volume-weighted averages for all stages (equivalent to the event-average values), calculated using Equation 3.1. Additional codes, generally following those used by the MAP3S Precipitation Chemistry Network, are listed below.

<	Less than detection limit (given)
NAP	No analysis performed
ISA	Insufficient sample for analysis
RPC	Rejected--probable contamination

TABLE A.1. High-Density Precipitation Chemistry Site Positions

<u>Site No.</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Site No.</u>	<u>Latitude</u>	<u>Longitude</u>
11	41.591	85.603	45	41.129	84.862
12	41.639	85.378	46	41.175	84.646
13	41.638	85.199	51	40.995	85.659
14	41.575	85.038	52	41.001	85.423
15	41.561	84.849	53	41.032	85.293
16	41.588	84.720	54	40.966	84.966
21	41.377	85.624	55	40.986	84.817
22	41.430	85.403	56	41.058	84.710
23	41.439	85.194	57	40.929	84.561
24	41.443	85.059	58	41.015	84.391
25	41.394	84.892	61	40.806	85.679
26	41.409	84.701	62	40.844	85.464
27	41.435	84.482	63	40.914	85.231
31	41.276	85.582	64	40.798	85.153
32	41.331	85.464	65	40.791	84.966
33	41.305	85.178	66	40.860	84.756
34	41.306	85.069	67	40.810	84.521
35	41.251	84.859	71	40.663	85.693
36	41.309	84.564	72	40.665	85.466
37	41.338	84.431	73	40.665	85.303
41	41.175	85.645	74	40.668	85.092
42	41.136	85.489	75	40.665	84.858
43	41.143	85.152	76	40.644	84.628
44	41.198	85.019			

TABLE A.2 OSCAR HIGH-DENSITY NETWORK PRECIPITATION CHEMISTRY
AND RAINFALL DATA.

SITE 11

COLLECTION EFFICIENCY = 0.83

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT)		DT	R-RATE	LAB PH	COND	ION BAL
	DAY	HR	HR	MM/HR		$\mu\text{MHO/CM}$	
1	4-13	12.43	0.14	5.33	4.45	27.0	-0.01
2	4-13	12.57	0.14	5.33	4.31	38.0	0.00
3	4-13	12.70	0.11	6.64	4.56	18.0	0.02
4	4-13	12.81	0.09	8.12	4.71	12.0	-0.17
5	4-13	12.90	0.09	8.12	4.70	12.0	-0.13
6	4-13	12.99	0.11	6.40	4.74	12.0	-0.11
7	4-13	13.11	0.12	6.09	4.75	9.9	-0.10
8	4-13	13.23	0.16	4.47	4.72	10.0	-0.11
AVG				6.08	4.59	17.4	-0.08
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	<0.2	25.0	<0.1	42.0	12.0	<0.2	104.
2	NAP	36.0	<0.1	59.0	15.0	<0.2	146.
3	NAP	15.0	NAP	21.0	6.7	<0.2	58.
4	<0.2	11.0	NAP	15.0	4.4	<0.2	41.
5	NAP	10.0	NAP	14.0	3.8	<0.2	38.
6	NAP	7.7	<0.1	10.0	3.0	<0.2	28.
7	NAP	7.1	NAP	9.4	3.3	<0.2	27.
8	NAP	7.5	NAP	10.0	3.9	<0.2	29.
AVG	--	14.9	--	22.5	6.5	--	59.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	35.5	35.0	8.2	1.7	8.1	3.4	103.
2	49.0	59.0	11.0	2.6	9.1	3.4	147.
3	27.5	19.0	5.2	0.7	2.3	1.0	59.
4	19.5	5.5	6.3	<0.4	1.0	0.8	35.
5	20.0	5.3	3.8	<0.4	1.4	0.6	33.
6	18.2	2.7	3.0	<0.4	<0.5	0.7	25.
7	17.8	1.9	2.2	<0.4	0.8	0.4	24.
8	19.1	1.7	1.9	0.4	0.9	0.5	26.
AVG	25.8	16.3	5.2	0.7	2.9	1.4	57.

TABLE A.2, CONTINUED.

SITE 12

COLLECTION EFFICIENCY = 0.88

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.60	0.16	4.44	4.29	45.0	0.02
2	4-13	12.76	0.16	4.45	4.44	26.0	0.03
3	4-13	12.93	0.14	5.10	4.79	13.0	0.20
4	4-13	13.07	0.13	5.71	4.68	13.0	0.03
5	4-13	13.20	0.13	5.71	4.78	10.0	-0.06
6	4-13	13.33	0.13	5.72	4.80	9.2	-0.05
7	4-13	13.46	0.13	5.71	4.80	9.2	-0.04
8	4-13	13.59	0.20	3.64	4.74	12.0	0.07
AVG				4.94	4.62	17.2	0.03
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	42.0	<0.1	71.0	18.0	<0.2	173.
2	NAP	20.0	0.1	30.0	6.7	<0.2	77.
3	NAP	12.0	NAP	15.0	4.5	<0.2	44.
4	NAP	8.4	NAP	13.0	3.1	<0.2	33.
5	NAP	7.5	0.1	11.0	2.2	<0.2	28.
6	NAP	6.1	NAP	10.0	1.6	<0.2	24.
7	NAP	6.4	NAP	8.6	1.4	<0.2	23.
8	NAP	10.0	NAP	11.0	3.0	<0.2	34.
AVG	--	14.1	0.1	21.2	5.1	--	54.
	FREE H	NH4	NA	K	CA	Mg	CAT SUM UEQ/L
1	51.3	63.0	17.0	4.6	17.0	3.7	177.
2	36.3	25.0	5.3	1.5	4.4	1.3	80.
3	16.2	8.9	3.8	0.6	9.4	2.4	53.
4	20.9	6.6	2.1	<0.4	1.7	0.5	34.
5	16.6	5.1	1.6	0.4	1.0	0.4	27.
6	15.8	2.7	1.0	<0.4	1.5	<0.4	23.
7	15.8	3.6	0.9	<0.4	0.8	<0.4	22.
8	18.2	8.6	2.4	<0.4	2.7	0.9	36.
AVG	23.9	15.4	4.3	0.9	4.8	1.1	56.

TABLE A.2, CONTINUED.

SITE 13

NO DATA - COLLECTOR MALFUNCTION

TABLE A.2, CONTINUED.

SITE 14

COLLECTION EFFICIENCY = 0.83

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	12.94	0.22	3.32	4.01	66.0	0.01
2	4-13	13.16	0.20	3.58	4.25	35.0	0.05
3	4-13	13.36	0.16	4.58	4.50	19.0	0.04
4	4-13	13.53	0.15	4.91	4.67	13.0	-0.07
5	4-13	13.67	0.10	7.18	4.69	12.0	-0.29
6	4-13	13.78	0.10	7.18	4.70	11.0	-0.35
7	4-13	13.88	0.12	6.12	4.73	9.5	-0.31
8	4-13	14.00	0.14	5.08	4.74	9.7	-0.33
AVG				4.87	4.45	21.9	-0.16
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	51.0	<0.1	100.0	19.0	<0.2	221.
2	NAP	28.0	<0.1	42.0	9.9	<0.2	108.
3	NAP	15.0	NAP	18.0	4.1	<0.2	52.
4	NAP	9.8	NAP	13.0	3.8	<0.2	36.
5	NAP	11.0	NAP	17.0	5.8	<0.2	45.
6	NAP	9.1	<0.1	11.0	5.7	<0.2	35.
7	NAP	7.3	NAP	9.3	7.9	<0.2	32.
8	NAP	7.4	NAP	9.6	6.4	<0.2	31.
AVG	--	17.3	--	27.5	7.8	--	70.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	97.7	85.0	10.0	<0.4	11.0	3.8	222.
2	56.2	34.0	6.7	<0.4	6.2	2.0	113.
3	31.6	14.0	3.3	<0.4	1.9	0.7	54.
4	21.4	5.1	2.2	<0.4	2.0	0.6	34.
5	20.4	7.7	2.0	<0.4	1.3	0.4	34.
6	20.0	1.6	1.7	<0.4	0.7	<0.4	25.
7	18.6	1.7	1.9	<2.9	0.6	<0.4	23.
8	18.2	0.9	1.4	<1.0	0.8	<0.4	22.
AVG	35.5	18.8	3.6	--	3.0	0.9	66.

TABLE A.2, CONTINUED.

SITE 15

COLLECTION EFFICIENCY = 0.80

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	13.34	0.16	4.61	4.15	57.0	0.04
2	4-13	13.50	0.16	4.61	4.40	27.0	0.06
3	4-13	13.66	0.16	4.61	4.61	16.0	0.05
4	4-13	13.82	0.16	4.61	4.52	17.0	0.27
5	4-13	13.98	0.16	4.61	4.80	9.4	-0.02
6	4-13	14.14	0.16	4.61	4.82	9.7	-0.12
7	4-13	14.29	0.16	4.61	4.78	9.7	-0.06
8	4-13	14.45	0.28	2.65	4.79	10.0	0.01
AVG				4.22	4.54	19.5	0.03
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	0.1	50.0	<0.1	91.0	18.0	<0.2	209.
2	NAP	20.0	<0.1	38.0	6.0	<0.2	84.
3	NAP	11.0	NAP	16.0	4.5	<0.2	43.
4	<0.2	8.3	NAP	11.0	3.9	<0.2	32.
5	NAP	5.9	NAP	7.9	2.3	<0.2	22.
6	NAP	5.7	NAP	8.7	3.1	<0.2	23.
7	NAP	5.7	NAP	9.2	1.9	<0.2	23.
8	NAP	6.9	NAP	9.0	2.3	<0.2	25.
AVG	0.1	14.2	--	23.8	5.3	--	57.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	70.8	92.0	12.0	3.8	16.0	3.7	218.
2	39.8	35.0	3.4	1.2	4.0	1.1	90.
3	24.5	13.0	2.4	<1.0	1.9	0.5	45.
4	30.2	6.1	2.1	<1.0	1.0	0.4	41.
5	15.8	2.8	1.6	<0.4	0.6	<0.4	22.
6	15.1	2.6	1.5	<0.4	0.6	<0.4	21.
7	16.6	3.6	1.0	<0.4	<0.5	<0.4	21.
8	16.2	5.9	1.5	<0.4	0.8	<0.4	25.
AVG	28.6	20.1	3.2	0.6	3.1	0.7	60.

TABLE A.2, CONTINUED.

SITE 16

COLLECTION EFFICIENCY = 0.48

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	13.50	0.17	4.35	5.08	41.0	-0.11
2	4-13	13.67	0.17	4.35	4.47	22.0	-0.24
3	4-13	13.84	0.17	4.35	4.55	16.0	0.02
4	4-13	14.01	0.14	5.14	4.67	12.0	-0.09
5	4-13	14.15	0.12	6.10	4.75	11.0	-0.21
AVG				4.77	4.66	20.4	-0.12
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	61.0	NAP	120.0	23.0	<0.2	265.
2	NAP	23.0	NAP	41.0	4.3	<0.2	91.
3	NAP	13.0	NAP	17.0	2.6	<0.2	46.
4	NAP	8.9	NAP	12.0	2.3	<0.2	32.
5	NAP	9.0	NAP	9.1	3.5	<0.2	31.
AVG	--	23.0	--	39.8	7.1	--	93.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	8.3	170.0	11.0	8.2	15.0	4.6	237.
2	33.9	30.0	1.7	<0.9	2.5	0.7	72.
3	28.2	9.1	5.8	<0.4	1.3	0.4	47.
4	21.4	4.7	1.4	<0.4	1.0	<0.4	29.
5	17.8	3.7	1.6	<0.4	0.8	<0.4	25.
AVG	21.9	43.5	4.3	1.6	4.1	1.1	82.

