02-8811-24-SI
REV. NO. 0

FINAL DRAFT
SITE INSPECTION REPORT
MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

PREPARED UNDER
TECHNICAL DIRECTIVE DOCUMENT NO. 02-8811-24
CONTRACT NO. 68-01-7346

FOR THE

ENVIRONMENTAL SERVICES DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

JUNE 27, 1989

NUS CORPORATION
SUPERFUND DIVISION

SUBMITTED BY:

DONALD P. HESSEMER
PROJECT MANAGER

GERALD V. GILLILAND
SITE MANAGER

REVIEWED/APPROVED BY:

RONALD M. NAMAN
FIT OFFICE MANAGER

397301

SITE NAME:	Maunabo Solid Waste Disposal	**EPA ID NO.:**	PRD980512420
ADDRESS:	State Road PR 759 km 2.5 Palo Seco Barrio Maunabo, Puerto Rico 00707	**LATITUDE:** **LONGITUDE:**	18° 00' 54" N 66° 55' 25" W

1.0 SITE SUMMARY

The Maunabo Solid Waste Disposal (SWD) Site is a 7.66-acre active municipal landfill located in the Palo Seco Barrio of Maunabo, a municipality of approximately 11,800 persons in southeastern Puerto Rico. The landfill is in a rural area 1 mile northwest of the Maunabo urban center, which has a population of approximately 3000. In the immediate vicinity of the site there are sugar cane and banana fields. There are residences 200 yards north of the site entrance. The site is at an elevation of approximately 50 feet above mean sea level (MSL), on higher ground than the fields to the east, south, and west, but below the slope that rises on the north. The Rio Maunabo, 1500 feet south of the site, flows southeast toward the Caribbean Sea, almost 3 miles downstream. The landfill sits adjacent to the floodplain of the Rio Maunabo. Groundwater and surface water supplies within 3 miles of the site are used for drinking water. The four wells used for Maunabo municipal water supply are all between 1 and 2 miles downgradient from the site.

The Maunabo SWD in Palo Seco has been active since 1974. It receives approximately 75 to 122 cubic meters of municipal garbage daily. There is no evidence in the available information of current or former hazardous waste disposal at the site. The landfill has been cited by the Environmental Quality Board (EQB) for deficiencies numerous times in the past. The most recent documentation of deficiencies was an October 1987 letter from the EQB to the Mayor of Maunabo. Violations listed include the lack of facilities and equipment necessary for the proper operation of a landfill, the absence of a fence surrounding the landfill, and inadequate security. The site was also noted to have erosion problems, and the loose cover material allows leachate generation in the system. The cover material and underlying deposits are the same highly permeable sandy alluvial deposits.

During a site inspection conducted by NUS Corporation Region 2 FIT on February 2, 1989, it appeared as though the deficiencies at the landfill had not been addressed. The same loose cover material was being used, and there was much exposed garbage, particularly around the edges bordering the fields. Exposed items include junked cars, tires, and a few drums, as well as household garbage. Some solid waste appeared to have fallen beyond the limits of the landfill area, which still was not defined by a fence. Five soil samples were collected to determine the presence or absence of hazardous contaminants at the site. One soil sample, collected near some oily ponded water near the south edge of the site, contained 620 parts per billion (ppb) of phenol and 88.6 parts per million (ppm) of lead. Other contaminants were also found in this and other soil samples. The results of sample analyses are discussed in Section 4.0.

Ref. Nos. 1-9, 11, 12, 16, 17,18

2.0 SITE INSPECTION NARRATIVE

2.1 EXISTING ANALYTICAL DATA

There is no evidence in the available information to indicate that sampling occurred in connection with the Maunabo SWD Site prior to the site inspection conducted by NUS Corporation on February 2, 1989.

Ref. Nos. 1, 3

2.2 WASTE SOURCE DESCRIPTION

Approximately 75 to 122 cubic meters of municipal garbage has been disposed of daily in the unlined landfill since its operation began in 1974. There is no evidence in the available information to suggest that hazardous waste has been disposed of at the landfill. Uncovered items observed during the NUS Corporation site inspection include numerous junked cars, tires, large appliances, and some small drums. The coarse sandy material that underlies the site and is also used as cover material is highly permeable and, as a result, during rainstorms waste may be transported off site via surface runoff or seepage. In an October 1987 letter from the Environmental Quality Board (EQB) to the Mayor of Maunabo, the landfill was cited for "allowing leachate to flow through the system" due to loose cover material. A June 1981 EQB internal memorandum also cited the landfill for erosion problems.

During the NUS Corporation Region 2 FIT site inspection, five soil samples were collected to determine the presence or absence of priority pollutants at the landfill. Sample locations are indicated on Figure 2 in Section 3.0.Results of the sample analyses are discussed in Section 4.0.

Ref. Nos. 1, 3, 4, 5, 18

2.3 GROUNDWATER ROUTE

The Maunabo SWD is located adjacent to the Rio Maunabo floodplain. The main aquifer in the Rio Maunabo drainage basin is alluvium as thick as 200 feet consisting of sand, silt, clay, and gravel, with lenticular deposits of sand, gravel, and cobbles. The average permeability of these alluvial deposits is greater than 10^{-3} cm/sec. This highly permeable unit contains the water table at a depth of approximately 33 feet below ground surface in the area of the site. Groundwater flows southwest locally and southeast toward the Caribbean Sea regionally. The net precipitation in the area is approximately 4.35 inches.

The San Lorenzo batholith, which forms most of the mountainous terrain surrounding the Rio Maunabo drainage basin, is a larger but less significant water-bearing unit than the alluvial deposits. It is a plutonic mass of mostly granodiorite and quartz diorite that is highly weathered in some places, allowing for good water-storage capabilities. As a whole, though, it is a less productive unit than the alluvium.

There are four Commonwealth of Puerto Rico Aqueduct and Sewer Authority (PRASA) wells between 1 and 2 miles southeast of the site. Their locations are shown on the Three-Mile Vicinity Map included as Ref. No 2. They are the municipal supply wells for Maunabo, which has a population of approximately 11,800. The closest well to the site is the PRASA Maunabo 3 well, 1.0 mile southeast of the site. There is a transient-clientele (i.e., restaurant) community well located in the Talante barrio north of the site. The available information does not indicate the existence of any other wells within 3 miles of the site.

The Maunabo SWD was previously cited for having cover material that is too loose, allowing leachate to flow through the system. There is a strong potential for groundwater contamination from this leaching process if hazardous substances are present in the landfill. However, groundwater samples were not collected during the NUS Corporation site inspection because it was determined that representative upgradient and downgradient samples were not available from existing wells.

Ref. Nos. 1-4, 9-17

2.4 SURFACE WATER ROUTE

The Maunabo SWD sits on higher ground than the fields to the east, south, and west. The sides of the landfill slope rather steeply toward these fields, and the overall site slope is estimated to be approximately 5 percent toward the south-southeast. The adjacent fields are lying almost flat on the Rio Maunabo floodplain with an estimated slope of less than 1 percent. The Rio Maunabo is located 1500 feet south of the landfill and flows generally to the southeast. It is the main river in the area, and it flows into the Carribbean Sea almost 3 miles downstream from the site. Surface water is used for some small community water supplies within 3 miles of the site, but it appears from the available information that the intakes are not downstream of the site. Notes included in Ref. No. 3 indicate that the Rio Maunabo is used for recreation.

During the NUS Corporation site inspection, it was noted that loose cover material and exposed garbage could lead to contaminant migration via surface runoff. The site has a history of erosion problems. However, specific drainage paths between the site and the Rio Maunabo were indeterminate due to the amount of vegetation on the adjoining fields. Therefore, surface water and sediment samples were not collected

The 1-year 24-hour rainfall in the area is 4.5 inches. There are no sensitive environments within 2 miles of the site.

Ref. Nos. 1-4, 6, 11, 12

2.5 AIR ROUTE

During the NUS Corporation site inspection, readings of 15 to 20 ppm above background of methane were detected approximately 20 feet north of soil sample location PR22-S4. Readings of 40-70 ppm above background were detected on the HNu photoionization detector in a drum near the northeast corner of the landfill. There were no readings above background in the ambient air near the drum.

The cover material used at the site is highly permeable and some garbage is exposed, so if hazardous volatile or semivolatile compounds exist, there is a potential for their release to the air. There is no evidence in the available information of burning of wastes or receipt of hazardous wastes at the landfill. There are no historic landmarks within view of the site.

Ref. Nos. 1, 3

2.6 ACTUAL HAZARDOUS CONDITIONS

No other hazardous conditions pertaining to human or environmental contamination have been documented. Specifically:

- Contamination has not been documented either in organisms in a food chain leading to humans or in organisms directly consumed by humans.
- There have been no documented observed incidents of direct physical contact with hazardous substances at the facility involving a human being (not including occupational exposure) or a domestic animal.
- There have been no documented incidents of damage to flora or fauna that can be attributed to the site.

- There is no documented contamination of a sewer or storm drain.
- A fire marshall has not certified that the facility presents a significant threat of fire and/or explosion. NUS Region 2 FIT field observations do not evidence a significant threat of fire or explosion.
- There is no direct evidence of release of a substance of concern from the facility to the groundwater.

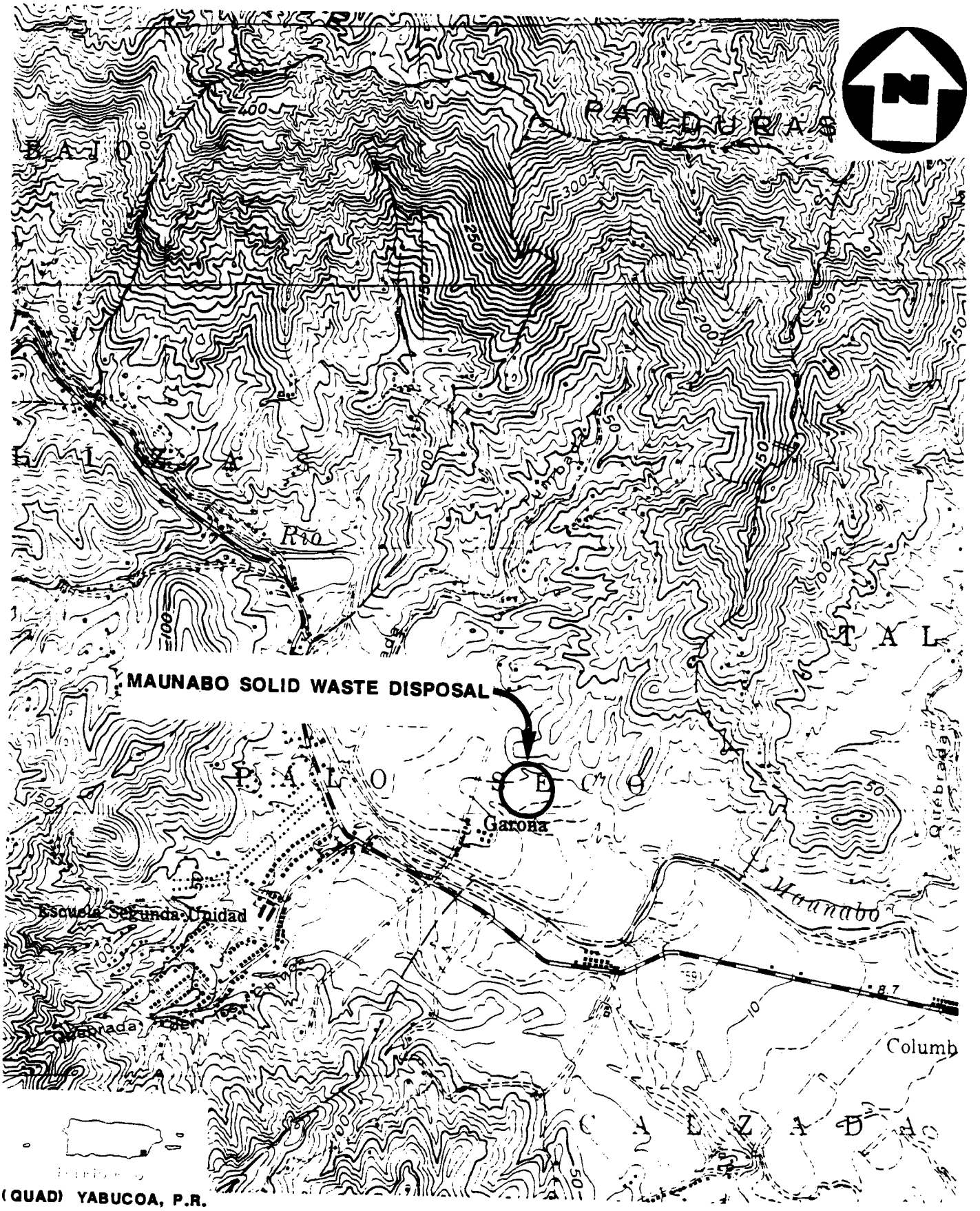
Ref. Nos. 1, 3

3.0 MAPS AND PHOTOS

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

CONTENTS

Figure 1: Site Location Map
Figure 2: Sample Location Map
Exhibit A: Photograph Log



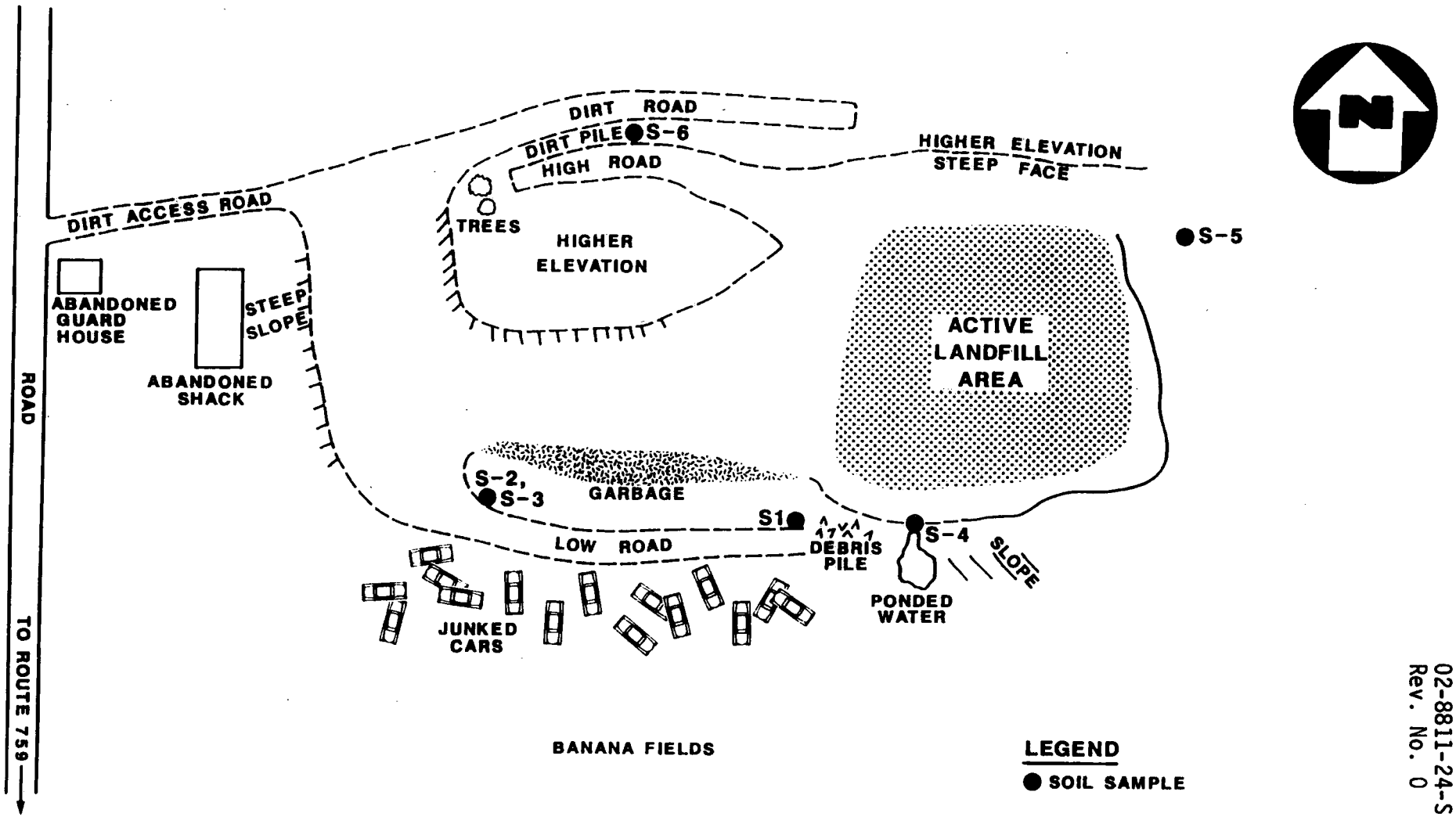
SITE LOCATION MAP

MAUNABO SOLID WASTE DISPOSAL, MAUNABO, P.R.

SCALE: 1" = 1688'

FIGURE 1

NUS CORPORATION



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NOTE: ALL SAMPLE NUMBERS ARE PRECEDED BY PR22.

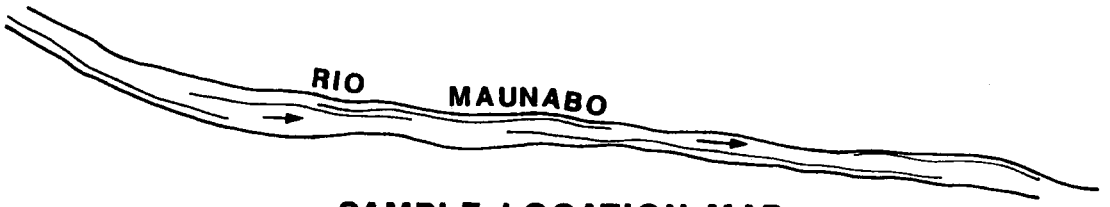


FIGURE 2

SAMPLE LOCATION MAP

MAUNABO SOLID WASTE DISPOSAL, MAUNABO, P.R.

(NOT TO SCALE)

NUS CORPORATION

EXHIBIT A

PHOTOGRAPH LOG

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

OFF-SITE RECONNAISSANCE: JANUARY 10, 1989
SITE INSPECTION: FEBRUARY 2, 1989

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO
OFF-SITE RECONNAISSANCE
JANUARY 10, 1989

PHOTOGRAPH INDEX

Photo Number	Description	Time
1R-14P	Looking northeast at the site entrance, gate, and sign.	0815
1R-15P	Looking east at the site access road that leads up to the fill area.	0816
1R-16P	Looking northeast toward the site. The banana field is in the foreground and the site is on the higher elevation in the background.	0830
1R-17P	Looking southeast from higher ground toward the fill area.	0840
1R-18P	Looking south from higher ground toward debris at the south edge of the landfill and the banana field behind it.	0840
1R-19P	Looking southwest from higher ground toward junk cars along the south edge at the west side of the site.	0840

All photos taken by Greg Pollack.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1R-14P January 10, 1989 0815
Looking northeast at the site entrance, gate, and sign.

1R-15P January 10, 1989 0816
Looking east at the site access road that leads up to the fill area.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1R-16P January 10, 1989 0830
Looking northeast toward the site. The banana field is in the foreground and the site is on the higher elevation in the background.

1R-17P January 10, 1989 0840
Looking southeast from higher ground toward the fill area.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1R-18P January 10, 1989 0840
Looking south from higher ground toward debris at the south edge of the landfill and the banana field behind it.

1R-19P January 10, 1989 0840
Looking southwest from higher ground toward junk cars along the south edge at the west side of the site.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO
SAMPLING TRIP
FEBRUARY 2, 1989
PHOTOGRAPH INDEX

Photo Number	Description	Time
1P-1	R. Pagano collecting soil sample PR22-S1 at the east end of the low road (along the south edge of the site).	0925
1P-2	Looking east at the PR22-S1 sample location.	0925
1P-3	R. Pagano collecting soil samples PR22-S2 and PR22-S3 (environmental duplicate) at the northwest corner of the low road.	0932
1P-4	R. Pagano collecting soil sample PR22-S4 near some oily ponded water approximately 25 feet east of the PR22-S1 sample location.	1005
1P-5	L. LaForge collecting soil sample PR22-S5 at the base of a drum near the northeast corner of the landfill.	1022
1P-6	L. LaForge collecting soil sample PR22-S6 from fill dirt at the crest of the high road (along the north edge of the site).	1036
1P-7	Looking east-southeast toward the fill area from the crest of the high road.	1100
1P-8	Looking northeast at the slope leading up to the crest of the high road.	1105
1P-9	Looking south at the pile of junk cars and other debris at the south edge of the landfill; note the entrance to the low road.	1105
1P-10	Looking east toward the fill area.	1105
1P-11	Looking west at the old shack on the lower portion of the site.	1105
1P-12	Looking northwest at a garbage truck entering the landfill.	1105

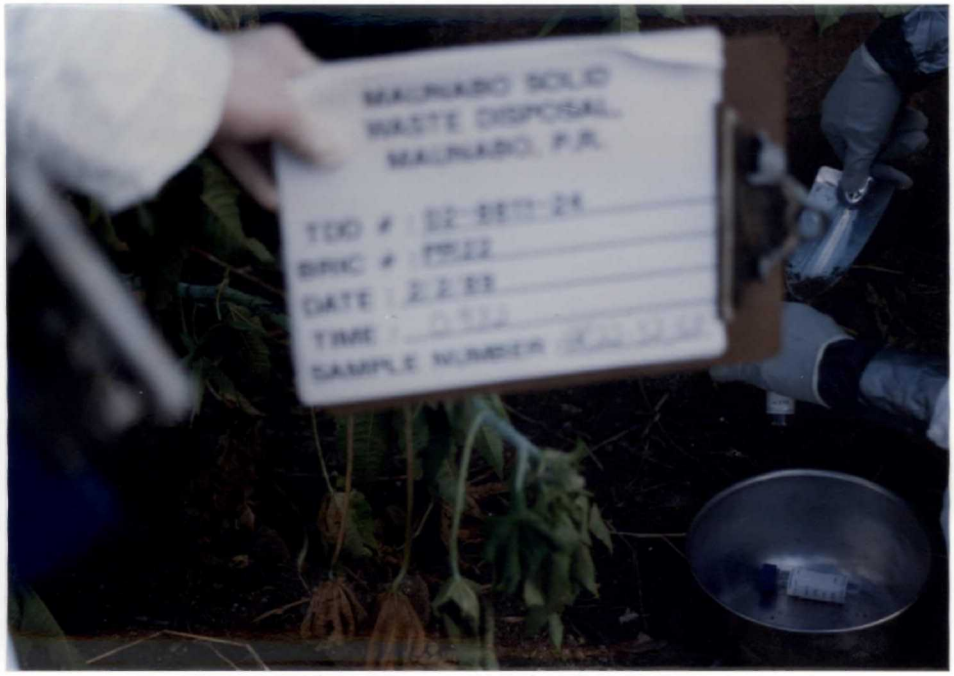
All photographs taken by Gerald Gilliland.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1P-1 February 2, 1989 0925
R. Pagano collecting soil sample PR22-S1 at the east end of the low road (along the south edge of the site).

1P-2 February 2, 1989 0925
Looking east at the PR22-S1 sample location.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO



1P-3 February 2, 1989 0932
R. Pagano collecting soil samples PR22-S2 and PR22-S3 (environmental duplicate) at the northwest corner of the low road.

1P-4 February 2, 1989 1005
R. Pagano collecting soil sample PR22-S4 near some oily ponded water approximately 25 feet east of the PR22-S1 sample location.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1P-5 February 2, 1989 1022
L. LaForge collecting soil sample PR22-S5 at the base of a drum near the northeast corner of the landfill.

1P-6 February 2, 1989 1036
L. LaForge collecting soil sample PR22-S6 from fill dirt at the crest of the high road (along the north edge of the site).

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1P-7 February 2, 1989 1100
Looking east-southeast toward the fill area from the crest of the high road.

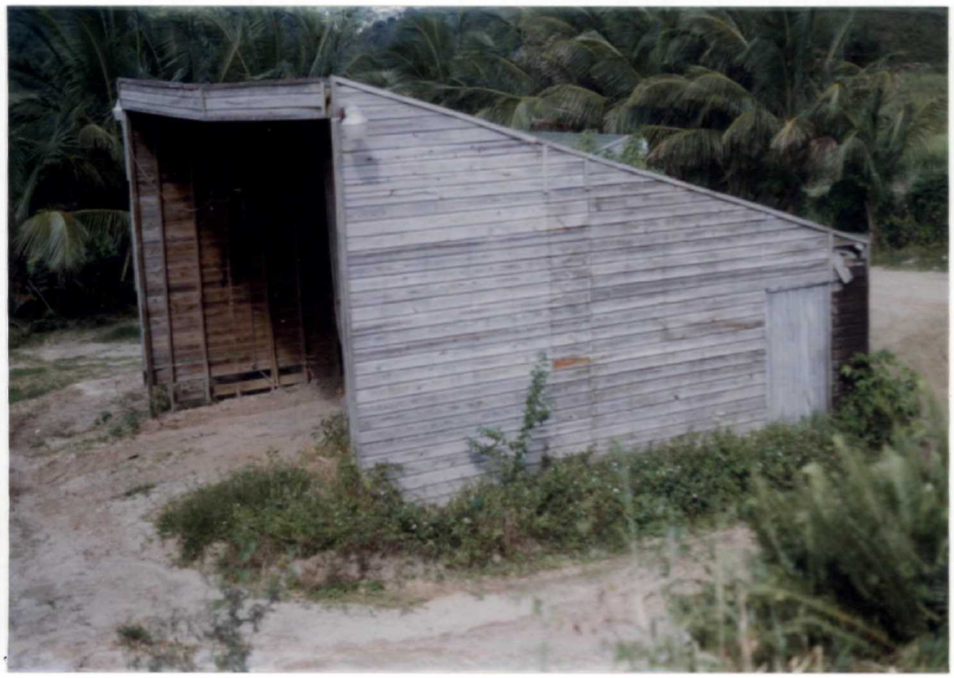
1P-8 February 2, 1989 1105
Looking northeast at the slope leading up to the crest of the high road.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO

1P-9 February 2, 1989 1105
Looking south at the pile of junk cars and other debris at the south edge of the landfill; note the entrance to the low road.

1P-10 February 2, 1989 1105
Looking east toward the fill area.

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO



1P-11 February 2, 1989 1105
Looking west at the old shack on the lower portion of the site.

1P-12 February 2, 1989 1105
Looking northwest at a garbage truck entering the landfill.

4.0 SITE INSPECTION SAMPLING RESULTS

The NUS Corporation Region 2 FIT collected five soil samples at the Maunabo SWD Site during the SI conducted on February 2, 1989. The U.S. EPA Contract Laboratory Program (CLP) was utilized for sample analysis. The results are included as Ref. No. 18. Sample locations are shown on Figure 2 in Section 3.0.

Three semivolatile compounds were detected in soils collected from the Maunabo SWD. Phenol was found at a concentration of 620 parts per billion (ppb) in sample PR22-S4, which was collected adjacent to some oily ponded water on the south side of the landfill. Butylbenzyl phthalate was detected at a concentration of 2200 ppb in sample PR22-S1, which was collected near the south edge of the landfill.

Bis(2-ethylhexyl)phthalate was detected at concentrations of 1100, 2500, and 680 ppb in samples PR22-S1, PR22-S4, and PR22-S5, respectively. Sample PR22-S5 was collected at the base of a drum slightly downslope from the northeast corner of the active landfill area. The polychlorinated biphenyl (PCB) Aroclor-1248 was detected at a concentration of 1200 ppb in Sample PR22-S4. There were no volatile organic compounds detected at significant concentrations in any soil samples collected from the Maunabo SWD.

Lead was detected at a concentration of 88.6 parts per million (ppm) in sample PR22-S4. Zinc was detected in the same sample at a concentration of 212 ppm. Mercury was detected at concentrations of 0.44 and 0.14 ppm in samples PR22-S4 and PR22-S5.

Ref. Nos. 1, 18

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Maunabo SWD is an active municipal landfill with no known history of hazardous waste disposal since its operation began in 1974. However, some of the solid wastes observed at the site, such as the scrapped cars and drums, may contain or generate hazardous materials. There is no containment method used to deter potential contaminants from migrating off site via surface water and groundwater routes. The underlying sandy alluvium is highly permeable, and the same material is used to cover the solid waste, which comes in at a rate of approximately 75 to 122 cubic meters per day. Erosion problems and inundations from rainstorms have been noted in previous investigations.

A **MEDIUM PRIORITY** for further action is recommended for the Maunabo SWD Site. This recommendation is based on several factors, including

- The presence of phenol, lead, and other priority pollutants in soils on site
- The absence of containment
- The location of municipal supply wells 1 to 2 miles downgradient of the site

The further study should include more soil sampling to further define the waste source, the installation of monitoring wells to assess the migration, if any, of contaminants into the groundwater system, and the determination of surface runoff paths to the Rio Maunabo and associated sampling to determine migration, if any, of contaminants off site via surface runoff.

