

QUALITY TRANSFORMATIONS IN RECHARGED RIVER WATER DURING
POSSIBLE INTERACTIONS WITH LANDFILL DEPOSITS ALONG THE SANTA CRUZ RIVER

ANNUAL REPORT
PHASE 2
1973-1974

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INTRODUCTION

The overall objectives of a study initiated in 1972 by the Water Resources Research Center (Univ. of Arizona), in cooperation with the Pima County Dept. of Sanitation, are to examine the possibility of interactions between recharged river water and deposits in adjoining landfills, and if such interactions occur to evaluate the effect on native groundwater quality. Corresponding to these objectives, the principal function of a monitoring program initiated during the project was to characterize background water levels and native groundwater quality during normal low flows (i.e., sewage flows) in the river, and to monitor changes, if such occur, during flood flows. As it turns out, data from the project should also be applicable to the anticipated irrigation of farmland near Marana, using effluent from the impending Ina Rd Treatment Facility. In particular, clues will be provided on transformations in sewage effluent quality during infiltration and deep percolation.

The first phase of the project was conducted at the Ina Rd landfill and the second involved both the Ina Rd and Ruthrauff Rd fills. Results of the first phase were reported in a paper by Wilson and Small. This report will review the results of the second study phase.

Specific objectives of the studies during the second phase included (1) obtaining river water and well water samples for chemical and microbiological analysis, (2) monitoring water level changes in available wells and (3) characterizing general features of the geohydrology in the vicinity of the landfills.

SAMPLING LOCATIONS

Water samples were obtained at the locations shown on Figure 1 for the Ina Rd fill and on Figure 2 for the Ruthrauff fill. The relative locations and designations of these sampling sites at Ina Rd are:

- 1) IR401 and IR601, two 4-inch diameter PVC wells located on a platform within the 10-acre lagoon at the Ina Rd site, terminating at 40 ft and 60 ft below the top of the platform - allow sampling of perched water tables,
- 2) IRA11 and IRA21, two 100 ft, 2-inch diameter access wells with screened well points terminating below the water table,
- 3) IRLF1, a 27 ft long, 4-inch diameter PVC well, terminating at the base of the Ina Rd fill,
- 4) IRPWL, a pumping well of the Cortaro Water Users Association (CWUA),
- 5) SCIR1, SCIR2 and SCIR3, within the Santa Cruz River, respectively located upstream of the outfall from the Ina Rd oxidation lagoon; at the outfall; and downstream of the outfall.

The locations and designations of wells at the Ruthrauff landfill are shown on Figure 2 and described as follows:

- 1) RRLF1, a 2-inch diameter PVC well terminating two feet below the base of the fill, within a shallow perched water table,
- 2) RRLF2, a 2-inch steel pipe, about 60 ft long, terminating at the base of the N.E. edge of the fill,
- 3) SCRR1, within the Santa Cruz River,
- 4) RRCY1 and SFIA1, two 2-inch diameter, 100-ft wells recently installed by the City of Tucson and constructed from drill rod.
- 5) SF2A, a well similar to those in (4) located near the Rabies Control Center. This well serves as an upstream control well.