TABLE A.2, CONTINUED.

SITE 21

COLLECTION EFFICIENCY = 0.69

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHC/CM}$	ION BAL
1	4-13	12.44	0.17	5.72	3.98	82.0	-0.11
2	4-13	12.61	0.17	5.72	4.42	29.0	-0.04
3	4-13	12.77	0.17	5.72	4.50	23.0	-0.08
4	4-13	12.94	0.42	2.29	4.57	19.0	-0.08
AVG				4.16	4.30	38.3	-0.08
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	87.0	NAP	120.0	28.0	<0.2	322.
2	NAP	29.0	NAP	40.0	11.0	<0.2	109.
3	NAP	20.0	NAP	28.0	7.7	<0.2	76.
4	NAP	16.0	NAP	21.0	6.4	<0.2	59.
AVG	--	38.0	--	52.3	13.3	--	142.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	104.7	110.0	17.0	5.5	19.0	6.2	288.
2	38.0	39.0	11.0	1.9	5.6	1.8	105.
3	31.6	24.0	6.8	<1.4	2.7	1.1	70.
4	26.9	17.0	4.8	1.3	1.7	0.8	55.
AVG	50.3	47.5	9.9	2.2	7.3	2.5	129.

TABLE A.2, CONTINUED.

SITE 22

COLLECTION EFFICIENCY = 0.94

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	12.74	0.21	3.31	4.17	50.0	-0.21
2	4-13	12.95	0.12	5.73	4.44	25.0	-0.13
3	4-13	13.07	0.12	5.73	4.50	18.0	-0.20
4	4-13	13.19	0.12	5.73	4.63	13.0	-0.23
5	4-13	13.32	0.12	5.73	4.59	14.0	-0.19
6	4-13	13.44	0.12	5.73	4.61	12.0	-0.21
7	4-13	13.56	0.52	1.35	4.49	17.0	-0.11
AVG				3.66	4.46	21.3	-0.18
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM $\mu\text{EQ/L}$
1	NAP	71.0	NAP	110.0	23.0	<0.2	275.
2	NAP	29.0	NAP	42.0	9.9	<0.2	110.
3	NAP	20.0	NAP	30.0	6.6	<0.2	77.
4	NAP	13.0	NAP	19.0	5.0	<0.2	50.
5	NAP	14.0	NAP	20.0	4.6	<0.2	53.
6	NAP	12.0	NAP	15.0	2.8	<0.2	42.
7	NAP	17.0	NAP	16.0	5.0	<0.2	55.
AVG	--	25.1	--	36.0	8.1	--	94.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	67.6	93.0	20.0	4.1	13.0	5.7	222.
2	36.3	31.0	10.0	1.7	5.9	2.6	96.
3	31.6	16.0	6.5	<0.6	2.8	1.4	63.
4	23.4	8.1	3.9	<0.4	1.4	0.7	40.
5	25.7	9.1	4.5	<0.4	1.4	0.8	44.
6	24.5	4.4	2.5	<0.4	0.8	0.4	34.
7	32.4	8.3	3.5	<0.4	1.6	0.9	49.
AVG	34.5	24.3	7.3	0.8	3.8	1.8	78.

TABLE A.2, CONTINUED.

SITE 23

COLLECTION EFFICIENCY = 0.81

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	MOE	MOE	MOE	MOE	RPC	RPC	--
2	MOE	MOE	MOE	MOE	RPC	RPC	--
3	MOE	MOE	MOE	MOE	RPC	RPC	--
4	MOE	MOE	MOE	MOE	RPC	RPC	--
5	MOE	MOE	MOE	MOE	RPC	RPC	--
6	MOE	MOE	MOE	MOE	RPC	RPC	--
7	MOE	MOE	MOE	MOE	RPC	RPC	--
8	MOE	MOE	MOE	MOE	RPC	RPC	--
AVG				--	--	--	--
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM $\mu\text{EQ/L}$
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--

TABLE A.2, CONTINUED.

SITE 24

COLLECTION EFFICIENCY = 0.77

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL	
1	4-13	12.83	0.36	2.38	4.10	58.0	-0.03
2	4-13	13.19	0.19	4.56	4.35	27.0	0.04
3	4-13	13.38	0.19	4.56	4.37	23.0	0.04
4	4-13	13.57	0.19	4.56	4.40	21.0	0.02
5	4-13	13.76	0.19	4.56	4.63	12.0	-0.05
6	4-13	13.94	0.24	3.62	4.66	11.0	-0.03
AVG			3.81	4.38	25.3	0.00	
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	68.0	NAP	110.0	22.0	<0.2	268.
2	NAP	28.0	NAP	41.0	8.6	<0.2	106.
3	NAP	20.0	NAP	28.0	7.0	<0.2	75.
4	NAP	19.0	NAP	23.0	5.5	<0.2	67.
5	NAP	11.0	NAP	13.0	3.7	<0.2	39.
6	NAP	10.0	NAP	11.0	2.7	<0.2	34.
AVG	--	26.0	--	37.7	8.3	--	98.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UER/L
1	79.4	99.0	14.0	0.7	23.0	9.9	259.
2	44.4	40.0	9.7	<0.4	5.6	2.3	110.
3	42.7	20.0	5.6	<0.4	3.3	1.5	78.
4	39.8	17.0	4.3	<0.4	2.1	1.1	68.
5	23.4	6.0	3.0	<0.4	1.4	0.8	37.
6	21.9	4.3	2.2	<0.4	1.5	0.6	33.
AVG	41.9	31.1	6.5	0.1	6.2	2.7	97.

TABLE A.2, CONTINUED.

SITE 25

NO DATA - COLLECTOR MALFUNCTION

TABLE A.2, CONTINUED.

SITE 26

COLLECTION EFFICIENCY = 0.81

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	13.10	0.57	1.43	4.18	46.0	-0.19
2	4-13	13.67	0.16	5.04	4.42	24.0	-0.08
3	4-13	13.83	0.14	5.83	5.34	3.3	-0.12
4	4-13	13.97	0.14	5.83	4.59	12.0	-0.09
5	4-13	14.11	0.14	5.83	4.66	11.0	-0.12
6	4-13	14.25	0.14	5.83	4.66	10.0	-0.19
7	4-13	14.39	0.14	5.83	4.68	10.0	-0.11
8	4-13	14.53	0.14	5.83	4.63	12.0	-0.15
9	4-13	14.66	0.36	2.47	4.64	11.0	-0.20
AVG				3.84	4.57	15.4	-0.14
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	57.0	NAP	99.0	21.0	<0.2	234.
2	NAP	26.0	NAP	41.0	8.7	<0.2	102.
3	NAP	2.7	NAP	4.2	2.2	<0.2	12.
4	NAP	11.0	<0.1	17.0	5.4	<0.2	44.
5	NAP	10.0	0.1	14.0	4.3	<0.2	38.
6	NAP	9.9	NAP	13.0	3.3	<0.2	36.
7	NAP	10.0	NAP	10.0	3.0	<0.2	33.
8	NAP	11.0	<0.1	12.0	4.4	<0.2	38.
9	NAP	11.0	NAP	13.0	3.3	<0.2	38.
AVG	--	16.5	0.0	24.7	6.1	--	64.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	66.1	77.0	12.0	1.5	13.0	5.6	194.
2	38.0	37.0	6.7	<0.4	4.3	1.9	94.
3	4.6	4.3	1.6	<0.4	<0.5	<0.4	10.
4	25.7	6.0	4.5	<0.4	1.6	0.6	41.
5	21.9	5.0	4.1	<0.4	1.0	0.6	34.
6	21.9	3.2	1.8	<0.4	0.9	0.5	30.
7	20.9	4.0	1.9	<0.4	0.9	0.5	30.
8	23.4	4.5	2.2	<0.4	0.9	0.5	33.
9	22.9	4.1	2.0	<0.4	0.8	0.5	31.
AVG	27.2	16.0	4.1	0.2	2.6	1.2	55.

TABLE A.2, CONTINUED.

SITE 27

COLLECTION EFFICIENCY = 0.86

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND ($\mu\text{MHO/CM}$)	ION BAL
1	4-13	13.90	0.26	2.91	4.19	45.0	-0.10
2	4-13	14.16	0.14	5.55	4.47	19.0	-0.06
3	4-13	14.30	0.14	5.55	4.52	15.0	0.09
4	4-13	14.44	0.14	5.55	4.59	13.0	0.02
5	4-13	14.58	0.14	5.55	4.68	11.0	--
6	4-13	14.71	0.14	5.55	4.76	8.6	0.04
7	4-13	14.85	0.14	5.55	4.79	7.9	0.01
8	4-13	14.99	0.18	4.20	4.74	9.0	0.17
AVG				4.81	4.55	16.1	0.03
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	51.0	<0.1	84.0	18.0	<0.2	204.
2	NAP	27.0	<0.1	26.0	5.7	<0.2	86.
3	NAP	13.0	NAP	14.0	3.6	<0.2	44.
4	NAP	12.0	NAP	8.9	3.3	<0.2	36.
5	NAP	10.0	0.1	6.9	RPC	<0.2	RPC
6	NAP	7.6	NAP	5.4	2.5	<0.2	23.
7	NAP	6.3	NAP	5.4	2.2	<0.2	20.
8	NAP	7.5	<0.1	6.7	2.3	<0.2	24.
AVG	--	16.8	0.0	19.7	5.4	--	62.
	FRFE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	64.6	63.0	11.0	1.7	15.0	7.5	185.
2	33.9	26.0	6.8	0.9	4.2	2.2	80.
3	30.2	8.4	2.6	0.8	1.9	1.0	48.
4	25.7	5.2	2.4	<0.4	1.1	0.7	37.
5	20.9	3.9	2.0	<0.4	0.9	0.6	30.
6	17.4	2.1	1.7	<0.4	1.0	0.5	24.
7	16.2	1.2	1.3	<0.4	0.9	<0.4	20.
8	18.2	2.4	4.4	1.0	0.9	0.4	29.
AVG	28.4	14.0	4.0	0.5	3.2	1.6	57.

TABLE 4.2, CONTINUED.