Ref. Nos. 1-18

6.0 REFERENCES

1. Field Notebook No. 0383, Maunabo Solid Waste Disposal, TDD No. 02-8811-24, off-site reconnaissance conducted January 10, 1989, and site inspection conducted February 2, 1989, NUS Corporation Region 2 FIT, Edison, New Jersey.

2. Three-Mile Vicinity Map based on U.S. Department of the Interior, Geological Survey Topographic Maps, 7.5-minute series, "Yabucao, PR", 1960 photorevised 1982, and "Punta Tuna, PR" 1960.

3. Preliminary Assessment Review Form with enclosed reports, Maunabo Solid Waste Disposal, Jose le Font, November 20, 1984.

4. Letter from Cortes, Director, Area Control Contaminacion de Terrenos, Junta de Calidad Ambiental (Spanish for Environmental Quality Board (EQB)), to Hon. J. Berrios, Mayor of Maunabo. October 16, 1987.

5. Letter from L. de la Cruz, Director, Programa Contamination de Terrenos, to Hon. J. Berrios, Mayor of Maunabo, June 2, 1981.

6. EQB memorandum from B. Canellas and F. Forestier to L. de la Cruz (all of EQB), Subject: Inspection Visit to the Maunabo Landfill. June 1, 1981.

7. EQB memorandum from B. Canellas and M. Guzman to J. Ortiz (all of EQB), Subject: Assessment and Inspection of the Maunabo Municipal Landfill. November 29, 1979.

8. EQB memorandum from F. Forestier to J. Ortiz (both of EQB), Subject: Visit to the Maunabo Landfill. August 14, 1978.

9. Torres-Gonzalez, A. and F. Gomez-Gomez, Geohydrologic descriptions of selected solid-waste disposal sites in Puerto Rico, U.S. Geological Survey (USGS) Open-File Report 81-490, 1982.

10. Gomez-Gomez, F. and J. E. Heisel, Summary Appraisals of the nation's ground-water resources-Caribbean region, USGS Professional Paper 813-U, (Date Unknown).

11. Letter from F. Rios, Acting Director, Air Quality Board, EQB, to J. Gutierrez, NUS Corporation, including the document Non-PRASA Water Supply Systems, September 23, 1988.

12. Telecon Note: Conversation between John Baglivi of the U.S. EPA Office of Permits, Management and Information Systems, and Gerald Gilliland, NUS Corporation, June 14, 1989.

13. Briggs, R.P., Provisional geologic map of Puerto Rico and adjacent islands, USGS Miscellaneous Geologic Investigations Map I-392, 1964.

14. Monroe, W.H., Some tropical landforms of Puerto Rico, USGS Professional Paper 1159, (Date Unknown).

REFERENCES (CONT'D)

15. Gomez-Gomez, F. and S. Guzman Rios, Reconnaissance of groundwater quality throughout Puerto Rico, September-October, 1981, USGS Water Resources Division Open-File Report 82-332, 1982.

16. Commonwealth of Puerto Rico, Aqueduct and Sewer Authority (PRASA), Water Supply Systems Maps, Map No. 55, Yabucoa, and Map No. 56, Punta Tuna, January 1983.

17. U.S. Department of the Commerce, Bureau of the Census, 1980 Census of Population and Housing Preliminary Reports, PHC80-P-53, Puerto Rico, issued February 1981.

18. U.S. EPA Contract Laboratory Program, Case No. 11335, Organic and Inorganic Laboratory Analysis from NUS Corporation Region 2 FIT Site Inspection conducted on February 2, 1989.

REFERENCE 1

NUS CORPORATION

II

0383

be made illegible.

- Include a sketch or map of the site which can be used to locate photo or sample locations. Note landmarks, indicate north, and if possible include an approximate scale. Include as many sketches and maps as necessary.

represented, their address and phone number.

- Record any other relevant information which would be difficult to generate at a later date.

MAUNABO SWD
02-8811-24
TDD MGR-D. HESSEMER/G.GILLILAND
LOGBOOK #0383
DECEMBER 21, 1988

Custody of Field Notebook 0383
was transferred to G. Gilliland
from D. Gessner on 1/17/89

Donald Gessner
1/17/89.

Gerald V. Gilliland
1/17/89

M. Vogel 2-17-89

Man
Table

OFF

Site

Pho

Sam

Ge

Mauvrabo SWD
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Gerald V. Caillouet
2/15/89 McVigel 2/17/89

Maunabo SWD 02-8811-24

Gerald V. Gilbert
2/15/89 M. Vogel 2/17/89

Maunabo SWD 02-8811-24

Gerald V. Gilkeson
2/15/89 MVogel 2/17/89

02-EE11-24 MAUNABO SWD

DIRECTIONS FROM SAN JUAN:

FOLLOW RT #52 SOUTH TO CAGUAS. OUTSIDE CAGUAS SET ON RT #1 SOUTH (CAGUAS). TAKE ROUTE #1 TO ROUTE #30 SOUTH TO HUMACO. OUTSIDE HUMACO LOOK FOR SIGN RT #30 TO YABUCOA. RT #30 TURNS INTO RT #3 OUTSIDE HUMACO. FOLLOW TO YABUCOA. (RT #3). OUTSIDE YABUCOA TURN LEFT AT TRAFFIC LIGHT FOLLOW RT #3 BYPASS. THRU THE MOUNTAINS "NARROW ROAD". FOLLOW RT #3 THRU MAUNABO TO ROUTE #759 TURN RIGHT. FOLLOW ~1.5m (K MARKER 2.5) TO FIRST ROAD ON RIGHT. CROSS BRIDGE FOLLOW ROAD TO LANDFILL ON RIGHT. ACCESS ROAD HAS A GATE AND A "WHITE" GUARDHOUSE WITH A SIGN ON TOP INDICATING THE LANDFILL.

1/10/89

Donald P. Hess
1/16/89

02-5811-24 1/10/87

MAUNABO SWD
RT. 759 MAUNABO, PUERTO RICO

OFF SITE RECONNAISSANCE
NUS PERSONNEL
DON HESSLER ~~SITE~~ PROJECT MANAGER - DOCUMENTATION
GREG POLLACK - SITE SAFETY OFFICER, PHOTOGRAPHER

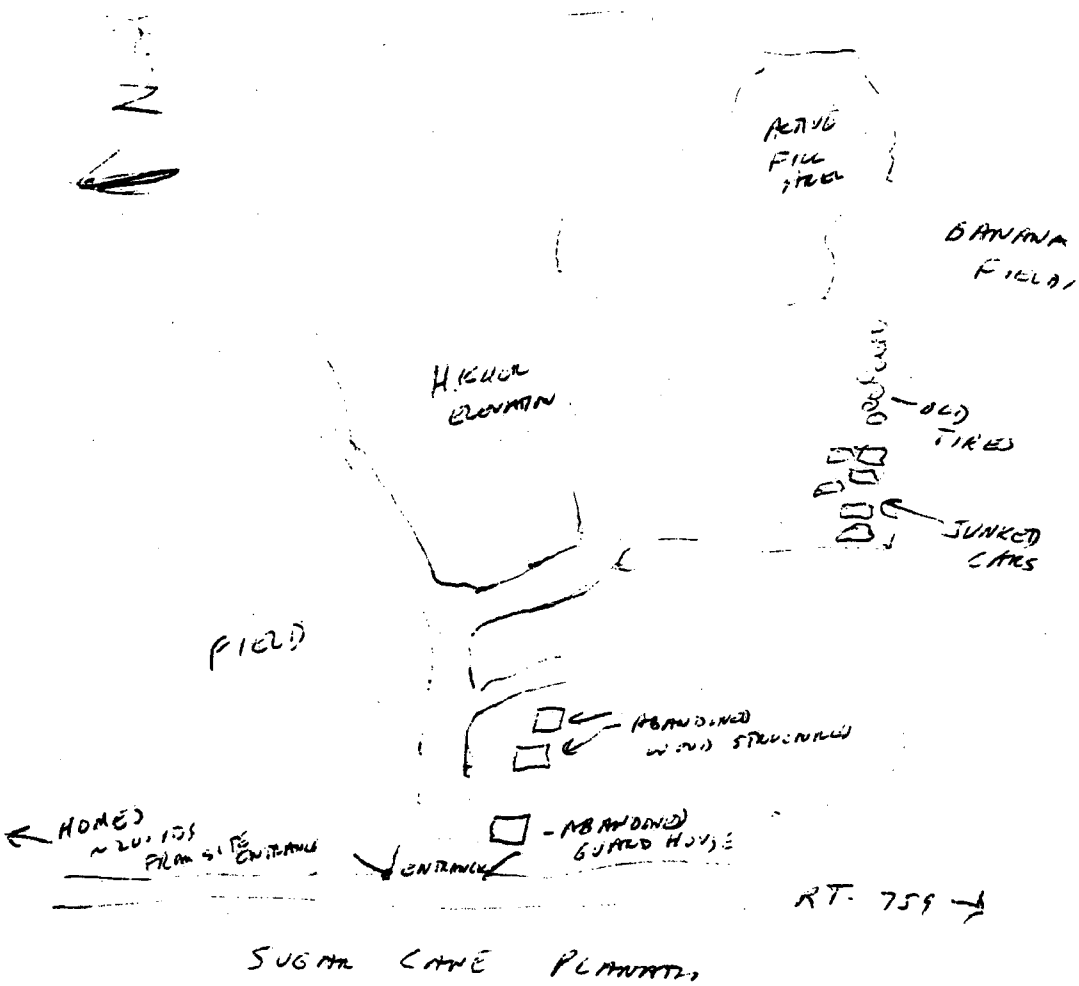
WEATHER CONDITIONS - TEMP ~70°, PARTLY CLOUDY, WIND 10MPH OUT OF EAST
0800 - ARRIVE AT SITE, A MUNICIPAL LANDFILL
MEET CARETAKER + BULLDOZER OPERATOR, NEITHER SPEAK ENGLISH. D. HESSLER TRYS TO EXPLAIN THE SITE INSPECTION PLANNED FOR FEB. 2. D. HESSLER LEAVES TELEPHONE # OF LAB AND EILEEN VILLAFANCE FOR THEM TO CONTACT IF THEY HAVE QUESTIONS

SITE IS ABOUT 1/2 MILE IN OFF RT 759 OFF A PAVED ACCESS RD. SUGAR CANE FIELD ACROSS FROM SITE SITE IS ACTIVE, GATE OPEN.

0815 - 1R, 14-P, 14S
PHOTO OF SITE ENTRANCE, GATE + SIGN LOOKING N.E. ~~SUD~~

0816 - 1R 15P - 15S
PHOTO OF SITE ACCESS ROAD LEADING UP TO FILL AREA.

[illegible] 1/16/89



RE
N

TEX
F

BA

0830

0840

0850

0850

0915

RESIDENTIAL AREA ~ 200 YARDS UP THE ROAD, NORTH OF SITE.

TERRAIN IS ROLLING HILLS. BULL GRAZING IN FIELD, DIRECTLY ADJACENT TO SITE (NORTH OF SITE)

BANANA FIELD ADJACENT TO SOUTH.

0830 - 1R, 16S, 16P
PHOTO OF S.W. SIDE OF SITE. BANANA FIELD IN FOREGROUND. SITE IS ON HIGHER ELEVATION IN BACKGROUND. NOTE BULLDOZER.

0840 1R, 17, 18, 19S / 17, 18, 19P — PANARAMIC VIEW OF FILL AREA LOOKING S.E. TO S.W.

BULLDOZER COMPACTING FILL, ~ 30FT. FROM ADJACENT TREE LINE
CUT + FILL OPERATION, MUNICIPAL REFUSE, ALSO TIRES, JUNKED CARS.

SEVERAL DOGS ON SITE, PICKING ON GARBAGE
TWO OTHER VEHICLES ON SITE BUT NO OTHER ACTIVITY

0850 - TRUCK "MUNICIPO DE MANATBO" ENTERS SITE, HAULING MUNICIPAL REFUSE
0858 - TRUCK LEAVES SITE
0915 - NUS PERSONNEL LEAVE SITE.
ANOTHER MANATBO MUN. GARBAGE TRUCK ENTERING SITE AS NUS LEAVES

[illegible] 1/16/89

Maunabo SWD 02-8811.24
Sampling Trip - 2/2/89

0830 Arrive at site. Eileen Villafane (EV) and Annabel Ortiz (AO) arrive at the same time.

The kickoff meeting. The following personnel understand Workplan, QA, and Health + Safety requirements:

Gerry Gilliland (GG)	SM	Gerald V. Gilliland	2/2/89
Joe Muntaugh (JM)	SSO	Joe Muntaugh	
Roberta Riccio (RR)	SMO	Roberta Riccio	2/2/89
Rich Pagano (RP)	Sampler	Rich Pagano	2/2/89
Jane Bullis (JB)	Sampler	Jane Bullis	2/2/89
Laura LaForge (LL)	Sampler	Laura LaForge	2-2-89

0840 JM checks out monitoring instruments + SCBA's

		Background
OVA C	# 307133	0 ppm
HNu G	# 469747 Probe # 469753	0 ppm
Mini Rad	# 428520	30 cpm

We set up the decon pad at the top of the entrance road. Landfill is substantially higher elevation than land to south (banana fields), east, and west. North is higher elevation, from which fill dirt is obtained.

Weather: 80-85°F, mostly sunny, wind 5-10 (estimated) from NW.

Gerald V. Gilliland
2/2/89 MVogel 2-17-89

Maunabo SWD
Sampling Trip - 2/2/89

02-8811-24

0900 SCBA's will be used as escape packs, soil locations will be monitored and level B only if readings above background. The site is active and there are several workers here.

SCBA #s RP #192069
LL 190006
JM (backup)

0915 We go to assess site and find first location

0920 Down low road, along junk cars, along south edge of site. Blockage in road, there is a drum marked Pfizer "Sorbitol Solution 70%". No readings above background on OVA, HNu, or MiniRad

0925 RP begins to collect PR22-S1 at base of drum. Photo 1P-1, 1S-1 of RP collecting S1
~~No re~~ GC 2/2/89 There is a junk car just above the drum.
Photo 1P-2, 1S-2, looking east at S1 location.

Soil is dry (slightly moist), sandy.

0930 RP Finishes collecting PR22-S1.

Gerald V. Gallo
2/2/89 MVogel 2-17-89

Maunabo SWD 02-8811-24
Sampling Trip - 2/2/89

0932 Arrive at location for PR22-S2, S3 (duplicate)
~~RP~~ GG 2/2/89 No readings above background on OVA, HNu or Mini Rad.
RP begins to sample S2, S3 - Photo 1P-3, 1S-3
S2, S3 is collected at west end of low road, on north side, next to an old water heater-looking small thing.

0936 RP finishes collecting PR22-S2, S3.
We will do a level B recon of the rest of the site so we can get rid of SCBA's. It's very hot and these guys don't want to wear them for too long.

0940 RP, LL on air, JM on backup. Walk around the facility. One spot right away ~~near tractor~~ GG 2/2/89 near S4 location → Readings on OVA 15-20 ppm, none on HNu. RP performs methane test, it is methane. About 20 feet from oily ponded water where S4 will be collected.
0952 No other readings above background at site. Level B recon is done. RP, LL off air. Back to remove tanks.
0955 Drop off tanks; RR collecting PR22-Rin1 (bowl rinsate)
1000 Arrive at S4 location, behind tire pile. Standing water with orange (rusty?) oily sheen. Sample will be taken at edge of water, about 25' east of S1 location.

1005 RP begins to collect PR22-S4. Photo 1P-4, 1S-4
No readings above background on OVA, HNu or MiniRad.
RP says a lot of glass + metal wires in soil here.

Gerald V. Gilbert
2/2/89 M. Vogel 2-17-89

Maunabo SWD 02-8811-24
Sampling Trip - 2/2/89

1015 RP finishes collecting S4.

1020 Arrive at location S5 at NE corner of landfill. down a footpath to get to drums over the edge. Standing unmarked drum, no markings on it, readings from within holes on top. No readings in breathing zone or at soil. 20' east of NE corner of active fill. HNu readings from within drum 40 to 70 ppm. LL says it smells like diesel

1022 LL begins collecting S5. Photo 1P-5, 1S-5 GG 2/2/89. No readings above background on OVA, HNu, or MiniRad. - except within the drum.

1030 LL finishes collecting S5. RR radios; she's collecting R in 2 (travel).

1035 Arrive at S6 location, on side of high road in pile at side of road. This is the background sample from the material they use for fill, taken at the crest of the high road.

1036 LL begins collecting PR22-S6. Many ants in this soil. No readings above background on OVA, HNu or MiniRad.
Photo 1P-6, 1S-6 of LL collecting sample.

1050 LL finishes collecting S6. LL, RP, JM back to command post to decon samples. GG remains at crest of hill for photos, within sight of command post.

Gerald V. Gelb
2/2/89 MVogel 2-17-89

Maunabo SWD
Sampling Trip - 2/2/89

02-8811-24

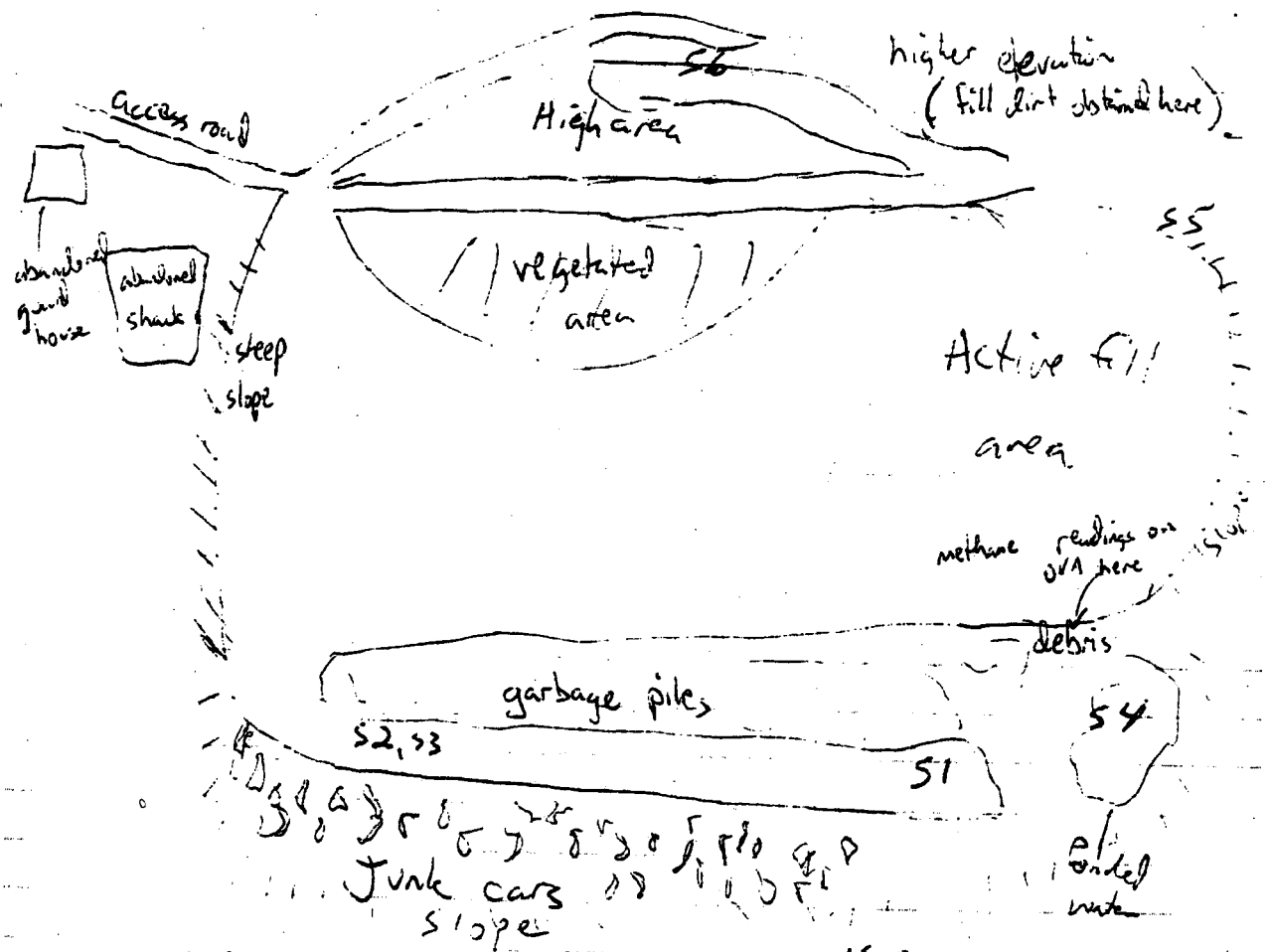
1100 GG takes ~~several~~ GG 2/2/89 photographs from high road
IP-7 looking east-southeast from crest of road.

General site sketch (not to scale)

N

Note: all soil samples were surface samples collected from 0-6 inch depth.

Overall average site slope ~ 5% (estimated)



1105 GG back to command post. Several photos IS-8 IP-8 through IS-12 IP-12 (see next page for description)

Gerald V. Gillmore
2/2/89 MVogel 2-17-89

Maunabo SWD 02-8811-24
Sampling Trip - 2/2/89

1115 Drainage routes to the Maunabo River are indeterminate, and the area between the landfill and the river is covered entirely by the banana fields. The river is 1500' from the landfill, ~~and~~ GG 2/2/89 No SW/sed samples will be collected. Fields are flat-lying, or near to it.

1145 Equipment is properly deconned and wrapped, samples are ready. NUS personnel leave site.

1700 Federal Express picks up samples at condo.

Photos taken by GG @ 1105

1P-8, 1S-8	Looking northeast at the slope leading up to the ~~high~~ GG 2/2/89 crest of the high road.
1P-9, 1S-9	Looking south at the pile of junk cars and other debris at the south edge of the landfill; note entrance to low road.
1P, 1S-10	Looking east toward the fill area.
1P, 1S-11	Looking ~~down~~ GG 2/2/89 west at the old shack on lower portion of the site.
1P, 1S-12	Looking northwest at a garbage truck entering the landfill.

Gerald V. Gilliland
2/2/89 MVogel 2.17.89

Maunabo SWD 02-8811-24
Photograph Log

Off-site Reconnaissance Photos
Taken by G. Pollack on 1/10/89

#	Description	Time
1R-14P, 14S	Site entrance, gate, + sign, looking NE.	0815
-15P, 15S	Site access road leading up to fill area.	0816
-16P, 16S	SW side of site. Banana fields in foreground. Site is on higher elevation in background.	0830
-17P, 17S	Panoramic view of site looking SE	0840
18P, 18S	to SW.	
19P, 19S		

Sampling Trip Photos
Taken by G. Gilliland on 2/2/89

#	Description	Time
1P-1, 1S-1	R. Pagano collecting PR22-S1, at east end of low road (south edge of site).	0925
1P-2, 1S-2	Looking east at PR22-S1 location.	0925
1P-3, 1S-3	RP collecting PR22-S2, S3 (dupe), at NW corner of low road.	0932
1P-4, 1S-4	RP collecting PR22-S4 near oily ponded water, about 25' east of location PR22-S1.	1005
1P-5, 1S-5	L. LaForge collecting PR22-S5, at base of drum near NE corner of landfill.	1022
1P-6, 1S-6	LL collecting PR22-S6, from fill dirt at crest of high road.	1036
1P-7, 1S-7	Photos GG 2/2/89 of landfill from the top of the high road.	1100
~~1P-8, 1S-8~~ GG 2/2/89		
1P-8, 1S-8 through 1P-12, 1S-12	see p. 13 of this logbook for descriptions	1105

Gerald V. Gilliland 2/15/89 Mvogel 2-17-89

Maunabo SWD 02-8811-24
Sample Management Information

Organic Lab	Inorganic Lab
CompuChem Labs	Skinner & Sherman
3308 Chapel Hill/Nelson Hwy.	300 Second Ave.
RTP, NC 27709	Waltham, MA 02254
FedEx Airbill # 400-9211 3486	FedEx Airbill # 400-9211 3475

NUS Sample #	Organic CLP #	Inorganic CLP #	Collection Time	Location/Description
PR22-S1*	BZ 687	MBX 379	0925	East end of low road, at the base of a drum.
PR22-S2	BZ 688	MBX 380	0932	NW corner of low road.
PR22-S3**	BZ 689	MBX 381	0932	Duplicate of PR22-S2.
PR22-S4	BZ 690	MBX 382	1005	At oily ponded water, about 25' east of PR22-S1 location.
PR22-S5	BZ 691	MBX 383	1022	At the base of a drum east of the NE corner of active area.
PR22-S6	BZ 692	MBX 384	1036	Fill dirt at the crest of the high road.
PR22-Rin1*	BZ 625	MBX 322	0955	Bowl rinsate.
PR22-Rin2	BZ 693	MBX 385	1030	Trowel rinsate.
PR22-Tblk1	BZ 627	—	—	Trip blank (VOA only).

* MS/MSD
** Environmental duplicate.

Gerald V. Gilbert
2/15/89 MWegel 2-17-89

Maunaba SWD
Sample Management Information

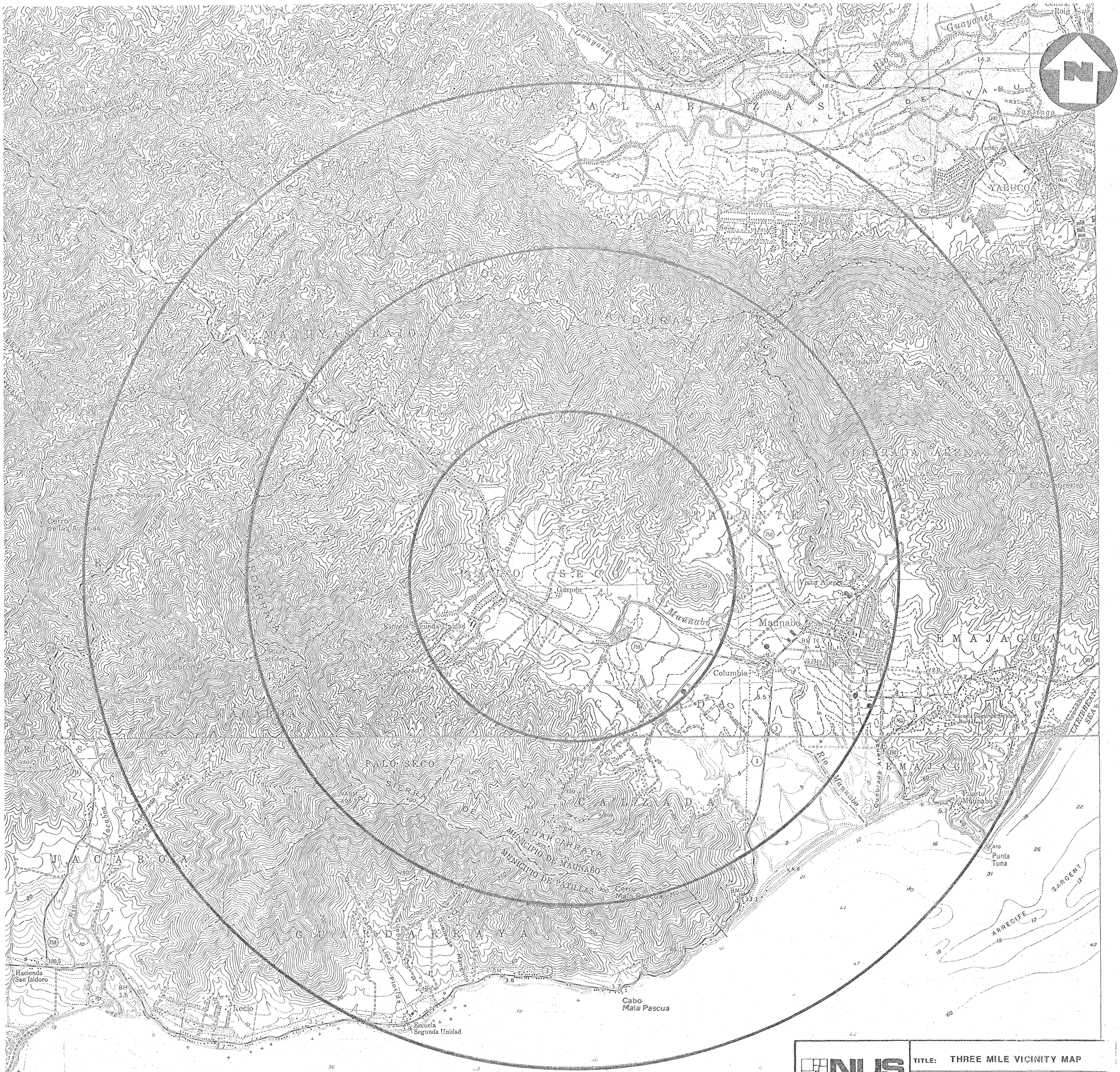
02-8811-24

Sample No.	Bottle Lot Numbers: 40-ml Vials	Bottle Lot Numbers: 8-oz Jars
PR22-S1	B8363873	F8246293
PR22-S2	"	"
PR22-S3	"	"
PR22-S4	"	"
PR22-S5	"	"
PR22-S6	"	"
PR22-Tblk1	"	NA
PR22-Rin1	"	NA
PR22-Rin2	"	NA

Note: Bottle lot numbers of 1-liter amber glass bottles and 1-liter polyethylene bottles used for sample # PR22-Rin1 and Rin2 were not recorded.