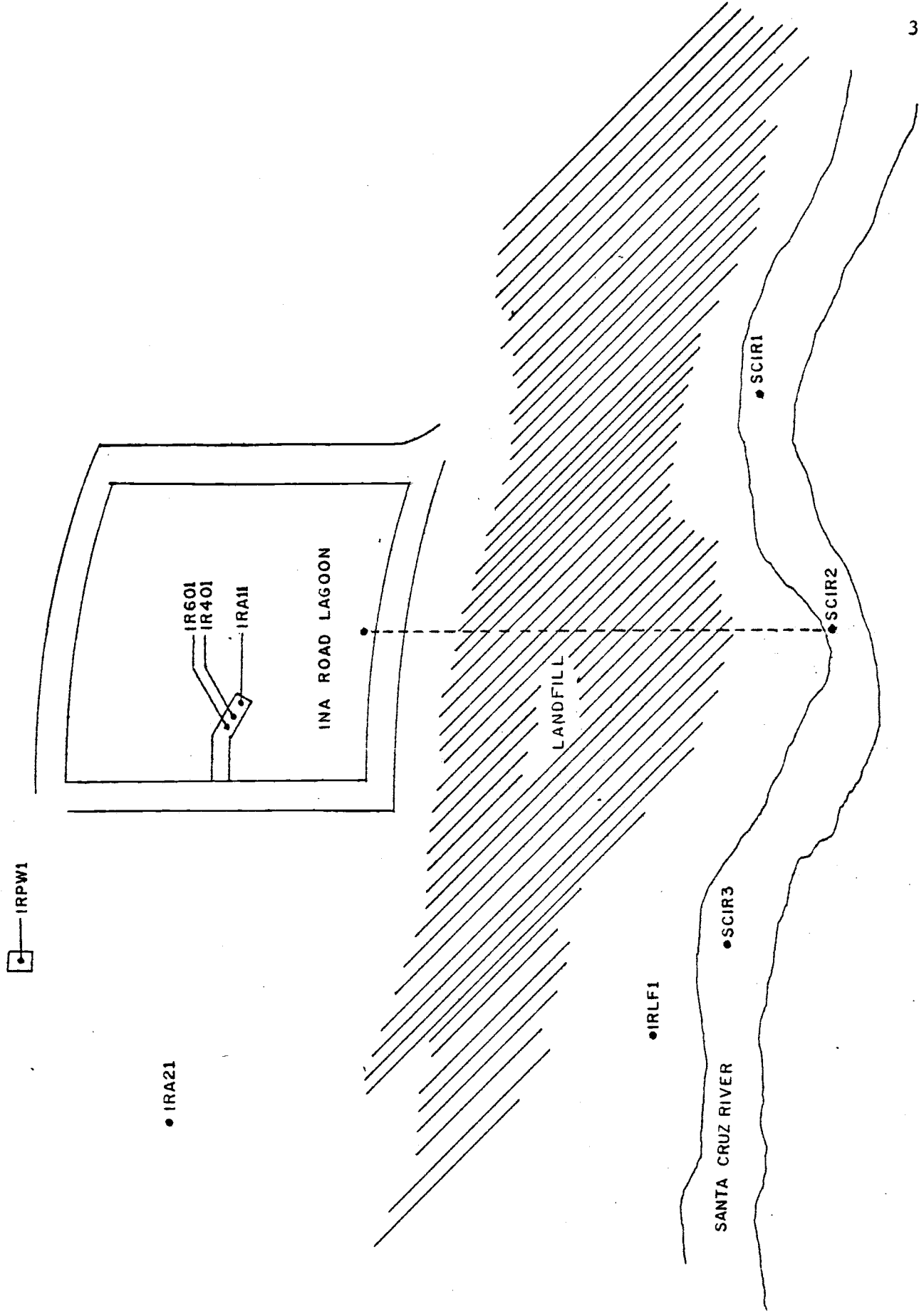


FIGURE 1. SAMPLING LOCATIONS, INA RD. LANDFILL SITE

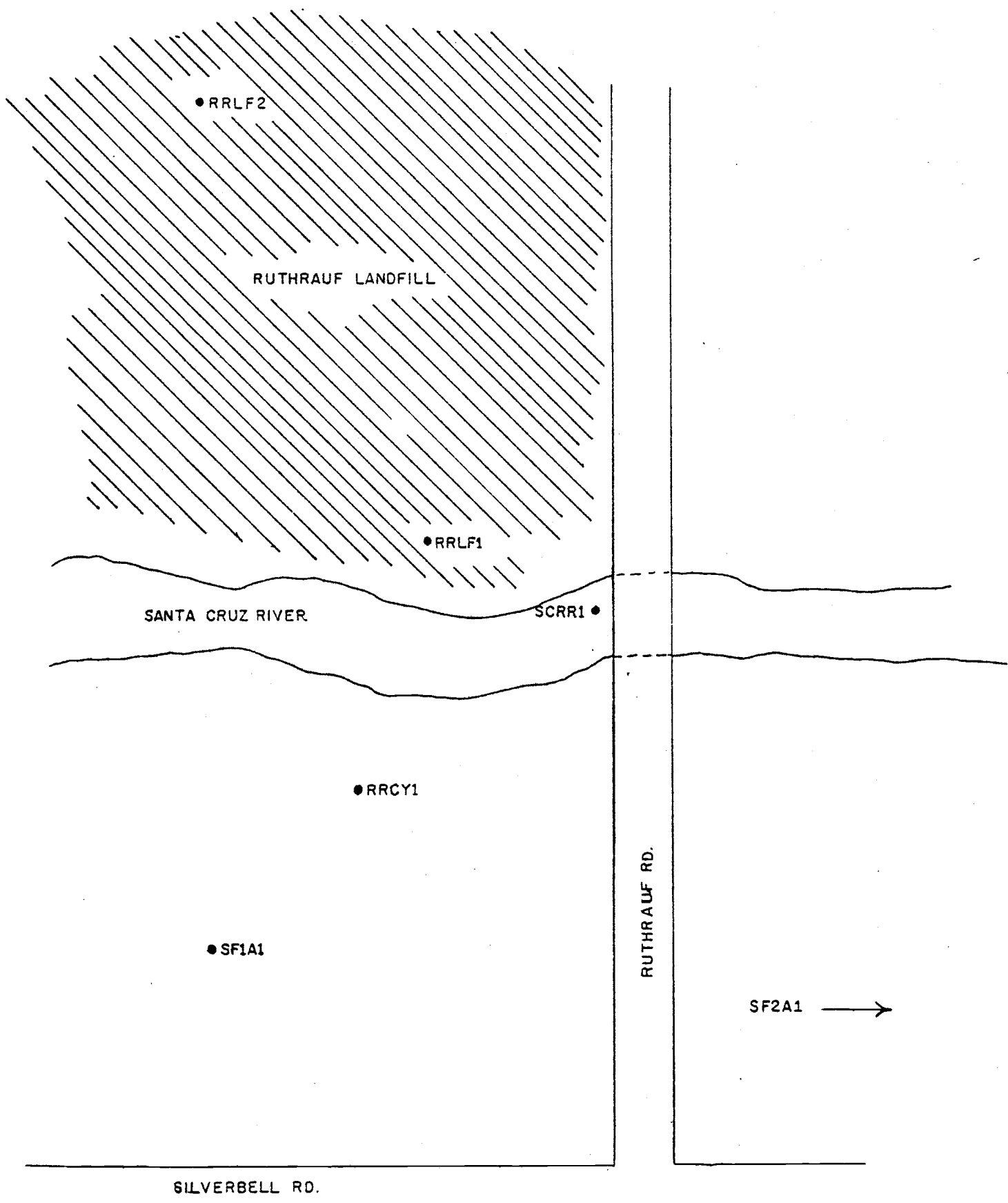


FIGURE 2. SAMPLING LOCATIONS, RUTHRAUF LANDFILL SITE

SAMPLING AND WATER LEVEL MEASUREMENT PROGRAM

The sampling program for the second phase of the project comprised the period January 1, 1974 through June 30, 1974.

The river samples designated SCIR3 and SCRR1 were obtained via 24-hour composite samplers. The remaining river samples (SCIR1 and SCIR2) were obtained as "grab" samples. Well samples were obtained at both locations on a weekly basis, except during flood discharge events in the river when more frequent sampling was initiated. Water levels were measured in wells in weekly intervals.

Coupled with the sampling operation, an intensive laboratory analysis program was initiated. Among the analyses conducted on a frequent basis were Kjeldahl-nitrogen, ammonia-nitrogen, nitrite-plus nitrate-nitrogen, pH, EC, sodium, potassium, calcium, magnesium, hardness, chloride, sulfate and bicarbonate. Samples were also examined for total and fecal coliform levels via the membrane technique (Millipore filter method).

HYDROGEOLOGIC SURVEY-METHODS

The purpose of a hydrologic survey conducted during phase 2 was to correlate subsurface geology along the Santa Cruz River roughly between the Rabies Control Center (near Well SF2A1) and Ina Rd; to determine the average thicknesses of sedimentary units in the area; and to obtain local aquifer transmissivity data near the CWUA well (IRPW1) at the Ina Rd fill.

Background data, including drillers' logs, were obtained from the Dept. of Soils, Water and Engineering (courtesy James Posedly). Such data were correlated with hydrogeologic information provided in the recently published report, Geohydrology and Water Resources of the Tucson Basin, Arizona, by E. S. Davidson (U.S.G.S. Water Supply Paper 1939-E, 1973).

RESULTS AND DISCUSSION

WATER QUALITY STUDIES - CHEMICAL DATA

The raw chemical data were subjected to statistical analysis using SPSS (STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES), a software package available at the University of Arizona Computer Center. The mean values of the various chemical constituents obtained via SUBROUTINE CODEBOOK of SPSS, are summarized in Table 1, in a separate appendix to this report. A complete set of computer read-out of raw data is given in Table 2 of the appendix. SUBROUTINE T-TEST of SPSS was used to compute student's t and probability levels for determining whether or not the differences of various two-sample means were significant. Results using SUBROUTINE T-TEST are reported in Table 3 to Table 7 in the appendix, for various locations.

RIVER WATER QUALITY

The mean values of the various chemical constituents in sewage effluent samples at upstream and downstream locations about 3.41 miles apart, are shown on Table 1. The specific sites are designated Santa Cruz Ruthrauff Rd (SCRR1) and Santa Cruz Ina Rd Downstream (SCIR3). It is evident that effluent quality at these two locations remained essentially unchanged, i.e., that minimum transformations had occurred. For example, chloride, a conservative ion, averaged 102.22 mg/l and 102.34 mg/l at SCRR and SCIR3, respectively. Similarly, little change occurred in the nitrogen series, $\text{NH}_4\text{-N}$, $\text{NO}_2\text{-N}$ plus $\text{NO}_3\text{-N}$, and KJN. Sebenik (Private communication) also observed little change in nitrogen constituents between the City of Tucson Treatment Plant and Cortaro Rd during a sampling program in 1973. To examine the hypothesis of equality of means, the t-test was used. Results for 68 cases each of SCIR3 and SCRR1 samples are shown on Table 3. The testing procedure is as follows: The F-test is used

to determine equality of sample variances. If the probability for F is greater than a certain significance value (e.g. 0.05), the value of t is based on pooled variance estimate; otherwise t should be based on a separate variance estimate. For the variables shown in Table 3, the F values are greater than 0.05 for all variables except for specific conductance. For this variable, the t-value according to a separate variance estimate, was -0.02, and the two-tail probability of getting this t value given that there was no difference in sample means was about 98 percent. Therefore, we may safely accept the hypothesis that sample means are the same. For the other variables we use the pooled variance estimate. The t values and associated probabilities again strongly suggest equality of means. The high values of $\text{NH}_4\text{-N}$ and KJN and low values of $\text{NO}_2\text{-N}$ and $\text{NO}_3\text{-N}$ in SCIR3 and SCRR1 samples indicate that nitrification had not occurred to a great extent in effluent during either discharge to the river from the City of Tucson Treatment Plant or during downstream flow in the Santa Cruz River channel.

Water quality data in the Santa Cruz River upstream of the outfall from the Ina Rd lagoons (designated SCIR1) and at the outfall (SCIR2), provide a comparison of the treatment methods (see Table 2). Unfortunately, it was not feasible to obtain sufficient data to provide definitive trends, nevertheless, certain features are apparent. First of all, it appears that EC, sodium, calcium, and magnesium levels were about the same in City Treatment Plant effluent (SCIR1) and lagoon effluent (SCIR2). Initially, nitrogen levels were generally higher in outfall samples than in river samples. Thus, for 2/25/74, KJN values were, respectively, 37.11 mg/l and 29.93 mg/l in SCIR2 and SCIR1 samples (see Table 2). On 3/11/74 and 3/21/74, however, the trend was reversed; an increase in KJN (and other nitrogen constituents) occurred in SCIR1 samples. For example, on 3/21/74, KJN values in SCIR1 reached a value

in excess of 100 mg/l, in contrast to an average value of about 30 mg/l. Possibly, a heavy load of sludge was released to the river from the City Treatment Plant. A high KJN value was also recorded in the SCIR3 sample on 3/21/74, which subsequently decreased after 3/25/74.

WELL WATER QUALITY

Ina Rd Site

Samples could be obtained only in the Cortaro Water Users Association Well (IRPW1) and the two access wells (IRA11 and IRA21). The remaining wells (IRLF1, IR401 and IR601) at Ina Rd were dry. The average quality of IRPW samples, reported in Table 1, were essentially the same as those found in phase 1 and reported by Wilson and Small. The quality of samples from the two access wells differed considerably, a somewhat surprising observation, since the wells both terminate near the water table, and the wells are only about 800 ft apart. In general, the quality of water from the field well, IRA21, was better than the quality in the platform well, IRA11. For example, conductivity values were 0.86 mmhos/cm and 1.18 mmhos/cm for IRA2 and IRA1, respectively. In contrast, total nitrogen values were less in IRA11 than in IRA21, but values for both locations were considerably lower than in river samples. Sodium, bicarbonate, calcium and magnesium values were markedly higher in IRA11 than in the IRA21 samples, but the reverse trend occurred in sulfate. The differing values in IRA11 over those in IRA21 may be a reflection of vertical seepage of effluent and associated salts from the lagoon, coupled with dissolution or precipitation of salts. The augmented calcium and bicarbonate values, for example, may be an indication that calcite is dissolved during seepage.

Ruthrauff Rd Site

Water samples from the plastic well RRLF1, which terminates at the base of the Ruthrauff landfill, reflect conditions within a shallow perched zone

from 30 to 40 ft below river level. The source of water in this zone may be either seeping river water or percolating water from Ruthrauff Pond, or a mixture. Water level fluctuations in the well appear to coincide with river stage (particularly evidenced during river flows in July 1974). Consequently, for the time being we will assume that water from this well originated principally from seepage in the Santa Cruz River.

Mean values for chemical water quality in well RRLF1 are reported in Table 1. It is of interest to compare the quality of this well water with river water at the site. That is, we will compare SCRR1 with RRLF1, employing the assumption of the last paragraph. It is evident that the quality of the two waters are quite dissimilar. The t-test was used to compare the means of the following variables: specific conductance, $\text{NH}_4\text{-N}$, $\text{NO}_2\text{+NO}_3\text{-N}$, KJN, sodium and chloride. Results are given in Table 4. It is seen from this table that except for sodium and chloride there is essentially no justification for assuming the equality of sample means. The difference in the mean values for chloride is within experimental error, so we conclude that the chloride in well samples is a reflection of river water. The fact that sodium mean values were so close indicates that sodium, not considered to be a conservative tracer, did not undergo interaction with geological deposits underlying the stream channel during recharge.