SITE 31

COLLECTION EFFICIENCY = 0.77

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAR PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	4-13	12.30	0.10	8.71	4.21	51.0	-0.24
2	4-13	12.40	0.10	8.71	4.47	25.0	0.10
3	4-13	12.50	0.10	8.71	4.52	23.0	0.07
4	4-13	12.59	0.10	8.71	4.43	25.0	0.04
5	4-13	12.69	0.10	8.71	4.35	26.0	0.06
6	4-13	12.79	0.10	8.71	4.27	34.0	-0.08
7	4-13	12.89	0.10	8.71	4.34	29.0	-0.21
8	4-13	12.99	0.10	8.71	4.49	20.0	-0.06
9	4-13	13.09	1.36	2.06	4.48	19.0	-0.09
AVG				4.49	4.40	26.2	-0.06
	SO2	SO4	NO2	NO3	CL	PO4	AM SUM $\mu\text{EQ/L}$
1	NAP	63.0	<0.1	94.0	22.0	<0.2	242.
2	NAP	26.0	<0.1	34.0	11.0	<0.2	97.
3	NAP	20.0	NAP	24.0	9.6	<0.2	74.
4	NAP	24.0	NAP	29.0	11.0	<0.2	88.
5	NAP	27.0	<0.1	31.0	13.0	<0.2	98.
6	NAP	33.0	NAP	42.0	12.0	<0.2	120.
7	NAP	33.0	<0.1	39.0	9.5	<0.2	115.
8	NAP	20.0	NAP	21.0	7.2	<0.2	68.
9	NAP	19.0	0.1	17.0	5.2	<0.2	60.
AVG	--	27.3	0.0	32.8	10.0	--	97.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	61.7	78.0	13.0	<0.4	13.0	5.4	189.
2	33.9	41.0	12.0	<0.4	7.0	2.9	107.
3	30.2	28.0	9.0	<0.4	3.9	1.8	79.
4	37.2	30.0	12.0	<0.4	4.1	2.1	92.
5	44.7	35.0	12.0	<0.4	4.0	2.3	104.
6	53.7	34.0	12.0	<0.4	3.5	2.1	111.
7	45.7	31.0	8.8	<0.4	2.2	1.6	93.
8	32.4	17.0	9.3	<0.4	1.6	1.2	64.
9	33.1	13.0	4.6	<0.4	1.2	0.9	55.
AVG	39.7	29.8	9.1	--	3.8	2.0	90.

TABLE A.2, CONTINUED.

SITE 32

COLLECTION EFFICIENCY = 0.90

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GNT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	12.52	0.21	3.53	4.17	51.0	-0.10
2	4-13	12.73	0.21	3.53	4.29	35.0	-0.05
3	4-13	12.94	0.21	3.53	4.29	32.0	-0.08
4	4-13	13.14	0.30	2.41	4.41	23.0	-0.08
5	4-13	13.45	0.39	1.87	4.44	23.0	-0.07
6	4-13	13.84	0.39	1.87	4.29	31.0	-0.12
7	4-13	14.23	0.10	1.87	4.19	ISA	-0.11
AVG				2.53	4.30	32.5	-0.08
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	62.0	<0.1	90.0	20.0	<0.2	234.
2	NAP	37.0	<0.1	51.0	15.0	<0.2	140.
3	NAP	32.0	NAP	38.0	11.0	<0.2	113.
4	NAP	23.0	NAP	25.0	8.8	<0.2	80.
5	NAP	20.0	NAP	20.0	5.7	<0.2	66.
6	NAP	31.0	0.1	24.0	7.6	<0.2	94.
7	NAP	39.0	NAP	32.0	11.0	<0.2	121.
AVG	--	34.4	0.0	40.9	11.3	--	121.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	67.6	84.0	18.0	4.7	14.0	5.1	213.
2	51.3	44.0	16.0	2.2	6.8	3.0	133.
3	51.3	31.0	11.0	<1.0	3.6	2.1	105.
4	38.9	20.0	7.5	<0.4	2.1	1.5	74.
5	36.3	14.0	5.7	<0.4	1.5	1.1	61.
6	51.3	17.0	6.9	<0.4	2.4	1.6	83.
7	64.6	17.0	11.0	<0.4	5.0	2.7	108.
AVG	50.1	34.3	10.9	1.1	5.1	2.4	111.

TABLE A.2, CONTINUED.

SITE 33

COLLECTION EFFICIENCY = 0.78

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.98	0.27	3.09	4.13	49.0
2	4-13	13.26	0.27	3.09	3.98	83.0
3	4-13	13.53	0.27	3.09	4.25	41.0
4	4-13	13.81	0.27	3.09	4.36	30.0
5	4-13	14.08	0.10	8.67	4.43	23.0
6	4-13	14.18	0.61	1.38	4.39	23.0
7	4-13	14.79	0.19	1.27	4.44	ISA
AVG				2.66	4.23	41.5
	SO2	SO4	NO2	NO3	CL	P04
						AN SUM UFQ/L
1	NAP	53.0	0.1	54.0	18.0	<0.2
2	NAP	97.0	<0.1	120.0	37.0	<0.2
3	NAP	44.0	NAP	55.0	16.0	<0.2
4	NAP	30.0	NAP	37.0	10.0	<0.2
5	NAP	21.0	<0.1	24.0	8.8	<0.2
6	NAP	22.0	<0.1	19.0	6.3	<0.2
7	NAP	21.0	NAP	13.0	5.0	<0.2
AVG	--	43.4	0.0	49.7	15.5	--
	FREE H	NH4	NA	K	CA	MG
						CAT SUM MEQ/L
1	74.1	43.0	12.0	2.1	12.0	5.5
2	104.7	98.0	17.0	12.0	37.0	11.0
3	56.2	54.0	16.0	5.8	9.4	3.6
4	43.7	40.0	10.0	1.7	4.0	2.2
5	37.2	19.0	6.7	<1.0	2.3	1.5
6	40.7	15.0	6.0	<1.0	2.1	1.5
7	36.3	16.0	4.5	<1.0	1.7	1.1
AVG	58.4	43.5	11.0	3.4	10.7	4.1

TABLE A.2, CONTINUED.

SITE 34

COLLECTION EFFICIENCY = 0.94

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LA9 PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	4-13	13.15	0.23	3.06	4.13	58.0	-0.05
2	4-13	13.38	0.24	2.92	4.22	43.0	-0.04
3	4-13	13.61	0.24	2.91	4.37	27.0	0.00
4	4-13	13.85	0.24	2.91	4.39	25.0	0.02
5	4-13	14.09	0.24	2.91	4.45	23.0	-0.16
6	4-13	14.33	0.13	5.21	4.30	29.0	0.12
7	4-13	14.47	0.16	4.37	4.23	34.0	-0.04
8	4-13	14.63	0.04	2.35	ISA	ISA	--
AVG				3.28	4.29	34.1	-0.02
	S02	S04	NO2	NO3	CL	P04	AN SUM $\mu\text{EQ/L}$
1	NAP	71.0	<0.1	88.0	21.0	<0.2	251.
2	NAP	46.0	0.1	56.0	14.0	<0.2	162.
3	NAP	26.0	<0.1	31.0	8.7	<0.2	92.
4	NAP	22.0	NAP	27.0	7.7	<0.2	79.
5	NAP	22.0	0.1	27.0	9.3	<0.2	80.
6	NAP	21.0	NAP	20.0	7.1	<0.2	69.
7	NAP	37.0	<0.1	26.0	10.0	<0.2	110.
8	NAP	35.0	NAP	21.0	7.8	<0.2	99.
AVG	--	35.0	0.0	39.0	11.1	--	120.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	74.1	79.0	18.0	7.1	24.0	6.2	239.
2	60.3	56.0	14.0	5.2	7.1	3.0	156.
3	42.7	30.0	7.9	1.7	3.0	1.6	91.
4	40.7	24.0	7.4	<0.4	2.4	1.5	80.
5	35.5	19.0	7.4	<1.0	1.8	1.5	68.
6	50.1	15.0	5.5	0.6	2.0	1.4	78.
7	58.9	25.0	9.1	1.0	3.5	2.6	106.
8	ISA	22.0	8.1	0.4	ISA	ISA	ISA
AVG	51.8	35.2	9.9	2.2	6.3	2.5	117.

TABLE A.2, CONTINUED.

SITE 35

COLLECTION EFFICIENCY = 0.89

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	13.28	0.32	2.31	4.33	69.0	-0.08
2	4-13	13.60	0.22	3.35	4.23	39.0	-0.03
3	4-13	13.82	0.22	3.35	4.38	25.0	-0.11
4	4-13	14.05	0.22	3.35	4.42	22.0	-0.16
5	4-13	14.27	0.32	2.34	4.41	22.0	-0.15
6	4-13	14.58	1.16	0.64	4.31	29.0	-0.18
7	4-13	15.74	0.24	3.04	4.19	40.0	-0.14
8	4-13	15.99	0.05	3.04	4.16	ISA	-0.17
AVG				1.94	4.31	35.1	-0.12
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM $\mu\text{EQ/L}$
1	0.2	120.0	0.1	150.0	35.0	<0.2	425.
2	NAP	42.0	<0.1	58.0	14.0	<0.2	156.
3	NAP	25.0	NAP	34.0	14.0	<0.2	98.
4	<0.1	21.0	<0.1	26.0	11.0	<0.2	79.
5	NAP	22.0	NAP	22.0	16.0	<0.2	82.
6	NAP	30.0	<0.1	29.0	19.0	<0.2	108.
7	<0.1	42.0	0.1	41.0	17.0	<0.2	142.
8	NAP	40.0	NAP	37.0	21.0	<0.2	138.
AVG	0.1	43.1	0.0	51.0	18.1	--	155.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	46.8	130.0	22.0	19.0	67.0	20.0	392.
2	58.9	54.0	13.0	2.5	7.8	3.8	152.
3	41.7	29.0	6.9	<0.4	3.1	1.8	87.
4	38.0	18.0	4.3	<1.0	2.2	1.3	67.
5	38.9	20.0	4.8	0.7	1.7	1.2	70.
6	49.0	24.0	7.0	<1.0	3.2	2.1	91.
7	64.6	28.0	12.0	1.8	4.8	3.7	123.
8	69.2	25.0	9.0	1.5	3.3	2.4	116.
AVG	48.9	42.7	10.0	3.4	12.5	4.8	140.

TABLE A.2, CONTINUED.

SITE 36

COLLECTION EFFICIENCY = 0.89

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAR PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	4-13	13.79	0.15	4.86	4.36	41.0	-0.02
2	4-13	13.94	0.15	4.86	4.30	36.0	-0.05
3	4-13	14.09	0.15	4.86	4.38	26.0	-0.07
4	4-13	14.24	0.15	4.86	4.48	19.0	-0.15
5	4-13	14.40	0.29	2.55	4.56	16.0	-0.19
6	4-13	14.69	0.35	2.14	4.45	19.0	-0.10
7	4-13	15.03	1.12	0.66	4.28	29.0	-0.18
8	4-13	16.15	0.13	5.21	4.22	32.0	-0.16
AVG				2.35	4.37	27.2	-0.11
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM DEQ/L
1	NAP	52.0	0.1	89.0	17.0	<0.2	210.
2	NAP	37.0	0.1	67.0	12.0	<0.2	153.
3	NAP	23.0	NAP	40.0	10.0	<0.2	95.
4	NAP	19.0	0.1	28.0	7.3	<0.2	73.
5	NAP	17.0	NAP	21.0	4.9	<0.2	60.
6	NAP	20.0	<0.1	22.0	5.8	<0.2	68.
7	NAP	32.0	NAP	34.0	9.8	<0.2	108.
8	NAP	33.0	0.1	37.0	10.0	<0.2	113.
AVG	--	29.1	0.1	42.3	9.6	--	110.
	FREE H	NH4	NA	K	CA	MG	CAT SUM DEQ/L
1	43.7	91.0	16.0	7.9	17.0	6.4	205.
2	50.1	61.0	8.4	3.2	8.4	3.2	146.
3	41.7	29.0	6.7	2.2	3.5	1.6	90.
4	33.1	18.0	5.3	<1.0	2.4	1.1	63.
5	27.5	14.0	3.6	<1.0	1.5	0.8	50.
6	35.5	14.0	6.4	<1.0	1.8	0.9	61.
7	52.5	21.0	6.7	<1.0	3.2	1.8	90.
8	60.3	18.0	7.4	0.7	3.1	1.7	96.
AVG	42.9	33.4	7.6	1.8	5.1	2.2	100.