Gerald V. Gilbert
2/15/89 MVogel 2/17/89

REFERENCE 2



LEGEND

● MAUNABO MUNICIPAL SUPPLY WELL

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 METERS

NUS CORPORATION

TITLE: THREE MILE VICINITY MAP

SITE:

MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PR

DATE: 6/9/89

TDD: 02-8811-24

QUAD: YABUCOA, PR

FIGURE NUMBER:

SCALE: 1" = 1688'

REFERENCE 3

PR0980512420

PRELIMINARY ASSESSMENT REVIEW FORM

SITE NAME: Maunabo Solid Waste Disposal
ALIASES:
ADDRESS: State Road P.R. 759 Km 2.5
CITY: Palo Seco Ward
COUNTY: Maunabo
STATE: Puerto Rico
PRIORITY RATING GIVEN:
(BY STATE OR CONTRACTOR)

AGREE:
DISAGREE:
(CHECK ONE)

N/A

IF DISAGREE, WHY?

OTHER COMMENTS: Cover material used is highly permeable. The bedrock is relatively permeable and there are three PRASA wells downgradient from site. Ground water is used for drinking.

RECOMMENDATION:
FINAL (BY EPA) For the reasons stated above I suggest a low priority in this site.

REVIEWER: Jose G. Gent
DATE: Nov 20, 84

EPA

POTENTIAL HAZARDOUS WASTE SITE IDENTIFICATION

REGION II | SITE NUMBER PR 00550

NOTE: The initial identification of a potential site or incident should not be interpreted as a finding of illegal activity or confirmation that an actual health or environmental threat exists. All identified sites will be assessed under the EPA's Hazardous Waste Site Enforcement and Response System to determine if a hazardous waste problem actually exists.

A. SITE NAME	B. STREET (or other identifier)		
Maunabo Solid Waste Disp.	Palo Seco Ward		
C. CITY	**D. STATE**	**E. ZIP CODE**	**F. COUNTY NAME**
Maunabo	P.R.	00707	~~Maunabo~~ Juagana

G. OWNER/OPERATOR (if known)

1. NAME: Dept. of Municipal Public Works

2. TELEPHONE NUMBER:

H. TYPE OF OWNERSHIP (if known)

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☒ 4. MUNICIPAL ☐ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION

Latitude 18° 00' 54"
Longitude 066°55' 25"
Estimated Loading: 122M^3/day
Geologic Formation: Plutonic rocle (TKP)

Landfill

J. HOW IDENTIFIED (i.e., citizen's complaints, OSHA citations, etc.): Agencies file- Site inf. report of E.P.A

K. DATE IDENTIFIED (mo., day, & yr.): 5-1-81

L. SUMMARY OF POTENTIAL OR KNOWN PROBLEM

1- Floodplains

2- Possible health hazard to residents bring downgradient of fill zone (Disease).

M. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE (mo., day, & yr.)
Jaime L. Ortiz-Project Director	725-5140	5-1-81

EPA Form 2070-8 (5-80)

Priority I

FORM EPA-2 (12-13-79)

Form Approved: O.M.B. No. 158-S79017

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

OPEN DUMP INVENTORY REPORT

Section I – GENERAL INFORMATION

1. Date of determination (Enter month, day, and year): Month 09 Day 15 Year 80

2a. Is this an update of a previous form? (Mark (X) one): 1 ☐ Yes 2 ☒ No

2b. Is this form being submitted to remove the facility from the open dump inventory? 1 ☐ Yes 2 ☒ No

3. Facility Identification Number: State 72 Cnty/City 095 Place 07000 Assigned Site No. 0001 Assigned Facility No. 001

4. EPA Surface Impoundment Assessment No. (If applicable): State NA Cnty/City Place Category Site Impoundment

5. State Facility Identification Number (If applicable): NA

6. Name of facility: Maunabo Municipal Landfill

7. Facility location: Street, road, or other location description: State Road PR 759 Km 2 Hm5 Palo Seco Ward

City, town, or place: Maunabo State: PR ZIP code: 00707

County name: Maunabo

8. Coordinates of facility location: Latitude Degrees 18 Minutes 00 Seconds 54 Longitude Degrees 066 Minutes 55 Seconds 25

9. Other legal description (If applicable): Range Township Section

10. Land owner: Name: Dept of Municipal Public Works

Mailing address: Municipality of Maunabo

City, town, or place: Maunabo State: PR ZIP code: 00707

11. Operator: Name: Same

Mailing address:

City, town, or place State ZIP code

EPA Form T8700-14 (3-80)

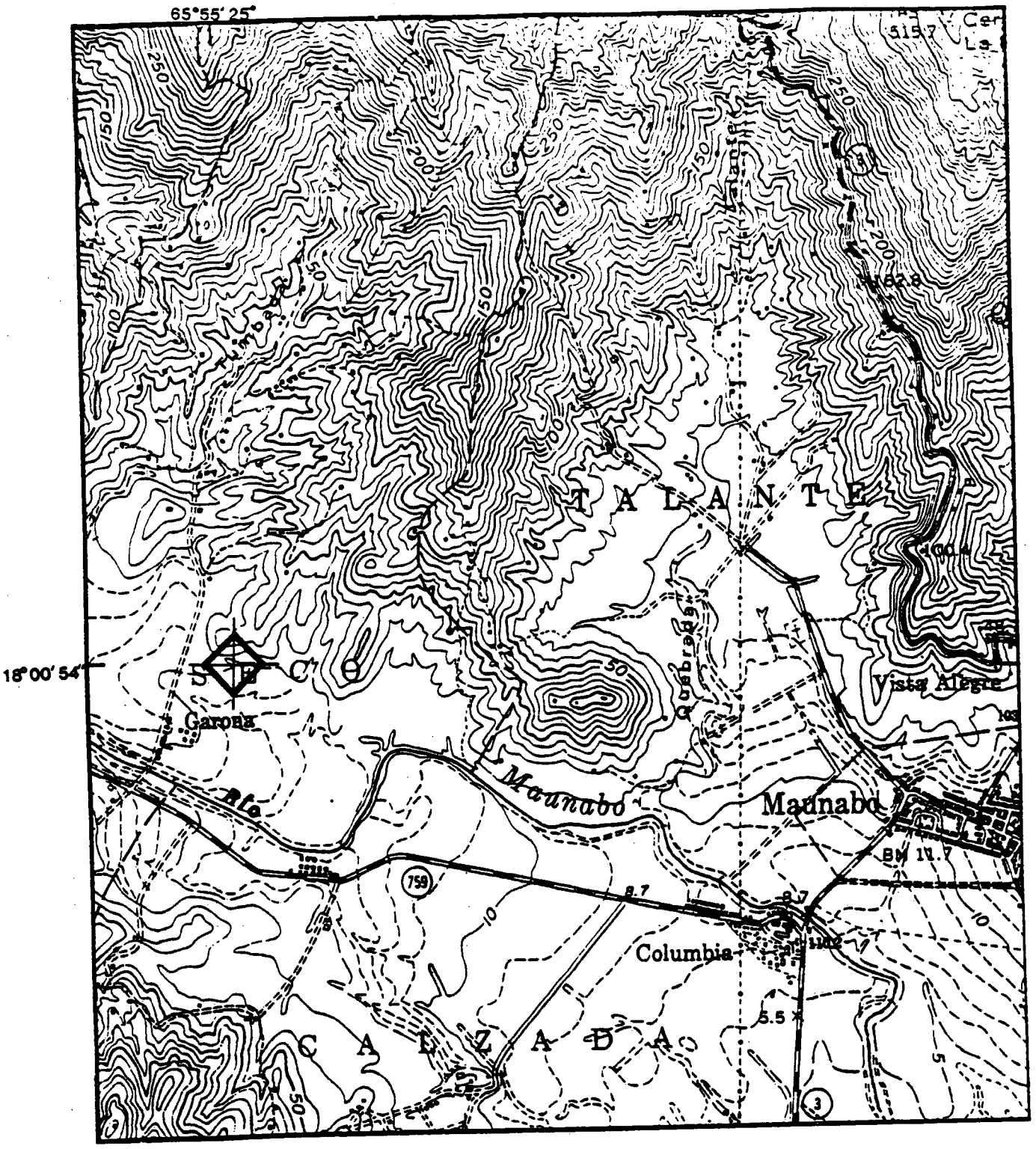


Figure 34.--Maunabo solid-waste disposal site at Palo Seco.

EPA

POTEN L HAZARDOUS WASTE SITE
IDENTIFICATION AND PRELIMINARY ASSESSMENT

REGION | SITE NUMBER (To be assigned by HQ)

NOTE: This form is completed for each potential hazardous waste site to help set priorities for site inspection. The information submitted on this form is based on available records and may be updated on subsequent forms as a result of additional inquiries and on-site inspections.

GENERAL INSTRUCTIONS: Complete Sections I and III through X as completely as possible before Section II *(Preliminary Assessment)*. File this form in the Regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

A. SITE NAME: Maunabo Solid Waste Disposal

B. STREET *(or other identifier)*: State Road PR 759 Km 2.5

C. CITY: Palo Seco Ward

D. STATE: P. R.

E. ZIP CODE: 00707

F. COUNTY NAME: Maunabo

G. OWNER/OPERATOR *(if known)*

1. NAME: Municipal Government

2. TELEPHONE NUMBER: (809) 861-5000

H. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☒ 4. MUNICIPAL ☐ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION

Landfill

J. HOW IDENTIFIED *(i.e., citizen's complaints, OSHA citations, etc.)*

See Annex 1 - A memorandum: An inspection made by EQB. The site was approved on October 12, 1973.

K. DATE IDENTIFIED *(mo., day, & yr.)*: Sept. 23, 1975

L. PRINCIPAL STATE CONTACT

1. NAME: María L. Morales

2. TELEPHONE NUMBER: 722-0437

II. PRELIMINARY ASSESSMENT *(complete this section last)*

A. APPARENT SERIOUSNESS OF PROBLEM

☐ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☐ 4. NONE ☐ 5. UNKNOWN

B. RECOMMENDATION

☐ 1. NO ACTION NEEDED *(no hazard)*

☐ 2. IMMEDIATE SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR:
b. WILL BE PERFORMED BY:

☐ 3. SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR:
b. WILL BE PERFORMED BY:

☐ 4. SITE INSPECTION NEEDED *(low priority)*

C. PREPARER INFORMATION

1. NAME: María L. Morales

2. TELEPHONE NUMBER: (809) 722-0437

3. DATE *(mo., day, & yr.)*: May 14, 1984

III. SITE INFORMATION

A. SITE STATUS

☒ 1. ACTIVE *(Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if infrequently.)*

☐ 2. INACTIVE *(Those sites which no longer receive wastes.)*

☐ 3. OTHER *(specify)*: *(Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)*

B. IS GENERATOR ON SITE?

☒ 1. NO ☐ 2. YES *(specify generator's four-digit SIC Code)*:

C. AREA OF SITE *(in acres)*: 8 cds. (1979) 7.76 acres

D. IF APPARENT SERIOUSNESS OF SITE IS HIGH, SPECIFY COORDINATES

1. LATITUDE *(deg.-min.-sec.)*: 18° 00' 54

2. LONGITUDE *(deg.-min.-sec.)*: 65° 55' 25"

E. ARE THERE BUILDINGS ON THE SITE?

☒ 1. NO ☐ 2. YES *(specify)*:

Continued From Page 2

V. WASTE RELATED INFORMATION (continued)

3. LIST SUBSTANCES OF GREATEST CONCERN WHICH MAY BE ON THE SITE (place in descending order of hazard).

4. ADDITIONAL COMMENTS OR NARRATIVE DESCRIPTION OF SITUATION KNOWN OR REPORTED TO EXIST AT THE SITE.

Approx. depth of water table: 10m

VI. HAZARD DESCRIPTION

A. TYPE OF HAZARD	B. POTENTIAL HAZARD (mark 'X')	C. ALLEGED INCIDENT (mark 'X')	D. DATE OF INCIDENT (mo., day, yr.)	E. REMARKS
1. NO HAZARD				
2. HUMAN HEALTH	X		Apr.13,1984	USGS Report - 1984
3. NON-WORKER INJURY/EXPOSURE				
4. WORKER INJURY				
5. CONTAMINATION OF WATER SUPPLY	X		Apr.13,1984	There PRASA wells downgradient from site - USGS Report
6. CONTAMINATION OF FOOD CHAIN				
7. CONTAMINATION OF GROUND WATER	X		Apr.13,1984	Leachate substances moves downgradient to the local ground-water system- USGS Report 1984
8. CONTAMINATION OF SURFACE WATER	X		Apr.13,1984	USGS Report 1984
9. DAMAGE TO FLORA/FAUNA				
10. FISH KILL				
11. CONTAMINATION OF AIR				
12. NOTICEABLE ODORS				
13. CONTAMINATION OF SOIL				
14. PROPERTY DAMAGE				
15. FIRE OR EXPLOSION				
16. SPILLS/LEAKING CONTAINERS/ RUNOFF/STANDING LIQUIDS				
17. SEWER, STORM DRAIN PROBLEMS				
18. EROSION PROBLEMS	X		May 13,1981	Annex 2
19. INADEQUATE SECURITY				
20. INCOMPATIBLE WASTES				
21. MIDNIGHT DUMPING				
22. OTHER (specify):				

Continue On Reverse

Annexes

Annex 1 : September 23, 1975

Deficiencies found in the new landfill:

1. A trench fill with water.
2. Only one access through a sugar -cane plantation
3. Lack of facilities in the landfill creates operational deficiencies.
4. Wastes were observed out of the landfill
5. Flies were observed
6. The rains creates inundations in the landfill

Annex 2 : May 13, 1981

The last technical inspection . Among deficiencies are erosion problems.

Annex 1

ESTADO LIBRE ASOCIADO DE PUERTO RICO / OFICINA DEL GOBERNADOR DS csh

Junta de Calidad Ambiental

1 de octubre de 1975

A : Jaime L. Ortiz Otero

P/C : Patrick W. Lewis

De : Charles Romney, Jr.

Asunto : Re-inspección Vertedero Municipal de Maunabo

El día 23 de septiembre de 1975 visité el vertedero municipal de Maunabo, ubicado al Norte del Km 2, Hm. 5 de la Carr. 759 en el Bo. Palo Seco de dicha municipalidad y además el antiguo vertedero ubicado en la carretera de Maunabo a Patillas .

El propósito de la visita era ver si la Administración Municipal de Maunabo había corregido las deficiencias en el antiguo vertedero (carretera de Maunabo a Patillas) que le había sido notificado mediante una orden emitida el día 29 de agosto de 1975 por la División Legal de esta Junta de Calidad Ambiental.

La orden fue emitida para que corrigiera las siguientes deficiencias:

1) Cesar de quemar los desperdicios sólidos.

2) Proceder de inmediato al soterrado de los desperdicios depositados.

3) Disponer de los desperdicios mediante el Sistema de Relleno Sanitario.

4) Proveer vigilancia adecuada en el área del vertedero.

5) Desarrollar un Sistema de Relleno Sanitario según las normas de esta Junta.

No se ha cumplido con la orden excepto con el inciso (3) que le indica que debían mudarse al Bo. Palo Seco lo cual la Administración Municipal hizo. Entiendo que han tenido tiempo más que suficiente para cumplir a cabalidad con lo que le requería la orden.

Sin embargo aunque el Municipio de Maunabo trasladó sus operaciones al Bo. Palo Seco pude observar que el Municipio de Patillas continua virtiendo sus desperdicios sólidos en el vertedero de la carretera de Maunabo a Patillas, (Cabo Mala Pascua). Lo cual es una violación al inciso (5) por parte de la Administración de Maunabo ya que no esta proveyendo la vigilancia adecuada para evitar que se depositen desperdicios sólidos en el antiguo vertedero ubicado en la carretera #3.

Las operaciones en el nuevo vertedero tienen una serie de deficiencias, entre las que podemos mencionar las siguientes:

1) Trinchera llena de agua debido a las lluvias caidas en el sector.

2) Tiene un solo acceso por un cañaveral, deben hacerle otro, para cuando comienze el tiempo lluvioso se pueda llegar al área de operación.

3) No tiene ningún tipo de facilidades, lo cual dificulta el que se realizé una buena labor.

4) Se observó basura descubierta fuera del área de operación.

5) Se observó la presencia de moscas.

6) Durante las lluvias recientes se inundó el vertedero.

7) Según pude observar durante mi visita las facilidades de mantenimiento del equipo son pésimas ya que no cuentan con ninguna.

RECOMENDACIONES:

1) Se refiera el caso nuevamente a la División Legal para la acción que ellos estimen pertinente.

2) Se envié personal de la sección de asesoramiento técnico del programa de desperdicios sólidos a Maunabo para que:

a) Le indique que medidas deben tomar para evitar que las condiciones en el nuevo vertedero empeoren y mas tarde sea mas dificil su corrección.

b) Le indique como y donde se deben construir los drenajes artificiales para evitar que en el futuro se inunde nuevamente el vertedero.

Junta de Calidad Ambiental

Annex 2

1ro. de junio de 1981

MEMORANDO

A : Ing. Luis E. de la Cruz
Director
Programa Contaminación de Terrenos

P/C : Ing. Bartolomé J. Cañellas
Director
Negociado Desperdicios Municipales

: Srta. Florilda Forestier, Sub-Directora
Negociado Desperdicios Municipales

DE : Víctor J. Matta, Jefe Sección
Estudios Especiales

ASUNTO : Visita inspección Vertedero de Maunabo

El día 13 de mayo de 1981, realicé una visita al vertedero mencionado en el epígrafe, acompañado del Sr. Roberto Berberena. Durante la inspección fuimos atendidos por el Sr. Pedro Lebrón García, operador de equipo pesado.

Sobre el particular le informo lo siguiente:

1- La facilidad en cuestión se encuentra localizada en el Bo. Palo Seco al Norte del Km. 2 Hm.5 de la Carr. 759 de dicha municipalidad.

2- Cuentan con una buena caseta dotada de las facilidades necesarias con espacio para guardar el equipo pesado. También existe otra pequeña caseta para el celador, localizada a la entrada.

3- En el área de operaciones se observó que se está utilizando el método de trincheras para disponer de los desperdicios recibidos. El material de relleno sobrante de la excavación preparada se estaba utilizando para soterrar unos desperdicios esparcidos y compactados dejados al descubierto en días anteriores.

4-Se encontró un área con dos chatarras y gomas abandonadas desde bastante tiempo.

5- El equipo pesado lo era una pala mecánica que se utiliza para preparar trincheras y las labores de esparcido, compactado y soterrado de los desperdicios.

6- Se observó un problema de erosión del terreno a consecuencia de las aguas de lluvia. No se observó un canal o medio adecuado para desviar hacia las orillas del sistema las aguas de lluvia.

Observaciones:

1- De acuerdo al expediente del municipio el vertedero es operado en forma ilegal aunque cuenta con los endosos de Agencias concernidas, La Declaración de Impacto Ambiental y el permiso de construcción.

2- En comunicaciones anteriores se ha solicitado al Hon. Alcalde someter los formularios de permiso para continuar operando la facilidad.

Se recomienda solicitar de nuevo se cumpla con los trámites de permiso de operación y se corrijan las deficiencias en la operación.

ATTACHMENT C

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 1 - SITE LOCATION AND INSPECTION INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
Maunabo disposal at Palo Seco Ward	Maunabo				
03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
	PR		Maunabo	095	

09 COORDINATES LATITUDE	LONGITUDE	10 TYPE OF OWNERSHIP (Check one)
18 00 54 .	065 55 25 .	☐ A. PRIVATE ☐ B. FEDERAL ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL ☐ F. OTHER ☐ G. UNKNOWN

III. INSPECTION INFORMATION

01 DATE OF INSPECTION	02 SITE STATUS	03 YEARS OF OPERATION
04 / 13 / 84 (MONTH DAY YEAR)	☐ ACTIVE ☐ INACTIVE	BEGINNING YEAR / ENDING YEAR ___ UNKNOWN

04 AGENCY PERFORMING INSPECTION (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR _____ (Name of firm) ☐ C. MUNICIPAL ☐ D. MUNICIPAL CONTRACTOR _____ (Name of firm)

☐ E. STATE ☐ F. STATE CONTRACTOR _____ (Name of firm) ☐ G. OTHER U.S. Geological Survey (Specify)

05 CHIEF INSPECTOR	06 TITLE	07 ORGANIZATION	08 TELEPHONE NO
			( )

09 OTHER INSPECTORS	10 TITLE	11 ORGANIZATION	12 TELEPHONE NO.
			( )
			( )
			( )
			( )
			( )

13 SITE REPRESENTATIVES INTERVIEWED	14 TITLE	15 ADDRESS	16 TELEPHONE NO
			( )
			( )
			( )
			( )
			( )
			( )

17 ACCESS GAINED BY (Check one)	18 TIME OF INSPECTION	19 WEATHER CONDITIONS
☐ PERMISSION ☐ WARRANT	1330	Sunny day, clear skies

IV. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NO
		( )

04 PERSON RESPONSIBLE FOR SITE INSPECTION FORM	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NO.	08 DATE
				MONTH DAY YEAR

EPA FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 ☒ A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: Y
02 ☐ OBSERVED (DATE: 04-13-84) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION Cover material (coarse sand) is highly permeable and offers insignificant attenuation to leachate substances, which evantually moves downgradient to the local ground-water systems. Geologic formation: Plutonic rock (Tkp), and alluvial deposits (Qa). Approximate depth to water table is about 33 ft., and rainfall averages 1770 mm per year.

01 ☒ B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: Y
02 ☐ OBSERVED (DATE:) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION Adjacent to Rio Maunabo flood plain. Rainfall in area averages 1770 mm per year. Actually seems like a landfill that used trench methods and part is an open dump. Nobody was at the site when visited. Lack of slope allows more contact between runoff and leachate.

01 ☐ C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED:
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED:
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED:
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: (Acres)
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☒ G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: Y
02 ☐ OBSERVED (DATE: 04-13-84) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION
Three PRASA wells downgradient from site.

01 ☐ H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED:
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

01 ☐ I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED:
02 ☐ OBSERVED (DATE:) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☐ A. NPDES				
☐ B. UIC				
☐ C. AIR				
☐ D. RCRA				
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE/DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☒ A. SURFACE IMPOUNDMENT		
☒ B. PILES		
☒ C. DRUMS, ABOVE GROUND		
☐ D. TANK, ABOVE GROUND		
☐ E. TANK, BELOW GROUND		
☒ F. LANDFILL		
☐ G. LANDFARM		
☒ H. OPEN DUMP		
☒ I. OTHER Junk cars, refrigerators, washers, tires, etc (Specify)		

04 TREATMENT (Check all that apply)

- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER _____ (Specify)

05 OTHER

- ☐ A. BUILDINGS ON SITE

06 AREA OF SITE

_____ (Acres)

07 COMMENTS

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ☐ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE. ☐ YES ☐ NO

02 COMMENTS

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as appropriate)

	SURFACE	WELL
COMMUNITY	A. ☐	B. ☐
NON-COMMUNITY	C. ☐	D. ☐

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A. ☐	B. ☐	C. ☐
D. ☐	E. ☐	F. ☐

03 DISTANCE TO SITE

A. _____ (mi)
B. _____ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☐ A. ONLY SOURCE FOR DRINKING ☒ B. DRINKING (Other sources available). COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available) ☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available) ☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER _____

03 DISTANCE TO NEAREST DRINKING WATER WELL _____ (mi)

04 DEPTH TO GROUNDWATER: 30 (ft)

05 DIRECTION OF GROUNDWATER FLOW: 700 SW, locally SE regionally

06 DEPTH TO AQUIFER OF CONCERN _____ (ft)

07 POTENTIAL YIELD OF AQUIFER _____ (gpd)

08 SOLE SOURCE AQUIFER ☐ YES ☐ NO

09 DESCRIPTION OF WELLS (Including usage, depth, and location relative to population and buildings)

10 RECHARGE AREA ☒ YES ☐ NO

COMMENTS: Cover material is highly permeable

11 DISCHARGE AREA ☒ YES ☐ NO

COMMENTS: Near Rio Maunabo boundaries

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☐ A. RESERVOIR, RECREATION DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Rio Maunabo	☒	_____ (mi)
	☐	_____ (mi)
	☐	_____ (mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE A. _____ NO. OF PERSONS

TWO (2) MILES OF SITE B. _____ NO. OF PERSONS

THREE (3) MILES OF SITE C. _____ NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION _____ (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE _____

04 DISTANCE TO NEAREST OFF-SITE BUILDING _____ (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site (e.g., total, density, distribution, and characteristics of population)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. $10^{-4} - 10^{-6}$ cm/sec ☐ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☐ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☒ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
40 to 100 (ft)	(ft)	

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE		
		SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
1770 mm per year (in)	4.5 (in)	%		%

09 FLOOD POTENTIAL	10
SITE IS IN ____ YEAR FLOODPLAIN	☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)		12 DISTANCE TO CRITICAL HABITAT (of endangered species)
ESTUARINE	OTHER	(mi)
A. ____ (mi)	B. ____ (mi)	ENDANGERED SPECIES: ____

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL/INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL/STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS PRIME AG LAND	AG LAND
A. ____ (mi)	B. ____ (mi)	C. ____ (mi)	D. ____ (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

North there are some hills which have used as cover material. West, downhill is a small valley (sugar cane fiels), and south another sugar cane field. East, there is a combination of hills close to the site and sugar cane field as we move to the south. Dump site actually is a small hill which most of the wastes were being disposed (open dump) at all edges leading to the top, for landfill operations.

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	0		
SURFACE WATER	0		
WASTE			
AIR			
RUNOFF			
SPILL			
SOIL			
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☐ GROUND ☒ AERIAL

02 IN CUSTODY OF Sigfredo Torres (Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS Geological Survey

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

FORM 2070-13 (7-81)

POZO 1 (MAUNABO)	[illegible]		
POZO 4 (URB. SAN PEDRO)	130013	0655321	62.5
CALZADA	130013	0655355	100.0

SURFACE WATER PRODUCTION FACILITIES

FACILITY NAME	LATITUDE	LONGITUDE	ANNUAL AMOUNT (MILLION GALLONS)
MATUYAS-MAUNABO	130235	0655303	26.3

QUALITY OF WATER OF SELECTED WELLS AND SURFACE WATER SITES

GROUND WATER

TY NAME	DATE	pH	COLOR	TUR	Ca	Mg	Na	K	CaCO3	SO4	Cl	F	SiO2	TDS	NO3-N	Fe	Mn
(MAUNABO)	11/02/81	7.1	0	0.3	49	23.0	55.0	1.3	202	71.0	41.0	0.0	40.0	439	2.50	0.14	0.00

SURFACE WATER

TY NAME	DATE	pH	COLOR	TUR	Ca	Mg	Na	K	CaCO3	SO4	Cl	F	SiO2	TDS	NO3-N	Fe	Mn
S-MAUNABO	11/24/81	7.7	0	0.7	27	0.6	15.0	0.8	59	19.0	19.0	0.3	34.0	214	0.30	0.13	0.00

TER PLANTS

ILTER PLANTS

US GEOLOGICAL SURVEY
WATER RESOURCES DIVISION, SAN JUAN, PR
REPORT ON WATER USE FOR YEAR 1983

MAUNABO

WELLS

FACILITY NAME	LATITUDE	LONGITUDE	ANNUAL AMOUNT (MILLION GALLONS)
POZO 1 (MAUNABO)	130010	0655346	60.0
POZO 4 (UPR. SAN PEDRO)	130013	0655321	62.5
CALZADA	130013	0655155	100.0

SURFACE WATER PRODUCTION FACILITIES

FACILITY NAME	LATITUDE	LONGITUDE	ANNUAL AMOUNT (MILLION GALLONS)
MATUYAS-MAUNABO	130235	0655303	26.3

QUALITY OF WATER OF SELECTED WELLS AND SURFACE WATER SITES

GROUND WATER

HRS COVER SHEET

FACILITY NAME : Maunabo [illegible]

EPA I.D. # : PRD 980512420

SCORES : HRS = 3.97

PRO = 19.62 (33.9)

ORIGINAL PRIORITY :

REVIEWED BY : Maria L. Morales

REASSESSED PRIORITY : Med

REVIEWED BY : Ben Conetta

COMMENTS : PRASA Wells downgradient of site - Leachate moves downgradient to the local groundwater system. Potential surface & ground water contamination. 95 m³/day [illegible] disposed. Geologic formation: Plutonic rock and alluvial deposits. Cover material is loose sandy material. Approximate depth to water table is 10 m.

Cover material is highly permeable & offers little attenuation to leached substances.

- No info on HW Quantity, if any.