Examination of nitrogen data indicates that total nitrogen decreased in recharged river water from about 30.7 mg/l to about 7.0 mg/l. Changes in individual nitrogen constituents, in respective SCRR1 and RRLF1 samples were: KJN 29.1 mg/l to 4.3 mg/l, $\text{NH}_4\text{-N}$, 23.0 mg/l to 2.0 mg/l, and $\text{NO}_2\text{+NO}_3\text{-N}$, 1.4 mg/l to 2.6 mg/l. As expected, ammonia nitrogen decreased with a concomitant increase in nitrate plus nitrate nitrogen. Of particular interest, however, is the large decrease in total nitrogen, amounting to about 78 percent. It

appears that continuous flooding of the channel by sewage effluent promotes conditions favoring anaerobic denitrification of nitrogen and/or sorption of ammonia on the base exchange of underlying deposits. The substantial increases in calcium, magnesium and particularly bicarbonate appear to reflect dissolution of native (relict) salts during infiltration of sewage effluent (Laney, R. L., Chemical Quality of the Tucson Basin, Arizona, U.S. Geological Survey, Water Supply Paper 1939-D, 1972). Corresponding to the increase in calcium and magnesium, the hardness increased from 173 mg/l in SCRR1 to 203 mg/l in RRLF1. The decrease in mean sulfate levels from 154 mg/l to 100 mg/l would imply the precipitation of sulfate salts during recharge.

The values reported above indicate changes in effluent during filtration through about 40 feet of sediment, overlying well RRLF1. Table 1 also includes salinity values for the city well near the Santa Cruz river (RRCY1) which manifest the further reactions during filtration through about 90 ft of sediments. T-test values are given in Table 5 for RRCY1 and SCRR1 samples, for the following variables: specific conductance, ammonia, nitrite plus nitrate, Kjeldahl nitrogen, sodium and chloride. Further changes in nitrogen obviously occurred during recharge: total N decreased to 3.73 mg/l in RRCY1 from a mean value of 30.7 mg/l in SCRR samples and 6.7 mg/l in RRLF1 samples. These changes may be a reflection of transformation in N or dilution of recharged effluent and native ground water. From t-test results for RRCY1 and SCRR1 samples, both sodium and chloride values indicate a fairly close matching of sample means for these constituents. Calcium, magnesium and bicarbonate values were again greater in RRCY1 samples than in SCRR1 samples but less than the corresponding values in RRLF1 samples.

The City of Tucson well, designated SFLA1, is located about 1,000 ft west of well RRCY1. From the values in Table 1 it is apparent that the quality

of water from the two wells is quite dissimilar. The t-values for RRCY1 and SF1A1, included on Table 6 in the Appendix, highlight these differences for means of the following variables: EC, ammonia-N, nitrate plus nitrite-N, KJN, sodium and chloride. Only KJN values appeared to have similar means. A decrease in the following constituents between RRCY1 and SF1A1 samples is apparent: EC, $\text{NH}_4\text{-N}$, $\text{NO}_2\text{+NO}_3\text{-N}$, KJN, pH, Na, Cl, HCO_3 . The following constituents increased: Mg, hardness, and SO_4 . Values for K and Ca remained about the same. The decrease in chloride, a conservative tracer, appears to indicate that if recharged effluent had indeed spread laterally to SF1A, dilution with a water source of lower overall salinity occurred.

The City of Tucson well designated SF2A1, near the Rabies Control Center, was sampled to provide water quality values at a site upstream of the City of Tucson Treatment Plant. That is, well SF2A1 is a control well. From Table 1 and t-test values in Table 7 for wells RRCY1 and SF2A1, it is evident that the salinity of water in the control well is generally higher than in RRCY1. The high correspondence in sample mean values for EC, a measure of total salts, may be a reflection of experimental error because of the higher values in most of the individual constituents in SF2A1 samples. It is interesting that total N was greater in the upstream well SF2A1 than in the downstream well RRCY1 immediately next to the river. Using chloride ion as an indicator of mixing, it appears that a 50 percent dilution occurred in ground water during flow between wells SF2A1 and RRCY1. In other words, recharge of sewage effluent would appear to have resulted in an overall improvement in the salinity of groundwater.

WATER LEVEL DATA

Water level values in wells near the two landfills are summarized in Table 8. The two PVC wells on the Ina Rd lagoon platform were dry throughout the measurement period. Levels in the access wells IRA11 and IRA21 may be divided

into two periods, before the initiation of pumping in Cortaro Water Users Assoc. well (i.e. before 2/19/74) and during the pumping period. Water levels in IRA11 dropped from 76.86 ft on January 10th to 81.00 ft on Feb. 20th, i.e., a decrease of 4.0 ft in a little over a month. The corresponding decrease in IRA21 was about 4 ft. This drastic reduction in water levels is representative of that in other areas of the Tucson basin (e.g. 6.0 ft drop in wells on the WRRC field lab between April 1973 and April 1974); and reflects the drought conditions in the Tucson basin during 1973-1974. The change in the access wells after February 14, 1974 manifest pumping effects in the large pumping well IRPW1. These data were used to estimate aquifer characteristics at the site - results are reported later.

Levels in the Ruthrauff Rd well RRLF1, indicating changes in a shallow, perched water table underlying the landfill site, were measured relative to the top of the well. Water levels dropped from 9.60 ft on 2/6/74 to 10.17 ft on 3/28/74. A rise appeared to occur on 4/3/74, possibly a manifestation of river recharge. Thereafter levels decreased again.

Water levels in wells RRCY1 and SF1A1 indicate changes near the water table on a transect perpendicular to the Santa Cruz River, near Ruthrauff Rd. Levels in RRCY1 and SF1A1 decreased 2.89 ft and 2.30 ft respectively during the period from 1/16/74 to 6/5/74. Levels in the upstream control well, SF2A1, dropped 1.33 ft during about the same period. Since these wells have not been developed to date, the reliability of results is not certain. Tentatively, it would appear that levels dropped at a greater rate in wells downstream of the effluent input to the river than in the upstream control well.

COLIFORM DATA

Both total coliform and fecal coliform levels were monitored in samples from locations SCRR, RRCY1, SF1A1 and SF2A1, near the Ruthrauff fill, using

"Membrane Filter" (MF) techniques (reported in Millipore Filter Corp., "Biological Analyses of Water and Wastewater", Applications Manual AM 302, 1972). Average values for duplicate samples are reported in Table 9. For the river sample, SCRR1, values for total and fecal coliform were exceedingly high, e.g. total coliform ranged from about 35,000 per 100 ml, to 675,000 per 100 ml. Average fecal coliform ranged from 600 per 100 ml to 58,250 per 100 ml. Fecal coliform results in RRLF1 were essentially zero, except for a value of 10 per 100 ml on 3/8/74. Total coli values ranged from zero per 100 ml to 350 per 100 ml, with many small values. Comparing these data with those from SCRR1 samples would appear to demonstrate the filtration of microorganisms produced by flow of sewage effluent through about 40 ft of surficial sediments between the river and sampling well. No inferences are intended on the fate of virus during filtration. The total and fecal coli levels in RRCY1 samples were somewhat higher than in RRLF1 samples. The maximum total coli level was "too numerous to count" (TNTC). However, many zero values were reported. The range of values indicates the difficulty that was experienced in obtaining reproducible results. One causative factor may be that samples from well RRCY1 were quite turbid. With impending development of this well we expect to reduce turbidity and hopefully improve the reproducibility of test results.

The total-and fecal-coli levels in samples from wells SFL1A1 and SF2A1 were essentially zero. It appears, therefore, that if indeed recharged effluent moved laterally from the vicinity of well RRCY1 to well SFL1A1, additional filtration and/or dilution effectively removed coliform organisms. Similarly, the samples in the control well SF2A1 upstream of the City of Tucson Treatment Plant, indicate that shallow samples of indigenous ground water are essentially free of microorganisms.

HYDROGEOLOGY OF THE PROJECT SITE

The following material is based on a brief report by Jeffery H. Randall ("Hydrology and Water Quality, Pima County Landfill Project") on a study of the hydrogeology of the approximate reach between Rabies Control Center and Ina Rd along the Santa Cruz River. The study was commissioned to define the geologic framework of the project area, including hydraulic estimates of aquifer characteristics. During the course of his study, Randall also prepared trilinear diagrams of water quality.

Stratigraphic information in the recent report by E. S. Davidson on the geohydrology of the Tucson basin (U.S.G.S. Water Supply Paper 1939-E, 1973) was used as basis of the study. Also, a structural cross-section of the geology was prepared using drillers' logs of wells in the environs of the study area (courtesy J. Posedly, Dept. of Soils, Water and Engineering, U. of A.). Randall concluded that the average thickness of sedimentary units in the area were as follows:

Surficial Material	40-100 ft, ave. 80 ft
Fort Lowell Formation	Ave. 100 ft
Tinaja Beds	Unknown

Using discharge estimates from the Cortaro Water Users Assoc. Well (designated herein as IRPWL) and 78 days of drawdown data in access wells at the Ina Rd site, Randall employed the Jacob method to estimate Transmissivity value of aquifer materials. The T & K value for the Fort Lowell Formation and Tinaja Beds was estimated as:

$$T = 35,000 \text{ gpd/ft}$$

$$K = 175 \text{ gpd/ft}^2$$

Corresponding estimates for the surficial deposits are:

$$T = 150,000-300,000 \text{ gpd/ft}$$

$$K = 1900-3800 \text{ gpd/ft}^2 \text{ (Equivalent to a very coarse sand).}$$

A Piper Diagram was prepared from quality data for pumping wells in the area (data courtesy James Posedly) and from the test wells used during this study. The diagram shown on Figure 3, shows the presence of two principal groups according to quality. The upper group represents water from the lower portion of the Fort Lowell Formation and Tinaja Beds. Randall considers this to be "virgin" water. The quality of water from the control well SF21A also falls in this group, although samples are from within the surficial deposits.