TABLE A.2, CONTINUED.

SITE 37

COLLECTION EFFICIENCY = 0.85

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	14.03	0.24	3.24	4.28	47.0	-0.04
2	4-13	14.27	0.24	3.24	4.40	28.0	-0.02
3	4-13	14.51	0.24	3.24	4.48	21.0	0.03
4	4-13	14.74	0.24	3.24	4.55	16.0	-0.03
5	4-13	14.98	0.24	3.24	4.56	15.0	0.05
6	4-13	15.22	1.03	0.75	4.37	23.0	-0.04
7	4-13	16.25	0.24	2.86	4.14	45.0	-0.11
AVG				2.16	4.38	27.6	-0.02
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM $\mu\text{EQ/L}$
1	NAP	55.0	<0.1	88.0	18.0	<0.2	216.
2	NAP	26.0	<0.1	46.0	9.5	<0.2	108.
3	NAP	18.0	NAP	29.0	7.1	<0.2	72.
4	NAP	16.0	0.1	20.0	5.1	<0.2	57.
5	NAP	13.0	NAP	14.0	4.2	<0.2	44.
6	NAP	24.0	NAP	20.0	5.5	<0.2	74.
7	NAP	48.0	<0.1	44.0	13.0	<0.2	153.
AVG	--	28.3	0.0	37.2	8.9	--	103.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	52.5	79.0	17.0	2.0	19.0	10.0	208.
2	39.8	38.0	6.9	1.0	6.2	3.9	106.
3	33.1	22.0	6.0	<1.0	4.1	2.5	74.
4	28.2	15.0	4.5	0.4	2.4	1.4	56.
5	27.5	10.0	3.3	<0.4	1.9	1.0	47.
6	42.7	15.0	4.8	0.5	1.9	1.2	69.
7	72.4	31.0	12.0	1.0	6.1	4.2	137.
AVG	41.9	30.0	7.7	0.7	5.9	3.4	99.

TABLE A.2, CONTINUED.

SITE 41

COLLECTION EFFICIENCY = 0VF

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	11.65	0.04	15.22	RPC	RPC	--
2	4-13	11.70	0.29	2.29	RPC	RPC	--
3	4-13	11.99	0.57	1.15	RPC	RPC	--
4	4-13	12.56	0.06	10.97	RPC	RPC	--
5	4-13	12.62	0.02	40.79	RPC	RPC	--
6	4-13	12.64	0.02	40.79	RPC	RPC	--
7	4-13	12.65	0.02	40.79	RPC	RPC	--
8	4-13	12.67	0.02	40.79	RPC	RPC	--
9	4-13	12.68	0.28	40.79	RPC	RPC	--
AVG				12.68	--	--	--
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
9	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
9	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--

TABLE A.2, CONTINUED.

SITE 42

COLLECTION EFFICIENCY = 0.93

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAR PH	COND $\mu\text{MHO/CM}$	TOTAL
1	4-13	12.85	0.02	39.70	4.24	69.0	-0.24
2	4-13	12.87	0.02	39.70	ISA	ISA	--
3	4-13	12.88	0.02	39.70	4.06	54.0	-0.21
4	4-13	12.90	0.02	39.70	4.07	50.0	-0.21
5	4-13	12.92	0.04	19.05	4.22	34.0	-0.22
6	4-13	12.96	0.08	9.40	4.39	22.0	-0.21
7	4-13	13.03	0.08	9.40	4.46	19.0	-0.24
8	4-13	13.11	0.55	1.29	4.50	18.0	-0.19
9	4-13	13.66	1.94	1.14	4.17	38.0	-0.19
AVG				2.87	4.22	38.0	-0.21
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	0.1	130.0	0.1	150.0	35.0	<0.2	445.
2	NAP	86.0	0.1	110.0	26.0	<0.2	308.
3	NAP	71.0	NAP	78.0	17.0	<0.2	237.
4	<0.2	66.0	0.1	66.0	15.0	<0.2	213.
5	NAP	44.0	NAP	41.0	9.6	<0.2	139.
6	NAP	27.0	0.1	25.0	6.8	<0.2	86.
7	NAP	24.0	NAP	21.0	6.9	<0.2	76.
8	NAP	21.0	NAP	18.0	5.7	<0.2	66.
9	<0.2	48.0	0.1	46.0	14.0	<0.2	156.
AVG	0.0	55.6	0.1	58.7	14.9	--	185.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	57.5	120.0	41.0	8.1	46.0	15.0	349.
2	ISA	78.0	30.0	2.2	13.0	6.9	ISA
3	87.1	63.0	19.0	1.7	6.6	3.7	191.
4	85.1	57.0	14.0	2.2	4.4	2.8	173.
5	60.3	34.0	7.7	<0.4	2.8	1.6	111.
6	40.7	17.0	5.2	<0.4	2.1	1.1	69.
7	34.7	13.0	4.9	<0.4	2.2	1.2	59.
8	31.6	13.0	4.6	<0.4	1.6	0.9	54.
9	67.6	30.0	14.0	<0.4	5.1	3.3	128.
AVG	60.1	43.9	15.3	1.3	8.5	3.9	139.

TABLE A.2, CONTINUED.

SITE 43

COLLECTION EFFICIENCY = 0.53

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.76	0.43	2.89	4.38	55.0	-0.16
2	4-13	13.19	0.07	16.85	4.36	36.0	-0.06
3	4-13	13.26	0.07	16.85	4.38	30.0	-0.13
4	4-13	13.34	0.07	16.85	4.35	29.0	-0.06
5	4-13	13.41	0.07	16.85	4.45	22.0	-0.10
6	4-13	13.48	0.07	16.85	4.57	16.0	0.01
7	4-13	13.56	0.07	16.85	4.58	15.0	-0.06
8	4-13	13.63	0.07	16.85	4.68	13.0	-0.12
9	4-13	13.70	2.04	6.10	4.36	26.0	-0.06
AVG				7.49	4.40	26.4	-0.07
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	0.1	87.0	NAP	110.0	23.0	<0.2	307.
2	NAP	42.0	NAP	51.0	16.0	<0.2	151.
3	NAP	33.0	NAP	38.0	19.0	<0.2	123.
4	<0.2	30.0	NAP	34.0	8.6	<0.2	103.
5	NAP	23.0	NAP	22.0	6.6	<0.2	75.
6	NAP	16.0	NAP	16.0	5.1	<0.2	53.
7	NAP	16.0	NAP	14.0	3.8	<0.2	50.
8	NAP	12.0	NAP	9.5	3.7	<0.2	37.
9	NAP	25.0	NAP	19.0	6.2	<0.2	75.
AVG	0.1	28.3	--	26.9	8.2	--	92.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	41.7	93.0	19.0	5.3	44.0	7.7	262.
2	43.7	49.0	19.0	2.7	11.0	3.2	143.
3	41.7	34.0	14.0	2.4	6.2	1.8	108.
4	44.7	31.0	8.4	1.1	4.2	1.4	96.
5	35.5	20.0	5.2	<0.4	2.4	0.9	67.
6	26.9	16.0	4.3	1.0	1.9	0.7	53.
7	26.3	13.0	3.0	0.7	1.5	0.5	47.
8	20.9	8.5	2.0	<0.4	0.8	<0.4	33.
9	43.7	16.0	5.7	0.6	1.5	0.9	71.
AVG	39.9	23.6	7.3	1.0	4.8	1.4	84.

TABLE A.2, CONTINUED.

SITE 44

COLLECTION EFFICIENCY = 0.46

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	TON BAL
1	4-13	12.97	0.27	5.35	4.55	41.0	-0.21
2	4-13	13.25	0.40	3.58	4.51	30.0	-0.23
3	4-13	13.65	0.54	2.69	4.32	42.0	-0.25
4	4-13	14.19	0.29	5.00	4.31	39.0	-0.26
5	4-13	14.48	1.19	1.22	4.47	24.0	-0.10
6	4-13	15.67	0.20	7.12	4.40	29.0	-0.10
7	4-13	15.87	0.04	5.05	4.42	ISA	-0.08
AVG				3.03	4.42	34.2	-0.19
	SO2	SO4	NO2	NO3	CL	P04	AN SUM UEQ/L
1	0.1	63.0	0.1	98.0	22.0	<0.2	246.
2	0.1	38.0	0.1	54.0	14.0	<0.2	144.
3	0.1	51.0	NAP	67.0	18.0	<0.2	187.
4	<0.1	44.0	0.2	57.0	16.0	<0.2	161.
5	<0.1	23.0	NAP	22.0	5.8	<0.2	74.
6	<0.1	28.0	<0.1	23.0	8.4	<0.2	87.
7	NAP	27.0	NAP	21.0	7.9	<0.2	83.
AVG	0.1	40.9	0.1	52.8	13.9	--	149.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	28.2	98.0	19.0	4.4	19.0	5.5	199.
2	30.9	46.0	14.0	1.1	8.0	3.1	114.
3	47.9	56.0	18.0	1.0	7.8	3.4	145.
4	49.0	45.0	13.0	0.7	5.7	2.4	124.
5	33.9	21.0	5.4	<0.4	2.1	1.1	67.
6	39.8	23.0	7.1	0.5	2.7	1.6	79.
7	38.0	20.0	7.7	0.8	3.3	1.7	76.
AVG	38.3	47.6	12.6	1.3	7.5	2.8	120.

TABLE A.2, CONTINUED.

SITE #5

NO DATA - COLLECTOR MALFUNCTION

TABLE A.2, CONTINUED.

SITE 46

COLLECTION EFFICIENCY = 0.50

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	14.08	0.25	5.37	RPC	RPC	--
2	4-13	14.33	0.44	3.01	RPC	RPC	--
3	4-13	14.77	0.22	6.09	RPC	RPC	--
4	4-13	14.99	0.10	13.66	RPC	RPC	--
5	4-13	15.08	5.86	0.23	RPC	RPC	--
6	4-13	20.94	0.32	4.07	RPC	RPC	--
7	4-13	21.27	0.30	4.07	RPC	RPC	--
AVG				1.22	--	--	--
	S02	S04	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--

TABLE A.2, CONTINUED.