PREPARER : Ben Conetta DATE : 6/2/88

Ground Water Route Work Sheet

Rating Factor	Assigned Value	Mult.	HRS	Max	PRO
1 Observed Release	0 45	1			45
If observed release is given a score of 45, proceed to line 4. If observed release is given a score of 0, proceed to line 2					
2 Route Characteristics					
Depth to Aquifer of Concern	0 1 (2) 3	2	1	6	1
Net Precipitation	0 1 (2) 3	1	1	3	1
Permeability of the Unsaturated Zone	0 1 2 3	1	1	3	3
Physical State	0 (1) 2 3	1	1	3	1
Total Route Characteristic Score			6	15	10
3 Containment	0 1 2 (3)	1	3	3	
4 Waste Characteristics					
Toxicity/Persistence	0 (3) 6 9 12 15 18	1	3	18	3
Hazardous Waste Quantity	0 1 (2) 3 4 5 6 7 8	1	1	8	8
Total Waste Characterization Score			4	28	11
5 Targets					
Ground Water Use	0 1 2 (3)	3	2	9	9
Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 (24) 30 32 35 40	1	4	40	4
Total Target Score			26	49	33
6 If line 1 is 45, multiply 1 x 4 x5 If line 1 is 0, multiply 2 x 3 x 4 x 5			172	57330	16335
7 Divide line 6 by 57,330 and multiply by 100			Sgw= 3.07		28.49

HRS = 3.97

Surface Water Route Work Sheet

Rating Factor	Assigned Value	Mult.	HRS	Max	PRO
1 Observed Release	0 45	1			
If observed release is given a score of 45, proceed to line 4 If observed release is given a score of 0, proceed to line 2					
2 Route Characteristics					
Facility Slope and Intervening Terrain	0 1 (2) 3	1	1	3	✓
1-yr. 24-hr. Rainfall	0 1 2 (3)	1		3	
Distance to Nearest Surface Water	0 1 (2) 3	2	4	6	4
Physical State	0 (1) 2 3	1	1	3	1
Total Route Characteristic Score			9	15	6
3 Containment	0 1 2 (3)	1	—	3	—
4 Waste Characteristics					
Toxicity/Persistence	0 (3) 6 9 12 15 18	1	3	18	
Hazardous Waste Quantity	0 1 2 3 4 5 6 7 (8)	1	1	8	8
Total Waste Characterization Score			4	28	11
5 Targets					
Surface Water Use	0 1 (2) 3	3	6	9	6
Distance to a Sensitive Environment	(0) 1 2 3	2		6	
Population Served/ Distance to Water Intake Downstream	0 4 6 8 10 12 16 18 20 24 (30) 32 35 40	1	30	40	30
Total Target Score			36	55	36
6 If line 1 is 45, multiply 1 x 4 x5 If line 1 is 0, multiply 2 x 3 x 4 x 5			3888	64350	11880
7 Divide line 6 by 64,350 and multiply by 100			Ssw= 6.04		18.46

S_{10} = 19.62

[illegible] $\frac{[illegible]}{[illegible]} \times \frac{3.31^3}{3^3} = 100\ yd^3/day \times 152\ days = 25,183$ [illegible]

[illegible] 65.34" from 69 Net [illegible] 4.35" [illegible] 5

39.69 Prec.

Net Precipitation in Maunabo area

[illegible]

Surface " " " Reduction - Rio Maunabo

Surface water use

Rio Maunabo = 0.45 km to south

$0.45\ km \times \frac{1\ mi}{1.6\ km} = 0.28\ mi = 1485\ ft$

Distance to SW

Pop 5,524 Maunabo NO 1-4, Calzada (6) wells

Public Supply well 2mi away

Irrig " 1mi "

Domestic = 1mi

Pop in Maunabo Municip 11,785

2½ miles from [illegible]

June 15, 19[illegible]
N.YC, N.Y.

Telephone Consultation with Shelley Johnson
Mitre Co, (703) 883-6905.

For municipals SWD the most common problem is contamination by heavy metals. Three metals (Chromium, Arsenic and Cadmium) are very common in municipals landfills and score 18 in the Tox/Per matrix. Eventhought there is no documentation addressing a problem with Heavy Metals in landfills all over P.R., we can't disregard this possibility. Therefore for reassesment purposes, municipals SWD will have a Tox/Per of 18 and a Quantity of 1.

REFERENCE 4

ESTADO LIBRE ASOCIADO DE PUERTO RICO / OFICINA DEL GOBERNADOR

Junta de Calidad Ambiental

10 de octubre de 1987

MEMORANDO

A : Srta. Raquel G. Cortés
Directora
Area Control Contaminación
de Terrenos

P/C : Sr. Víctor J. Matta
Jefe Sección
Asesoramiento Técnico y Permisos

DE : Israel Torres Rivera
Especialista en Ciencias Ambientales
Principiante

ASUNTO : **Inspección Vertedero Municipal de Naunabo**

El día 2 de octubre de 1987, realicé una nueva inspección al vertedero de epígrafe.

Inicialmente visité el taller de Obras Públicas, para coordinar con el Sr. Pedro Castro, Director sobre el manejo de los desperdicios en el vertedero de dicha localidad.

En vista de que el señor Castro no estuvo disponible al momento de la inspección, me trasladé al referido vertedero.

Adjunto notificación preparada al Hon. José Rosa Berrios, Alcalde donde se desglosan las deficiencias presenciadas durante la investigación y acción a seguir en el caso.

ITR/fsp

16 de octubre de 1987

Hon. José Rosa Berrios
Alcalde
Apartado 70
Naunabo, Puerto Rico 00707

REF: **Inspección Vertedero Municipal de Naunabo**

Estimado señor Alcalde:

La División de Asesoramiento Técnico y Permisos del Area Control Contaminación de Terrenos de esta Junta, realizó una nueva inspección al Vertedero Municipal de Naunabo el día 2 de octubre de 1987. La reinspección del caso se efectuó a los fines de evaluar las deficiencias señaladas en la notificación fechada el 11 de abril de 1985.

De la investigación llevada a cabo a la facilidad de disposición final de desperdicios sólidos no peligrosos se concluye lo siguiente:

1- Las facilidades físicas tales como caseta y sanitarios, se encuentran en completo estado de deterioro.

2- El vertedero carece de equipo de primera ayuda, comunicación, insecticidas y extintores.

3- No se presenció vigilancia o registro de entrada y salida en el área donde ubica la caseta del guardia.

4- No se observó rotulación adecuada tanto en el exterior como dentro de las facilidades.

5- En cuanto a las operaciones diarias del vertedero se observó que;

A) Los desechos son soterrados adecuadamente, pese a la falta de equipo pesado que acarree el material de relleno hasta la sección de vertido diario.

B) Permanecen varios rescatadores de desperdicios en los predios del vertedero.

[illegible] drenajes [illegible] y la [illegible] permeabilidad del material de relleno existente permiten la generación de jugos de lixiviación y su percolación a través del sistema. Es por esto que es necesario establecer dicho drenajes y declives adecuados que minimizen el estancamiento o percolación de aguas de lluvia.

6- Es sumamente importante proveer al vertedero de la verja anteriormente existente ya que se desconocen los límites colindantes y expansiones efectuadas a la facilidad.

A estos efectos el municipio deberá someter un Plan de Operación actualizado y un Plan de Cumplimiento en donde se desglosen las deficiencias descritas y se establezcan períodos de tiempo para la corrección de las mismas.

Las deficiencias requerirán ser corregidas de acuerdo al plano de desarrollo sometido originalmente por la firma Huyke Colón y Olabarrieta.

En vista de lo antes detallado, esta Junta le concede veinte (20) días a partir del recibo de esta notificacion para que se radiquen los documentos señalados.

Finalmente le recomendamos designar un oficial de enlace que coordine todo lo referente a las deficiencias, supervisión y documentos relacionados con el vertedero.

Para cualquier duda al respecto, favor de comunicarse al Tel. 722-0000.

Cordialmente,

Raquel G. Cortés
Directora
Area Control Contaminación
de Terrenos

ITR/fsp

Oficina del Gobernador

JUNTA DE CALIDAD AMBIENTAL

PROGRAMA CONTROL DE DESPERDICIOS SOLIDOS

Inspección de Vertederos

I. a. Clase de vertedero

b. Localización: Bo. Palo Seco Municipal (✓) Privado ( )

Carr. 959 Km. 2.5 Hm. ____

c. Municipio: Manatí

II. a. Tipo de Operación: Relleno Sanitario

b. Tamaño del predio: 10 cds.

c. Vertido a cuerpo de agua (indique)

( ) río ( ) lago ( ) playa

III. a. Sistema de Operación:

( ) área ( ) trinchera (✓) modificado

b. Indique días de operación y horario: Días Lunes a Viernes

Hrs. 7:00 A.M. a 3:30 P.M.

IV. Personal encargado de las actividades:

a. Título	Sí	No
Supervisores	( )	(✓)
Operadores	(✓)	( )
Celadores	(✓)	( )
Otros (especifique)		

V. Clase de equipo utilizado (indique cantidad y capacidad)

a. Compactadores:

b. Palas mecánicas: 1 John Deere 750 (Bulldozer)

c. Otros (especifique) (Equipo nuevo)

VI. Describa facilidades en el vertedero, haciendo un signo de cotejo ( ) en el encasillado correspondiente

Facilidad	Sí	No	Bueno	Regular	Malo
1. Portón	(✓)	( )	( )	(✓)	( )
2. Caseta	(✓)	( )	( )	( )	(✓)
3. Rótulo	( )	(✓)	( )	( )	( )
4. Balanzas	( )	(✓)	( )	( )	( )
5. Acceso	(✓)	( )	( )	(✓)	( )
6. Verja	( )	(✓)	( )	( )	( )
7. Facilidades de mantenimiento	( )	(✓)	( )	( )	( )

	Si	No	Bueno	Regular	Malo
8. Facilidades Sanitarias	(✓)	( )	( )	( )	(✓)
9. Agua Potable	(✓)	( )	( )	( )	( )
10. Energía Eléctrica	(✓)	( )	( )	( )	( )
11. Uso de Insecticidas	( )	(✓)	( )	( )	( )
12. Control de Incendios	( )	(✓)	( )	( )	( )
13. Facilidades Primera Ayuda	( )	(✓)	( )	( )	( )
14. Facilidades de Comunicación	( )	(✓)	( )	( )	( )
15. Verja portátil para Control Volado de Papeles	( )	(✓)	( )	( )	( )
16. Control de Polvo	( )	(✓)	( )	( )	( )

17. Sistema para el control de incendios — ( ) cubos de agua ( ) extinguidores ( ) arena ( ) otros — N/A

18. Indique facilidades disponibles para el manejo y disposición final de:
    a. chatarra y objetos grandes — N/A
    b. desperdicios tóxicos, peligrosos y patológicos — N/A

19. Otros

VII. Si es vertedero de relleno sanitario, indique el material usado y procedencia

Del mismo predio

VIII. Deficiencias en la operación

a. Problemas de vectores:

( ) Ratas ( ) Moscas ( ) Mosquitos

( ) Otros (especifique)

b. Indique si hay presencia de rescatadores de desperdicios y/o animales: Si

c. Presencia de fuego : ( ) Superficial ( ) Subterráneo N/O

d. (✓) desperdicios al descubierto fuera del área de vertido muy pocos

e. ( ) no se aplica suficiente material de relleno

f. ( ) deficiente operación de esparcir, compactar y soterrar desperdicios sólidos

g. (✓) carece del equipo pesado necesario

h. ( ) contaminación abastos de agua

i. (✓) problema de lixiviación (leachates)

j. ( ) problema de polvo fugitivo

Comentarios:

Sr. Pedro Lebrón, operador
Sr. Valentín Santiago, celador } Intervenidos

2/oct./97
Fecha de Inspección

[signature] - J.C.A
Firma y Título del Funcionario

Fecha de Notificación

Firma y Título Persona Notificada

(Llénese en caso de Re-inspección para señalar acción tomada)

Fecha 1ra. Re-inspección : _____ de _____ de _____

( ) Cumplió ( ) No cumplió ( ) Parcialmente cumplida

Comentarios:

Fecha 2da. Re-inspección : _____ de _____ de _____

( ) Cumplió ( ) No cumplió ( ) Parcialmente cumplida

Comentarios:

REFERENCE 5

file

2 de junio de 1981

Hon. José Rosa Berrios
Alcalde
Maunabo, P.R. 00707

RE: Vertedero Municipal

Estimado señor Alcalde:

Personal técnico del Programa Contaminación de Terrenos, realizó una visita de inspección al vertedero municipal para evaluar la operación del mismo.

Sobre el particular deseo informarle que en el momento de la visita se encontró unas deficiencias en las labores de esparcir, compactado y soterrado de los desperdicios. Las gomas y chatarras se disponen en forma inadecuada. Estas se encuentran abandonadas sobre el terreno presentando un problema de desarrollo potencial de vectores y fuegos.

Gran parte del terreno (áreas terminadas y taludes) presenta un problema de erosión a consecuencia de las aguas de lluvia. Al presente no existe un canal o medio adecuado para desviar las aguas hacia un punto determinado fuera del sistema.

Deseamos recordarle que la operación de la facilidad en cuestión se lleva a cabo sin el debido permiso de esta Junta. A tales efectos le estamos enviando los formularios de solicitud de permiso, los cuales deberán ser cumplimentados y devueltos con el pago correspondiente para proseguir con los trámites pertinentes.

Las deficiencias operacionales así como la falta del permiso de operación constituyen violación a las Reglas 202 (A) (B) (E) y 303 del Reglamento para el Control de los Desperdicios Sólidos, Peligrosos y no Peligrosos de esta Junta.

Por lo antes expuesto se le concederá un plazo de veinte (20) días a partir del recibo de esta comunicación para coordinar la corrección de las deficiencias en la operación.

Para cualquier duda sobre el particular le recomendamos se comunique con nosotros y le exhortamos a que continúe cooperando en la labor de la protección del ambiente.

Cordialmente,

Luis E. de la Cruz

Ing. Luis E. de la Cruz
Director
Programa Contaminación de Terrenos

VJM/lsp

REFERENCE 6

1ro. de junio de 1981

MEMORANDO

A : Ing. Luis E. de la Cruz
Director
Programa Contaminación de Terrenos

P/C : Ing. Bartolomé J. Cañellas
Director
Negociado Desperdicios Municipales

: Srta. Florilda Forestier, Sub-Directora
Negociado Desperdicios Municipales

DE : Víctor J. Matta, Jefe Sección
Estudios Especiales

ASUNTO : Visita inspección Vertedero de Maunabo

El día 13 de mayo de 1981, realicé una visita al vertedero mencionado en el epígrafe, acompañado del Sr. Roberto Berberena. Durante la inspección fuimos atendidos por el Sr. Pedro Lebrón García, operador de equipo pesado.

Sobre el particular le informo lo siguiente:

1- La facilidad en cuestión se encuentra localizada en el Bo. Palo Seco al Norte del Km. 2 Hm.5 de la Carr. 759 de dicha municipalidad.

2- Cuentan con una buena caseta dotada de las facilidades necesarias con espacio para guardar el equipo pesado. También existe otra pequeña caseta para el celador, localizada a la entrada.

3- En el área de operaciones se observó que se está utilizando el método de trincheras para disponer de los desperdicios recibidos. El material de relleno sobrante de la excavación preparada se estaba utilizando para soterrar unos desperdicios esparcidos y compactados dejados al descubierto en días anteriores.

4-Se encontró un área con dos chatarras y gomas abandonadas desde bastante tiempo.

5- El equipo pesado lo era una pala mecánica que se utiliza para preparar trincheras y las labores de esparcido, compactado y soterrado de los desperdicios.

6- Se observó un problema de erosión del terreno a consecuencia de las aguas de lluvia. No se observó un canal o medio adecuado para desviar hacia las orillas del sistema las aguas de lluvia.

Observaciones:

1- De acuerdo al expediente del municipio el vertedero es operado en forma ilegal aunque cuenta con los endosos de Agencias concernidas, La Declaración de Impacto Ambiental y el permiso de construcción.

2- En comunicaciones anteriores se ha solicitado al Hon. Alcalde someter los formularios de permiso para continuar operando la facilidad.

Se recomienda solicitar de nuevo se cumpla con los trámites de permiso de operación y se corrijan las deficiencias en la operación.

REFERENCE 7

ESTADO LIBRE ASOCIADO DE PUERTO RICO / OFICINA DEL GOBERNADOR

Junta de Calidad Ambiental

29 de noviembre de 1979

MEMORANDO

A : Sr. Jaime L. Ortíz, Director
Area Contaminación de Terrenos

P/C : Ing. Bartolomé J. Cañellas, Jefe
Sección Asesoramiento Técnico

DE : Miguel A. Guzmán, Ingeniero

ASUNTO : Asesoramiento e inspección
Vertedero Municipal de Maunabo

El día 1 de noviembre de 1979, acompañado por el Sr. Pedro Lebrón García, operador de equipo pesado, realizé la inspección sita en la carr. PR-759, km. 2.5 en el Barrio Palo Seco del Municipio de Maunabo, Puerto Rico. De la inspección realizada puedo informar lo siguiente:

1) Este vertedero opera en forma eficiente en la fase de esparcir, compactar y soterrar los desperdicios sólidos. No obstante, deberá aplicar más cantidad de material de relleno a los desperdicios compactados de manera que todos los desperdicios sean cubiertos.

2) Carece de las siguientes facilidades, aunque muchas de ellas se encuentran en proceso: facilidades de primera ayuda, uso de insecticidas, agua potable y control de polvo.

3) Este vertedero recibe chatarra en pequeñas cantidades.

4) Cuenta con una pala mecánica grande con una cuchara de 14 pies de ancho la cual es eficiente en este tipo de operación.

Esta facilidad cuenta con los endosos del Area de Recursos Naturales del Departamento de Obras Públicas, 3 de noviembre de 1972, del Departamento de Salud, 1 de agosto de 1972, de Planificación, 13 de agosto de 1976, Declaración de Impacto Ambiental, Solicitud Permiso de Construcción 16 de agosto de 1977, Plan de Operación, 25 de agosto de 1977. El 14 de septiembre de 1977, la Junta de Calidad Ambiental, le otorgó el permiso de construcción de nueva facilidad.

Esta facilidad se encuentra en operación antes del 16 de septiembre de 1973.

Recomendaciones:

1) Notificar al Hon. Alcalde los resultados de la inspección y solicitarle que someta los formularios de permiso DS-2 para continuar operando la facilidad de disposición de desperdicios sólidos.

2) El Hon. Alcalde deberá hacer las gestiones para proveer las siguientes facilidades: uso de insecticidas, extinguidores, agua potable y control de polvo fugitivo.

Anexo:

REFERENCE 8

ESTADO LIBRE ASOCIADO DE PUERTO RICO / OFICINA DEL GOBERNADOR

Junta de Calidad Ambiental

14 de agosto de 1978

MEMORANDO

A : Sr. Jaime L. Ortiz
Director
Programa Desperdicios Sólidos

P/C : Srta. Florilda Forestier
Especialista en Rec. Nat.

DE : Sr. Julio Toro
Especialista en Rec. Nat.

ASUNTO : Llamada al Municipio de Maunabo

El día 24 de julio de 1978, me comuniqué con el Municipio de Maunabo con propósito de indagar sobre las gestiones realizadas por el municipio para obtener área y material de relleno para disponer los desperdicios sólidos, ya que la última inspección (28 de julio/78) reveló que dicho vertedero no poseía material de relleno para seguir operando.

El Alcalde estaba en San Juan y me comuniqué con el Sr. Sixto Díaz, Director de Obras Públicas el cual me informó lo siguiente:

1- El Municipio de Maunabo le prohibió el tiro al Municipio de Patillas en el vertedero de Maunabo.

2- El Municipio de Maunabo adquirió la parcela de terreno en forma de loma al norte del vertedero. Esta pertenecía a Isabelo Díaz (ver mapa) y es de 1.72 85 cuerdas de cabida.

3- El municipio esta usando un sistema de trincheras en el predio entre el área de vertido y la nueva propiedad adquirida. Cuando se llegue al límite de este predio, se comenzará a usar un método de área usando el material de relleno de la nueva parcela.

RECOMENDACION

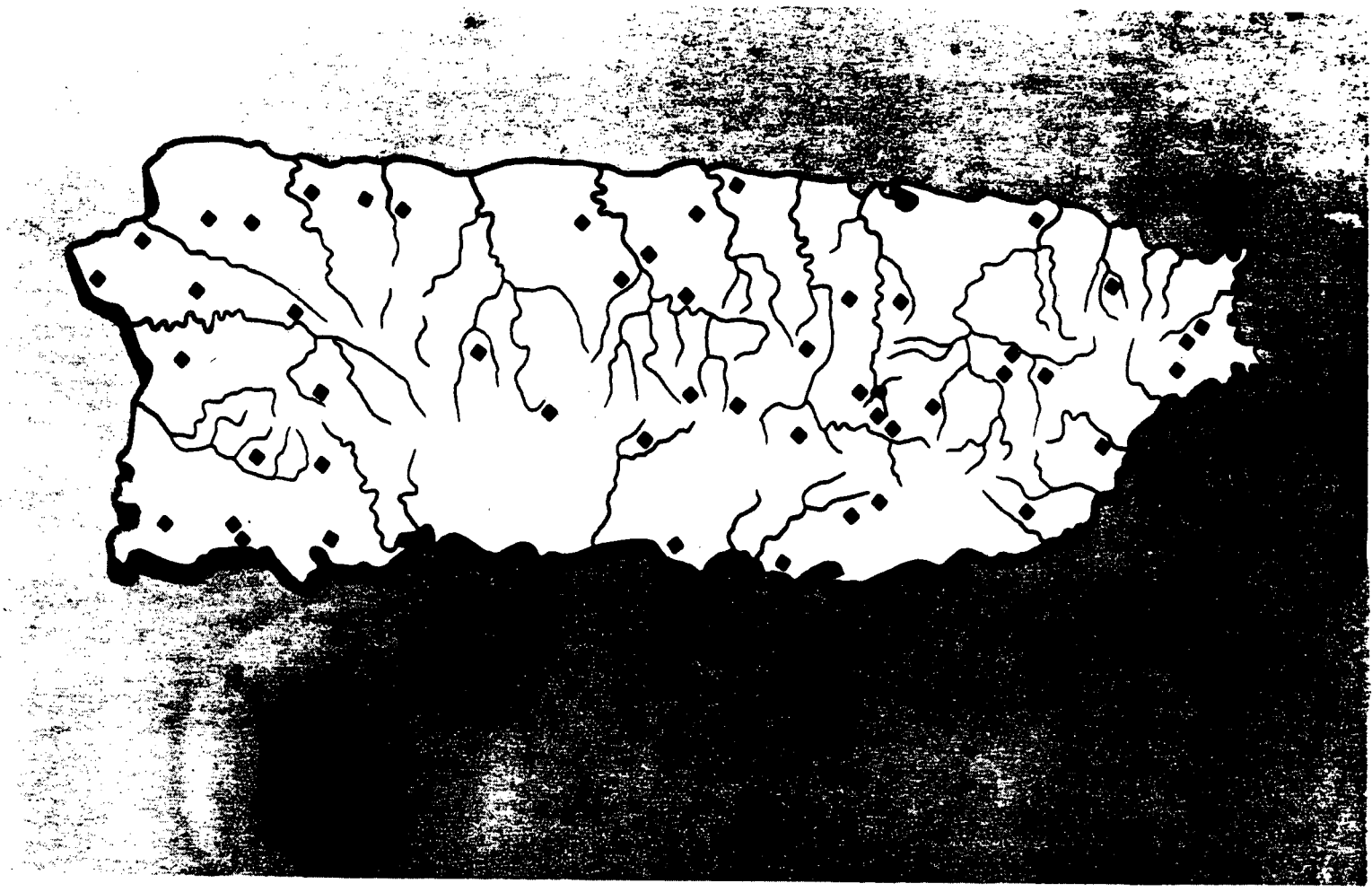
El Sr. Sotelo indicó que se le debe solicitar al Alcalde que inicié todos los trámites correspondientes para la adquisición de la parcela, ya que se hizo sin nuestro conocimiento.

DS/JT/lco

REFERENCE 9

GEOHYDROLOGIC DESCRIPTIONS OF SELECTED SOLID-WASTE DISPOSAL SITES IN PUERTO RICO

U.S. GEOLOGICAL SURVEY
Open-file Report 81-490



Prepared in cooperation with the
ENVIRONMENTAL QUALITY BOARD OF PUERTO RICO

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GEOHYDROLOGIC DESCRIPTIONS OF SELECTED SOLID-WASTE DISPOSAL SITES IN PUERTO RICO

By Arturo Torres-González and Fernando Gómez-Gómez

Open-File Report 81-490

Prepared in cooperation with the

Environmental Quality Board of Puerto Rico

San Juan, Puerto Rico
1982

GEOHYDROLOGIC DESCRIPTIONS OF SELECTED SOLID-WASTE DISPOSAL SITES IN PUERTO RICO

by

Arturo Torres-González and Fernando Gómez-Gómez

ABSTRACT

Fifty solid-waste disposal sites in Puerto Rico were examined in 1977 and ranked according to their potential for degradation of the water resources. Twenty-five of the sites show significant leachate pollution potential. The cover material at 21 sites is relatively permeable and offers insignificant attenuation to leachates. Thirty-six sites are adjacent to streams and nine of these are located in headwater areas. Rainfall is abundant and at 40 of the sites exceeds 1,500 millimeters per year.

General description of the 50 disposal sites are given with their geohydrologic setting. Baseline data consisting of specific conductance, pH, temperature, dissolved oxygen, and common ions were obtained at many of the sites. Such information provides a technical basis for assessing future effects of those solid-waste disposal sites on the quality of water resources.

INTRODUCTION

In 1977, under the auspices of the Islandwide 208 Project, the U.S. Geological Survey made a reconnaissance of 50 selected solid-waste disposal sites. The objective of the reconnaissance was to provide the Division of Solid Waste (DSW) of the Puerto Rico Environmental Quality Board (EQB) and the Islandwide 208 Project with a generalized description of the geology and hydrology of the sites. Although general in nature, the information provides sufficient detail for the DSW to rank the sites as to potential for degradation of the water resources.

Prior to 1977, little information was available on the disposal sites on the island with the exception of a reconnaissance made by the Survey in 1975 in cooperation with DSW on six sites (Gómez-Gómez, 1979).

The completion of this reconnaissance provides the necessary information to enable DSW to determine which sites would require closer monitoring of operations. Additionally, the Islandwide 208 Project receives information which would aid in the 208 Project's responsibility to improve or maintain the quality of the island's water resources.

Some general findings of this solid-waste disposal site reconnaissance are that many of the sites:

EXPLANATION
FOR FIGURES 2 THRU 51

10 — TOPOGRAPHIC CONTOUR --Shows elevation of land surface in meters. Contour interval varies from 5, 10, 20, 50, and 100 meters. Datum is mean sea level.

2 — INTERMEDIATE TOPOGRAPHIC CONTOUR -- Shows elevation of land surface in meters. Contour interval 2,3, and 4 meters. Datum is mean sea level.

1 — SUPPLEMENTARY TOPOGRAPHIC CONTOUR -- Shows elevation of land surface in meters. Contour interval 1 meter. Datum is mean sea level.

HARD SURFACE, HEAVY-DUTY ROAD

HARD SURFACE, MEDIUM-DUTY ROAD

IMPROVED LIGHT-DUTY ROAD

UNIMPROVED DIRT ROAD

TRAIL

52 — HIGHWAY NUMBER

MUNICIPIO OR BARRIO BOUNDARY

P — SOLID WASTE DISPOSAL SITE --Shows location of site. Large P next to some sites means proposed sites.

2 — SAMPLING SITE AND NUMBER

Base map used in figures 2 to 51 are from USGS topographic maps, scale 1:20,000, dated 1958-72.