The lower group evidently represents water from the surficial deposits and upper Fort Lowell Formation. This group contains Santa Cruz River water (sewage effluent), as well as samples from 1RA21, RRCY1, and SE1A1.

General patterns of water movement during river recharge in the vicinity of the Ruthrauff fill may be inferred from our gross knowledge of the hydrogeology of the area, the water quality data obtained during this project, and experience at the WRRC recharge site, slightly upstream of Ruthrauff Rd. In addition to vertical movement, river water seeping across the river bed appears to move laterally through certain surficial regions to form perched water tables. Apparently, deposits in this stretch of the river are continuously wetted, promoting the creation of shallow, anaerobic layers and thereby stimulate denitrification. Flow in the surficial deposits may be mixed saturated-unsaturated states. The water table appears to correspond to the interface between surficial deposits and the Fort Lowell Formation. The permeability of the latter formation is lower than in the surficial deposits. Furthermore, the lateral hydraulic conductivity of surficial (and Fort Lowell) deposits is generally much greater in the lateral than vertical direction. Consequently, river water reaching the water table tends to spread laterally on top of the native ground water, possibly forming slight mounds. Vertical mixing of indigenous and recharge effluent is effected by the mechanisms of hydrodynamic dispersion.



FIGURE 3. PIPER DIAGRAM

The overall consequence of the above recharge process is that shallow water tends to reflect sewage effluent quality and deeper water the indigenous supply. Quality data from the Ina Rd site, particularly for IRPW1 and IRA21, illustrate that this process also occurs at the Ina Rd site.

SUMMARY

During the second phase of the project, studies on the interaction of recharged river water and landfill deposits were continued at the Ina Rd site and similar studies were initiated at the Ruthrauff site. Water samples were obtained at regular intervals from two locations in the river and from wells near the sites. for chemical and microbiological analysis. Statistical methods were used to test the hypothesis of equality of means of various variables among the samples from several locations. A general hydrogeologic survey in the environs of the landfills was conducted using drillers' logs, published information, Piper Diagrams, etc.

There was apparently little change in the quality of river water (sewage effluent) during flow between Ruthrauff Rd and Ina Rd. For example, total nitrogen at the Ruthrauff Rd and Ina Rd locations averaged 30.69 mg/l and 31.28 mg/l, respectively. The slightly higher total N at Ina Rd may reflect inflow from the Ina Rd ponds. Overall, it appeared that nitrification was not significant in the river reach between Ruthrauff Rd and Ina Rd.

The overall salinity of water from the field access well at Ina Rd was generally lower than in the access well within the 10-acre lagoon. Possibly leaching below the lagoon promoted downward movement of salts into native ground water. The pumped water from the CWUA well at Ina Rd tended to represent the quality of water from both surficial and deeper (Fort Lowell) geologic deposits--the salinity of water from this well exceeded that from the access wells.

The quality of water from the shallow plastic well at Ruthrauff Rd

represents the salinity within a shallow perched water table. Except for sodium there was little indication that means of sample constituents from this well and the nearby river water were equal. A substantial (78%) reduction occurred in total N during flow of sewage effluent from the river to this well, apparently a reflection of denitrification and/or sorption. Calcium, magnesium and bicarbonate levels increased, however, possibly a manifestation of the dissolution of relict salts.

The total N level of water in samples from a city well near the Santa Cruz River and Ruthrauff Rd illustrated that further reduction in N occurred during recharge into the main water table. Again, calcium, magnesium and bicarbonate levels exceeded values in the river.

An overall improvement in quality was apparent in samples from a city well, about 1,000 ft west of the well near the river. However, total N remained about the same. Possibly, low salinity ground water moving in from the Tucson Mountains may have promoted dilution with laterally-flowing, recharged effluent.

The quality of water in an upstream control well near the Rabies Control Center was generally much poorer than in downstream wells. For example, chloride values in the upstream well were almost twice those in the downstream wells.

In general, the water levels in wells of the area showed substantial declines, corresponding to the general decline in the Tucson Basin in 1973-74.

Using membrane filter methods (MF) it was found that excessive levels of total and fecal coliform were present in river samples, (e.g. maximum total coliform was 675,000 colonies per 100 ml). Corresponding values in wells of the area, including the shallow landfill well, were generally within the limit of public health tolerances. That is, filtration through shallow surficial deposits was effective in reducing levels of microorganisms.

In a brief study, J. H. Randall delineated the thicknesses of the following formations: surficial deposits, Fort Lowell Formation and the Tinaja Beds. Using water level data for the Ina Rd access wells, and pumping data from the CWUA well, transmissivity of the lower beds was estimated to be 35,000 gpd/ft, c.f. 150,000-300,000 gpd/ft for surficial deposits. A Piper Diagram prepared from water quality data in the area substantiated the observation than an overall improvement of quality in water within surficial deposits occurs during the recharge of sewage effluent.

APPENDIX

TABULAR DATA

TABLE 1

MEAN WATER QUALITY VALUES, LANDFILL PROJECT, 1974

LOCATION	EC	NH ₄	NO ₂ /3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO ₃	SO ₄
SCIR3	1.00	22.21	1.51	31.20	8.01	130.51	16.24	55.38	8.52	176.69	102.34	269.60	149.00
SCRR1	1.09	22.91	1.43	30.69	7.71	129.27	15.65	55.15	8.32	173.52	102.22	266.93	154.00
IRPH1	1.23	.30	2.65	1.05	7.10	127.78	6.00	125.00	16.86	-0.00	101.62	381.75	-0.00
IRA11	1.18	1.84	.27	3.39	7.96	186.27	12.50	45.07	16.29	126.78	105.25	509.83	42.00
IRA21	.86	3.41	.34	5.15	8.11	127.58	13.40	35.27	10.75	102.87	94.00	272.20	92.00
RRLF1	1.17	2.05	2.57	4.34	7.23	129.36	12.50	94.25	13.41	202.92	104.20	427.17	100.00
RRCY1	1.53	1.05	.86	2.87	7.43	130.54	12.25	70.80	9.33	261.65	103.40	297.17	87.00
SF1A1	.94	.67	.49	2.63	7.08	102.31	12.60	69.75	13.25	318.51	84.00	263.33	135.00
SF2A1	1.56	2.26	.94	3.92	7.06	190.25	-0.00	116.87	24.12	-0.00	200.40	307.83	249.00

SCIR3 = SANTA CRUZ RIVER INA ROAD DOWNSTREAM
 SCRR1 = SANTA CRUZ AT RUTHRAUF RD
 IRPH1 = CORTARO WATER USERS WELL
 IRA11 = PLATFORM ACCESS WELL
 IRA21 = FIELD ACCESS WELL
 RRLF1 = RUTHRAUF RD LANDFILL WELL N01
 RRCY1 = CITY WELL NEAR RIVER, RUTHRAUF RD
 SF1A1 = CITY WELL NEAR SILVERBELL RD
 SF2A1 = CITY WELL NEAR RABIES CONTROL CENTER

SANTA CRUZ INA RD, UPSTREAM

TABLE 2

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/27/74	1.10	31.12	1.92	36.39	7.80	134.00	16.00	48.00	8.25	153.81	-0.00	-0.00
2/3/74	1.03	20.83	1.44	27.29	7.80	120.00	15.00	54.00	7.40	159.20	-0.00	-0.00
2/18/74	1.10	27.57	-0.00	32.58	7.90	-0.00	-0.00	51.00	-0.00	-0.00	-0.00	-0.00
2/25/74	-0.00	28.70	.62	29.93	-0.00	128.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/1/74	1.15	24.28	.92	24.90	8.00	135.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/11/74	1.20	38.44	.84	60.20	7.75	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/21/74	1.70	83.08	.64	99.99	7.90	128.00	-0.00	56.00	11.00	-0.00	-0.00	-0.00

INTA CRUZ INA RD, AT OUTFALL

TABLE 2 (cont)

DATE	EC	NH4	N02/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
2/25/74	-0.00	33.74	.42	37.11	-0.00	128.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/1/74	1.07	32.87	.36	37.59	7.20	128.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/11/74	1.09	33.18	.45	33.60	7.35	100.00	-0.00	44.00	6.00	-0.00	-0.00	-0.00
3/21/74	1.00	30.55	.53	45.36	7.62	116.00	-0.00	48.00	6.00	-0.00	-0.00	-0.00