SITE 51

COLLECTION EFFICIENCY = 0.90

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.52	0.01	55.88	4.02	72.0	-0.09
2	4-13	12.53	0.01	55.88	4.35	30.0	-0.02
3	4-13	12.54	0.01	55.89	4.42	25.0	0.00
4	4-13	12.56	0.01	55.88	4.43	24.0	-0.04
5	4-13	12.57	0.01	55.88	4.46	23.0	-0.05
6	4-13	12.58	0.01	55.88	4.50	22.0	-0.07
7	4-13	12.60	0.01	55.88	4.49	20.0	-0.04
8	4-13	12.61	0.02	33.87	4.49	20.0	-0.31
9	4-13	12.63	2.82	2.33	4.40	28.0	-0.17
AVG				4.24	4.38	28.7	-0.12
	S02	S04	N02	N03	CL	P04	AN SUM UEQ/L
1	NAP	84.0	NAP	110.0	28.0	<0.2	306.
2	NAP	30.0	NAP	36.0	12.0	<0.2	108.
3	NAP	25.0	NAP	29.0	10.0	<0.2	89.
4	NAP	23.0	NAP	26.0	12.0	<0.2	84.
5	NAP	22.0	NAP	24.0	11.0	<0.2	79.
6	NAP	20.0	NAP	21.0	8.6	<0.2	70.
7	NAP	20.0	NAP	22.0	11.0	<0.2	73.
8	NAP	20.0	ISA	21.0	25.0	<0.2	86.
9	NAP	28.0	NAP	29.0	11.0	<0.2	96.
AVG	--	29.2	--	32.4	12.7	--	103.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	95.5	99.0	33.0	3.3	18.0	6.7	280.
2	44.7	34.0	12.0	1.3	5.1	2.0	106.
3	38.0	28.0	11.0	2.1	3.5	1.4	89.
4	37.2	22.0	11.0	1.5	3.3	1.4	81.
5	34.7	21.0	9.9	1.2	2.7	1.3	75.
6	31.6	18.0	7.9	<1.0	2.7	1.1	65.
7	32.4	19.0	9.5	1.8	2.4	1.2	70.
8	32.4	16.0	7.0	<0.4	2.6	1.1	63.
9	39.8	22.0	9.5	1.2	2.9	1.5	81.
AVG	41.5	26.8	11.0	1.3	3.9	1.7	92.

TABLE A.2, CONTINUED.

SITE 52

COLLECTION EFFICIENCY = 0.71

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.92	0.05	20.26	3.90	92.0	-0.14
2	4-13	12.97	0.05	20.26	4.18	50.0	-0.07
3	4-13	13.02	0.03	32.20	4.38	32.0	-0.07
4	4-13	13.05	0.03	36.89	4.45	25.0	-0.08
5	4-13	13.07	0.03	36.89	4.52	22.0	-0.09
6	4-13	13.10	0.03	36.89	4.60	18.0	-0.15
7	4-13	13.12	0.04	25.14	4.62	16.0	-0.11
8	4-13	13.16	0.09	10.85	4.68	15.0	-0.19
9	4-13	13.24	1.85	3.92	4.32	31.0	-0.10
AVG				6.78	4.33	32.4	-0.10
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	100.0	NAP	130.0	24.0	<0.2	354.
2	NAP	53.0	NAP	71.0	17.0	<0.2	194.
3	NAP	32.0	NAP	38.0	11.0	<0.2	113.
4	NAP	24.0	NAP	25.0	7.4	<0.2	80.
5	NAP	21.0	NAP	21.0	7.0	<0.2	70.
6	NAP	18.0	NAP	17.0	5.5	<0.2	59.
7	NAP	17.0	NAP	16.0	3.2	<0.2	53.
8	NAP	16.0	NAP	14.0	5.2	<0.2	51.
9	NAP	33.0	NAP	27.0	9.4	<0.2	102.
AVG	--	34.1	--	34.3	9.7	--	112.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	125.9	110.0	27.0	3.9	15.0	6.1	309.
2	66.1	62.0	24.0	2.2	10.0	3.7	182.
3	41.7	34.0	14.0	1.4	5.2	2.1	106.
4	35.5	21.0	7.3	1.0	3.4	1.2	74.
5	30.2	19.0	6.8	0.9	2.5	1.1	64.
6	25.1	14.0	4.9	0.7	1.9	0.8	50.
7	24.0	14.0	4.1	0.8	1.7	0.8	48.
8	20.9	13.0	3.4	0.6	1.4	0.7	42.
9	47.9	28.0	9.0	<1.0	2.6	1.4	93.
AVG	47.0	32.0	10.2	0.7	3.9	1.7	101.

TABLE A.2, CONTINUED.

SITE 53

COLLECTION EFFICIENCY = OVF

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT)		OT	R-RATE	LAB PH	COND	ION BAL
	DAY	HR	HR	MM/HR		UMHO/CM	
1	4-13	13.01	0.11	5.75	3.96	92.0	-0.14
2	4-13	13.13	0.06	10.22	4.08	58.0	-0.04
3	4-13	13.19	0.06	11.92	4.38	26.0	-0.07
4	4-13	13.25	0.05	13.39	4.39	27.0	-0.06
5	4-13	13.30	0.02	43.43	4.47	21.0	0.13
6	4-13	13.31	0.02	43.43	4.57	16.0	0.00
7	4-13	13.33	0.02	43.43	4.58	15.0	-0.01
8	4-13	13.34	0.02	43.43	4.65	14.0	-0.02
9	4-13	13.36	0.57	19.79	4.47	21.0	-0.03
AVG				18.10	4.42	25.0	-0.03
	S02	S04	N02	N03	CL	P04	AN SUM
							UEQ/L
1	<0.2	120.0	<0.1	130.0	31.0	<0.2	401.
2	<0.2	59.0	0.1	70.0	18.0	<0.2	206.
3	<0.2	28.0	<0.1	30.0	9.7	<0.2	96.
4	<0.2	25.0	0.1	26.0	8.3	<0.2	84.
5	<0.2	19.0	NAP	18.0	5.5	<0.2	62.
6	<0.2	16.0	<0.1	15.0	4.8	<0.2	52.
7	<0.2	15.0	NAP	14.0	5.0	<0.2	49.
8	<0.2	13.0	NAP	12.0	5.0	<0.2	43.
9	0.1	21.0	<0.1	17.0	6.3	<0.2	65.
AVG	0.1	26.1	0.0	24.1	7.8	--	84.
	FREE H	NH4	NA	K	CA	MG	CAT SUM
							UEQ/L
1	109.6	110.0	39.0	7.1	29.0	12.0	348.
2	83.2	61.0	24.0	1.8	9.0	5.1	198.
3	41.7	26.0	10.0	<0.4	3.6	2.0	89.
4	40.7	22.0	8.4	<0.4	2.7	1.5	80.
5	33.9	25.0	5.8	<0.4	1.8	0.9	70.
6	26.9	15.0	4.7	0.8	1.3	0.8	52.
7	26.3	12.0	5.2	<0.4	1.6	0.9	48.
8	22.4	11.0	4.6	<0.4	1.2	0.8	42.
9	33.9	17.0	6.9	<0.4	1.7	1.1	63.
AVG	38.4	22.8	8.7	0.4	3.2	1.7	80.

TABLE A.2, CONTINUED.

SITE 54

COLLECTION EFFICIENCY = 0.95

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAR PH	COND UMHO/CM	ION BAL
1	4-13	13.53	0.13	5.54	4.07	69.0	-0.04
2	4-13	13.66	0.13	5.54	4.22	47.0	-0.06
3	4-13	13.78	0.67	1.04	4.31	36.0	-0.06
4	4-13	14.45	0.02	32.66	4.10	61.0	-0.08
5	4-13	14.47	0.02	32.66	4.18	50.0	-0.08
6	4-13	14.49	0.02	32.66	4.25	39.0	-0.18
7	4-13	14.52	0.02	32.66	4.29	35.0	-0.08
8	4-13	14.54	0.02	32.66	4.36	29.0	-0.10
9	4-13	14.56	6.54	0.90	4.32	32.0	-0.11
AVG				1.51	4.26	38.7	-0.10
	S02	S04	NO2	NO3	CL	PO4	AN SUM UMOL/L
1	NAP	79.0	<0.1	120.0	26.0	<0.2	304.
2	NAP	52.0	<0.1	69.0	19.0	<0.2	192.
3	NAP	37.0	NAP	47.0	17.0	<0.2	138.
4	NAP	67.0	NAP	80.0	25.0	<0.2	239.
5	NAP	57.0	<0.1	60.0	19.0	<0.2	193.
6	NAP	48.0	NAP	48.0	13.0	<0.2	157.
7	NAP	36.0	<0.1	38.0	12.0	<0.2	122.
8	NAP	29.0	NAP	31.0	9.2	<0.2	98.
9	NAP	32.0	<0.1	32.0	12.0	<0.2	108.
AVG	--	41.1	--	46.4	14.7	--	143.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UMOL/L
1	85.1	120.0	36.0	3.5	16.0	7.9	292.
2	60.3	64.0	26.0	2.4	8.9	4.9	180.
3	49.0	39.0	20.0	2.2	6.4	3.3	130.
4	79.4	67.0	35.0	3.5	12.0	5.9	221.
5	66.1	58.0	25.0	4.7	7.6	4.4	178.
6	56.2	43.0	16.0	1.5	4.6	2.8	132.
7	51.3	35.0	13.0	1.5	3.7	2.1	112.
8	43.7	27.0	8.7	<0.4	3.3	1.6	89.
9	47.9	28.0	11.0	<0.4	2.9	2.0	97.
AVG	54.4	41.9	16.6	1.2	5.3	3.0	131.

TABLE A.2, CONTINUED.

SITE 55

COLLECTION EFFICIENCY = 0.74

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	13.82	0.05	17.32	4.10	72.0	-0.11
2	4-13	13.87	0.09	9.89	4.37	31.0	-0.03
3	4-13	13.96	0.21	4.27	4.35	32.0	-0.02
4	4-13	14.17	0.34	2.62	4.24	40.0	-0.07
5	4-13	14.51	0.15	6.14	4.06	55.0	-0.07
6	4-13	14.65	0.05	18.55	4.91	27.0	0.04
7	4-13	14.70	0.05	17.41	4.27	33.0	0.00
8	4-13	14.75	0.06	14.43	4.32	32.0	0.07
9	4-13	14.81	6.51	0.88	4.29	34.0	0.04
AVG				1.71	4.28	37.5	0.00
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	81.0	<0.1	120.0	27.0	<0.2	309.
2	NAP	36.0	<0.1	43.0	12.0	<0.2	127.
3	NAP	32.0	NAP	38.0	13.0	<0.2	115.
4	NAP	41.0	0.2	49.0	16.0	<0.2	147.
5	NAP	60.0	<0.1	69.0	22.0	<0.2	211.
6	NAP	48.0	NAP	53.0	26.0	<0.2	175.
7	NAP	35.0	NAP	42.0	11.0	<0.2	123.
8	NAP	31.0	0.2	35.0	8.2	<0.2	105.
9	NAP	35.0	NAP	34.0	12.0	<0.2	116.
AVG	--	40.8	0.1	46.3	14.7	--	143.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	79.4	100.0	34.0	2.7	20.0	10.0	276.
2	42.7	42.0	15.0	3.1	6.9	3.5	124.
3	44.7	35.0	17.0	0.8	5.0	2.9	113.
4	57.5	38.0	20.0	1.8	6.7	3.4	138.
5	87.1	53.0	25.0	2.7	9.1	4.9	196.
6	12.3	49.0	32.0	1.0	29.0	15.0	182.
7	53.7	42.0	14.0	<0.6	4.5	2.3	123.
8	47.9	39.0	12.0	3.3	3.8	1.9	114.
9	51.3	37.0	16.0	1.5	4.6	2.8	121.
AVG	52.3	44.1	18.8	1.7	7.9	4.3	141.

TABLE A.2, CONTINUED.