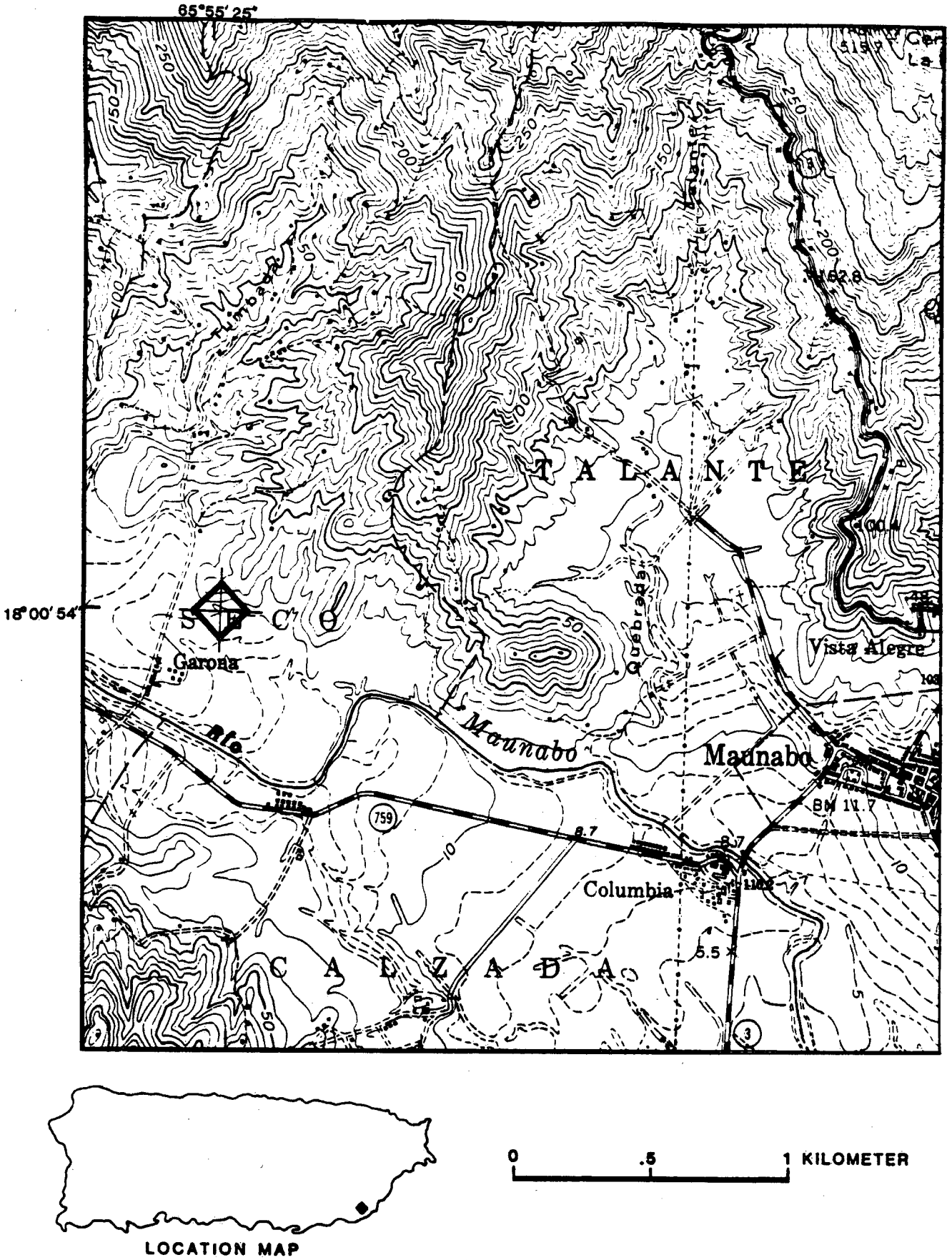


Figure 34.--Maunabo solid-waste disposal site at Palo Seco.

MAUNABO SOLID-WASTE DISPOSAL SITE

1. General information:

   A. Barrio: Palo Seco.

   B. Latitude 18°00'54", longitude 65°55'25".

   C. Date established and size (ha): 1974; 3.1.

   D. Type of waste: Municipal.

   E. Loading (m^3/day): 75 (estimated).

   F. Operating method: Landfill.

2. Geologic formation: Plutonic rock (Tkp), and alluvial deposits (Qa).

3. Cover material: Loose sandy material.

4. Approximate depth to water table (m): 10.

5. Drainage stream: Adjacent to Río Maunabo flood plain.

6. Pollution potential:

Cover material is highly permeable and offers little attenuation to leached substances. Rainfall in area averages about 1,770 mm per year. When visited, no leachate was observed. Leached substances might move downward and reach local ground-water system.

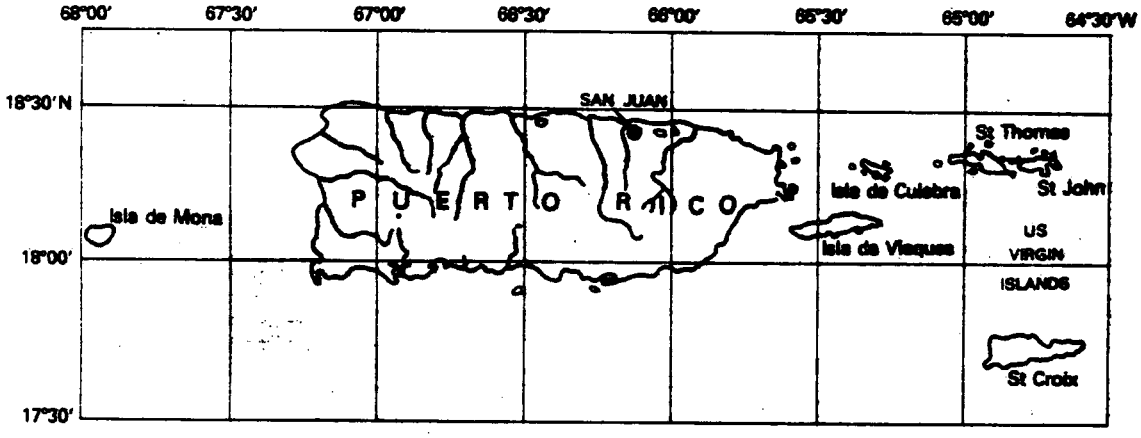
GEOLOGIC DESCRIPTION--Continued

Solid-waste disposal site	Geologic symbol	Description	Reference number
27 Jayuya	Tkg	Plutonic igneous rocks.	11
28 Juncos	Tkgo	Plutonic rocks.	6
29 Lajas (new)	Kt	Tuffaceous breccia and tuff.	6
30 Lajas (old)	Qs	Swamp and marsh deposits. Largely organic swamp muck, locally sandy or silty, and peat; water in these swamps is commonly moderately saline.	6
31 Manatí	Tay; QTb	Tay.--Aymamón Limestone.	17
		QTb.--Blanket deposits, clay, sandy clay found between limestone ridges and believed to have been lowered by solution of the underlying limestone (Briggs, 1966). 0-30(?) m thick.	
32 Maricao	Ky	Yauco mudstone.	6
33 Maunabo	TKp; Qa	Plutonic rocks, diorite and granodiorite rock of the San Lorenzo batholith.	6
		Qa.--Alluvial deposits.	
34 Mayaguez	Kt	Lava tuff and shale.	6
35 Naguabo	Qa	Colluvium.	6
36 Naranjito (proposed)	Kp	Perchas Formation.	25
37 Orocovis	Kr	Robles Formation. Medium gray to light-brown tuffaceous siltstone.	4
38 Quebradillas	Tay;QTbs	Tay.--Aymamón Limestone. White to very pale orange, locally pale yellow and grayish-pink very pure limestone; lower part generally indurated into finely crystalline rather dense limestone, locally a rubble of recemented solution fragments generally of cobble size; upper part compact very finely crystalline chalk; on surface both parts weathered and recemented into irregular, solution sculptured dense limestone having abundant sharp spires a few centimeters high; thickness is 200± m.	19

REFERENCE 10

Summary Appraisals of the Nation's Ground-Water Resources—Caribbean Region

GEOLOGICAL SURVEY PROFESSIONAL PAPER 813-U



Summary Appraisals of the Nation's Ground-Water Resources—Caribbean Region

By FERNANDO GÓMEZ-GÓMEZ *and* JAMES E. HEISEL

GEOLOGICAL SURVEY PROFESSIONAL PAPER 813-U

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1980

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The alluvial aquifer generally will yield but a few liters per second to wells, with the exception of the alluvial fans on the north edge of the valley, which will yield as much as 20 L/s. The limestone aquifer reportedly yielded 30–120 L/s to wells in the 1940's. Yield to wells of 10–30 L/s are obtained from what is probably the volcanic conglomerate and massive limestone aquifer.

Agriculture is the main activity in the valley and is largely dependent for irrigation on intrabasin transfer of water from Lago Loco in the Guanica Valley. Ground water was used for irrigation prior to the completion of the irrigation canals in 1955, but most irrigation wells in the valley have since been abandoned because of the poor quality of the ground water. Presently the only wells used for irrigation are in the La Plata Basin. There are a number of small-capacity wells used for stock watering. The major ground-water discharge is by flowing relief wells and tile underdrains used to control water-logging of soils in the eastern part of the basin. The decline in ground-water pumpage and the importation of surface water apparently has had an impact on the water budget of the valley. Water budget estimates indicate that net recharge is approximately 5.5 hm^3/yr (cubic hectometers per year). By means of a salt-balance calculation, Anderson (1977) estimated the recharge to be about 45 mm/yr (5 hm^3/yr). This "net input" may be real, for 74 percent of the valley had water-table increases in 1974; this trend has been observed since introduction of irrigation water from Lago Loco reservoir in 1955.

WEST COAST PROVINCE

Four alluvial valleys on the west coast have some potential for ground-water development (fig. 8). The greatest potential exists in the Río Guanajibo valley (89 km^2), but moderate amounts of freshwater can be obtained from the Río Yaguez valley (7 km^2), the Río Grande de Añasco valley (48 km^2), and the Río Culebrinas valley (41 km^2). Sugarcane cultivation and processing are the main activities in the Guanajibo, Añasco, and Culebrinas areas. In the Río Yaguez valley, the town of Mayagüez and adjacent urban development have almost completely covered the alluvial surface.

The Río Guanajibo valley deposits consist of detrital clay, silt, sand, and gravel and one or more beds of limestone. Depth of alluvium is at least 24 m. Limestone in the western part of the valley is more than 30 m thick but thins to the east and is reported to be absent near San Germán (Anders, 1968).

Yields of the more productive wells tapping both alluvium and limestone in Río Guanajibo valley range from 25 L/s to 95 L/s. Wells tapping alluvium are more numerous and have yields between 1.5 and 38 L/s.

In the Río Yaguez valley, alluvium is the principal aquifer and has a maximum known thickness of 60 m (Bogart and others, 1964). The alluvial deposits are underlain by alternating layers of clastic sediments and limestone. Well yields are reported between 3 and 25 L/s. Yields of more than 25 L/s may be possible for wells in alluvium near the Río Yaguez or where fragmented limestone is overlain by alluvium.

The Río Grande de Añasco alluvial valley is relatively flat and has poor drainage. Alluvium is as much as 139 m thick, the maximum reported depth. The alluvium consists predominately of clay strata interbedded with beds of sand and limestone. The better water-yielding areas may be located toward the center of the valley and possibly in the apex of the alluvial fan, where more sand and gravel are likely to have been deposited.

No information is currently available on the alluvial aquifer of the Río Culebrinas valley, but the aquifer is probably similar to that of the Río Grande de Añasco.

EAST COAST PROVINCE

This province consists of the coastal area extending east of Punta Picua on the northeast to the Río Maunabo valley on the southeast. Four major areas make up this province: Fajardo, Naguabo-Humacao, Yabucoa, and Maunabo.

FAJARDO AREA

This area consists of the interrupted narrow coastal plain and small valleys from Punta Pićua on the north to Punta Lima on the east coast. Alluvium, the principal aquifer, consists of lenticular beds of clay, sand and gravel, and rock fragments to a depth less than 30 m. The best water yielding formations are in the vicinity of Fajardo. Yields to wells range from 13 to 62 L/s, but the water is brackish to salty. Most attempts at obtaining freshwater have failed in this area. Fresh ground-water yields as much as 60 L/s may be possible in the upper alluvial valley of the Río Fajardo, where inflow may be induced from the river through the predominating gravel and sand deposits.

NAGUABO-HUMACAO AREA

This area includes the coalescing alluvial deposits in the lower valleys of the Ríos Santiago, Blanco, Anton Ruíz, Humacao, and Candelero. Alluvium in most of the area consists of clay and silt. Alluvium in the Río Humacao, which is derived from the granitic San Lorenzo batholith, has considerable quantities of sand. The maximum recorded thickness of alluvium is 50 m in the valley of the Río Anton Ruíz. Yields to large diameter

wells obtaining water from fine-grained alluvium average about 9.5 L/s, whereas wells tapping sand and gravel beds such as found in the upper valley of the Río Anton Ruíz yield as much as 32 L/s.

YABUCOA AREA

This area consists of the Yabucoa Valley, which has been incised in the San Lorenzo batholith. Alluvium is as much as 122 m thick in a depression near the center of the valley and about 30 m at the artificial harbor at the southeast edge of the valley. The alluvium consists largely of clay but has appreciable amounts of sand. Yields to wells average about 32 L/s and range between 6 L/s and 127 L/s.

Optimum development of the aquifer under present conditions would yield 45,000 m^3/d (cubic meters per day) (Robison and Anders, 1973).

MAUNABO AREA

The main aquifer in the Maunabo area is alluvium as much as 60 m thick that contains lenticular deposits of sand, gravel, and cobbles.

Well yields in the alluvial valley range from 1 L/s to 95 L/s. Yields greater than 30 L/s may be possible to wells constructed in places where sand and gravel are well sorted and have a saturated depth in excess of 30 m. Wells along the Rio Maunabo and Quebrada Arenas have high yields because of induced infiltration from the streams.

Optimum development of the aquifer under present conditions would yield about 8,000 m^3/d, as indicated by a model analysis (Adolphson and others, 1977).

INTERIOR PROVINCE

Most of the Interior province is mountainous terrane consisting of volcanic rocks, a few interbedded limestones, and intrusive rocks. Small isolated alluvial deposits are present in the major river valleys. In the Caguas-Juncos Valley (80 km^2), alluvium consisting of clay, sand, and gravel averages about 18 m thick in the vicinity of Caguas and about 37 m at Gurabo. In the Cayey Valley (8.7 km^2), alluvium consists predominately of clay and rock fragments and averages about 7.5 m in thickness.

The bedrock will yield from 1 to 30 L/s to wells that tap fracture systems. The higher yields usually are obtained in the valleys where fractures are more abundant. Yields to wells from the alluvium and underlying bedrock in the Caguas-Juncos Valley average about 15 L/s and in the Cayey Valley, about 11 L/s.

WATER QUALITY

A seawater-freshwater interface is present in the aquifers throughout the coastal areas of Puerto Rico, usually within a short distance inland of the coastline. The greatest inland penetration is adjacent to rivers and lagoons or where ground-water pumpage has caused encroachment. Water from alluvial aquifers along the coast locally will have high concentrations of iron and manganese. The source of these minerals is unknown, but they may be derived from buried swamp or lagoon deposits.

In southwest Puerto Rico a magnesium bicarbonate water, high in silica, is present in serpentine rock and in adjacent aquifers that receive drainage from the rocks. Water in the Lajas Valley is a sodium bicarbonate-sodium chloride type; the minerals are probably the result of residual seawater trapped in the aquifers and of concentrations from bulk precipitation.

Ground water throughout most of Puerto Rico is of a calcium bicarbonate type (fig. 11), differing mainly in the concentration of dissolved solids (table 3).

TABLE 3.—*Range in dissolved-solids concentration for ground water in Puerto Rico*

Province	Aquifer	Range of dissolved solids (mg/L)
North Coast	Water table: limestone and alluvium.	200– 500
Do	Artesian: limestone and clastic rocks.	300– 400
South Coast	Alluvium	300– 500
Do	Limestone	500– 800
Lajas Valley	Alluvium, limestone, and conglomerate.	1,000–4,000
West Coast	Alluvium and limestone	300– 500
East Coast	Alluvium	100– 300
Interior	Volcanic rocks	200– 500
Do	Intrusive rocks	100– 200
Do	Serpentine	500– 800

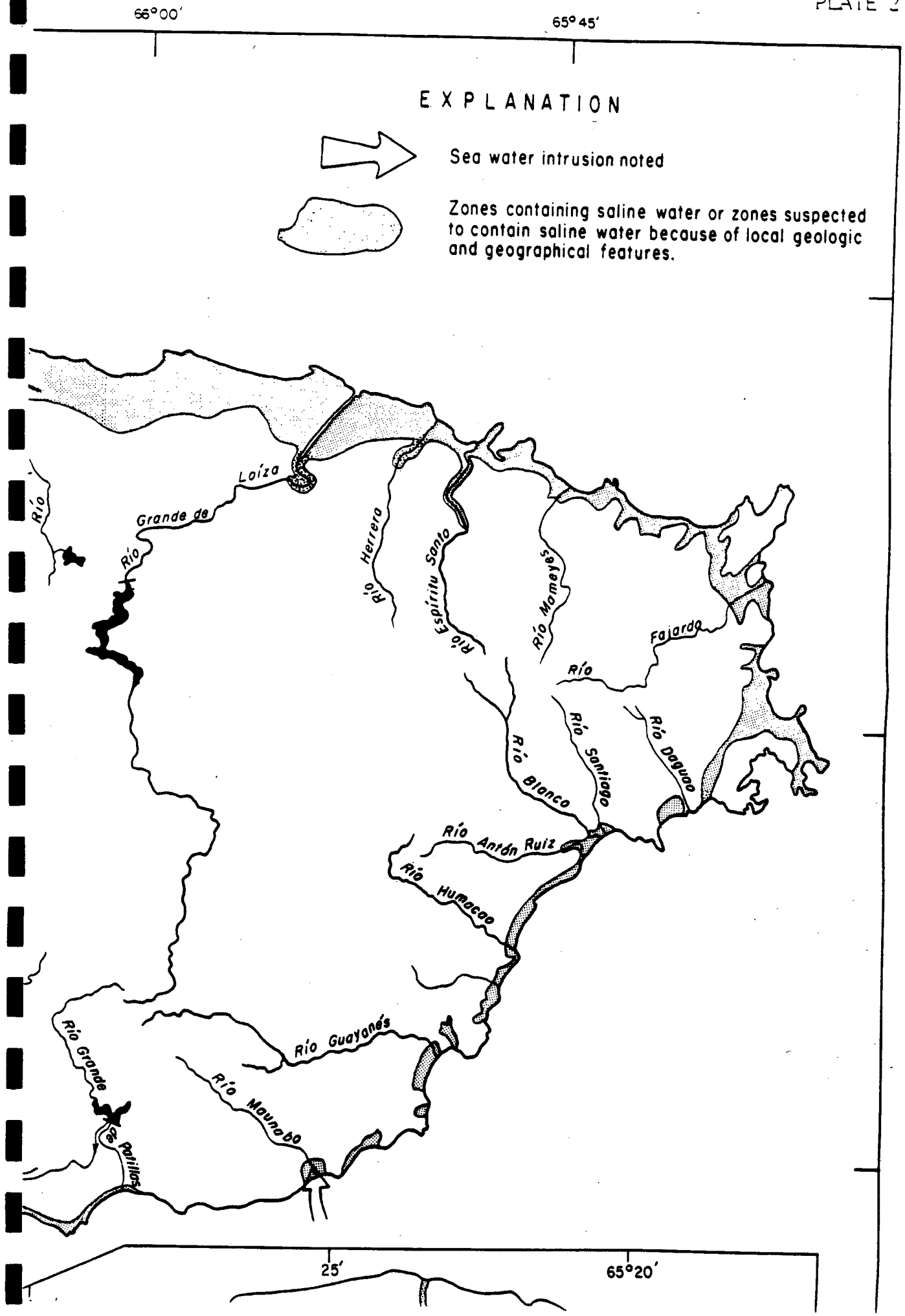
PUERTO RICO'S OFFSHORE ISLANDS

VIEQUES

The 132 km^2 of Vieques is underlain by volcanic rock and granodiorite (fig. 7). Small patches of limestone are present on the north and south coasts and the eastern tip of the island. The principal aquifers are the sandy alluvial deposits in the major valleys. Only two of the alluvial deposits are significant to the water-supply of the island—those in the Resolucíon Valley on the west end of the island and those in the vicinity of Esperanza on the southwest coast.

The alluvial deposits will yield from 0.5 to 2 L/s to wells, whereas the fractured bedrock will commonly yield less than 0.5 L/s, as does the limestone of the south coast.

The civilian population, between 9,000 and 10,000 inhabitants, relies almost entirely on ground-water pro-


66°00'
65°45'
EXPLANATION
Sea water intrusion noted
Zones containing saline water or zones suspected to contain saline water because of local geologic and geographical features.
Río Grande de Loíza
Río
Río Herrera
Río Espíritu Santo
Río Mameyes
Fajardo
Río
Río Santiago
Río Daguao
Río Blanco
Río Antón Ruiz
Río Humacao
Río Guayanés
Río Grande de Patillas
Río Maunabo
25'
65°20'

REFERENCE 11

COMMONWEALTH OF PUERTO RICO / OFFICE OF THE GOVERNOR

Environmental Quality Board

September 23, 1988

Mr. Juan Gutiérrez
NUS/CORPORATION
1090 King Georges
Suite 1103
Edison, New Jersey 08837

Dear Mr. Gutiérrez:

Enclosed you will find all the information you requested to our office. We have the description of the abbreviations G and S of the document:

"Public Water Supplies Systems Major Sources: Groundwater and Surface Water".

The G stands for groundwater and the S for surfacewater. The rest of the abbreviations can be obtained from the Office of Permits, Management and Information System, with Mr. George Nussa, Section Chief, at the Environmental Protection Agency (EPA), New York, telephone number (212) 264-9850. We obtained this document from their Division.

In case of any question do not hesitate to contact us at the Environmental Quality Board (EQB) at (809) - 722-0077.

Sincerely yours,

Francisco Claudio Ríos

Francisco Claudio Ríos
Acting Director
Air Quality Board

EV/jrs

OFFICE OF THE BOARD: 204 DEL PARQUE ST. CORNER OF PUMARADA / MAILING ADDRESS: P.O. BOX 11488,
SANTURCE, PUERTO RICO 00910 / TELEPHONE: 725-5140

SISTEMAS NON-PRASA
COMUNALES Y NO COMUNALES

Town PUEBLO	PWS-ID	Owner DUENO	or Operator o ENCARGADO	System SISTEMA	POBLACION (PERSONAS)	ABAST	Source FUENTE	PRODUCCION	TRATAMIENTO
Comerio.....	523045	Sr. Fco.Hernandez..... Box.537 Tel.875-2243, Naranjito P.R.		Fca. Fco. Hernandez..... Carr. 790 cerca Colmado Berrios, Bo. Dona Elena,Comerio	150	C	S		No
Comerio	523055	Sr. Juanito Melendez Antonio Ayala Facon Diaz. Hc-2 Box.9203 Comerio,P.R.00642 Tel.759-7979 (Trab.) Tel.875-4247 (casa)	Y/O. Anton	Fca. Negron..... Carr. 780 Km. 2 Comerio	430	C	S		No
Comerio	523065	Sr. Nelson Alicea ..... Bo. Dona Elena Comerio,P.R.00642		La Loma Los Pinos..... Fca. Julio Falcon	125	C	S		No
Comerio.....	523095	Cedrito..... Comunidad Cedrito Bz.Hc1-Box.22520642 Tel.875-3237 Comerio,P.R.		Cedrito..... Carr.781 Km.3.6 Sector Cedrito Bo.La Prieta Comerio,P.R.	300	C	S	5,000 gal/dia	No
Comerio	[illegible]	[illegible] Bo.Dona Elena Comerio,P.R. Tel.875-3016 -2878		[illegible] Bo.Dona Elena Comerio,P.R.	[illegible]	C	S		No
Guayama.....	530015	Phillips P.R. Corp..... Box 1166		Phillips P.R. Corp..... Carr. 710 Km. 1.3	1500	P	G		Clor
		Carr.63 Km.138.3 Bo.Jobos Sector Pozo Hondo Guayama,P.R. 00654		Carr. 63 Salida Salinas Sector Pozo Hondo Bo.Jobos Guayama,P.R. 00654					
Maunabo.....	549015	Sr. Cruz Fontanez..... Correo General Maunabo Postmaster General of Maunabo		Quebrada Arenas..... Carr. 939 Km. 1.3 Int.	200	C	S		No
Maunabo.....	549025	Sr. Julian Leon..... Bo. Liza (Vicente Leon Amar		Lizas..... Bo. Lizas	100	C	S		No
Maunabo.....	549035	Carmelo Gonzalez..... Bzn. 1201 Sector La Pica		La Pica..... Carr. 103 Km.1.2 Bo. Talante	175	C	S		No

SISTEMAS NON-PRASA
COMUNALES Y NO COMUNALES

PUEBLO	PWS-ID	DUENO o ENCARGADO	SISTEMA	POBLACION (PERSONAS)	ABASTO	FUENTE	PRODUCCION	TRATAMIENTO
Maunabo.....	549045	Sr. Felias Diaz..... Bzn. 125 B. Talante	Talante..... Carr. 950 Km. 2.5 Bo.Talante	375	C	G		No
Maunabo.....	549055	Alejo Torres..... Buzon 1433-A Bo. Lizas	Lizas II..... Carr. 759 Km. 3.9 Int. Bo. Lizas	75	C	S		No
Maunabo.....	549065	Sr. William Amaro Cruz.... Apdo. 645-A Maunabo, P.R. 00707	Pandura- Tumbao..... Bo.Palo Seco Sector Tumbao Carr. 759 Km.3.9 Int.	125	C	S		No
		Bo. Mulas Buzon 3565 Patillas,P.R.	Bo. Mulas Carr. 754 final	[illegible]	C	S		No
Patillas.....	556025	Sr. Felix Mendez..... Bo.Rual , Carr.184 Km. 10.9	Bo.Real..... Carr.184 Km.12.5	300	C	S		No
Patillas	[illegible]	Sr. Agustin Sotomayor Ninoyes [illegible] Patillas,P.R.	Bo Quebrada Arriba [illegible]	200	C	S		Clor
Patillas.....	556045	Sr. Guillermo Garcia..... Bo. Marin Buzon 4129-B Patillas,P.R.	Bo. Marin..... Carr. 7759 Km. 3.4	108	C	S		No
Patillas.....	556055	Sr. Domingo Morales..... Patillas,P.R.	Bo. Mamey.....	240	C	S		No
Patillas.....	556065	Sr. Gerardo Rodriguez..... Rios Carr. 758 Buzon 7884 Patillas,P.R.	Bo. Rios..... Carr. 758 Km. 6.0	300	C	S		Clor.
Patillas.....	556095	Gabriel Figueroa..... Bz. 2652	Guardarraya..... Carr.3 int Bo.Guardarraya Patillas	128	C	S		No
Salinas.....	563015	Corp. Azucarera..... Ing. Exio Mejias Seccion Ingenieria Central Aguirre P.R.	Bo Aguirre..... Carr. 705 Km. 2.2	1500	C	S		Clor

SISTEMAS NON-PRASA
COMUNALES Y NO COMUNALES

PUEBLO	PWS-ID	DUENO o ENCARGADO	SISTEMA	POBLACION (PERSONAS)	ABAST	FUENTE	PRODUCCION	TRATAMIENTO
Comerio.....	523045	Sr. Fco.Hernandez..... Box.537 Tel.875-2243, Naranjito P.R.	Fca. Fco. Hernandez..... Carr. 790 cerca Colmado Serrios, Bo. Dona Elena,Comerio	150	C	S		No
Comerio	523055	Sr. Juanito Melendez Y/O. Antonio Ayala Facon , Antón Diaz. Hc-2 Box.9203 Comerio,P.R.00642 Tel.759-7979 (Trab.) Tel.875-4247 (casa)	Fca. Negron..... Carr. 780 Km. 2 Comerio	430	C	S		No
Comerio	523065	Sr. Nelson Alicea ..... Bo. Dona Elena Comerio,P.R.00642	La Loma Los Pinos..... Fca. Julio Falcon	125	C	S		No
Comerio.....	523095	Cedrito..... Comunidad Cedrito Bz.Hc1-Box.22520642 Tel.875-3237 Comerio,P.R.	Cedrito..... Carr.781 Km.3.6 Sector Cedrito Bo.La Prieta Comerio,P.R.	300	C	S	5,000 galóna	No
Comerio	[illegible]	Sr. Francisco Perez Santiago [illegible] Bo.Dona Elena Comerio,P.R. Tel.875-3016 -2878	Las Piedras Altas [illegible] Carr. 90 Dumas 7780 Km 1.0 Bo.Dona Elena Comerio,P.R.	[illegible]	C	S		No
Guayama.....	530015	Phillips P.R. Core..... Box 1166	Phillips P.R. Core..... Carr. 710 Km. 1.3	1300	P	G		Clor
		Carr.#3 Km.138.3 Bo.Jobos Sector Pozo Hondo Guayama,P.R. 00654	Carr. #3 Salida Salinas Sector Pozo Hondo Bo.Jobos Guayama,P.R. 00654					
Maunabo.....	549015	Sr. Cruz Fontanez..... Correo General Maunabo	Quebrada Arenas..... Carr. 939 Km. 1.3 Int.	200	C	S		No
Maunabo.....	549025	Sr. Julian Leon..... Bo. Liza (Vicente Leon Amar	Lizas..... Bo. Lizas	100	C	S		No
Maunabo.....	549035	Carmelo Gonzalez..... Bzn. 1201 Sector La Pica	La Pica..... Carr. 103 Km.1.2 Bo. Talante	175	C	S		No