ANTA CRUZ INA RD, DOWNSTREAM

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/10/74	1.10	-0.00	-0.00	33.29	7.90	119.00	15.00	53.00	8.63	167.86	-0.00	-0.00
1/16/74	1.00	-0.00	-0.00	24.40	8.30	128.00	14.00	59.00	9.13	184.90	-0.00	-0.00
1/25/74	-0.00	21.31	1.92	27.77	-0.00	129.00	15.00	54.00	9.75	174.97	-0.00	-0.00
1/27/74	1.05	30.16	1.92	36.63	7.50	134.00	16.00	48.00	7.88	152.29	-0.00	-0.00
1/28/74	1.09	26.33	2.15	29.69	7.90	125.00	15.00	51.00	8.75	163.36	-0.00	-0.00
1/29/74	1.11	25.14	1.68	28.97	7.60	122.00	15.00	72.00	8.25	213.74	-0.00	-0.00
1/30/74	1.06	20.11	4.79	26.09	7.70	132.00	15.00	53.00	9.50	171.44	-0.00	-0.00
1/31/74	1.08	24.66	2.87	24.42	7.70	134.00	16.00	56.00	10.00	180.99	-0.00	-0.00
2/ 1/74	1.10	23.46	2.39	26.33	7.75	134.00	16.00	54.00	9.75	174.97	-0.00	-0.00
2/ 3/74	1.05	23.22	.72	27.29	7.80	118.00	15.00	54.00	7.10	156.22	-0.00	-0.00
2/ 4/74	1.05	24.66	0.00	28.97	7.77	120.00	15.00	52.00	7.75	155.36	-0.00	-0.00
2/ 5/74	1.05	25.62	1.68	-0.00	7.70	132.00	16.00	58.00	9.85	177.26	-0.00	-0.00
2/ 6/74	-0.00	20.11	5.51	24.42	-0.00	200.00	22.00	80.00	13.95	245.69	-0.00	-0.00
2/ 7/74	1.15	29.45	.96	33.28	7.70	124.00	14.00	57.00	7.35	166.53	-0.00	-0.00
2/ 8/74	1.12	-0.00	-0.00	-0.00	7.60	124.00	15.00	60.00	8.45	177.64	-0.00	-0.00
2/11/74	-0.00	24.18	0.00	28.25	-0.00	118.00	13.00	56.00	6.70	161.89	-0.00	-0.00
2/12/74	-0.00	30.07	-0.00	39.09	7.70	-0.00	-0.00	59.00	-0.00	-0.00	-0.00	-0.00
2/13/74	-0.00	28.57	-0.00	40.60	7.75	-0.00	-0.00	62.00	-0.00	-0.00	-0.00	-0.00
2/14/74	.95	20.30	-0.00	30.57	7.70	-0.00	-0.00	64.00	-0.00	-0.00	-0.00	-0.00

SANTA CRUZ INA RD, DOWNSTREAM

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
2/15/74	1.10	19.05	-0.00	28.32	7.90	-0.00	-0.00	58.00	-0.00	-0.00	-0.00	-0.00
2/16/74	1.10	23.61	-0.00	31.33	7.90	-0.00	-0.00	58.00	-0.00	-0.00	-0.00	-0.00
2/19/74	1.05	23.61	-0.00	33.83	7.70	-0.00	-0.00	53.00	-0.00	-0.00	-0.00	-0.00
2/20/74	1.10	24.56	-0.00	34.23	7.80	-0.00	-0.00	56.00	-0.00	-0.00	-0.00	-0.00
2/21/74	1.14	28.95	.61	40.94	7.70	138.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/22/74	1.11	30.13	.64	32.32	7.70	138.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/22/74	1.11	30.13	.64	32.32	7.70	138.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/25/74	1.11	28.73	.50	30.68	7.90	128.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/26/74	-0.00	23.24	2.13	21.55	-0.00	128.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	1.15	26.21	.76	30.16	8.20	135.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/28/74	1.08	22.99	1.26	25.62	8.00	131.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 1/74	1.15	24.84	1.82	30.16	7.80	142.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 4/74	1.10	27.24	.56	31.36	7.80	131.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 5/74	-0.00	25.37	.84	28.97	-0.00	135.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	28.14	.48	28.28	7.96	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	28.14	.48	28.28	7.96	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 7/74	1.15	24.95	.62	31.92	8.10	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 8/74	1.10	22.79	.70	21.56	7.90	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/11/74	1.25	38.39	.48	42.00	7.65	128.00	-0.00	54.00	8.00	-0.00	-0.00	-0.00

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HC03
3/15/74	1.15	27.38	.34	36.40	7.80	124.00	-0.00	55.00	9.00	-0.00	-0.00	-0.00
3/18/74	1.12	22.60	.48	27.44	8.10	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/20/74	1.09	23.72	.34	29.96	8.00	132.00	-0.00	54.00	6.00	-0.00	-0.00	-0.00
3/21/74	1.70	89.46	.31	99.99	7.71	132.00	-0.00	55.00	10.00	-0.00	-0.00	-0.00
3/25/74	1.10	21.95	.62	27.72	8.10	122.00	-0.00	50.00	8.00	-0.00	-0.00	-0.00
3/28/74	1.09	24.53	.31	20.16	8.20	106.00	-0.00	46.00	6.00	-0.00	90.00	-0.00
3/29/74	1.05	19.88	.56	25.76	8.40	132.00	-0.00	53.00	8.00	-0.00	112.00	-0.00
4/ 1/74	1.05	19.82	.64	23.80	8.30	122.00	-0.00	48.00	8.00	-0.00	92.00	-0.00
4/ 3/74	1.10	20.16	1.20	24.08	8.30	138.00	-0.00	53.00	8.00	-0.00	100.00	-0.00
4/10/74	1.06	19.49	2.04	24.64	7.90	138.00	-0.00	53.00	8.00	-0.00	97.00	-0.00
4/17/74	1.20	9.94	4.82	13.72	8.35	-0.00	-0.00	-0.00	-0.00	-0.00	113.00	239.00
4/24/74	1.10	9.07	5.40	15.96	8.10	-0.00	-0.00	-0.00	-0.00	-0.00	114.00	259.00
5/ 1/74	1.00	8.96	3.98	12.04	8.60	-0.00	-0.00	-0.00	-0.00	-0.00	87.00	246.00
5/ 8/74	1.00	10.42	2.91	13.72	8.30	120.00	-0.00	54.00	9.00	-0.00	102.00	-0.00
5/10/74	.99	3.22	1.17	-0.00	8.60	-0.00	-0.00	-0.00	-0.00	-0.00	104.00	-0.00
5/13/74	1.05	4.71	.84	-0.00	8.30	-0.00	-0.00	-0.00	-0.00	-0.00	90.00	-0.00
5/14/74	1.00	4.13	.83	-0.00	8.35	-0.00	-0.00	-0.00	-0.00	-0.00	96.00	-0.00
5/22/74	1.03	3.82	.83	-0.00	8.30	-0.00	-0.00	-0.00	-0.00	-0.00	103.00	281.00
5/23/74	1.10	4.30	.54	-0.00	8.08	-0.00	-0.00	-0.00	-0.00	-0.00	108.00	278.00
5/24/74	1.04	10.42	1.90	-0.00	8.10	-0.00	-0.00	-0.00	-0.00	-0.00	108.00	273.00

ITA CRUZ AT RUTHRAUFF RD

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/ 8/74	1.10	-0.00	-0.00	7.46	7.60	134.00	14.00	59.00	9.25	185.40	-0.00	-0.00
1/10/74	1.08	-0.00	-0.00	26.40	7.85	122.00	14.00	56.00	9.00	176.68	-0.00	-0.00
1/24/74	-0.00	23.46	1.92	27.53	-0.00	132.00	15.00	50.00	8.25	158.81	-0.00	-0.00
1/25/74	-0.00	24.66	2.63	27.77	-0.00	122.00	15.00	48.00	8.38	154.35	-0.00	-0.00
1/27/74	1.13	33.04	2.15	36.63	7.70	136.00	16.00	48.00	8.50	154.64	-0.00	-0.00
1/28/74	.93	22.98	3.11	25.62	7.60	122.00	14.00	50.00	8.50	159.84	-0.00	-0.00
1/29/74	1.19	22.26	1.92	29.45	7.60	134.00	15.00	112.00	8.50	314.65	-0.00	-0.00
1/30/74	1.04	23.46	5.03	26.57	7.70	132.00	15.00	50.00	8.25	158.81	-0.00	-0.00
1/31/74	1.10	25.86	1.92	30.64	7.70	132.00	15.00	50.00	8.50	159.84	-0.00	-0.00
2/ 1/74	1.11	-0.00	-0.00	-0.00	7.70	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/ 3/74	1.01	20.83	1.44	25.86	7.76	120.00	14.00	53.00	7.50	157.04	-0.00	-0.00
2/ 4/74	1.41	91.45	0.00	92.89	7.85	118.00	21.00	57.00	8.90	171.63	-0.00	-0.00
2/ 5/74	1.10	31.60	1.19	38.54	7.60	124.00	16.00	56.00	8.05	166.34	-0.00	-0.00
2/ 6/74	-0.00	29.69	2.16	36.39	-0.00	124.00	15.00	54.00	8.00	161.18	-0.00	-0.00
2/ 7/74	1.10	28.73	1.68	33.52	7.60	124.00	14.00	57.00	7.60	167.35	-0.00	-0.00
2/ 8/74	1.08	27.29	0.00	31.36	7.70	130.00	15.00	58.00	8.45	172.65	-0.00	-0.00
2/11/74	-0.00	24.90	0.00	30.16	-0.00	118.00	13.00	53.00	7.48	156.71	-0.00	-0.00
2/12/74	-0.00	26.31	-0.00	37.60	7.60	-0.00	-0.00	54.00	-0.00	-0.00	-0.00	-0.00
2/13/74	-0.00	21.80	-0.00	32.33	7.80	-0.00	-0.00	53.00	-0.00	-0.00	-0.00	-0.00