SITE 56

COLLECTION EFFICIENCY = 0.91

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAR PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	13.99	0.01	60.51	4.11	61.0	0.02
2	4-13	14.00	0.01	60.52	4.27	35.0	-0.06
3	4-13	14.01	0.01	60.51	4.38	26.0	-0.05
4	4-13	14.03	0.01	60.51	4.37	25.0	0.00
5	4-13	14.04	0.01	60.52	4.39	24.0	0.02
6	4-13	14.05	0.01	60.51	4.40	22.0	-0.01
7	4-13	14.06	0.01	50.81	4.51	19.0	-0.04
8	4-13	14.08	0.19	3.78	4.52	17.0	-0.06
9	4-13	14.27	7.19	1.43	4.36	26.0	0.09
AVG				2.35	4.36	26.9	0.05
	S02	S04	NO2	NO3	CL	P04	AN SUM $\mu\text{EQ/L}$
1	NAP	68.0	<0.1	100.0	22.0	<0.2	258.
2	NAP	37.0	<0.1	41.0	8.5	<0.2	124.
3	NAP	27.0	NAP	30.0	6.5	<0.2	91.
4	NAP	25.0	0.1	26.0	6.2	<0.2	82.
5	NAP	23.0	NAP	24.0	6.5	<0.2	77.
6	NAP	21.0	NAP	22.0	7.1	<0.2	71.
7	NAP	17.0	0.1	19.0	5.9	<0.2	59.
8	NAP	16.0	NAP	17.0	7.9	<0.2	57.
9	NAP	22.0	<0.1	22.0	11.0	<0.2	77.
AVG	--	24.4	0.0	26.3	10.3	--	85.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	77.6	110.0	30.0	4.6	14.0	6.0	262.
2	53.7	38.0	11.0	2.2	3.7	2.2	117.
3	41.7	27.0	7.4	1.6	2.6	1.5	86.
4	42.7	26.0	6.7	<0.6	2.2	1.2	82.
5	40.7	23.0	6.3	1.4	2.1	1.1	78.
6	39.8	20.0	5.3	<0.6	1.7	0.9	70.
7	30.9	16.0	4.6	<0.4	1.6	0.9	56.
8	30.2	14.0	4.6	<0.4	1.7	0.8	54.
9	43.7	23.0	9.7	<0.4	2.4	1.6	84.
AVG	44.0	26.7	9.6	0.4	2.8	1.7	90.

TABLE A.2. CONTINUED.

SITE 57

COLLECTION EFFICIENCY = 0.87

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	MOE	MOE	MOE	MOE	4.27	46.0	-0.07
2	MOE	MOE	MOE	MOE	4.15	48.0	-0.03
3	MOE	MOE	MOE	MOE	4.05	61.0	0.01
4	MOE	MOE	MOE	MOE	3.97	68.0	0.08
5	MOE	MOE	MOE	MOE	4.11	50.0	0.09
6	MOE	MOE	MOE	MOE	4.27	35.0	0.08
7	MOE	MOE	MOE	MOE	4.28	32.0	-0.05
8	MOE	MOE	MOE	MOE	4.05	54.0	-0.07
9	MOE	MOE	MOE	MOE	4.24	35.0	-0.05
AVG				--	4.19	40.5	-0.03
	S02	S04	N02	N03	CL	P04	AN SUM $\mu\text{EQ/L}$
1	NAP	56.0	<0.1	92.0	17.0	<0.2	221.
2	NAP	51.0	0.1	76.0	19.0	<0.2	197.
3	NAP	63.0	NAP	86.0	28.0	<0.2	240.
4	NAP	62.0	0.1	84.0	25.0	<0.2	233.
5	NAP	43.0	NAP	55.0	16.0	<0.2	157.
6	NAP	30.0	0.1	38.0	11.0	<0.2	109.
7	NAP	33.0	NAP	38.0	11.0	<0.2	115.
8	NAP	55.0	NAP	69.0	17.0	<0.2	196.
9	NAP	36.0	<0.1	38.0	15.0	<0.2	125.
AVG	--	41.1	0.0	49.3	16.2	--	148.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	53.7	73.0	22.0	2.9	19.0	7.8	205.
2	70.8	58.0	26.0	2.5	12.0	4.8	191.
3	89.1	66.0	40.0	3.5	15.0	6.3	241.
4	107.2	69.0	35.0	3.4	13.0	6.2	253.
5	77.6	50.0	21.0	<2.9	7.5	3.7	171.
6	53.7	35.0	14.0	<2.9	5.1	2.5	118.
7	52.5	28.0	13.0	1.5	4.8	2.3	109.
8	89.1	50.0	20.0	1.7	7.5	3.6	183.
9	57.5	31.0	16.0	1.7	3.5	2.7	119.
AVG	64.0	39.8	19.1	1.8	6.2	3.5	144.

TABLE A.2, CONTINUED.

SITE 58

COLLECTION EFFICIENCY = 0.99

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	14.57	0.09	7.40	4.29	41.0	-0.03
2	4-13	14.66	0.12	5.81	4.31	31.0	0.02
3	4-13	14.78	0.04	18.49	4.16	42.0	0.00
4	4-13	14.81	0.07	9.13	4.16	41.0	0.04
5	4-13	14.89	0.15	4.35	4.14	43.0	-0.01
6	4-13	15.04	0.09	7.71	4.13	45.0	-0.01
7	4-13	15.13	0.01	55.47	4.11	46.0	-0.04
8	4-13	15.14	0.01	55.47	4.24	34.0	-0.02
9	4-13	15.15	6.68	1.63	4.33	28.0	0.00
AVG				2.24	4.28	32.1	0.00
	S02	S04	N02	N03	CL	P04	AN SUM UEQ/L
1	NAP	53.0	<0.1	70.0	16.0	<0.2	192.
2	NAP	32.0	NAP	41.0	12.0	<0.2	117.
3	NAP	42.0	NAP	50.0	15.0	<0.2	149.
4	NAP	42.0	NAP	45.0	11.0	<0.2	140.
5	NAP	44.0	0.1	47.0	11.0	<0.2	146.
6	NAP	48.0	NAP	52.0	14.0	<0.2	162.
7	NAP	51.0	NAP	52.0	11.0	<0.2	165.
8	NAP	39.0	NAP	38.0	6.9	<0.2	123.
9	NAP	30.0	NAP	30.0	8.4	<0.2	98.
AVG	--	34.6	0.1	36.4	9.6	--	115.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	51.3	75.0	18.0	1.9	14.0	6.1	186.
2	49.0	37.0	12.0	1.1	7.1	3.2	120.
3	69.2	45.0	15.0	1.3	6.5	3.1	150.
4	69.2	49.0	11.0	1.4	5.1	2.4	146.
5	72.4	49.0	10.0	1.1	4.1	2.0	145.
6	74.1	51.0	17.0	1.0	5.7	2.9	160.
7	77.6	55.0	13.0	<1.0	4.3	2.3	159.
8	57.5	48.0	7.3	<1.0	2.7	1.4	121.
9	46.8	33.0	8.9	<1.0	3.1	1.8	98.
AVG	52.8	39.0	10.2	0.3	4.1	2.2	115.

TABLE A.2, CONTINUED.

SITE 61

COLLECTION EFFICIENCY = 0.90

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.57	0.01	50.83	4.34	40.0	-0.04
2	4-13	12.59	0.01	50.83	4.36	32.0	-0.04
3	4-13	12.60	0.01	50.83	4.45	23.0	-0.02
4	4-13	12.62	0.01	50.83	4.54	19.0	-0.05
5	4-13	12.63	0.01	50.83	4.58	17.0	0.01
6	4-13	12.65	0.01	50.83	4.59	17.0	-0.04
7	4-13	12.66	0.64	1.15	4.50	21.0	0.04
8	4-13	13.30	6.36	0.12	4.16	48.0	-0.06
9	4-13	19.67	0.37	10.82	4.20	44.0	-0.15
AVG				1.33	4.32	34.0	-0.08
	S02	S04	N02	N03	CL	P04	AN SUM UEQ/L
1	NAP	54.0	0.1	71.0	15.0	<0.2	194.
2	NAP	39.0	NAP	46.0	13.0	<0.2	137.
3	NAP	27.0	NAP	28.0	9.8	<0.2	92.
4	NAP	21.0	NAP	22.0	8.2	<0.2	72.
5	NAP	19.0	NAP	20.0	8.1	ISA	66.
6	NAP	20.0	NAP	20.0	8.3	<0.2	68.
7	NAP	24.0	0.1	28.0	11.0	<0.2	87.
8	NAP	56.0	NAP	66.0	21.0	<0.2	199.
9	NAP	44.0	NAP	42.0	21.0	<0.2	151.
AVG	--	37.2	0.1	39.4	15.5	--	129.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	45.7	86.0	18.0	1.3	12.0	5.7	186.
2	43.7	53.0	15.0	0.9	6.0	3.2	131.
3	35.5	31.0	11.0	0.8	3.7	2.1	90.
4	28.8	21.0	9.1	<1.0	2.9	1.8	68.
5	26.3	21.0	9.4	<2.0	3.2	1.9	67.
6	25.7	19.0	9.6	<1.0	3.8	1.9	66.
7	31.6	26.0	19.0	<1.0	4.6	2.4	91.
8	69.2	57.0	31.0	<2.0	10.0	5.4	188.
9	63.1	28.0	20.0	2.1	5.8	2.7	130.
AVG	48.3	34.7	17.2	1.1	5.8	2.9	119.

TABLE A.2, CONTINUED.

SITE 62

COLLECTION EFFICIENCY = 0.89

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	12.87	0.10	7.62	4.11	77.0	-0.10
2	4-13	12.96	0.51	1.47	4.06	62.0	-0.08
3	4-13	13.47	0.02	47.63	4.16	53.0	-0.06
4	4-13	13.49	0.02	47.62	4.18	46.0	-0.05
5	4-13	13.50	0.02	47.63	4.28	34.0	-0.05
6	4-13	13.52	0.02	47.62	4.36	29.0	-0.04
7	4-13	13.53	0.02	47.63	4.42	24.0	-0.07
8	4-13	13.55	0.02	47.62	4.43	22.0	0.01
9	4-13	13.57	6.57	1.10	4.28	33.0	-0.03
AVG				1.82	4.26	37.7	-0.04
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UMOL/L
1	<0.2	100.0	NAP	120.0	28.0	<0.2	348.
2	<0.2	66.0	NAP	79.0	21.0	<0.2	232.
3	<0.2	58.0	NAP	71.0	23.0	<0.2	210.
4	<0.2	48.0	NAP	51.0	17.0	<0.2	164.
5	<0.2	36.0	NAP	35.0	12.0	<0.2	119.
6	<0.2	27.0	NAP	26.0	9.7	<0.2	90.
7	0.1	24.0	NAP	22.0	8.1	<0.2	78.
8	0.1	20.0	NAP	18.0	7.7	<0.2	66.
9	0.1	32.0	NAP	31.0	16.0	<0.2	111.
AVG	0.1	38.9	--	40.8	15.9	--	135.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UMOL/L
1	77.6	120.0	37.0	5.0	26.0	11.0	314.
2	87.1	69.0	31.0	<2.5	9.4	3.9	214.
3	69.2	65.0	33.0	<2.5	11.0	4.6	198.
4	66.1	46.0	23.0	2.0	6.3	3.1	156.
5	52.5	31.0	15.0	1.2	4.4	2.1	113.
6	43.7	22.0	11.0	1.0	2.9	1.4	86.
7	38.0	18.0	8.4	1.3	2.3	1.2	73.
8	37.2	16.0	6.3	<1.0	2.4	1.0	66.
9	52.5	25.0	16.0	1.9	4.1	2.1	108.
AVG	55.4	35.5	18.1	1.6	5.9	2.7	128.

TABLE A.2, CONTINUED.