SISTEMAS NON-PRASA
COMUNALES Y NO COMUNALES

PUEBLO	PWS-ID	DUENO o ENCARGADO	SISTEMA	POBLACION (PERSONAS)	ABASTO	FUENTE	PRODUCCION	TRATAMIENTO
Maunabo.....	549045	Sr. Felias Diaz..... Bzn. 125 B. Talante	Talante..... Carr. 950 Km. 2.5 Bo.Talante	375	C	S		No
Maunabo.....	549055	Alejo Torres..... Buzon 1433-A Bo. Lizas	Lizas II..... Carr. 759 Km. 3.9 Int. Bo. Lizas	75	C	S		No
Maunabo.....	549065	Sr. William Amarao Cruz.... Apdo. 645-A Maunabo, P.R. 00707	Pandura- Tumbao..... Bo.Palo Seco Sector Tumbao Carr. 759 Km.3.9 Int.	125	C	S		No
[illegible]	[illegible]	[illegible] Bo. Mulas Buzon 3565 Patillas,P.R.	[illegible] Bo. Mulas Carr. 754 final	[illegible]	[illegible]	[illegible]		No
Patillas.....	556025	Sr. Felix Mendez..... Bo.Real , Carr.184 Km. 10.9	Bo.Real..... Carr.184 Km.12.5	300	C	S		No
Patillas	[illegible]	Sr. Agustin [illegible] [illegible] Patillas,P.R.	Bo. [illegible] [illegible]	[illegible]	C	S		Clor
Patillas.....	556045	Sr. Gullermo Garcia..... Bo. Marin Buzon 4129-B Patillas,P.R.	Bo. Marin..... Carr. 7759 Km. 3.4	108	C	S		No
Patillas.....	556055	Sr. Domingo Morales..... Patillas,P.R.	Bo. Mamey.....	240	C	S		No
Patillas.....	556065	Sr. Gerardo Rodriguez..... Rios Carr. 758 Buzon 7884 Patillas,P.R.	Bo. Rios..... Carr. 758 Km. 6.0	300	C	S		Clor.
Patillas.....	556095	Gabriel Figueroa..... Bz. 2652	Guardarraya..... Carr.3 int Bo.Guardarraya Patillas	128	C	S		No
Salinas.....	563015	Corp. Azucarera..... Ing. Exio Mejias Seccion Ingenieria Central Aguirre P.R.	Bo Aguirre..... Carr. 705 Km. 2.2	1500	C	S		Clor

REFERENCE 12

NUS CORPORATION TELECON NOTE

CONTROL NO:	DATE: 6/14/89	TIME: 11:30

DISTRIBUTION: Maunabo SWD 02-881-24

BETWEEN: John Baglivi	OF: EPA Office of Permits Mgmt & Info Systems	PHONE: (212) 264-4850

AND: Gerald V. Gilliland (NUS)

DISCUSSION:

Re: document "Sistemas Non-PRASA"
"Comunales y No Comunales"
"Non-PRASA (Water Supply) Systems"
"Community and Non-Community"

The column marked "Abasto" on said document defines the recipient of the water supply; the code is as follows:

C = Community Supplier (Transient i.e. Restaurant) serves > 25 persons year-round

NC = Non-Community Supplier serves < 25 persons or only part of year

P = Non-Transient Non-Community Supplier serves < 25 persons and is not their primary source i.e. small office

ACTION ITEMS:

NUS 067 REVISED 0881

REFERENCE 13

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE COMMONWEALTH OF PUERTO RICO
ECONOMIC DEVELOPMENT ADMINISTRATION
INDUSTRIAL RESEARCH DEPARTMENT

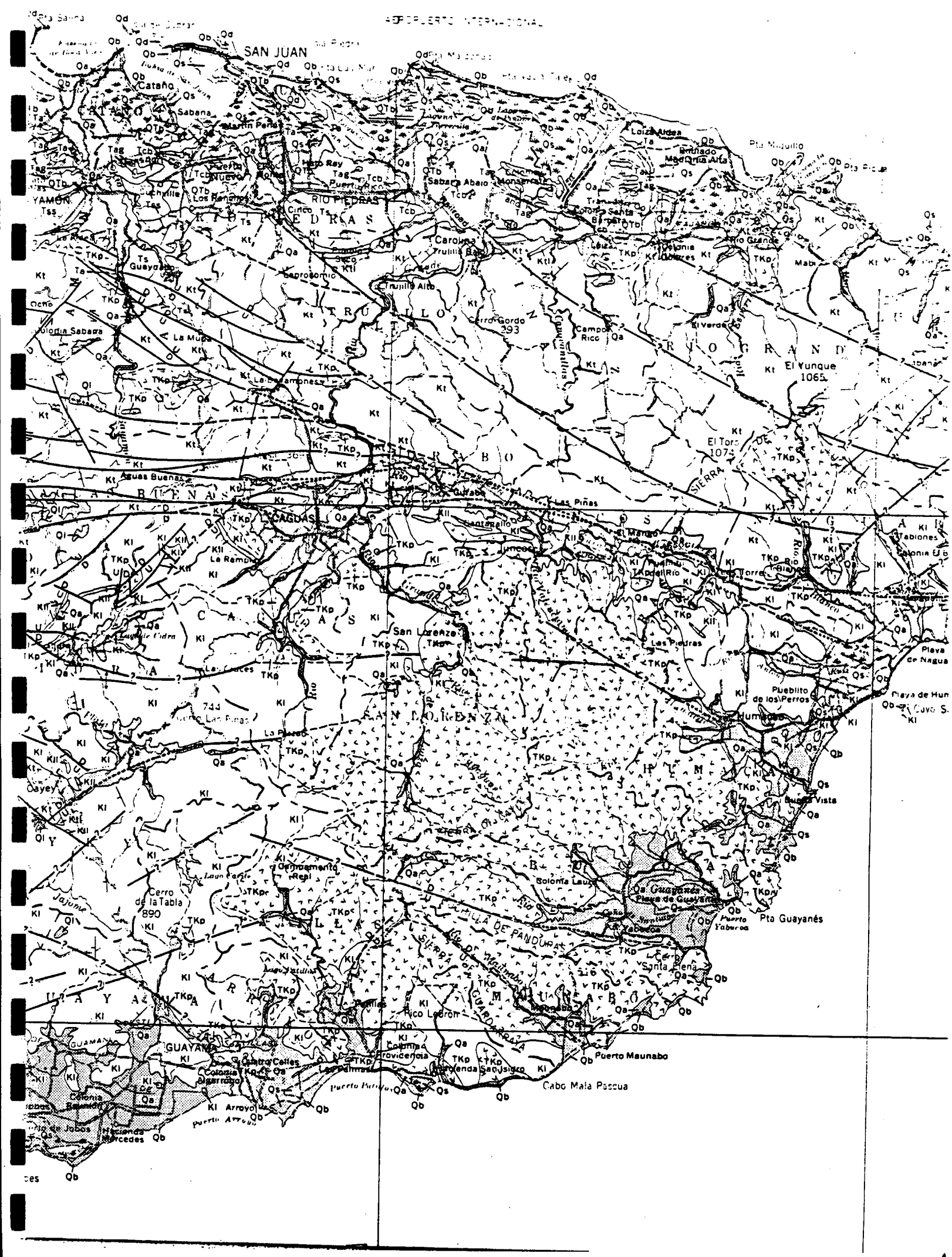
PROVISIONAL GEOLOGIC MAP OF PUERTO RICO AND ADJACENT ISLANDS

By
Reginald P. Briggs

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-392

PUBLISHED BY THE U. S. GEOLOGICAL SURVEY
WASHINGTON, D.C.
1964

MAP I-392



AEROPUERTO INTERNACIONAL
SAN JUAN
Cataño
Sabana
Martin Peña
Puerto Nuevo
Hato Rey
Puerto Rico
RIO PIEDRAS
Sabana Abajo
Loiza Aldea
Pta Miquillo
Pta Picua
Colonia Santa Barbara
Colonia Dolores
Rio Grande
Mabi
Carolina
Trujillo Alto
Cerro Gordo
393
Campo Rico
El Verde
El Yunque
1065
El Toro
1074
SIERRA DE
Aguas Buenas
Las Piñas
Juncos
Las Torres
Tablones
Las Piedras
San Lorenzo
Playa de Nagua
Playa de Hum
Pueblito de los Perros
Humacao
Buena Vista
Cayey
Cerro Las Piñas
Cerro de la Tabla
890
Campamento Real
Colonia Laura
Playa de Guayanés
Puerto Yabucoa
Pta Guayanés
Santa Elena
Rico Lebron
Colonia Providencia
Puerto Maunabo
Cabo Mala Pascua
GUAYAMA
Colonia Algarrobo
Arroyo
Puerto Arroyo
Hacienda Mercedes
Colonia Reunión
Jajome

64 000 | 67°15' | 67°00' | 96 000

Qa

Alluvial deposits

Sand, silt, clay, and gravel floodplain and terrace deposits, and piedmont fan deposits; also includes colluvium at margins of alluvial deposits

Ql

Landslide deposits

Commonly composed of blocks and residual boulders 10 feet or more across in a matrix of clay, sand, and gravel

Qb

Beach and dune deposits

Largely calcite, quartz, and (or) volcanic-rock-fragment sand with locally conspicuous magnetite; includes pebble and cobble deposits and organic reef rubble, especially along the south coast; locally includes cemented sand (beach-rock) in bands parallel to the shore; includes some made-land at San Juan, Mayagüez, and Playa de Ponce

Largely c and pe modera Juan, M Puerca

Qd

Compound dunes

Friable eolianite and marine sandstone largely composed of calcite and quartz; some hard calcarenite beds 10 feet or less in thickness; located principally along the north coast

QTb

Blanket deposits

Quartz sand, clayey sand, sandy clay, and clay; principally in the north coastal plain and in areas of karst topography developed on strata of Oligocene and Miocene age

UNCONFORMITY

Paleocene and(or) Eocene

Ts — Tsl

Siltstone, sandstone, conglomerate, lava and tuff

Probably mostly deposited in a marine environment; Tsl, *extensive algal limestone beds, locally at base. Locally deeply weathered. Unit as shown on map probably includes some plutonic rocks and some hydrothermally altered rocks and may include some strata of Cretaceous age. Total thickness may exceed 6000 feet*

LOCAL UNCONFORMITY

Upper Cretaceous

Kt — Ktl

Tuffaceous sandstone, siltstone, breccia, and conglomerate, lava, and tuff

Marine lava, tuff, and volcanic sandstone and siltstone predominate in lower part; in upper part marine and sub-aerial tuffaceous conglomerate and sub-aerial and marine tuff and tuffaceous breccia predominate; Ktl, *some pure and impure limestone lenses most common in the southwestern and south-central parts of the map; some hydrothermally altered rocks. Extensive deep weathering. Unit as shown on map includes all Cretaceous strata believed to be stratigraphically above the base of the Robles Formation (Pease and Briggs, 1960). However, the lower part of the Robles Formation may be of Early Cretaceous age. As shown also may include some strata of Paleocene and (or) Eocene age. Total thickness may exceed 20,000 feet*

LOCAL UNCONFORMITY

Lower Cretaceous

Kl — Kll

Lava, lava breccia, tuff, and tuffaceous breccia

Largely deposited in a marine environment; some thin-bedded sandstone and siltstone; Kll, *some limestone lenses; some hydrothermally altered rocks; some amphibolite. Extensive deep weathering. Some strata of Late Cretaceous age may be included within this map unit. Total thickness may exceed 30,000 feet*

TKs — TKsl

Sandstone, siltstone, conglomerate, lava, tuff, and tuffaceous breccia

Largely deposited in a marine environment. TKsl, *some limestone on Isla de Vieques. Extensive deep weathering. Unit as shown on map contains a few localities from which Paleocene and (or) Eocene fossils have been recovered, but other evidence indicates that most of these rocks may be Late Cretaceous in age*

TKp

Plutonic rocks

Largely granodiorite and quartz diorite; some diorite; minor quartz porphyry, gabbro, and amphibolite; believed to have been emplaced during the Late Cretaceous, Paleocene, and Eocene. Includes some hydrothermally altered rock and some areas of complexly and intimately associated plutonic and volcanic rock. Locally deeply weathered

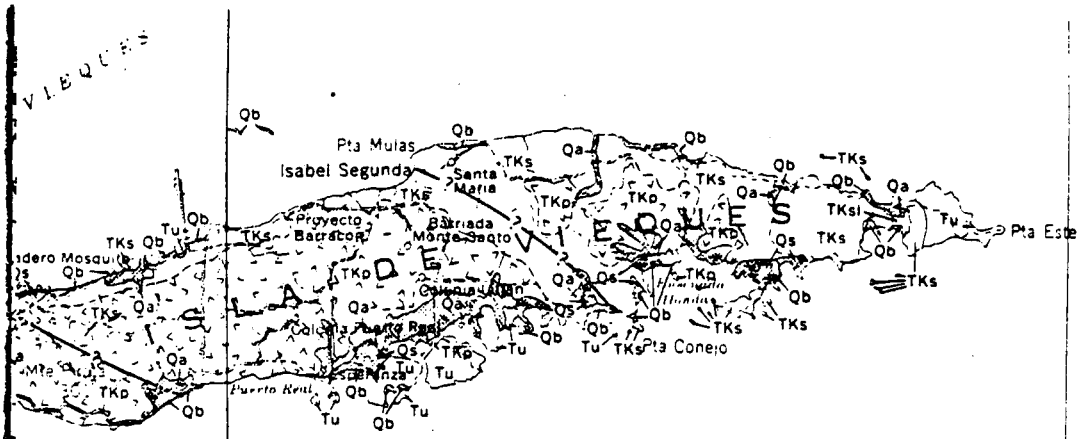
CRETACEOUS

Ks

Serpentinite

Serpentinized peridotite(?); probably emplaced during the Early or early Late Cretaceous. Includes small

TACEOUS(?)

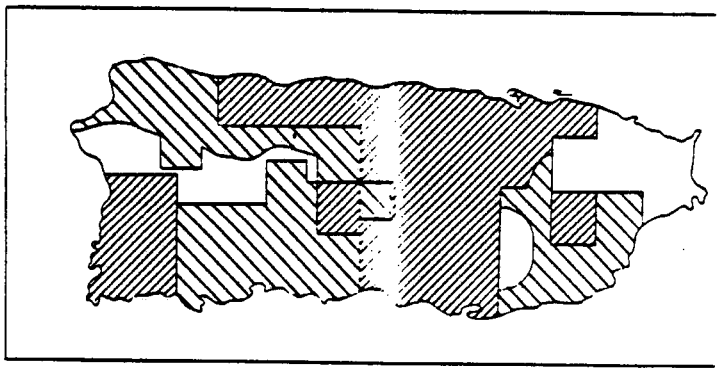


Accuracy good—Data from detailed geologic maps at 1:30,000 scale or larger

Accuracy moderate to good—Data from semidetailed geologic maps at scales generally smaller than 1:30,000

Accuracy poor to moderate—Data from reconnaissance geologic maps at scales smaller than 1:30,000 and from large scale detailed maps of limited areas

Accuracy moderate to good on Isla Mona and Isla Caja de Muertos. Accuracy poor to moderate on Isla Desecheo, Vieques, Culebra, and other islands.



MAP SHOWING RELATIVE ACCURACY OF PARTS OF THE GEOLOGIC MAP

65°30' 256000 65°15' 288000 METERS

Geology compiled by R. P. E

TERTIARY

Contact

Dashed where gradational or position uncertain, dotted where concealed

Fault

Dashed where approximately located, queried where doubtful or inferred, dotted where concealed; U, indicates upthrown side, D, downthrown side; arrows show directions of apparent strike-slip movement

REFERENCE 14

Some Tropical Landforms of Puerto Rico

GEOLOGICAL SURVEY PROFESSIONAL PAPER 1159

SOME TROPICAL LANDFORMS OF PUERTO RICO

By Watson H. Monroe

ABSTRACT

Puerto Rico is in the northwestern corner of the Caribbean Sea. The island is roughly rectangular, about 175 km long from east to west and about 60 km wide from north to south; the total land area is slightly less than 8,500 km². Altitudes range from sea level to a maximum of 1,338 m at Cerro de Punta on the Cordillera Central.

A large variety of landforms in diverse geographic provinces make the island of Puerto Rico an especially interesting area for the study of geomorphology. The landforms are characteristic of tropical areas in the trade-wind belts where high mountains cause convectional rain, which results in an extremely varied rainfall. In Puerto Rico, yearly rainfall averages from about 500 mm in areas of "rain shadow" to a maximum of slightly more than 4,000 mm in a rain forest near the northeastern corner of the island. Rock types in Puerto Rico include such diverse kinds as lava, tuff, intrusive rocks, metamorphic rocks, limestone, and unconsolidated sand and clay; such diversity is reflected in many contrasting kinds of topography within small areas. In common with other tropical areas, many features resulting from torrential rainfall are found in Puerto Rico; many similar features are found in temperate zones but only in arid and glaciated areas.

The rivers of Puerto Rico have had a long, active history, which can be deciphered from the sediments in rocks of middle Tertiary age. Many rivers have been behaded by more actively growing streams, and many have [illegible] segments of flow on nearly level surfaces followed by [illegible] have been entrenched more than [illegible] m.

The island can be divided into three principal physiographic areas of [illegible] topography: (1) coastal lowlands, (2) a belt of karst [illegible] in northern Puerto Rico, and (3) an upland, which is extensively [illegible] features because of complex geologic structure, varied rock types, and a long and complicated history of erosion.

INTRODUCTION

Puerto Rico is the easternmost island of the Greater Antilles and stands near the northeastern corner of the Caribbean Sea (fig. 1). It has roughly a rectangular shape – about 175 km east-west and 60 km north-south – and an area of 8,497 km². In its political territory are several smaller islands, including Isla de Vieques and Isla de Culebra to the east, Isla Desecheo and Isla Mona to the west, and Isla Caja de Muertos to the south. Puerto Rico and its offshore islands all lie in the area between lat 17°37' and 18°31' N., and long 65°14' and 67°56' W. Puerto Rico lies about 160 km south of the Puerto Rico Trench, which reaches depths of about 8,265 m – the deepest known part of the Atlantic Ocean. The main island is bounded on the east by the Vieques Passage (Pasaje de Vieques) and on the west by the Mona Passage (Canal de la Mona).

Puerto Rico has a great variety of landforms, particularly those related to a tropical climate, because it is a high island subject to rapid erosion, its climate varies from warm humid to semiarid, and it has a variety of rock types that have different erosional characteristics.

Most of the island is mountainous (pl. 1). The Cordillera Central, from 15 to 25 km from the south coast, extends from the west coast eastward for about 100 km; farther east, the Sierra de Cayey continues east-southeast to the southeast corner of the island. The Sierra de Luquillo is an east-trending range in the northeastern part of the island. Several other less prominent mountain ranges are described in a later part of this report. This mountainous terrain is the Upland province.

In north-central and northwestern Puerto Rico, dissolution of limestone has resulted in a belt of karst topography 15-23 km wide and about 135 km long – the Northern Karst province.

Near the sea, lowlands form a discontinuous Coastal Plains province, consisting of coalescing flood plains, alluvial fans, and a variety of beach and lagoonal deposits.

PREVIOUS INVESTIGATIONS

The first scientific study of the physical geography of Puerto Rico was made by R. T. Hill (1899a, b, c) and was based on a visit he made at about the time of the Spanish American War. Hill's observations were very general, but he called attention to the principal mountain ranges of Puerto Rico; to the "pepino hills," called now the Northern Karst province; to "playa plains," here described as coastal plains; and to several features, such as the "parting valley," by which he meant valleys between coastal hills and the central mountains, such as the Lajas Valley in southwestern Puerto Rico. Hill also described in very general terms the geology, soils, mineral resources, and forest conditions of Puerto Rico.

In 1913 the Council of the New York Academy of Sciences (Britton, 1919) proposed that the Academy

...al precipitation is only 1,681 mm. Rates of ... have been recorded at only a few places but ...nsiderable everywhere, even in the mountains ...e rainfall is plentiful. At Adjuntas near the Cor...a Central, where the rainfall is 2,146 mm, the rate ...vaporation is 1,294 mm a year.

...southwestern Puerto Rico in the lee of the Cor...ra Central, the combination of high temperature, ...stant wind direction, and large evaporation rate has ...duced a distinct rain shadow. At several stations the ...fall is less than 800 mm, and the rate of evaporation ...he agricultural experiment station at Lajas is more ...n 2,000 mm. This part of Puerto Rico has a semiarid, ...steppe, climate.

...ost rainfall in Puerto Rico is in the form of sudden ...wers that have sharp boundaries, so that the path of ... rain is plainly marked. The showers tend to be tor...tial but generally last only between 15 and 30 ...utes. The National Weather Service (Calvesbert, ...70) reported that nearly half of their 40 weather sta...ns show that from 30 to 50 days a year have more ...n 12.7 mm of rain. As long-lasting rainstorms are ...atively uncommon in Puerto Rico, except during hur...anes, these figures indicate that showers amounting ...2-10 mm are relatively common. Such torrential ...nstorms have caused rapid downcutting of valleys ...d an asymmetric shape of hills of limestone. They are ...o responsible for the formation of several landforms ...re generally associated with arid climates, such as ...ad alluvial fans, which are common especially in ...uthern Puerto Rico, and bajadas, or coalesced alluvial ...s, which extend along the north side of the Río ...rabo on the south flank of the Sierra de Luquillo ...roedel, 1961).

...uerto Rico is in the belt where hurricanes can be ex...cted every year, but owing to its long east-west shape, ...st of these tropical storms pass north or south of the ...and. Only four hurricanes have passed over Puerto ...co since 1900 (Calvesbert, 1970), but several others ...ve been close enough to cause considerable damage. ...he principal effect has been extremely heavy rain...ll – at times as much as 400 mm in a day – accompanied ... strong wind. The National Weather Service predicts ...at winds of 175 km/h can be expected at least once a ...ntury. The heavy rainfall accompanying the hur...canes causes extensive erosion and flooding and may ...e responsible in large part for the very steep sided ...alleys in the island.

GEOLOGY OF PUERTO RICO

Puerto Rico consists of a central east-west axis of ...redominantly volcanic rocks, flanked on the north and ...outh sides (Briggs and Akers, 1965; Beinroth, 1969; ...ox and Briggs, 1973) by younger sedimentary rocks (fig. 4). Near the coast on all sides of the island are discontinuous coastal plains of alluvium. The different kinds of rocks have their own weathering and erosion characteristics, which result in distinctive landforms.

The igneous core of Puerto Rico consists predominantly of Lower Cretaceous to middle Eocene volcanic rocks. The Lower Cretaceous rocks are exposed mostly near the center of the island near Orocovis, Barranquitas, and Cidra and in belts that extend south from Cidra through Cayey to Guayama and eastward north of Caguas. These rocks are mainly submarine volcanic-ash deposits interspersed with lava flows. Near the top of the Lower Cretaceous sequence, the volcanic rocks are interlayered with a few discontinuous beds of reefoid limestone.

The Lower Cretaceous rocks are overlain by Upper Cretaceous interbedded volcanic and sedimentary rocks that include sandstone and conglomerate, derived from volcanic rocks, and limestone deposited as reefs around volcanic islands. The Cretaceous rocks are intruded by a number of masses of plutonic rock, generally of granodiorite to diorite composition, that were emplaced in very Late Cretaceous or early Tertiary time. The largest masses of intrusive rock are the San Lorenzo batholith, which is near San Lorenzo, Las Piedras, Humacao, Yabucoa, and Maunabo, and the Utuado batholith, which crops out in a wide belt between Jayuya and Lares. Smaller instrusive bodies are present at many places in the island, including areas on the south side of Sierra de Luquillo, near Morovis, and at Ciales. In western Puerto Rico several bodies of serpentinite are present in linear belts transecting Cretaceous rocks.

The Cretaceous rocks are overlain by Paleocene to middle Eocene rocks consisting of tuff and sedimentary rocks, including conglomerate that contains fragments of granodiorite eroded from the intrusive rocks. Most of these rocks are present on the northern and southern flanks of the central core, but some are also present in a faulted belt that extends west-northwest across west-central Puerto Rico.

The Cretaceous and lower Tertiary rocks have been folded and intensely faulted into hundreds of fault blocks (Cox and Briggs, 1973).

The folded and faulted Cretaceous and lower Tertiary rocks are overlain unconformably in both northern and southern Puerto Rico by conglomerate, sand, and clay of Oligocene age, derived from soils that had formed on igneous rocks over a period of millions of years and later were reworked by the sea. The contact between the older rocks and the overlying sediments is irregular and has a moderate relief of a few hundred meters. The Oligocene sediment is overlain by limestone of Oligocene and Miocene age that in northern Puerto Rico is more than 1,400 m thick and in southern Puerto Rico is more than 1,000 m thick.

FIGURE 11.—Entrenched meander of Río Grande de Manatí, 3.6 km south-southeast of Morovis. The peak west (left) of the river is 120 m above the river, which at this point has an altitude of 150 m. This ridge rises to 270 m west of the river, and a matching ridge to the east rises to 400 m.

LOWLAND AREAS

Included in the Upland province are several large low areas surrounded by high mountains. Some of these lowland areas, such as the Cayey plain south of the valley of the Río de La Plata and the valley at Cidra, are remnants of an old upland erosion surface. Most of the lowland areas, however, are places where weathering has proceeded much more rapidly than elsewhere and, consequently, has been followed by deep erosion. Most such areas are underlain by intrusive rocks such as granodiorite or quartz diorite, which, after decomposition by chemical weathering, contain enough quartz to serve as a scouring agent. Many of these areas are relatively small, such as the wide valley of the Río Grande de Manatí between Morovis and Orocovis at the southern edge of the Morovis stock of granodiorite (Berryhill, 1965), but two of the areas are large.

In the area between Jayuya and Utuado in west-central Puerto Rico, the surface is covered with loose clayey sand that is residual from underlying granodiorite and quartz diorite. Because the quartz acts as a scouring agent, the clay is easily eroded, and the countryside is carved into many closely spaced gullies. Erosion has been so rapid relative to the adjacent soils derived from volcanic and metamorphic rocks and not bearing quartz that the area of the Utuado batholith is now a basinlike lowland surrounded by such high mountains of volcanic rocks as Cerro Roncador and Cerro Morales.

The largest lowland of this kind is the area of the San Lorenzo batholith that covers most of the southeastern corner of Puerto Rico between Las Piedras and Maunabo and between San Lorenzo and Humacao. The granodiorite and quartz diorite in this area has weathered to slightly ferruginous clayey sand, and the rapid erosion common in sandy soils rich in quartz has caused the landscape to be eroded into a close network of gullies, which are small hillside valleys having steep sides and are separated one from the next by sharp ridges.

Especially striking in this area are the thousands of granitic core stones, which give Las Piedras its name (fig. 12). These core stones are the centers of joint blocks

of quartz diorite and granodiorite. Ground water containing plant-derived carbonic acid seeps down places where granitic rocks have been cut by widely spaced joints, causing weathering of some of the minerals in the granitic rock at the joint sides. The rock near the joint is thus changed into clayey sand. This soillike material is easily eroded and the joint is widened into a small gully. Eventually, under conditions of rapid erosion, all the weathered rock is removed, leaving fresh rock exposed only in the center of the blocks. When the weathered rock has been removed from the fresh rock, weathering almost ceases, and the stone remains on the surface as a residual core stone. Such stones cap many of the hills in the Las Piedras area.

The Caguas Valley is another lowland related in origin to other areas of outcrop of granitic rocks but modified by deposition of alluvial-fan deposits on the sides of the valley, similar to those on the north side of the Río Gurabo at the foot of the Sierra de Luquillo (Broedel, 1961).

FAULT-LINE SCARPS AND VALLEYS

The rocks of the Upland province have been cut by thousands of faults. At the sides of the faults the rocks have been shattered by the movements into a gouge where ground water can seep easily; the seepage causes more rapid weathering than elsewhere in the rock mass. This so facilitates erosion that faults in the mountains of Puerto Rico are commonly marked by notches or valleys (Monroe, 1966b).

The best examples of fault-line valleys in Puerto Rico are along the Río La Venta, 10 km due north of Jayuya (for exact location, see the Florida Quadrangle topographic or geologic maps, Nelson and Monroe, 1966). The trend continues along several other valleys towards the east-southeast. At places where the movements along the fault have brought into juxtaposition two kinds of rock having different weathering and erosion characteristics, the fault may be marked by a fault-line scarp. The south wall of the valley of Río La Venta (Nelson and Monroe, 1966) and the other valleys along the same trend show the characteristics of such a fault-line scarp. Perhaps the most prominent of such fault-line scarps in Puerto Rico are the nearly straight mountain fronts on the north side of the Río Gurabo (Seiders, 1971b), which marks the line of the fault at the south side of the Sierra Luquillo, and the scarp at the north side of the Río Añasco in northwestern Puerto

FIGURE 12.—Core stones on crest of hill of quartz diorite about 2 km southeast of Juncos, in the Las Piedras area.

At least one is now partly submerged and forms the reef off the Condado section of San Juan, connecting parts of the ancient dune still above sea level at the forts of El Morro and San Cristóbal on the island of San Juan with the eolianite hills at Punta Maldonado farther east. As are the beaches, most of the eolianite is composed largely of shell fragments. The dissolving action of the salt spray of the ocean has carved the eolianite at places along the shore into an intricate topography of sharp spires and shallow basins (fig. 23) of a few centimeters relief (Kaye 1959a).

FIGURE 23 – Large solution pan dissolved in eolianite at Mar Chiquita, 5 km north of Manatí.

At several places in the northern Coastal Plains are extensive deposits of white sand composed almost exclusively of quartz. This sand was brought by rivers from areas of quartz-bearing intrusive rock to the coast where it was washed by the sea, and all clay, iron oxide, and other impurities were removed; then it was blown across the plain by the wind. Today it forms a surface of alternating low hills and depressions – low dunes and deflation hollows. The most extensive area of this white dune sand is north of Highway 2 between Manatí and Vega Baja, south of Laguna Tortuguero. This sand has been mined for use in making glass.