SANTA CRUZ AT RUTHRAUFF RD

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
2/14/74	1.15	25.31	-0.00	32.58	7.60	-0.00	-0.00	54.00	-0.00	-0.00	-0.00	-0.00
2/15/74	1.05	19.55	-0.00	29.32	7.70	-0.00	-0.00	57.00	-0.00	-0.00	-0.00	-0.00
2/18/74	1.05	17.04	-0.00	26.56	7.50	-0.00	-0.00	53.00	-0.00	-0.00	-0.00	-0.00
2/19/74	1.04	23.56	-0.00	30.32	7.50	-0.00	-0.00	56.00	-0.00	-0.00	-0.00	-0.00
2/20/74	1.06	25.34	.50	28.49	7.90	128.00	16.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/21/74	1.11	27.30	1.15	31.12	7.85	138.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/22/74	1.20	26.85	1.29	28.97	7.00	142.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/25/74	1.10	24.72	.56	26.57	7.70	121.00	16.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/26/74	-0.00	28.84	.98	34.23	-0.00	144.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	1.16	28.00	1.20	30.40	7.80	138.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/28/74	1.18	24.72	.76	25.38	7.50	138.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 1/74	1.15	24.25	.70	26.57	7.75	144.00	16.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 4/74	1.10	24.50	.98	27.29	7.60	142.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 5/74	-0.00	24.72	1.20	27.29	-0.00	125.00	16.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	23.74	.39	28.84	7.69	124.00	-0.00	56.00	8.00	-0.00	-0.00	-0.00
3/ 7/74	1.10	25.96	-0.00	28.28	7.75	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 8/74	1.09	24.58	.64	26.88	7.53	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 9/74	-0.00	25.12	.56	23.24	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/11/74	1.10	26.57	.59	26.88	7.60	116.00	-0.00	54.00	8.00	-0.00	-0.00	-0.00
3/13/74	1.09	12.60	.36	20.44	7.60	120.00	-0.00	59.00	9.00	-0.00	-0.00	-0.00

DATE	EC	NH4	N02/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HC03
/15/74	1.03	26.76	.42	37.52	7.75	134.00	-0.00	59.00	9.00	-0.00	-0.00	-0.00
/18/74	1.09	26.38	.42	31.92	7.90	128.00	-0.00	53.00	8.00	-0.00	-0.00	-0.00
/20/74	1.00	26.42	.39	37.52	7.72	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
/21/74	1.19	38.69	.45	49.00	7.60	132.00	-0.00	56.00	9.00	-0.00	-0.00	-0.00
/25/74	1.05	20.27	.28	22.68	7.85	116.00	-0.00	54.00	8.00	-0.00	-0.00	-0.00
/26/74	1.05	21.20	.39	20.44	8.01	116.00	-0.00	48.00	8.00	-0.00	90.00	-0.00
/29/74	1.09	21.25	.50	26.68	7.89	-0.00	-0.00	-0.00	-0.00	-0.00	119.00	-0.00
/ 1/74	1.08	21.28	.45	27.72	7.95	132.00	-0.00	55.00	8.00	-0.00	90.00	-0.00
/ 3/74	1.18	23.91	.70	25.76	7.75	-0.00	-0.00	-0.00	-0.00	-0.00	116.00	-0.00
/10/74	1.10	16.77	1.46	21.56	7.65	142.00	-0.00	54.00	8.00	-0.00	92.00	-0.00
/17/74	1.08	16.91	3.16	22.40	7.80	-0.00	-0.00	-0.00	-0.00	-0.00	106.00	256.00
/24/74	1.09	13.36	3.53	17.36	7.60	124.00	-0.00	55.00	9.00	-0.00	113.00	266.00
/ 1/74	1.05	13.58	3.11	16.80	7.90	-0.00	-0.00	-0.00	-0.00	-0.00	94.00	266.00
/ 8/74	1.04	9.91	3.28	14.28	7.80	134.00	-0.00	55.00	9.00	-0.00	95.00	-0.00
/10/74	1.01	12.15	3.36	15.40	7.65	120.00	-0.00	54.00	9.00	-0.00	104.00	-0.00
/13/74	1.11	5.19	1.02	-0.00	7.70	-0.00	-0.00	-0.00	-0.00	-0.00	99.00	-0.00
/14/74	1.03	4.31	1.01	-0.00	7.80	-0.00	-0.00	-0.00	-0.00	-0.00	84.00	-0.00
/14/74	1.03	4.31	1.10	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
/22/74	1.05	4.12	1.23	-0.00	7.80	-0.00	-0.00	-0.00	-0.00	-0.00	104.00	266.00

ANTA CRUZ AT RUTHRAUFF RD

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
5/24/74	1.05	10.26	3.22	-0.00	7.85	-0.00	-0.00	-0.00	-0.00	-0.00	98.00	256.00
5/28/74	1.10	12.71	2.91	-0.00	7.85	-0.00	-0.00	-0.00	-0.00	-0.00	106.00	271.00
5/29/74	1.05	13.44	3.11	-0.00	7.60	142.00	-0.00	51.00	8.00	-0.00	104.00	265.00
5/30/74	1.05	-0.00	-0.00	-0.00	7.52	138.00	-0.00	53.00	8.00	-0.00	111.00	268.00
5/31/74	1.09	-0.00	-0.00	-0.00	7.60	132.00	-0.00	51.00	8.00	-0.00	122.00	285.00
6/ 3/74	1.02	-0.00	-0.00	-0.00	7.85	122.00	-0.00	51.00	8.00	-0.00	92.00	276.00
6/ 4/74	1.00	-0.00	-0.00	-0.00	7.84	132.00	-0.00	51.00	8.00	-0.00	103.00	268.00
6/ 5/74	1.01	-0.00	-0.00	-0.00	7.78	-0.00	-0.00	-0.00	-0.00	-0.00	100.00	268.00
6/ 6/74	1.03	-0.00	-0.00	-0.00	7.87	-0.00	-0.00	-0.00	-0.00	-0.00	104.00	261.00

UTTHRAUFF RD LANDFILL WELL NO1

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/ 6/74	.90	-0.00	-0.00	7.75	7.35	146.00	13.00	59.00	11.50	194.66	-0.00	-0.00
1/30/74	1.35	2.39	1.20	6.70	7.60	158.00	13.00	51.00	8.13	160.01	-0.00	-0.00
2/ 6/74	1.30	.72	9.82	3.11	7.70	124.00	11.00	81.00	15.50	253.30	-0.00	-0.00
2/13/74	-0.00	.70	-0.00	7.27	7.70	-0.00	-0.00	62.00	-0.00	-0.00	-0.00	-0.00
2/20/74	1.12	-0.00	-0.00	4.01	7.50	-0.00	-0.00	67.00	-0.00	-0.00	-0.00	-0.00
2/27/74	1.19	.45	5.15	1.20	7.70	115.00	13.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	.50	3.36	0.00	7.49	132.00	-0.00	125.00	15.00	-0.00	-0.00	-0.00
3/13/74	1.19	.84	.53	3.08	6.97	148.00	-0.00	125.00	25.00	-0.00	-0.00	-0.00
3/14/74	1.19	1.29	1.09	0.00	6.90	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/14/74	1.19	1.29	1.09	0.00	69.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/20/74	1.14	2.27	2.83	3.36	7.30	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/28/74	1.20	1.74	.92	3.92	7.40	72.00	-0.00	100.00	8.00	-0.00	95.00	-0.00
4/ 3/74	1.30	3.05	1.79	3.64	6.70	138.00	-0.00	125.00	14.00	-0.00	103.00	-0.00
4/10/74	1.18	3.53	.98	5.04	6.90	138.00	-0.00	125.00	13.00	-0.00	103.00	-0.00
4/17/74	1.22	3.39	2.35	7.28	7.60	-0.00	-0.00	-0.00	-0.00	-0.00	108.00	493.00
4/24/74	1.32	2.30	2.24	8.96	7.60	-0.00	-0.00	-0.00	-0.00	-0.00	109.00	473.00
5/ 1/74	1.10	3.70	2.88	3.92	6.99	-0.00	-0.00	-0.00	-0.00	-0.00	102.00	386.00
5/ 8/74	1.14	4.14	2.18	4.48	6.88	124.00	-0.00	86.00	13.00	-0.00	99.00	-0.00
5/22/74	1.14	1.73	1.26	-0.00	6.98	-0.00	-0.00	-0.00	-0.00	-0.00	103.00	425.00

RUTHRAUFF RD LANDFILL WELL NO1

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
5/31/74	1.11	-0.00	-0.00	-0.00	6.70	128.00	-0.00	125.00	11.00	-0.00	110.00	422.00
6/5/74	1.05	-0.00	-0.00	-0.00	6.80	-0.00	-0.00	-0.00	-0.00	-0.00	110.00	364.00

CORTARO WATER USERS WELL

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
2/20/74	1.21	.31	2.46	0.00	7.10	128.00	6.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	1.29	.53	2.16	0.00	6.88	142.00	6.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	.36	1.26	0.00	7.01	128.00	-0.00	125.00	16.00	-0.00	-0.00	-0.00
3/13/74	1.30	0.00	3.30	.56	7.20	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/20/74	1.21	0.00	2.77	1.40	7.15	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/29/74	1.23	0.00	2.63	.56	7.30	-0.00	-0.00	-0.00	-0.00	-0.00	124.00	-0.00
4/ 3/74	1.25	.34	2.83	2.52	7.00	132.00	-0.00	125.00	16.00	-0.00	94.00	-0.00
4/10/74	1.20	.34	2.60	3.64	7.10	128.00	-0.00	125.00	16.00	-0.00	97.00	-0.00
4/17/74	1.25	.36	1.85	0.00	7.35	128.00	-0.00	125.00	16.00	-0.00	94.00	383.00
4/24/74	1.22	.31	3.64	.84	7.25	124.00	-0.00	125.00	18.00	-0.00	97.00	390.00
5/ 1/74	1.22	.42	2.72	.28	7.10	120.00	-0.00	125.00	16.00	-0.00	98.00	373.00
5/ 8/74	1.22	.64	3.61	2.80	7.00	120.00	-0.00	125.00	20.00	-0.00	104.00	-0.00
6/ 5/74	1.20	-0.00	-0.00	-0.00	7.15	-0.00	-0.00	-0.00	-0.00	-0.00	105.00	381.00