SITE 63

COLLECTION EFFICIENCY = 0.72

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	13.37	0.58	1.60	3.89	99.0	-0.11
2	4-13	13.94	0.05	18.51	4.04	65.0	0.04
3	4-13	13.99	0.05	18.51	4.14	54.0	-0.09
4	4-13	14.04	0.05	18.51	4.32	33.0	-0.04
5	4-13	14.09	0.05	18.51	4.27	35.0	-0.03
6	4-13	14.14	5.09	0.18	4.40	27.0	-0.10
7	4-13	19.24	0.01	5.08	ISA	ISA	--
AVG				0.95	4.14	52.2	-0.05
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	0.1	110.0	NAP	130.0	31.0	<0.2	381.
2	NAP	61.0	NAP	73.0	28.0	<0.2	223.
3	NAP	52.0	NAP	59.0	19.0	<0.2	182.
4	<0.2	29.0	NAP	32.0	10.0	<0.2	100.
5	NAP	32.0	NAP	33.0	11.0	<0.2	108.
6	<0.2	24.0	NAP	22.0	8.4	<0.2	78.
7	NAP	18.0	NAP	17.0	7.8	<0.2	61.
AVG	0.0	50.9	--	57.6	17.8	--	177.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	128.8	110.0	39.0	5.2	22.0	7.4	342.
2	91.2	60.0	39.0	2.8	14.0	5.4	232.
3	72.4	48.0	27.0	2.2	8.6	3.9	175.
4	47.9	23.0	12.0	<0.4	4.7	1.8	96.
5	53.7	25.0	13.0	<0.4	4.7	1.8	105.
6	39.8	16.0	7.4	<0.4	2.7	1.3	71.
7	ISA	9.7	8.0	1.8	ISA	ISA	ISA
AVG	72.3	46.5	22.7	1.7	9.4	3.6	170.

TABLE A.2, CONTINUED.

SITE 64

COLLECTION EFFICIENCY = 0.91

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	14.25	0.05	15.17	3.81	110.0	-0.17
2	4-13	14.30	0.05	15.17	4.20	41.0	-0.09
3	4-13	14.35	0.04	17.38	4.35	25.0	0.02
4	4-13	14.39	0.02	42.47	4.42	23.0	-0.03
5	4-13	14.41	0.02	42.47	4.42	22.0	0.00
6	4-13	14.43	0.02	42.47	4.31	30.0	0.01
7	4-13	14.44	0.02	42.47	4.16	41.0	-0.01
8	4-13	14.46	0.02	42.47	4.33	26.0	-0.02
9	4-13	14.48	5.94	0.86	4.38	24.0	0.03
AVG				1.77	4.28	32.4	0.00
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UMOL/L
1	NAP	150.0	0.2	160.0	25.0	<0.2	485.
2	NAP	49.0	0.1	54.0	15.0	<0.2	167.
3	NAP	26.0	NAP	24.0	9.9	<0.2	86.
4	NAP	23.0	NAP	21.0	8.4	<0.2	75.
5	NAP	22.0	NAP	18.0	9.3	<0.2	71.
6	NAP	29.0	NAP	28.0	12.0	<0.2	98.
7	NAP	43.0	0.1	35.0	14.0	<0.2	135.
8	NAP	27.0	NAP	20.0	13.0	<0.2	87.
9	NAP	24.0	NAP	22.0	13.0	<0.2	83.
AVG	--	35.8	0.1	34.2	13.2	--	119.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UMOL/L
1	154.9	170.0	24.0	2.7	20.0	9.6	411.
2	63.1	46.0	19.0	<1.0	8.2	4.2	153.
3	44.7	19.0	11.0	<1.0	4.0	2.4	87.
4	38.0	18.0	8.3	<1.0	2.8	1.7	73.
5	38.0	18.0	7.7	<0.4	2.2	1.5	71.
6	49.0	31.0	11.0	<1.0	2.3	1.8	99.
7	69.2	41.0	13.0	0.5	2.6	2.1	133.
8	46.8	23.0	8.1	<1.0	1.9	1.6	85.
9	41.7	23.0	12.0	<1.0	2.7	1.9	86.
AVG	53.0	35.1	12.4	0.2	4.2	2.5	114.

TABLE A.2, CONTINUED.

SITE 65

COLLECTION EFFICIENCY = 0.53

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	14.65	0.08	16.05	4.10	63.0	-0.18
2	4-13	14.73	0.08	16.05	4.29	32.0	-0.13
3	4-13	14.81	0.58	2.15	4.22	36.0	-0.13
4	4-13	15.39	MOE	MOE	4.28	32.0	-0.22
5	MOE	MOE	MOE	MOE	4.39	24.0	-0.13
6	MOE	MOE	MOE	MOE	4.27	33.0	-0.14
7	MOE	MOE	MOE	MOE	4.26	37.0	-0.09
8	MOE	MOE	MOE	MOE	4.26	38.0	-0.11
9	MOE	MOE	MOE	MOE	4.59	15.0	-0.08
AVG				--	4.30	32.2	-0.13
	S02	S04	NO2	NO3	CL	PO4	AN SUM $\mu\text{EQ/L}$
1	NAP	90.0	<0.1	110.0	25.0	<0.2	315.
2	NAP	39.0	NAP	43.0	16.0	<0.2	137.
3	NAP	42.0	NAP	38.0	21.0	<0.2	143.
4	NAP	37.0	<0.1	36.0	20.0	<0.2	130.
5	NAP	28.0	NAP	24.0	11.0	ISA	91.
6	NAP	38.0	NAP	34.0	13.0	<0.2	123.
7	NAP	43.0	NAP	54.0	27.0	<0.2	167.
8	NAP	44.0	NAP	48.0	29.0	<0.2	165.
9	NAP	17.0	NAP	16.0	9.6	<0.2	60.
AVG	--	39.2	--	41.5	18.0	--	138.
	FREE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	79.4	120.0	24.0	1.4	13.0	6.5	264.
2	51.3	34.0	17.0	<1.0	5.8	3.3	120.
3	60.3	34.0	17.0	<1.0	4.4	3.0	126.
4	52.5	21.0	15.0	<1.0	5.0	2.8	104.
5	40.7	22.0	9.0	<1.0	2.5	1.6	80.
6	53.7	29.0	14.0	<1.0	3.0	2.2	107.
7	55.0	35.0	31.0	1.1	9.6	5.5	152.
8	55.0	39.0	31.0	1.0	6.2	4.6	148.
9	25.7	15.0	8.3	0.6	1.5	1.2	55.
AVG	49.6	36.1	17.3	0.5	5.2	3.2	120.

TABLE A.2, CONTINUED.

SITE 66

COLLECTION EFFICIENCY = 0.73

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHO/CM}$	ION BAL
1	4-13	14.93	0.27	3.39	3.99	94.0	-0.17
2	4-13	15.20	0.07	13.73	4.08	54.0	-0.08
3	4-13	15.26	4.52	0.20	4.33	26.0	-0.12
4	4-13	19.78	0.05	18.71	4.60	14.0	-0.07
5	4-13	19.83	0.05	18.71	4.07	54.0	-0.17
6	4-13	19.87	0.79	1.14	4.12	50.0	-0.17
7	4-13	20.66	0.06	15.85	4.21	37.0	-0.15
8	4-13	20.72	0.06	15.85	4.33	27.0	-0.04
9	4-13	20.78	0.72	5.19	4.31	30.0	-0.03
AVG				1.67	4.22	39.5	-0.09
	S02	S04	NO2	NO3	CL	P04	AN SUM $\mu\text{EQ/L}$
1	NAP	140.0	0.2	180.0	34.0	<0.2	494.
2	NAP	60.0	NAP	77.0	26.0	<0.2	223.
3	NAP	30.0	NAP	31.0	11.0	<0.2	102.
4	NAP	13.0	NAP	14.0	6.7	<0.2	47.
5	NAP	75.0	NAP	76.0	33.0	<0.2	259.
6	NAP	66.0	NAP	64.0	35.0	<0.2	231.
7	NAP	47.0	NAP	42.0	24.0	<0.2	160.
8	NAP	30.0	NAP	25.0	18.0	<0.2	103.
9	NAP	33.0	NAP	29.0	20.0	<0.2	115.
AVG	--	49.2	0.2	51.7	22.3	--	172.
	FPEE H	NH4	NA	K	CA	MG	CAT SUM $\mu\text{EQ/L}$
1	102.3	210.0	37.0	3.3	22.0	11.0	419.
2	83.2	54.0	31.0	2.8	11.0	6.0	205.
3	46.8	18.0	11.0	0.9	4.4	2.4	90.
4	25.1	8.6	4.1	0.7	1.6	1.0	44.
5	85.1	53.0	40.0	2.0	12.0	7.1	218.
6	75.9	50.0	40.0	1.2	7.9	6.1	195.
7	61.7	32.0	26.0	0.8	4.6	3.8	137.
8	46.8	22.0	18.0	<1.0	3.3	2.6	99.
9	49.0	28.0	21.0	<1.0	3.7	3.0	111.
AVG	60.1	46.4	24.2	1.0	6.8	4.3	154.

TABLE A.2, CONTINUED.

SITE 67

COLLECTION EFFICIENCY = OVF

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	14.19	0.10	6.66	4.62	47.0	-0.06
2	4-13	14.29	0.63	1.06	4.24	46.0	-0.02
3	4-13	14.92	0.05	13.31	4.21	42.0	0.07
4	4-13	14.97	0.77	0.86	4.06	55.0	-0.04
5	4-13	15.74	0.10	6.47	4.21	39.0	-0.03
6	4-13	15.84	0.09	7.21	4.39	24.0	-0.06
7	4-13	15.93	0.01	79.80	4.23	33.0	-0.09
8	4-13	15.94	0.01	79.80	4.39	22.0	-0.05
9	4-13	15.95	0.14	79.80	4.42	20.0	-0.12
AVG				8.76	4.37	25.9	-0.09
	SO2	SO4	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	89.0	NAP	100.0	20.0	<0.2	298.
2	NAP	62.0	NAP	74.0	23.0	<0.2	221.
3	NAP	48.0	NAP	63.0	24.0	<0.2	183.
4	NAP	61.0	NAP	73.0	27.0	<0.2	222.
5	NAP	40.0	NAP	51.0	22.0	<0.2	153.
6	NAP	23.0	NAP	28.0	17.0	<0.2	91.
7	NAP	36.0	NAP	36.0	14.0	<0.2	122.
8	NAP	24.0	NAP	25.0	10.0	<0.2	83.
9	NAP	23.0	NAP	20.0	9.3	<0.2	75.
AVG	--	30.9	--	31.5	12.6	--	106.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	24.0	180.0	28.0	5.4	15.0	6.9	281.
2	57.5	91.0	30.0	<1.0	13.0	6.3	217.
3	61.7	59.0	39.0	1.3	12.0	5.6	196.
4	87.1	51.0	34.0	1.2	14.0	6.5	214.
5	61.7	32.0	30.0	0.9	7.8	4.3	149.
6	40.7	18.0	14.0	<1.0	4.1	2.4	86.
7	58.9	24.0	15.0	<1.0	4.2	2.7	112.
8	40.7	19.0	12.0	<1.0	2.1	1.4	79.
9	38.0	14.0	9.7	<1.0	1.4	1.1	67.
AVG	43.1	28.4	14.6	0.4	3.8	2.2	99.

TABLE A.2, CONTINUED.