This is an appropriate place to mention the marine-cut terrace at the northwest corner of Puerto Rico on which an air force base was built, although the terrace is not part of the Coastal Plains province. This plain was apparently cut by the sea (Meyerhoff, 1938) at some time in the past (Monroe, 1968) when sea level was about 80 m higher than it is now. Similar wave-cut terraces in the Aguadilla area are found at several lower altitudes, especially at 40–50 m and at 10 m above sea level. All along the northern coast, traces of a fossil beach can be found 4 m above present sea level, marked at most places by eroded layers of ancient beach rock and at many places by ancient sea caves.

EASTERN COASTAL PLAINS

The eastern coast of Puerto Rico consists of rocky headlands where the mountains of the central Uplands plunge into the sea, between coastal lowlands composed of sand and cobbles discharged by rivers from the uplands to the west brought to the coast by rivers. Because much of southeastern Puerto Rico consists of granodiorite and quartz diorite, rocks which weather to clay and quartz sand, the beaches along this coast are made up largely of quartz sand and hence are firm beaches, generally lacking beachrock.

The beaches are shaped by long-shore currents. This effect is especially well shown at El Morillo at the southwestern end of Puerto de Humacao; the beach is much wider south of the point at which a hill of volcanic rock has been partly buried by sand piled up by currents than it is to the north. This pattern is repeated at many places along the coast, such as Punta Fraile.

Beach ridges inland from the coast, especially near Humacao, indicate recent growth of the coastal plain into the sea. The larger rivers, such as Río Humacao and Río Guayanés, that enter the sea along the coast have filled their valleys with thick deposits of sandy alluvium that provide a nearly unlimited store of underground water.

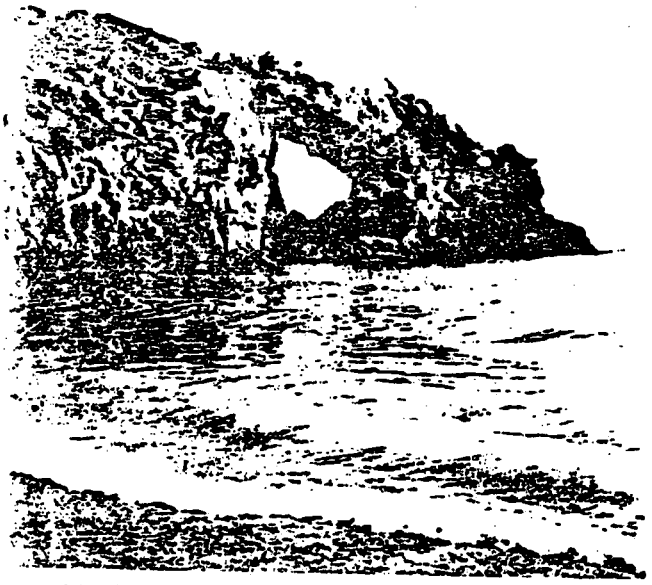
SOUTHERN COASTAL PLAINS

Whereas the northern Coastal Plains are characterized by sand beaches that pass landward into broad playa plains of sand and clay, the southern Coastal Plains, particularly the part between Ponce and Guayama, consists of a series of great alluvial fans of poorly sorted clastic debris from the mountains to the north. Nearly every stream or arroyo that reaches the Coastal Plains ends in a fan, and the larger drainage basins end in fans that have a radius of as much as 5 km. All the fans have a noticeable though gentle slope from the apex in all southerly directions. The fan of the Río Salinas (whose upstream name is Río Majada) extends from Coqui to Salinas and has its apex nearly as far north as Sabana Llana. The large alluvial fan north of Bahía de Jobos, farther east, shows exceptionally well on the Central Aguirre Quadrangle (Berryhill, 1960) as a set of very regular convex topographic contours.

Gravel and cobbles are so common in the sediments of the alluvial fans that they become concentrated at the strand line when finer material is washed away by waves and currents. Hence, most of the beaches east of Ponce are composed of cobbles. Large lagoons are less

on the southern coast than on the northern. n Bahía de Jobos has almost been closed to form oon, as has already happened at the nearby Laguna las Mareas (Berryhill, 1960) farther east. Coral reefs e present all along the southern coast but are more ndant in the western part. Mangrove swamps line ch of the coast, and at places they are gradually ering coral reefs and killing the coral.

West of Ponce, the coast is dominated by sea cliffs, rgely of middle Tertiary limestone. These are interpted, however, by several bays. At the eastern end of is stretch of coast is the Bahía de Tallaboa, which has a rthern shoreline composed largely of sediment carried the coast by the Río Tallaboa. Action of the currents as carried much of this sediment westward to form a ng spit known as Punta Guayanilla. The east side of is spit is composed of the clastic debris brought to the a by the Río Tallaboa; the west side is mostly angrove swamp. This spit forms the east boundary of he nearly land-locked Bahía de Guayanilla, into which rain the Río Guayanilla and the Río Yauco. On the uthwest side of the bay is the rocky Punta Verraco, ut the northern and western shores of the bay are composed of clastic debris carried to the sea by the rivers d are bordered at most places by mangrove swamps rocky headlands. West of the Punta Verraco is the cky cliff into which Punta Ventana (fig. 24) has been ssolved.



URE 24.—Punta Ventana, a natural window dissolved in Miocene estone at edge of Caribbean Sea, 6 km south-southwest of Guayanilla.

West of Bahía de Guayanilla, rocky headlands alternate with small areas of coastal plain composed of clastic debris and mangrove swamps. At the southwest corner of Puerto Rico are the complex multiple tombolos of Cabo Rojo in which a series of sandy beaches have been shaped by currents from the east and the north, enclosing several lagoons and connecting two rocky islands with the mainland. North of Bahía Sucia are several lagoons that have been modified into salt pans in which seawater evaporates to form sea salt, sold commercially.

WESTERN COASTAL PLAINS

The west coast of Puerto Rico is much like the east coast in that it consists of rocky headlands, where the longitudinal mountain chains of Puerto Rico plunge into the sea, transecting wide coastal plains, where the major west-flowing rivers enter the sea. The alluvium brought in by these rivers has been shaped by long-shore currents into a number of cuspate beaches, some of which have been extended beyond the lowland areas to form narrow beaches at the foot of headlands. Mangrove swamps are common at the sides of and behind beach deposits.

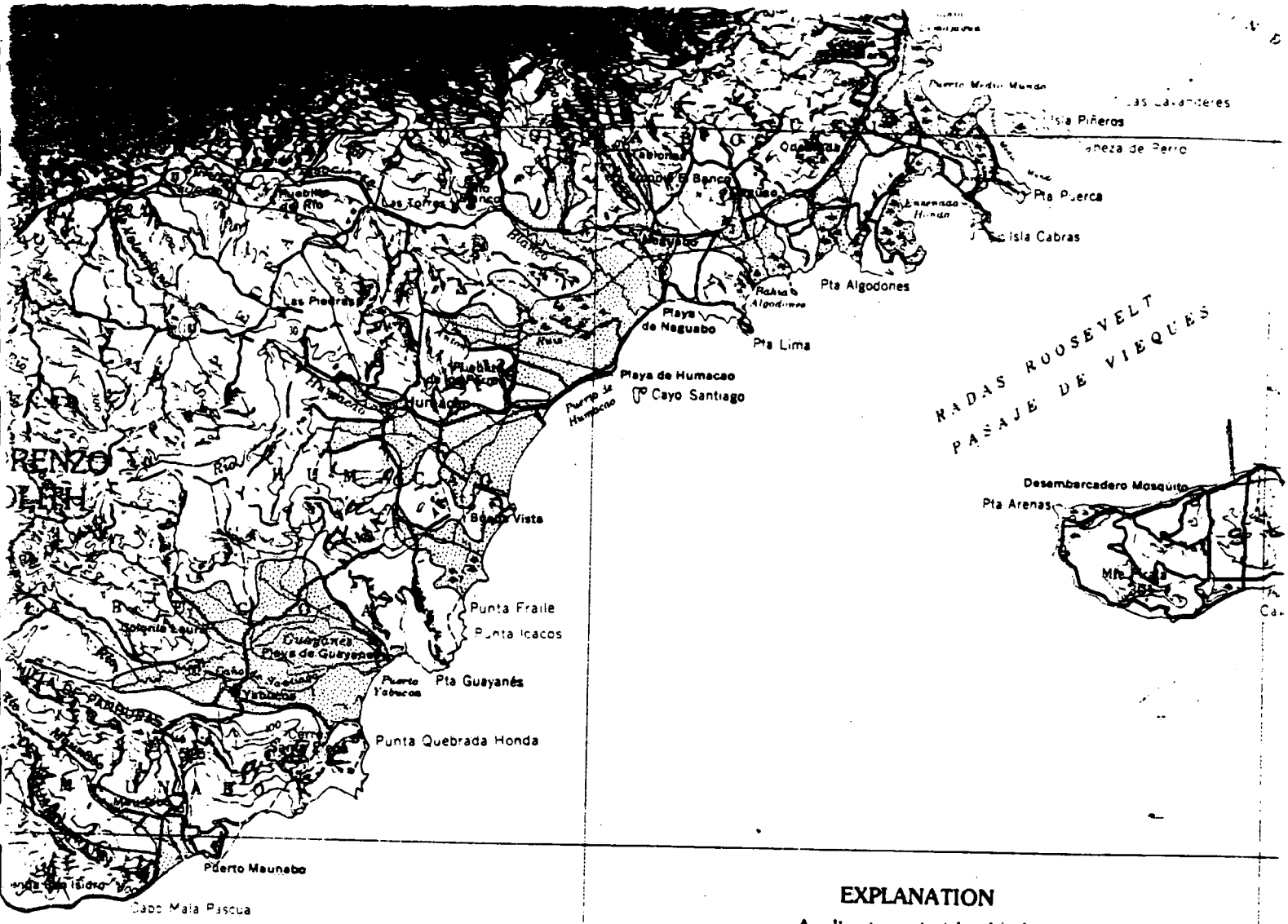
The north wall of the Añasco Valley is apparently a faultline scarp that can be traced southeast to the Ponce area (Cox and Briggs, 1973), but the fault itself is concealed near Añasco by thick alluvial deposits of the Río Grande de Añasco. The beach of Bahía de Añasco has advanced seaward a few hundred meters, as shown by the beach ridges behind the present beach.

In contrast to the stony beaches of the south coast, those of the west coast are sandy, probably because the rivers feeding them are longer, less precipitous, and carry more sand and fewer cobbles to the sea.

LAJAS VALLEY

One of the most interesting geomorphologic features in Puerto Rico is the Lajas Valley. Until the Pleistocene Epoch this valley was a strait that separated Sierra Bermeja and other hilly areas of southwest Puerto Rico from the main island. The valley is nearly flat; formerly a number of lakes or lagoons were present, but all have been drained by canals except Laguna Cartagena. The highest divide in the valley is about 2 km east of Laguna Cartagena where Highway 303 crosses the valley at an altitude of 13 m.; from this divide the surface slopes irregularly both east toward the Río Loco and west toward Boquerón. The subsoil of the valley consists of a mass of alluvium, several hundred meters thick at some places.

Apparently the Lajas Valley was originally formed by block faulting when the Sierra Bermeja was faulted up from the main area of Puerto Rico and was tilted toward



EXPLANATION

Applies to main island only

Upland province

Northern Karst province

Coastal Plains province

224 000

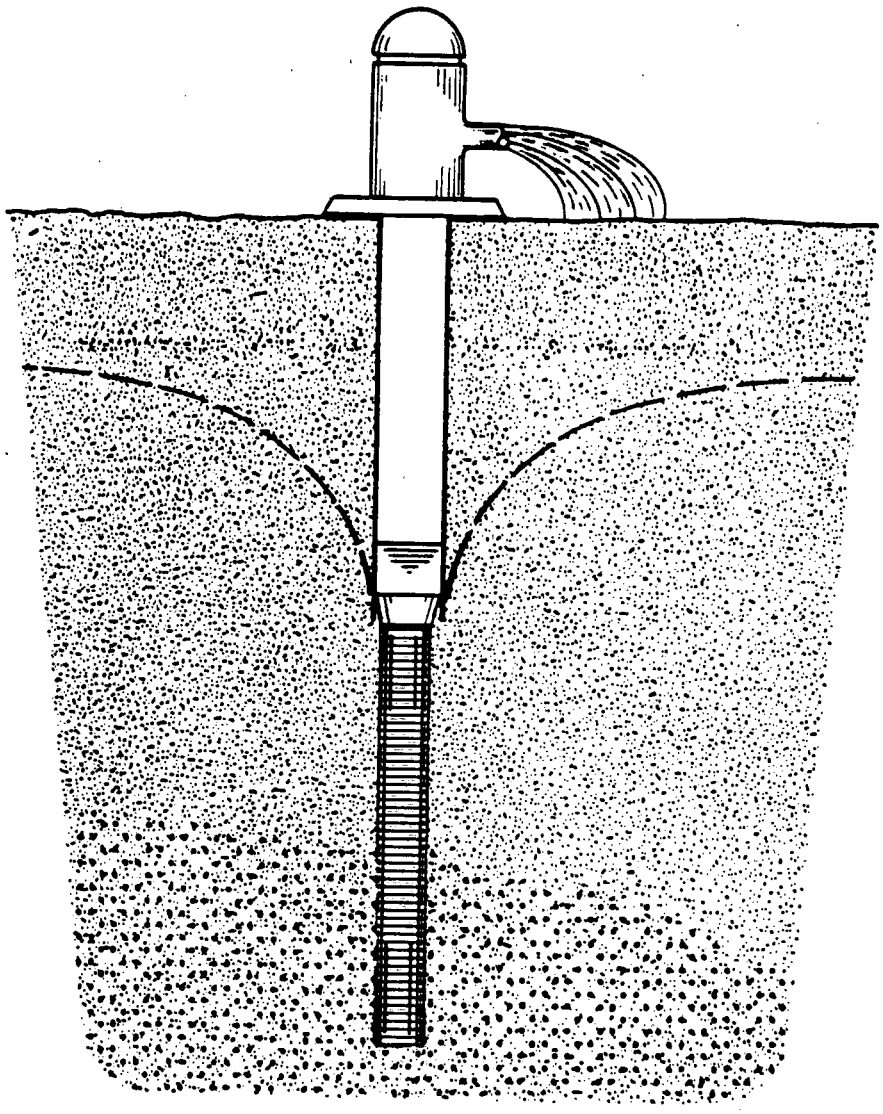
65°45'

65°30'

REFERENCE 15

RON NAMAN

RECONNAISSANCE OF GROUND-WATER QUALITY THROUGHOUT PUERTO RICO, SEPTEMBER-OCTOBER 1981



UNITED STATES GEOLOGICAL SURVEY WATER RESOURCES DIVISION OPEN-FILE REPORT 82-332

Prepared in cooperation with the ENVIRONMENTAL QUALITY BOARD OF PUERTO RICO

1982

RECONNAISSANCE OF GROUND-WATER QUALITY THROUGHOUT PUERTO RICO, SEPTEMBER-OCTOBER 1981

By

Fernando Gómez-Gómez and Senén Guzmán-Ríos

INTRODUCTION

The quality of ground water in the aquifers throughout Puerto Rico is one of the major knowledge gaps in the islands's hydrologic environment. There are no active ground-water monitoring networks. Previous data have been generated from areal studies conducted by the U.S. Geological Survey and other agencies involved in water resources investigations. This type of data are limited in scope and areal extent, tailored to the particular investigation.

The demand for ground water in Puerto Rico has increased dramatically during the last decade (Gómez-Gómez and Heisel, 1980). This often results in overpumpage of wells. In coastal areas, seawater encroachment has been detected (Díaz, 1979). Contaminants can migrate into aquifers from accidental spills, waste disposal, agricultural practices or land application of wastes. The extent of contamination of ground waters in the principal aquifers is not known.

An Island-wide sampling of ground waters was conducted by the U.S. Geological Survey, Water Resources Division, between September and October 1981. The project, in cooperation with the Environmental Quality Board of Puerto Rico, was designed to collect baseline physical, chemical, and bacteriological data from selected wells and springs at the principal aquifers throughout Puerto Rico. Emphasis was placed in collecting samples from wells in the north coast limestone and south coast - alluvial water-table aquifers. These are the areas of more intense ground-water development.

METHODS AND PROCEDURES

Samples were collected from 57 selected wells and springs throughout Puerto Rico (fig. 1). Methods described by Greeson and others (1977), Skougstad and others (1979), and Goerlitz and others (1972) were used for collection and analyses of the samples. Field determinations were made of pH, temperature, and total alkalinity (as calcium carbonate, $CaCO_3$). Incubation of filtered samples for the determination of total, fecal, and fecal streptococci bacteria was begun shortly after collection of the samples. Raw and filtered samples were processed and preserved for further analyses (tables 1 thru 4). The samples were analyzed at the U.S. Geological Survey, Water Resources Division Central Laboratory in Doraville, Georgia. All parameters for which analyses were conducted and concentrations determined are stored in the U.S. Geological Survey's National Water Data Storage and Retrieval System (WATSTORE).

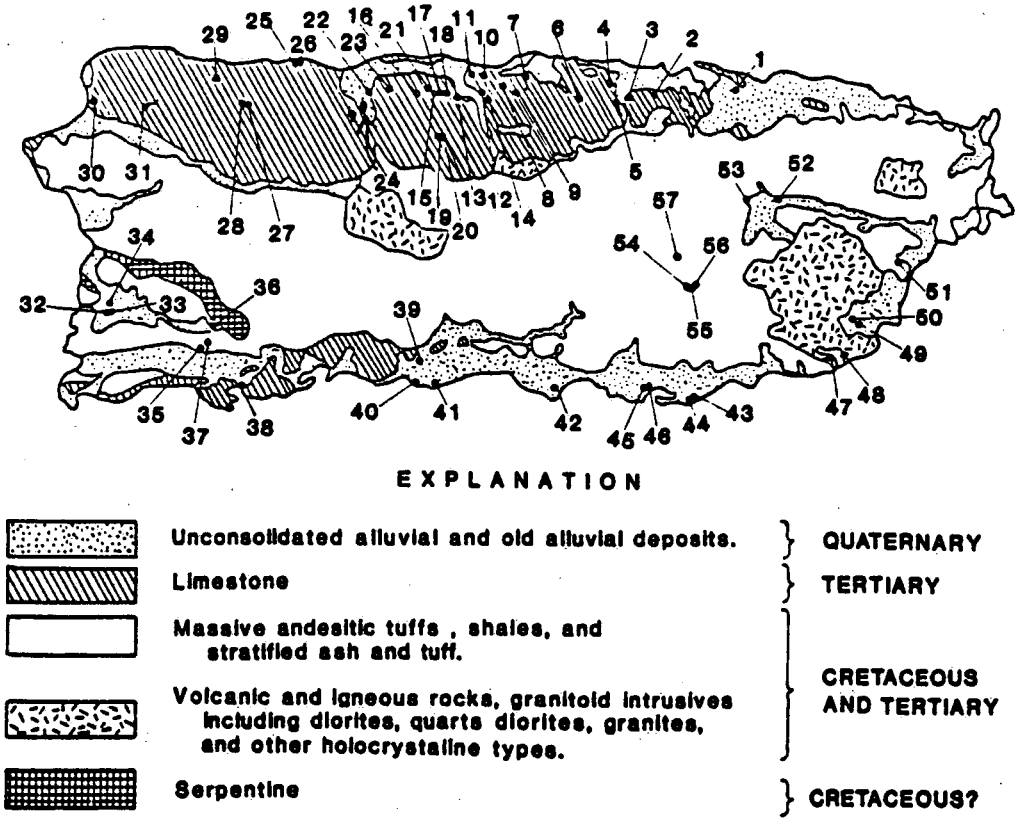
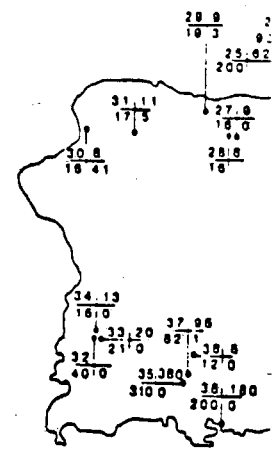


Figure 1.--Geologic formations and sampled sites.



REPO

Sodium, ir

Chloride, i

Fecal coli per 10C

Figure 2.--Concentra

RESULTS

Results of the field and laboratory analyses are summarized in tables 1 thru 4. The following general conclusions can be derived from the data:

1. High salinity is the principal problem in ground waters throughout Puerto Rico. Samples from wells in both the north and south coast aquifers have high chloride concentrations (fig. 2). Three major sources are apparent: (a) seawater intrusion, (b) concentration of salts from irrigation practices and, (c) residual salts contained in various rock formations.

2. About one third of the sampled wells and springs were positive for fecal coliform bacteria (fig. 2), an indicator of fecal matter or sewage contamination. This indicates that domestic wastes now discharged or infiltrating into the aquifers move within a short period of time into areas tapped by water-supply wells or into the source of springs.

3. The detection of trace organics at several wells indicates that more serious contamination of the aquifers could be occuring (tables 3 and 4). Additional sampling and more intense investigations at suspected areas within the north coast limestone aquifers will be required. In contrast, there seems to be no contamination of the shallow alluvial aquifer on the south coast by chlorinated pesticides, eventhough these were used intensively on sugarcane crops.

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of bacteria in wate
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A first-time
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Brown, E., Skougst
collection a
and gases:
Investigatio

Díaz, J.R., 1979,
1966-67: U.

Table 1.--Phys

WELL MAP NUMBER	LAT/LONG	MUNICIPALITY	DEPTH OF WELL (FT)	DEPTH OF WATER (FT)	pH	SC	T	Ca	Mg
1	182550660309	Hato Rey, SJ	205	33	7.0	632	27.0	102	11.0
2	182548661223	Toa Baja	(150)	(10)	7.0	464	25.5	98	4.7
3	182518661441	Toa Baja	(300)	28	7.3	1220	26.0	99	26.0
4	182636661641	Dorado	(200)	50	7.1	526	25.5	89	5.4
5	182446661555	Dorado Hwy 693	Spring (2 cfs)		7.2	354	26.5	58	2.5
37	180234665809	Sabana Grande	(250)	(15)	6.9	1040	27.5	110	31
38	175810665445	Guanica	(140)	26	7.2	1600	27.0	54	100
39	180022663635	Ponce	135	12	6.8	672	28.0	72	14
40	175930663702	Ponce	185	15	7.2	794	29.5	91	16
41	175948663511	Ponce	170	13	7.1	708	27.0	95	19
42	175814662257	Santa Isabel	150	28	7.1	876	27.0	59	26
43	175738660845	Guayama	100	30	6.8	1140	28.0	81	35
44	175736660859	Guayama	150	11	6.9	444	28.0	40	17
45	175826661344	Salinas	(80)	(10)	7.4	536	28.0	43	21
46	175823661312	Salinas	105	11	7.5	1500	28.5	32	12
47	180013655450	Maunabo	80	10	6.8	560	27.0	38	19
48	180011655343	Maunabo	125	17	6.8	504	27.0	40	18
49	180339655237	Yabucoa	150	23	6.8	456	27.0	30	13
50	180327655153	Yabucoa	120	13	6.2	580	27.5	43	25
51	180859654741	Humacao	100	17	7.3	652	27.5	30	11
52	181549655921	Gurabo	160	31	6.6	1120	26.0	82	52
53	181540660219	Caguas	140	40	6.4	444	25.5	36	23
54	180708660842	Cayey	(220)	(12)	7.0	668	24.0	46	13
55	180718660832	Cayey	(205)	(11)	6.9	798	24.5	44	16
56	180741660807	Cayey	(167)	(11)	6.8	808	25.0	66	23
57	181037660945	Cidra	(200)	(93)	6.7	590	24.5	50	29

EXPLANATION

pH, units (values in parenthesis measured in laboratory)

SC, specific conductance, micromhos per centimeter at 25° Celcius (values measured in laboratory)

T, temperature in °Celsius

Ca, Calcium
Mg, Magnesium
Na, Sodium
K, Potassium
HCO_3, Bicarbonate
Cl, Chloride
} Concentration in milligrams per liter (mg/L)

TOC, Total organic carbon in milligrams

Fe, Iron (Ferric + Ferrous)
Mn, Manganese
Phenols, total
} Concer micro lite

TC, Total coliforms
FC, Fecal coliforms
FS, Fecal streptococci
} In co 100 mi se

N - non ideal count

REFERENCE 16

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

YABUCOA QUADRANGLE
PUERTO RICO
7.5 MINUTE SERIES (TOPOGRAPHIC)

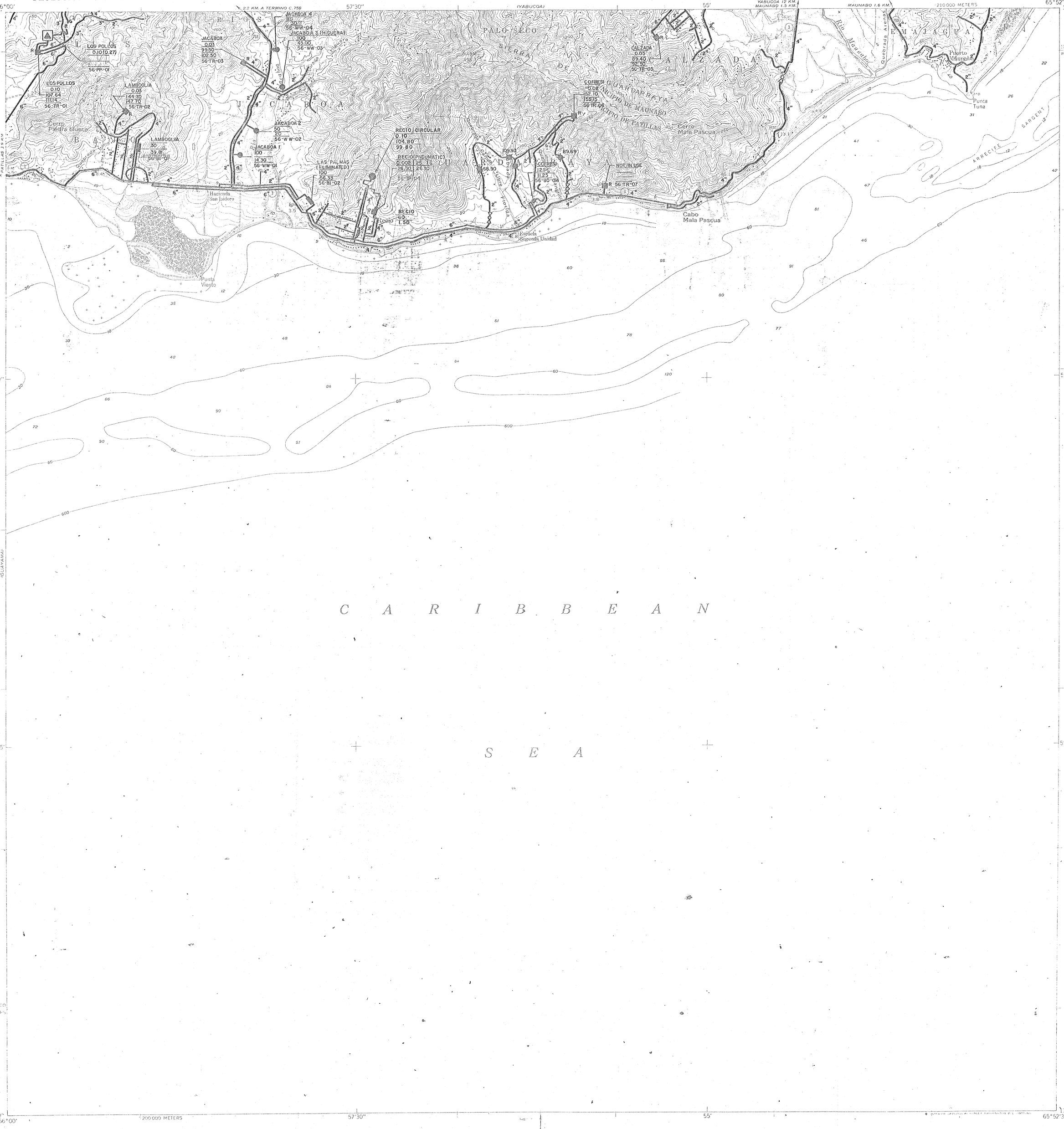
55

54
56
50
60
(CAGUAS)
CAGUAS 21 KM.
SAN LORENZO (EMP. C. 183) 11 KM.
(JUNCOS)
(PATILLAS)
(PUNTA GUAYANES)
(PUNTA TUNA)
PATILLAS 17 KM.
GUAYAMA 33 KM.
PUERTO MAUNABO 1.4 KM.
GUAYAMA 20 KM.
PATILLAS (EMP. C. 3) 5.6 KM.
1.4 KM. A EMP. C. 3
2.6 KM. A EMP. C. 3
66°00'
65°52'30"
18°07'30"
18°00'
57'30"
55'
2'30"
210 000 METERS
200 000 METERS
132 000 METERS
20 000 METERS
SIERRA DE CAYEY
LIMONES
Martorell
Escuela Segunda Unidad
Limones
Río Grande de Arecibo
Río Grande de Loíza
Río Grande de Patillas
Río Guayanés
Río Guayabota
Río Marín
Río Matuyas
Río Pica y Panduras
Río Palo Seco
Río Maunabo
Río Santiago
Río Limones
Río Grande de Maunabo
Río Grande de Arecibo
Río Grande de Loíza
Río Grande de Patillas

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PUNTA TUNA QUADRANGLE
PUERTO RICO
7.5 MINUTE SERIES (TOPOGRAPHIC)

56



BASE MAP LEGEND

SCALE 1:20000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 METERS
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

Primary highway, all weather, hard surface
Light-duty road, all weather, improved surface
Secondary highway, all weather, hard surface
Unimproved road, fair or dry weather
Insular Route

N

QUADRANGLE LOCATION

FACILITIES LEGEND

DESIGN CAPACITY (M.G.D.)/(PRODUCTION(M.G.D.)) — WATER ELEV.(MTS.) — FLOOR ELEV.(MTS.) — Partial Plant

DESIGN CAPACITY (M.G.D.)/(PRODUCTION(M.G.D.)) — WATER ELEV.(MTS.) — FLOOR ELEV.(MTS.) — Package Plant

DES'GN CAPACITY (M.G.D.)/(PRODUCTION (M.G.D.)) — WATER ELEV.(MTS.) — FLOOR ELEV.(MTS.) — Filter Plant

DESIGN CAPACITY (G.P.M.) — ELEV.(MTS.) — Well

CAPACITY (M.G.) — BOTTOM ELEV.(MTS.) — WATER ELEV.(MTS.) — Tank (P=PNEUMATIC R=RESERVOIR)

DESIGN CAPACITY (G.P.M.) — FLOOR ELEV.(MTS.) — Inline Booster Pump Station

DESIGN CAPACITY (G.P.M.) — FLOOR ELEV.(MTS.) — Pump Station

04-TR-10 — Facility Number

CEDRO ARRIBA — Facility Name

R — TANK: CAPACITY (M.G.) — BOTTOM ELEV.(MTS.) — WATER ELEV.(MTS.) — PUMP STATION: DESIGN CAPACITY (G.P.M.) — FLOOR ELEV.(MTS.) — Tank & Pump Station

4" R — Raw Water Pipe

4" — Distribution Pipe

Pressure Reducing Valve — ELEV.(MTS.)