LATFORM ACCESS WELL

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/10/74	1.40	-0.00	-0.00	7.75	8.95	200.00	11.00	14.00	15.75	99.75	-0.00	-0.00
1/16/74	1.38	-0.00	-0.00	6.31	8.55	200.00	10.00	34.00	16.50	152.81	-0.00	-0.00
1/30/74	1.30	2.87	.72	6.22	8.20	200.00	13.00	26.00	14.25	123.58	-0.00	-0.00
2/ 6/74	1.20	1.92	0.00	5.03	8.40	200.00	13.00	34.00	14.00	131.00	-0.00	-0.00
2/13/74	-0.00	2.51	-0.00	6.77	7.90	-0.00	-0.00	28.00	-0.00	-0.00	-0.00	-0.00
2/20/74	1.22	2.63	.28	1.68	8.00	200.00	15.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	1.29	1.48	0.00	1.20	7.45	200.00	13.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	2.18	0.00	0.00	8.07	200.00	-0.00	48.00	14.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	2.18	0.00	0.00	8.07	200.00	-0.00	48.00	14.00	-0.00	-0.00	-0.00
3/13/74	1.25	2.30	.31	0.00	7.91	200.00	-0.00	46.00	14.00	-0.00	-0.00	-0.00
3/20/74	1.10	2.30	0.00	2.80	7.92	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/29/74	1.21	.73	0.00	3.08	8.00	192.00	-0.00	49.00	13.00	-0.00	136.00	-0.00
4/ 3/74	1.21	1.93	-0.00	4.48	7.81	188.00	-0.00	53.00	-0.00	-0.00	103.50	-0.00
4/10/74	1.13	1.96	.39	5.04	7.80	192.00	-0.00	48.00	14.00	-0.00	104.00	-0.00
4/17/74	1.12	1.46	.14	0.00	7.95	148.00	-0.00	81.00	23.00	-0.00	99.00	544.00
4/24/74	1.14	1.46	.28	5.32	7.73	176.00	-0.00	53.00	19.00	-0.00	98.00	566.00
5/ 1/74	1.16	1.68	.39	1.96	7.70	-0.00	-0.00	-0.00	-0.00	-0.00	99.00	532.00
5/ 8/74	1.10	1.34	.76	0.00	7.75	160.00	-0.00	63.00	21.00	-0.00	105.00	-0.00
5/22/74	1.00	.71	.26	-0.00	7.70	-0.00	-0.00	-0.00	-0.00	-0.00	99.00	473.00

TABLE 2 (cont)

ATFORM ACCESS WELL

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	MCO3
5/29/74	1.00	1.76	.48	-0.00	7.70	138.00	-0.00	46.00	17.00	-0.00	107.00	473.00
6/5/74	.99	-0.00	-0.00	-0.00	7.79	-0.00	-0.00	-0.00	-0.00	-0.00	102.00	471.00

WELL ACCESS FIELD

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/16/74	.82	-0.00	-0.00	6.32	6.55	125.00	10.00	34.00	10.75	129.15	-0.00	-0.00
1/30/74	.81	4.79	.72	9.34	8.40	132.00	13.00	26.00	10.38	107.65	-0.00	-0.00
2/ 7/74	.85	5.27	0.00	9.10	8.20	124.00	15.00	19.00	7.40	71.61	-0.00	-0.00
2/13/74	-0.00	3.00	-0.00	-0.00	8.50	-0.00	-0.00	22.00	-0.00	-0.00	-0.00	-0.00
2/20/74	.80	5.12	.39	4.31	8.50	128.00	16.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	.99	3.96	.22	1.20	7.20	128.00	13.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	4.34	.14	5.04	8.30	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/13/74	.90	4.26	.22	0.00	8.05	124.00	-0.00	48.00	13.00	-0.00	-0.00	-0.00
3/20/74	.85	3.81	.31	7.00	8.31	134.00	-0.00	41.00	11.00	-0.00	-0.00	-0.00
3/20/74	.85	3.81	.31	7.00	8.31	134.00	-0.00	41.00	11.00	-0.00	-0.00	-0.00
3/29/74	.83	3.81	.34	8.12	8.40	128.00	-0.00	36.00	8.00	-0.00	115.00	-0.00
4/ 3/74	.85	2.97	.36	2.80	8.20	128.00	-0.00	39.00	11.00	-0.00	88.00	-0.00
4/10/74	.85	3.25	.39	5.04	7.00	132.00	-0.00	39.00	10.00	-0.00	89.00	-0.00
4/17/74	.91	3.05	.36	6.44	7.45	-0.00	-0.00	-0.00	-0.00	-0.00	86.00	295.00
5/ 1/74	.89	1.90	.50	.28	8.05	120.00	-0.00	44.00	13.00	-0.00	91.00	300.00
5/ 8/74	.88	.75	.16	-0.00	8.00	-0.00	-0.00	-0.00	-0.00	-0.00	97.00	-0.00
5/22/74	.80	.85	.27	-0.00	8.49	-0.00	-0.00	-0.00	-0.00	-0.00	93.00	224.00
5/29/74	.89	1.88	.76	-0.00	8.32	128.00	-0.00	41.00	13.00	-0.00	94.00	259.00
6/ 5/74	.84	-0.00	-0.00	-0.00	8.00	-0.00	-0.00	-0.00	-0.00	-0.00	93.00	283.00

WELL NEAR RIVER, RUTHRAUF 1

TABLE 2 (cont)

IE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
10/74	-0.00	-0.00	-0.00	6.60	7.90	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
1/30/74	1.20	.24	1.20	11.25	7.40	146.00	10.00	89.00	13.00	275.74	-0.00	-0.00
1/6/74	1.15	0.00	0.00	2.39	7.30	144.00	9.00	82.00	13.00	247.56	-0.00	-0.00
1/13/74	-0.00	.60	-0.00	3.76	7.30	-0.00	-0.00	83.00	-0.00	-0.00	-0.00	-0.00
1/20/47	1.10	1.09	.31	0.00	7.40	138.00	11.00	-0.00	-0.00	-0.00	-0.00	-0.00
1/27/74	1.16	1.26	.25	1.44	7.20	144.00	19.00	-0.00	-0.00	-0.00	-0.00	-0.00
1/6/74	-0.00	1.37	.25	1.96	7.30	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
1/13/74	1.08	.90	.31	0.00	7.20	132.00	-0.00	84.00	9.00	-0.00	-0.00	-0.00
1/20/74	1.02	.73	.48	0.00	7.25	134.00	-0.00	84.00	11.00	-0.00	-0.00	-0.00
1/28/74	1.00	.45	0.00	3.64	7.39	128.00	-0.00	60.00	8.00	-0.00	100.00	-0.00
1/3/74	.99	.92	.45	3.92	7.10	-0.00	-0.00	-0.00	-0.00	-0.00	98.00	-0.00
1/10/74	.93	.10	1.26	2.52	7.30	116.00	-0.00	56.00	8.00	-0.00	102.00	-0.00
1/17/74	.96	2.16	1.01	4.20	7.60	-0.00	-0.00	-0.00	-0.00	-0.00	98.00	322.00
1/24/74	.98	2.10	1.48	.84	7.35	120.00	-0.00	63.00	8.00	-0.00	104.00	317.00
5/1/74	9.30	1.74	3.02	3.36	7.30	-0.00	-0.00	-0.00	-0.00	-0.00	101.00	290.00
5/8/74	.89	1.79	.92	0.00	7.43	112.00	-0.00	56.00	8.00	-0.00	105.00	-0.00
5/22/74	.90	.56	.26	-0.00	7.50	-0.00	-0.00	-0.00	-0.00	-0.00	105.00	295.00
5/29/74	.90	1.90	2.63	-0.00	7.60	122.00	-0.00	51.00	6.00	-0.00	111.00	288.00
6/5/74	.89	-0.00	-0.00	-0.00	8.41	-0.00	-0.00	-0.00	-0.00	-0.00	111.00	-0.00

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
5/74	.89	-0.00	-0.00	-0.00	6.41	-0.00	-0.00	-0.00	-0.00	-0.00	110.00	271.00

ITY WELL NEAR SILVERBELL RD

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
1/ 8/74	1.30	-0.00	-0.00	10.91	7.75	146.00	13.00	84.90	25.13	313.18	-0.00	-0.00
1/30/74	1.22	1.20	.72	6.46	7.50	134.00	13.00	105.00	23.38	358.42	-0.00	-0.00
2/ 6/74	1.20	.96	0.00	1.20	7.50	100.00	11.00	87.00	20.25	283.92	-0.00	-0.00
2/13/74	-0.00	.50	-0.00	4.26	7.00	-0.00	-0.00	89.00	-0.00	-0.00	-0.00	-0.00
2/20/74	.98	.81	.45	1.20	6.90	86.00	9.00	-0.00	-0.00	-0.00	-0.00	-0.00
2/27/74	.99	.84	.42	2.15	6.81	100.00	17.00	-0.00	-0.00	-0.00	-0.00	-0.00
3/ 6/74	-0.00	.87	.31	0.00	6.87	94.00	-0.00	84.00	13.00	-0.00	-0.00	-0.00
3/13/74	.99	.59	.28	3.92	6.85	98.00	-0.00	95.00	14.00	-0.00	-0.00	-0.00
3/20/74	.81	.42	.11	1.68	6.89	86.00	-0.00	54.00	9.00	-0.00	-0.00	-0.00
3/28/74	.81	.45	0.00	.84	7.00	86.00	-0.00	49.00	8.00	-0.00	81.00	-0.00
4/ 3/74	.82	.50	0.00	2.24	6.75	90.00	-0.00	46.00	8.00	-0.00	86.00	-0.00
4/10/74	.78	.64	.62	2.80	7.70	94.00	-0.00	51.00	6.00	-0.00	88.00	-0.00
4/17/74	.90	.56	.78	0.00	7.20	-0.00	-0.00	-0.00	-0.00	-0.00	82.00	193.00
4/24/74	.87	.45	.95	1.40	6.89	-0.00	-0.00	-0.00	-0.00	-0.00	80.00	200.00
5/ 1/74	.84	.59	.45	2.52	6.87	-0.00	-0.00	-0.00	-0.00	-0.00	80.00	244.00
5/ 8/74	.86	.84	1.43	.56	6.85	104.00	-0.00	46.00	10.00	-0.00	82.00	-0.00
5/22/74	.89	.39	.30	-0.00	6.90	-0.00	-0.00	-0.00	-0.00	-0.00	84.00	254.00
5/29/74	.83	.84	.95	-0.00	7.14	116.00	-0.00	48.00	9.00	-0.00	85.00	251.00
6/ 5/74	.90	-0.00	-0.00	-0.00	7.15	-0.00	-0.00	-0.00	-0.00	-0.00	92.00	276.00