SITE 71

COLLECTION EFFICIENCY = 0.92

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND $\mu\text{MHQ/CM}$	ION BAL
1	4-13	12.53	0.05	15.21	4.30	36.0	-0.05
2	4-13	12.58	0.05	15.21	4.67	18.0	0.06
3	4-13	12.62	0.05	15.21	4.51	20.0	0.03
4	4-13	12.67	6.53	0.11	4.40	25.0	0.10
5	4-13	19.20	0.05	14.04	4.47	22.0	0.17
6	4-13	19.25	0.05	14.04	4.34	32.0	0.11
7	4-13	19.30	0.05	14.04	4.20	38.0	0.19
8	4-13	19.35	0.05	14.04	4.29	29.0	0.03
9	4-13	19.40	1.06	8.98	4.59	13.0	-0.03
AVG				1.92	4.50	18.5	0.01
	SO2	SO4	NO2	NO3	CL	PO4	AM SUM MER/L
1	NAP	41.0	<0.1	52.0	31.0	<0.2	165.
2	NAP	18.0	<0.1	32.0	11.0	<0.2	79.
3	NAP	23.0	NAP	27.0	10.0	<0.2	83.
4	NAP	27.0	NAP	32.0	14.0	<0.2	100.
5	NAP	26.0	<0.1	32.0	15.0	<0.2	99.
6	NAP	31.0	NAP	42.0	29.0	<0.2	133.
7	NAP	36.0	<0.1	36.0	24.0	<0.2	132.
8	NAP	29.0	NAP	21.0	16.0	<0.2	95.
9	NAP	12.0	NAP	9.8	8.6	<0.2	42.
AVG	--	18.3	--	19.0	12.4	--	68.
	FREE H	NH4	NA	K	CA	MG	CAT SUM MER/L
1	50.1	45.0	30.0	<1.0	10.0	5.8	157.
2	21.4	39.0	5.6	<1.0	6.4	2.4	84.
3	30.9	26.0	12.0	<1.0	5.7	2.7	86.
4	39.8	34.0	17.0	<1.0	6.5	3.2	110.
5	33.9	40.0	23.0	2.3	6.0	3.0	117.
6	45.7	48.0	27.0	<1.0	8.9	4.7	148.
7	63.1	44.0	32.0	1.9	4.4	5.1	160.
8	51.3	21.0	15.0	<1.0	2.7	2.8	98.
9	25.7	7.6	4.9	<1.0	0.8	0.7	41.
AVG	31.8	18.7	10.7	0.2	2.9	1.8	71.

TABLE A.2, CONTINUED.

SITE 72

COLLECTION EFFICIENCY = 0.95

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	4-13	13.73	0.06	11.08	4.22	58.0	-0.09
2	4-13	13.80	0.06	11.08	4.32	34.0	0.00
3	4-13	13.86	6.14	0.11	4.37	28.0	0.04
4	4-13	20.00	0.02	29.09	4.24	41.0	0.35
5	4-13	20.03	0.02	29.09	4.10	59.0	-0.02
6	4-13	20.05	0.02	29.09	4.18	40.0	0.04
7	4-13	20.07	0.02	29.09	4.19	37.0	-0.08
8	4-13	20.10	0.02	29.09	4.26	32.0	-0.01
9	4-13	20.12	0.24	29.09	4.52	18.0	0.09
AVG				1.91	4.37	28.3	0.07
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	84.0	<0.1	110.0	23.0	<0.2	301.
2	NAP	44.0	<0.1	56.0	19.0	<0.2	163.
3	NAP	32.0	NAP	40.0	14.0	<0.2	118.
4	NAP	57.0	NAP	70.0	24.0	<0.2	208.
5	NAP	68.0	NAP	87.0	51.0	<0.2	274.
6	NAP	46.0	NAP	42.0	27.0	<0.2	161.
7	NAP	44.0	NAP	32.0	19.0	<0.2	139.
8	NAP	33.0	<0.1	22.0	16.0	<0.2	104.
9	NAP	17.0	NAP	13.0	9.1	<0.2	56.
AVG	--	31.9	--	32.5	15.7	--	112.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	60.3	130.0	29.0	2.4	17.0	9.7	275.
2	47.9	55.0	29.0	2.0	8.9	5.3	162.
3	42.7	42.0	17.0	1.5	6.5	3.6	123.
4	57.5	120.0	83.0	6.5	9.9	5.3	297.
5	79.4	71.0	66.0	4.4	14.0	9.9	269.
6	66.1	54.0	29.0	2.3	4.3	4.1	168.
7	64.6	33.0	18.0	1.6	2.9	2.6	128.
8	55.0	26.0	13.0	1.2	2.2	1.8	103.
9	30.2	18.0	8.1	1.1	1.2	0.9	62.
AVG	42.9	39.2	20.1	1.8	4.3	2.8	118.

TABLE A.2, CONTINUED.

SITE 73

COLLECTION EFFICIENCY = 0.95

UNITS ARE $\mu\text{MOL/L}$ UNLESS NOTED

STAGE	START DAY	(GMT) HR	RT HR	R-RATE MM/HR	LAB PH	COND ($\mu\text{MHO/CM}$)	ION BAL
1	4-13	13.97	0.04	19.09	3.89	110.0	-0.14
2	4-13	14.01	0.20	3.49	4.20	44.0	-0.01
3	4-13	14.21	0.01	50.92	4.31	38.0	0.00
4	4-13	14.22	0.01	50.92	4.36	28.0	-0.12
5	4-13	14.23	0.01	50.92	4.41	24.0	-0.07
6	4-13	14.25	5.89	0.12	4.40	25.0	-0.15
7	4-13	20.14	0.14	5.02	4.32	30.0	-0.10
8	4-13	20.28	0.05	15.28	4.19	50.0	-0.02
9	4-13	20.32	0.45	20.34	4.47	20.0	0.27
AVG				2.17	4.36	28.9	0.14
	S02	S04	NO2	NO3	CL	PO4	AN SUM UEQ/L
1	NAP	150.0	<0.1	160.0	24.0	<0.2	484.
2	NAP	48.0	NAP	55.0	22.0	<0.2	173.
3	NAP	46.0	NAP	53.0	18.0	<0.2	163.
4	NAP	34.0	<0.1	35.0	13.0	<0.2	116.
5	NAP	28.0	NAP	27.0	10.0	<0.2	93.
6	NAP	30.0	NAP	28.0	12.0	<0.2	100.
7	NAP	36.0	NAP	34.0	13.0	<0.2	119.
8	NAP	54.0	NAP	74.0	37.0	<0.2	219.
9	NAP	12.0	<0.1	16.0	12.0	<0.2	52.
AVG	--	27.6	--	31.9	14.5	--	102.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	128.8	190.0	23.0	3.3	25.0	13.0	421.
2	63.1	54.0	24.0	2.7	9.0	5.0	172.
3	49.0	62.0	23.0	2.3	8.4	4.9	163.
4	43.7	32.0	13.0	0.7	3.9	2.7	103.
5	38.9	28.0	9.8	1.1	2.5	1.9	87.
6	39.8	26.0	9.9	1.0	2.7	1.9	86.
7	47.9	29.0	14.0	1.1	4.9	3.0	108.
8	64.6	57.0	43.0	3.2	15.0	8.7	215.
9	33.9	16.0	11.0	0.7	1.8	1.5	68.
AVG	43.5	32.5	14.4	1.2	4.5	2.9	106.

TABLE A.2, CONTINUED.

SITE 74

COLLECTION EFFICIENCY = ? (NO RAINGAUGE DATA)
 UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL
1	MOE	MOE	MOE	MOE	3.76	140.0	-0.26
2	MOE	MOE	MOE	MOE	4.03	86.0	-0.09
AVG				--	3.83	122.0	-0.20
	S02	S04	N02	N03	CL	P04	AN SUM UEQ/L
1	NAP	190.0	<0.1	210.0	34.0	<0.2	624.
2	NAP	110.0	NAP	150.0	62.0	<0.2	432.
AVG	--	163.3	--	190.0	43.3	--	560.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	173.8	200.0	32.0	4.6	22.0	14.0	482.
2	93.3	140.0	64.0	8.6	31.0	14.0	396.
AVG	147.0	180.0	42.7	5.9	25.0	14.0	454.

TABLE A.2, CONTINUED.

SITE 75

COLLECTION EFFICIENCY = 0.87

UNITS ARE UMOL/L UNLESS NOTED

STAGE	START (GMT) DAY	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	ION BAL	
1	4-13	13.53	1.03	5.01	66.0	-0.24	
2	4-13	14.56	1.15	4.12	58.0	-0.09	
3	4-13	15.71	0.04	18.28	3.95	-0.05	
4	4-13	15.75	0.07	10.87	3.95	0.07	
5	4-13	15.82	0.09	5.71	4.09	0.07	
AVG			1.49	4.11	65.3	-0.06	
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	NAP	140.0	<0.1	150.0	33.0	<0.2	463.
2	NAP	71.0	NAP	89.0	39.0	<0.2	270.
3	NAP	76.0	NAP	90.0	42.0	<0.2	284.
4	NAP	65.0	NAP	69.0	36.0	<0.2	235.
5	NAP	61.0	<0.1	66.0	37.0	<0.2	225.
AVG	--	84.0	--	94.5	37.4	--	300.
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	9.8	200.0	33.0	4.6	37.0	22.0	365.
2	75.9	77.0	45.0	2.6	14.0	8.8	246.
3	112.2	66.0	51.0	3.0	11.0	8.4	271.
4	112.2	60.0	46.0	2.4	8.3	6.9	251.
5	81.3	51.0	44.0	3.1	18.0	13.0	241.
AVG	78.1	93.4	43.8	3.1	17.6	11.7	277.

TABLE A.2, CONTINUED.

SITE 76

COLLECTION EFFICIENCY = 1.00

UNITS ARE UMDL/L UNLESS NOTED

STAGE	START DAY	(GMT) HR	DT HR	R-RATE MM/HR	LAB PH	COND UMHO/CM	TION BAL
1	4-13	21.07	0.13	5.11	RPC	RPC	--
2	4-13	21.20	0.08	8.06	RPC	RPC	--
3	4-13	21.28	0.03	26.26	RPC	RPC	--
4	4-13	21.30	0.03	26.26	RPC	RPC	--
5	4-13	21.33	0.03	26.26	RPC	RPC	--
6	4-13	21.35	0.03	26.26	RPC	RPC	--
7	4-13	21.38	0.03	22.57	RPC	RPC	--
8	4-13	21.41	0.03	21.89	RPC	RPC	--
9	4-13	21.44	0.06	21.89	RPC	RPC	--
AVG				15.32	--	--	--
	S02	S04	NO2	NO3	CL	P04	AN SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
9	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--
	FREE H	NH4	NA	K	CA	MG	CAT SUM UEQ/L
1	RPC	RPC	RPC	RPC	RPC	RPC	RPC
2	RPC	RPC	RPC	RPC	RPC	RPC	RPC
3	RPC	RPC	RPC	RPC	RPC	RPC	RPC
4	RPC	RPC	RPC	RPC	RPC	RPC	RPC
5	RPC	RPC	RPC	RPC	RPC	RPC	RPC
6	RPC	RPC	RPC	RPC	RPC	RPC	RPC
7	RPC	RPC	RPC	RPC	RPC	RPC	RPC
8	RPC	RPC	RPC	RPC	RPC	RPC	RPC
9	RPC	RPC	RPC	RPC	RPC	RPC	RPC
AVG	--	--	--	--	--	--	--

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