ITY WELL NEAR RABIES CONTROL

TABLE 2 (cont)

DATE	EC	NH4	NO2/3	KJN	PH	NA	K	CA	MG	HARD.	CL	HCO3
3/20/74	1.51	3.30	.87	7.84	-0.00	200.00	-0.00	125.00	24.00	-0.00	-0.00	-0.00
3/28/74	1.70	4.03	.50	5.32	7.10	200.00	-0.00	125.00	24.00	-0.00	214.00	-0.00
4/ 3/74	1.52	3.02	.34	4.48	6.80	192.00	-0.00	125.00	24.00	-0.00	220.00	-0.00
4/10/74	1.59	2.66	.48	1.12	6.95	180.00	-0.00	125.00	26.00	-0.00	215.00	-0.00
4/17/74	1.68	2.52	1.20	5.32	7.20	-0.00	-0.00	-0.00	-0.00	-0.00	199.00	251.00
4/24/74	1.59	2.63	1.62	2.52	6.95	188.00	-0.00	104.00	25.00	-0.00	198.00	246.00
5/ 1/74	1.51	.81	1.40	3.92	6.96	188.00	-0.00	106.00	25.00	-0.00	195.00	271.00
5/ 8/74	1.50	2.88	.92	.84	6.81	188.00	-0.00	100.00	25.00	-0.00	197.00	-0.00
5/22/74	1.58	1.16	.28	-0.00	7.11	-0.00	-0.00	-0.00	-0.00	-0.00	190.00	322.00
5/29/74	1.52	2.58	1.76	-0.00	7.30	186.00	-0.00	125.00	20.00	-0.00	190.00	371.00
6/ 5/74	1.51	-0.00	-0.00	-0.00	7.44	-0.00	-0.00	-0.00	-0.00	-0.00	186.00	386.00

TABLE 3

FILE LANDFILL (CREATION DATE = 08/06/74) STUDY

		SANTA CRUZ RIVER NEAR INA ROAD		SANTA CRUZ RIVER NEAR RUTHRAUFF		T - T E S T		SEPARATE VARIANCE ESTIMATE		VARIANCE ESTIMATE	
GROUP 1 - FIRST	66 CASES	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD ERROR	F VALUE	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
GROUP 2 - NEXT	67 CASES										
VAR005	SPECIFIC CONDUCTANCE										
GROUP 1	57	.101	1.0851	.013	1.0851	.013	2.15	.005	-.04	112	.965
GROUP 2	57	.069	1.0850	.009	1.0850	.009			-.04		.966
VAR006	AMMONIA										
GROUP 1	56	12.176	22.2082	1.627	22.2082	1.627	1.07	.810	-.31	112	.756
GROUP 2	58	11.791	22.9079	1.548	22.9079	1.548			-.31	111.49	.756
VAR007	NITRATE PLUS NITRITE										
GROUP 1	49	1.400	1.5069	.200	1.5069	.200	1.45	.196	.31	90	.755
GROUP 2	51	1.163	1.4267	.163	1.4267	.163			.31		.756
VAR008	KJELDAHL NITROGEN										
GROUP 1	49	12.158	23.7780	1.737	23.7780	1.737	1.17	.579	.28	100	.779
GROUP 2	53	11.242	29.1247	1.544	29.1247	1.544			.28		.779
VAR010	SODIUM										
GROUP 1	41	13.244	130.5122	2.068	130.5122	2.068	2.47	.004	.52	83	.606
GROUP 2	44	8.429	129.2727	1.271	129.2727	1.271			.51		.611
VAR015	CHLORIDE										
GROUP 1	23	8.183	102.3478	1.706	102.3478	1.706	1.42	.414	.05	44	.961
GROUP 2	23	9.765	102.2174	2.036	102.2174	2.036			.05		.961

FILE LANDFILL (CREATION DATE = 06/06/74) STUDY

T E S T

GROUP 1 - FIRST	67 CASES	SANTA CRUZ RIVER AT RUTHRAUFF ROAD		POOLED VARIANCE ESTIMATE		SEPARATE VARIANCE ESTIMATE		
GROUP 2 - NEXT	19 CASES	CITY WELL NEAR SANTA CRUZ RIVER		T VALUE	DEGREES OF FREEDOM	T VALUE	DEGREES OF FREEDOM	
VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	F VALUE	2-TAIL PROB.
VAR005 SPECIFIC CONDUCTANCE								
GROUP 1	57	1.0858	.069	.009	905.11	.000	-1.64	71
GROUP 2	16	1.5281	2.075	.519				
VAR006 AMMONIA								
GROUP 1	58	22.9079	11.791	1.548	283.94	.000	7.60	73
GROUP 2	17	1.0535	.790	.170				
VAR007 NITRATE PLUS NITRITE								
GROUP 1	51	1.4267	1.163	.153	1.69	.264	1.77	65
GROUP 2	16	.8644	.894	.223				
VAR008 KJELDAHL NITROGEN								
GROUP 1	53	29.1247	11.242	1.544	14.70	.000	9.20	67
GROUP 2	16	2.8675	2.932	.733				
VAR010 SODIUM								
GROUP 1	44	129.2727	8.429	1.271	1.99	.116	-.41	53
GROUP 2	11	130.5455	11.903	3.589				
VAR015 CHLORIDE								
GROUP 1	23	102.2174	9.765	2.036	4.65	.022	-.36	31
GROUP 2	10	103.4000	4.526	1.431				

TABLE 8

WATER LEVELS, LANDFILL PROJECT, 1974

DATE	IRA11	IRA21	RRL1	RRCY1	SF1A1	SF2A1
1/ 8/74						103.42
1/10/74	76.86			82.88		
1/16/74	77.03	68.90		82.11	89.85	
1/23/74	77.21	69.25		82.02	90.07	
1/30/74	77.47	69.41		82.17	89.90	
2/06/74	77.70	69.75	9.60	82.34	89.34	
2/13/74	77.91	69.88	9.92	82.40	89.97	
2/20/74	81.00	73.80	9.95	82.55	89.93	
2/27/74	82.39	75.27		82.74		
3/ 6/74	83.20	76.02	9.90	82.74	90.15	
3/13/74	83.94	77.00	10.08	82.89	91.78	
3/20/74	84.64	77.68	10.17	83.06	91.86	
3/28/74			10.17	83.31	90.58	104.07
3/29/74	85.52	78.59				
4/ 3/74	85.97	79.03	9.99	83.46	90.74	104.10
4/10/74	86.56	79.74	10.02	83.62	90.90	104.06
4/17/74	87.24	80.38	10.20	83.74	91.03	104.24
4/24/74	87.90	81.10	10.19	83.95	91.23	104.35
5/ 1/74	88.42	81.58	10.34	84.09	91.37	104.42
5/ 8/74	88.86	81.94	10.32	84.28	91.54	104.44
5/22/74	86.28	78.50	10.37	84.65	91.84	104.63
5/29/74	85.98	78.18	10.33	84.81	92.17	104.64
6/ 5/74	88.74	81.90	10.33	85.	92.25	104.75

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TABLE 9

COLIFORM DATA, LANDFILL PROJECT, 1974 (NO. PER 100 ML)

DATE	COLI	SCRR1	SF1A1	SF2A1	RRCY1	RRLF1
3/ 5/74	TOTAL	65000	0	0	6000	500
	FECAL	600	3		TNTC	10
3/15/74	TOTAL	63000			6600	0
	FECAL	2000	0		2	0
3/21/74	TOTAL	100000	0	0	450	40
	FECAL	8800	0	0	0	0
3/28/74	TOTAL	95000	0	0	0	0
	FECAL	3200	0	0	0	0
4/ 4/74	TOTAL	115000	0	0	3000	150
	FECAL	6600	0	0	0	0
4/11/74	TOTAL	TNTC	0	4	3750	0
	FECAL	35000	0	0	0	0
4/18/74	TOTAL	520000	0	0	1550	150
	FECAL	58250	0	0	0	0
4/26/74	TOTAL	675000	0	0	0	350
	FECAL	2000	0	0	0	0
5/ 2/74	TOTAL	35000	0	0	0	35
	FECAL	500(*)	0	0	0	0
5/ 9/74	TOTAL	68000	0	0	0	20
	FECAL	1600	0	0	0	0
5/24/74	TOTAL	540000	0	4	0	0
	FECAL	41000	0	0	0	0
	FECAL	41000	0	0	0	0
5/30/74	TOTAL	480000	0	0	400	0
	FECAL	44000	0	0	0	0
6/13/74	TOTAL	546000	0	0	0	0
	FECAL	33200	0	0	0	0

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