Open Valve

Closed Valve

Intake — WEIR ELEV.(MTS.)

Intake & Pump Station (at Intake) — WEIR ELEV.(MTS.)

Chlorine Application (at Intake or Tank)

Dam

COMMONWEALTH OF PUERTO RICO
AQUEDUCT AND SEWER AUTHORITY

WATER SUPPLY SYSTEMS MAP
PUNTA TUNA

Santiago Vázquez Flaherty • Giavara SVFG
403 PANGUE STREET, SAN JUAN, PUERTO RICO 809-726-2323, 726-2324
Estado Libre Asociado de Puerto Rico
AUTORIDAD DE ACUEDUCTOS Y ALCANTARILLADOS

DATE: JAN. 1983

MAP NUMBER: 56

REFERENCE 17

NOT TO BE SOLD

PRELIMINARY REPORTS

1980 Census of Population and Housing

PHC80-P-53

PUERTO RICO

Preliminary Population and Housing Unit Counts

This report is based on preliminary counts of population and housing units as compiled in the 1980 census district offices. The series consists of 56 reports—number 1 for the United States; numbers 2 through 52 for the States and the District of Columbia in alphabetical order rather than in order of publication; and numbers 53 through 56 for Puerto Rico, Guam, Virgin Islands, and American Samoa. Preliminary counts for the Northern Mariana Islands and the remainder of the Trust Territory of the Pacific Islands are not part of this series of reports. These counts will be made available in a separate press release issued for each area.

As of April 1, 1980, the population of Puerto Rico was 3,187,570, according to a preliminary count of the returns of the 1980 census. This figure represents an increase of 475,537, or 17.5 percent, from the 2,712,033 inhabitants enumerated in the 1970 census.

The preliminary count of housing units in Puerto Rico as of April 1, 1980, was 990,172. This figure, which includes both occupied and vacant housing units, represents an increase of 276,459, or 38.7 percent, from the 713,713 units enumerated in the 1970 census.

This report presents preliminary 1980 census population and housing unit counts for the Commonwealth, municipios, municipio subdivisions, zonas urbanas, and standard metropolitan statistical areas (SMSA's).

The 1970 data are presented only for Puerto Rico and its municipios. The boundaries used in the 1970 census did not represent the official boundaries of some of the barrios, ciudades, and pueblos.

These preliminary figures will be superseded by the final counts to be shown in Advance Reports, series PHC80-V, which will be issued within the next few months. The final counts are subject to further processing and review and may differ from the preliminary figures.

An outline of the publication and computer tape program for the 1980 Census of Population and Housing can be obtained free of charge from the Data User Services Division, Bureau of the Census, Washington, D.C. 20233.

Symbols used in tables. A dash "-" represents zero. Three dots "..." means not applicable, and "(NA)" means not available. The prefix " ' " indicates that the count has been revised since publication of 1970 census reports.

Issued February 1981

U.S. Department of Commerce
BUREAU OF THE CENSUS

For Sale by the Bureau of the Census and U.S. Department of Commerce District Offices, 45 cents

Table 1. Population and Housing Unit Counts for Puerto Rico by Municipios and Municipio Subdivisions: 1980 and 1970—Con.

(Counts relate to areas as delineated at each census. Information on boundary changes will be shown in the PC80-1 A report for this area. For meaning of symbols see text)

Puerto Rico Municipios Municipio Subdivisions	Population 1980 (prelim inary)	Population 1970	Housing units 1980 (prelim inary)	Housing units 1970
Manati Municipio	36 480	30 559	11 656	8 713
• Bauro Adentro barrio	2 128		655	
Bauro Afuera barrio	267		91	
Coto Norte barrio	7 791		2 345	
Manati zona urbana (pt.)	3 414		1 015	
Coto Sur barrio	7 830		2 413	
Manati zona urbana (pt.)	5 556		1 676	
Manati pueblo	8 284		2 915	
Manati zona urbana (pt.)	8 284		2 915	
• Rio Arriba Poniente barrio	1 601		579	
• Rio Arriba Saliente barrio	2 315		774	
Tierras Nuevas Poniente barrio	2 857		913	
Tierras Nuevas Saliente barrio	3 417		1 071	
Maricao Municipio	6 617	5 991	2 079	1 659
Bucarabones barrio	603		180	
Indiera Alta barrio	1 323		463	
Indiera Baja barrio	460		134	
Indiera Fria barrio	520		176	
Maricao pueblo	1 220		370	
Maricao zona urbana (pt.)	1 220		370	
Maricao Afuera barrio	1 477		471	
Maricao zona urbana (pt.)	183		53	
Montoso barrio	1 014		285	
Maunabo Municipio	11 785	10 792	3 196	2 611
Calzada barrio	1 432		360	
Emajagua barrio	3 132		882	
Maunabo zona urbana (pt.)	522		140	
Lizas barrio	906		221	
Matuyas Alta barrio	239		68	
Matuyas Baja barrio	321		98	
Maunabo pueblo	727		253	
Maunabo zona urbana (pt.)	727		253	
Palo Seco barrio	1 923		515	
Quebrada Arenas barrio	2 382		590	
Maunabo zona urbana (pt.)	1 493		371	
Talante barrio	723		209	
Maunabo zona urbana (pt.)	250		58	
Mayaguez Municipio	95 886	85 857	31 626	23 908
Algarrobos barrio	5 324		1 537	
Mayaguez zona urbana (pt.)	5 324		1 537	
Bateyes barrio	1 030		363	
Guanajibo barrio	7 202		2 129	
Mayaguez zona urbana (pt.)	7 202		2 129	
Isla de Mona e Islote Monito barrio			6	
Juan Alonso barrio	1 223		390	
Mayaguez zona urbana (pt.)	882		284	
Leguisamo barrio	1 370		421	
Limon barrio	1 482		485	
Malezas barrio	960		293	
Mayaguez ciudad	40 149		13 980	
Mayaguez zona urbana (pt.)	40 149		13 980	
Mayaguez Arriba barrio	5 786		1 769	
Mayaguez zona urbana (pt.)	5 786		1 769	
Miradero barrio	4 111		1 422	
Mayaguez zona urbana (pt.)	4 111		1 422	
Montoso barrio	808		253	
Naranjales barrio	571		175	
Quebrada Grande barrio	4 544		1 873	
Mayaguez zona urbana (pt.)	4 100		1 751	
Quemado barrio	2 003		682	
Rio Canas Abajo barrio	1 408		431	
Mayaguez zona urbana (pt.)	881		258	
Rio Canas Arriba barrio	1 334		391	
Rio Hondo barrio	2 607		813	
Mayaguez zona urbana (pt.)	1 925		584	
Rosario barrio	753		189	
Sabalos barrio	9 819		2 980	
Mayaguez zona urbana (pt.)	9 819		2 980	
Sabanetas barrio	3 402		1 064	
Mayaguez zona urbana (pt.)	2 574		748	
Moca Municipio	29 309	22 361	7 969	5 569
Aceitunas barrio	2 634		723	
Capa barrio	2 131		523	
Centro barrio	784		208	
Cerro Gordo barrio	2 700		642	
Cruz barrio	835		253	
Cuchillas barrio	3 895		993	
Marias barrio	1 272		351	
Moca pueblo	2 309		721	
Moca zona urbana (pt.)	2 309		721	
Naranjo barrio	1 864		503	
Plata barrio	692		168	
Pueblo barrio	3 784		1 052	
Moca zona urbana (pt.)	1 581		407	
Rocha barrio	3 078		926	
Voladoras barrio	3 331		906	
Morovis Municipio	21 145	19 059	5 454	4 095
• Barahona barrio	2 906		788	
Cuchillas barrio	1 018		254	
Franquez barrio	3 596		916	
Monte Llano barrio	1 979		502	
Morovis Municipio—Con.				
Monte Llano barrio—Con.				
Morovis zona urbana (pt.)	1 059		271	
Morovis pueblo	1 463		500	
Morovis zona urbana (pt.)	1 463		500	
Morovis Norte barrio	1 408		393	
Morovis zona urbana (pt.)	114		28	
Morovis Sud barrio	1 654		398	
Pasto barrio	700		157	
Perchas barrio	946		218	
Rio Grande barrio	597		143	
San Lorenzo barrio	1 046		253	
Torrecillas barrio	421		123	
Unibon barrio	2 693		649	
Vega barrio	715		160	
Naguabo Municipio	20 633	17 996	6 914	5 026
Daguao barrio	2 006		746	
Duque barrio	2 679		878	
Naguabo zona urbana (pt.)	675		200	
Mucares barrio	1 415		511	
Maizales barrio	1 245		382	
Mariana barrio	1 447		535	
Naguabo pueblo	2 056		845	
Naguabo zona urbana (pt.)	2 056		845	
Pena Pobre barrio	3 157		878	
Rio barrio	2 615		870	
Naguabo zona urbana (pt.)	1 409		446	
Rio Blanco barrio	3 072		1 012	
Santiago y Lima barrio	941		257	
Naranjito Municipio	23 613	19 913	6 572	4 444
Achiote barrio	3 688		1 004	
Naranjito zona urbana (pt.)	935		236	
Anones barrio	3 204		869	
Cedro Abajo barrio	3 216		895	
Cedro Arriba barrio	2 780		605	
Guadiana barrio	3 256		897	
Naranjito zona urbana (pt.)	152		87	
Lomas barrio	3 027		854	
Naranjito pueblo	1 758		587	
Naranjito zona urbana (pt.)	1 758		587	
Nuevo barrio	3 184		881	
Orocovis Municipio	19 304	20 701	5 230	4 340
Ala de la Piedra barrio	389		158	
Barros barrio	1 574		373	
Bauta Abajo barrio	1 349		374	
Bauta Arriba barrio	467		135	
Bermejales barrio	672		165	
Botijas barrio	3 391		902	
Cacaos barrio	489		173	
Collores barrio	61		31	
Damian Abajo barrio	562		133	
Damian Arriba barrio	876		220	
Gato barrio	1 171		373	
Mata de Canas barrio	585		169	
Orocovis barrio	3 101		793	
Orocovis pueblo	1 257		378	
Orocovis zona urbana	1 257		378	
Pellejas barrio	659		138	
Sabana barrio	533		139	
Saltos barrio	2 218		574	
Patillas Municipio	17 820	17 878	5 083	4 331
Apeadero barrio	795		228	
Bajo barrio	1 696		499	
Cacao Alto barrio	1 744		381	
Patillas zona urbana (pt.)	319		107	
Cacao Bajo barrio	1 771		459	
Patillas zona urbana (pt.)	191		39	
Egoscue barrio	141		30	
Guardarraya barrio	1 770		545	
Jacabao barrio	1 081		303	
Jaguel barrio	349		108	
Mamey barrio	1 795		457	
Patillas zona urbana (pt.)	1 200		279	
Marin barrio	1 307		344	
Patillas zona urbana (pt.)	323		86	
Mulas barrio	599		148	
Munoz Rivera barrio	565		169	
Patillas pueblo	1 115		445	
Patillas zona urbana (pt.)	1 115		445	
Pollos barrio	2 313		599	
Quebrada Arriba barrio	868		222	
Rios barrio	501		151	
Penuelas Municipio	18 238	15 973	5 098	3 553
Barrizal barrio	385		106	
Coto barrio	1 032		286	
Cuebas barrio	395		127	
Emajagua barrio	1 816		480	
Jaguas barrio	998		296	
Penuelas zona urbana (pt.)				
Macana barrio	821		237	

Table 2 Population and Housing Unit Counts for Zonas Urbanas: 1980 and 1970

[Counts relate to places as delineated at each census. Information on boundary changes will be shown in the PL 94-171 report for this area. For meaning of symbols see text]

Zonas Urbanas	Municipios	Population 1980 (preliminary)	Population 1970	Housing units 1980 (preliminary)	Housing units 1970
Adjuntas zona urbana	Adjuntas	5 184		1 599	
Aguada zona urbana	Aguada	5 028		1 541	
Aguadilla zona urbana	Aguadilla	20 879		6 831	
Aguas Buenas zona urbana	Aguas Buenas	3 769		1 136	
Aibonito zona urbana	Aibonito	9 369		2 717	
Anasco zona urbana	Anasco	5 340		1 667	
Arecibo zona urbana	Arecibo	48 586		15 302	
Arroyo zona urbana	Arroyo	8 486		2 565	
Barceloneta zona urbana	Barceloneta	4 498		1 541	
Barranquitas zona urbana	Barranquitas	3 613		1 091	
Bayamon zona urbana	Bayamon	184 854		52 835	
Cabo Rojo zona urbana	Cabo Rojo	10 254		3 505	
Caguas zona urbana	Caguas	87 718		26 494	
Camuy zona urbana	Camuy	3 832		1 272	
Canovanas zona urbana	Canovanas	7 263		2 178	
Carolina zona urbana	Carolina	147 100		47 488	
Catano zona urbana	Catano	26 318		7 632	
Cayey zona urbana	Cayey	23 315		7 000	
Ceiba zona urbana	Ceiba	4 964		1 679	
Ciales zona urbana	Ciales	3 590		1 076	
Cidra zona urbana	Cidra	6 065		1 694	
Coamo zona urbana	Coamo	12 834		3 921	
Comerio zona urbana	Comerio	5 751		1 700	
Corozal zona urbana	Corozal	5 891		1 742	
Culebra zona urbana	Culebra	937		317	
Dorado zona urbana	Dorado	10 204		3 609	
Fajardo zona urbana	Fajardo	26 845		10 076	
Florida zona urbana	Florida	3 610		1 123	
Guanica zona urbana	Guanica	9 627		3 771	
Guayama zona urbana	Guayama	21 044		6 725	
Guayanilla zona urbana	Guayanilla	6 191		1 770	
Guaynabo zona urbana	Guaynabo	65 091		19 782	
Gurabo zona urbana	Gurabo	7 646		2 746	
Hatillo zona urbana	Hatillo	5 039		1 454	
Hormigueros zona urbana	Hormigueros	11 991		3 764	
Humacao zona urbana	Humacao	19 135		6 385	
Isabela zona urbana	Isabela	12 097		3 769	
Jayuya zona urbana	Jayuya	3 577		1 012	
Juana Diaz zona urbana	Juana Diaz	10 496		3 077	
Juncos zona urbana	Juncos	7 898		2 553	
Lajas zona urbana	Lajas	4 267		1 481	
Lares zona urbana	Lares	5 178		1 555	
Las Marias zona urbana	Las Marias	801		353	
Las Piedras zona urbana	Las Piedras	4 878		1 566	
Loiza zona urbana	Loiza	3 942		962	
Luquillo zona urbana	Luquillo	4 536		2 888	
Manati zona urbana	Manati	17 254		5 606	
Maricao zona urbana	Maricao	1 403		423	
Maunabo zona urbana	Maunabo	2 992		822	
Mayaguez zona urbana	Mayaguez	82 703		27 422	
Moca zona urbana	Moca	3 890		1 128	
Morovis zona urbana	Morovis	2 636		799	
Naguabo zona urbana	Naguabo	4 140		1 491	
Naranjito zona urbana	Naranjito	2 845		870	
Orocovis zona urbana	Orocovis	1 257		378	
Patillas zona urbana	Patillas	3 148		956	
Penuelas zona urbana	Penuelas	3 471		1 063	
Ponce zona urbana	Ponce	161 760		47 380	
Quebradillas zona urbana	Quebradillas	3 787		1 164	
Rincon zona urbana	Rincon	1 702		629	
Rio Grande zona urbana	Rio Grande	12 068		3 571	
Sabana Grande zona urbana	Sabana Grande	7 368		2 551	
Salinas zona urbana	Salinas	6 740		1 946	
San German zona urbana	San German	13 093		4 159	
San Juan zona urbana	San Juan	422 701		152 766	
San Lorenzo zona urbana	San Lorenzo	8 886		2 765	
San Sebastian zona urbana	San Sebastian	10 792		3 399	
Santa Isabel zona urbana	Santa Isabel	6 965		2 036	
Toa Alta zona urbana	Toa Alta	4 419		1 197	
Toa Baja zona urbana	Toa Baja	1 979		614	
Trujillo Alto zona urbana	Trujillo Alto	41 097		12 840	
Utuado zona urbana	Utuado	11 049		3 497	
Vega Alta zona urbana	Vega Alta	10 584		2 996	
Vega Baja zona urbana	Vega Baja	18 020		5 631	
Vieques zona urbana	Vieques	2 322		1 053	
Villalba zona urbana	Villalba	3 468		862	
Yabucoa zona urbana	Yabucoa	6 782		2 095	
Youco zona urbana	Youco	14 598		4 845	

D. POLULATION SERVED BY GROUNDWATER

MUNICIPALITY	POPULATION SERVED BY GROUNDWATER	TOTAL POPULATION SERVED BY PRASA
Guayama	5,602	33,094
Hatillo	7,732	27,532
Vega Alta	35,535	37,995
*Florida	7,600	7,600
Camuy	7,381	14,981
Ciales	2,500	17,533
** Quebradillas	4,320	27,000
Ponce	123,832	240,423
***Ceiba	0	0
Caguas	24,970	123,700

* Population is served only by groundwater

** Estimated groundwater use. 16% of total population is served by groundwater

*** Water used came from other municipalities

The information was obtained from a printout of the U.S. Environemental Protection Agency Title Model State Information System, Public Water System Inventory, Subsystem Record Creation and Maintenance. The coded data in this printout was given by the Puerto Rico Aqueduct and Sewer Authority and the Department of Health.

REFERENCE 18

- Copy of CLP Data
(Redlined & marked)

- Computer QA'd printout

Site Name: Mannabe SWD
Case : 11335
Brics#: PR22
TDD#: 02-8811-24

05/10/89

SITE NAME: MAUNABO SOLID WASTE DISPOSAL
TDD#: 02-8811-24
SAMPLING DATE: 2/2/89
EPA CASE NO.: 11335
LAB NAME: SKINNER & SHERMAN

INORGANICS									
Sample ID No.	PR22-S1(MS/MSD)	PR22-S2	PR22-S3(DUP)	PR22-S4	PR22-S5	PR22-S6	PR22-RIN1(MS/MSD)	PR22-RIN2	PR22-TBLK1
Traffic Report No.	MBX379	MBX380	MBX381	MBX382	MBX383	MBX384	MBX322	MBX385	N/A
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	WATER	WATER	N/A
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L	ug/L	ug/L
Dilution Factor									
Aluminum	9970	8480	8200	10600	17000	21000			NR
Antimony									NR
Arsenic	2.1	2.2	2.1	5	3.3	3.4			NR
Barium	147	145	131	118	130	198			NR
Beryllium	J	J	J	J	J	J	J	J	NR
Cadmium		J		2.3	J				NR
Calcium	7180 E	6170 E	5910 E	9110 E	6420 E	3580 E			NR
Chromium	2.5			11.2	6.2				NR
Cobalt	J	J	J	J	J	J		14.7	NR
Copper	98.6 E	58.6 E	58.1 E	127 E	34.8 E	84.5			NR
Iron	23400 E	17800 E	16000 E	25800 E	24100 E	209000 E	J	J	NR
Lead	16	3.7	2.5	88.6	4.3	2.4			NR
Magnesium	3890 E	3030 E	35000 E	3410 E	4380 E	3300 E			NR
Manganese	337 E	274 E	282 E	345 E	611 E	397 E			NR
Mercury				0.44	0.14				NR
Nickel	J			43.5	J				NR
Potassium	J	J	J	1830	J	J		J	NR
Selenium			J	J		J			NR
Silver									NR
Sodium	J	J	J	J	J	J			NR
Thallium									NR
Vanadium	74.2 E	62.1 E	50.5 E	52.4 E	77.2 E	70.4 E		J	NR
Zinc	65.1	28.5	35.1	212	71.4	33.2	J		NR

NOTES:
Blank space - compound analyzed for but not detected
E - estimated value
J - estimated value, compound present below CRDL but above IDL
R - analysis did not pass EPA QA/QC
NR - analysis not required

05/10/89

SITE NAME: MAUNABO SOLID WASTE DISPOSAL
TDD#: 02-8811-24
SAMPLING DATE: 2/2/89
EPA CASE NO.: 11335 LAB: COMPUCHEM

VOLATILES									
Sample ID No.	PR22-S1(MS/MSD)	PR22-S2	PR22-S3(DUP)	PR22-S4	PR22-S5	PR22-S6	PR22-RIN1(MS/MSD)	PR22-RIN2	PR22-TBLK1
Traffic Report No.	BZ687	BZ688	BZ689	BZ690	BZ691	BZ692	BZ625	BZ693	BZ627
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	WATER	WATER	WATER
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/L
Dilution Factor	1	1	1	1	1	1	1	1	1
Percent Moisture	8	14	7	47	26	14	--	--	--
Chloromethane									
Bromomethane									
Vinyl Chloride									
Chloroethane									
Methylene Chloride									
Acetone			R				R	R	R
Carbon Disulfide									
1,1-Dichloroethene									
1,1-Dichloroethane									
Trans-1,2-Dichloroethene (total)									
Chloroform							J	J	J
1,2-Dichloroethane									
2-Butanone	R	R	R	R	R	R	R	R	R
1,1,1-Trichloroethane									
Carbon Tetrachloride									
Vinyl Acetate									
Bromodichloromethane									
1,2-Dichloropropane									
cis-1,3-Dichloropropene									
Trichloroethene									
Dibromochloromethane									
1,1,2-Trichloroethane									
Benzene									
trans-1,3-Dichloropropene									
Bromoform									
4-Methyl-2-Pentanone									
2-Hexanone									
Tetrachloroethene									
Toluene									
1,1,2,2-Tetrachloroethane									
Chlorobenzene									
Ethylbenzene									
Styrene									
Xylenes (Total)									

NOTES:
Blank space - compound analyzed for but not detected
B - compound found in lab blank as well as sample, indicates possible/probable blank contamination
E - estimated value
J - estimated value, compound present below CRQL but above IDL
R - analysis did not pass EPA QA/QC
N - Presumptive evidence of the presence of the material
NR - analysis not required
Detection limits elevated if Dilution Factor >1 and/or percent moisture >0%

05/10/89

SITE NAME: MAUNABO SOLID WASTE DISPOSAL
TDD#: 02-8811-24
SAMPLING DATE: 2/2/89
EPA CASE NO.: 11335 LAB: COMPUCHEM

SEMI-VOLATILES									
Sample ID No.	PR22-S1(MS/MSD)	PR22-S2	PR22-S3(DUP)	PR22-S4	PR22-S5	PR22-S6	PR22-RIN1(MS/MSD)	PR22-RIN2	PR22-TBLK1
Traffic Report No.	BZ687	BZ688	BZ689	BZ690	BZ691	BZ692	BZ625	BZ693	BZ627
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	WATER	WATER	WATER
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/L
Dilution Factor/GPC Cleanup (Y)	1	1	1	1	1	1	1	1	N/A
Percent Moisture	8	14	7	47	26	14	--	--	N/A
Phenol				620					NR
bis(2-Chloroethyl)ether									NR
2-Chlorophenol									NR
1,3-Dichlorobenzene									NR
1,4-Dichlorobenzene									NR
Benzyl alcohol									NR
1,2-Dichlorobenzene									NR
2-Methylphenol									NR
bis(2-Chloroisopropyl)ether									NR
4-Methylphenol									NR
N-Nitroso-di-n-dipropylamine									NR
Hexachloroethane									NR
Nitrobenzene									NR
Isophorone									NR
2-Nitrophenol									NR
2,4-Dimethylphenol									NR
Benzoic acid	J	R	R	R	R	R			NR
bis(2-Chloroethoxy)methane									NR
2,4-Dichlorophenol									NR
1,2,4-Trichlorobenzene									NR
Naphthalene									NR
4-Chloroaniline									NR
Hexachlorobutadiene									NR
4-Chloro-3-Methylphenol									NR
2-Methylnaphthalene									NR
Hexachlorocyclopentadiene									NR
2,4,6-Trichlorophenol									NR
2,4,5-Trichlorophenol									NR
2-Chloronaphthalene									NR
2-Nitroaniline									NR
Dimethylphthalate									NR
Acenaphthylene									NR
2,6-Dinitrotoluene									NR
3-Nitroaniline									NR
Acenaphthene									NR
2,4-Dinitrophenol									NR
4-Nitrophenol									NR
Dibenzofuran									NR
2,4-Dinitrotoluene									NR
Diethylphthalate									NR
4-Chlorophenyl-phenyl ether									NR
Fluorene									NR
4-Nitroaniline									NR

05/10/89

SITE NAME: MAUNABO SOLID WASTE DISPOSAL
TDD#: 02-8811-24
SAMPLING DATE: 2/2/89
EPA CASE NO.: 11335 LAB: COMPUCHEM

SEMI-VOLATILES									
Sample ID No.	PR22-S1(MS/MSD)	PR22-S2	PR22-S3(DUP)	PR22-S4	PR22-S5	PR22-S6	PR22-RIN1(MS/MSD)	PR22-RIN2	PR22-TBLK1
Traffic Report No.	BZ687	BZ688	BZ689	BZ690	BZ691	BZ692	BZ625	BZ693	BZ627
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	WATER	WATER	WATER
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/L
Dilution Factor/GPC Cleanup (Y)	1	1	1	1	1	1	1	1	N/A
Percent Moisture	8	14	7	47	26	14	--	--	N/A
4,6-Dinitro-2-methylphenol									NR
N-nitrosodiphenylamine									NR
4-Bromophenyl-phenyl ether									NR
Hexachlorobenzene				J					NR
Pentachlorophenol									NR
Phenanthrene									NR
Anthracene									NR
Di-n-butylphthalate	J		J	J					NR
Fluoranthene									NR
Pyrene									NR
Butylbenzylphthalate	2200	J							NR
3,3'-Dichlorobenzidine									NR
Benzo(a)anthracene									NR
Chrysene									NR
bis(2-Ethylhexyl)phthalate	1100	J		2500	680				NR
Di-n-octylphthalate									NR
Benzo(b)fluoranthene									NR
Benzo(k)fluoranthene									NR
Benzo(a)pyrene									NR
Indeno(1,2,3-cd)pyrene									NR
Dibenz(a,h)anthracene									NR
Benzo(g,h,i)perylene									NR

NOTES:
Blank space - compound analyzed for but not detected
B - compound found in lab blank as well as sample, indicates possible/probable blank contamination
E - estimated value
J - estimated value, compound present below CRQL but above IDL
R - analysis did not pass EPA QA/QC
N - Presumptive evidence of the presence of the material
NR - analysis not required
Detection limits elevated if Dilution Factor >1 and/or percent moisture >0%

05/10/89

SITE NAME: MAUNABO SOLID WASTE DISPOSAL
TDD#: 02-8811-24
SAMPLING DATE: 2/2/89
EPA CASE NO.: 11335 LAB: COMPUCHEM

PESTICIDES									
Sample ID No.	PR22-S1(MS/MSD)	PR22-S2	PR22-S3(DUP)	PR22-S4	PR22-S5	PR22-S6	PR22-RIN1(MS/MSD)	PR22-RIN2	PR22-TBLK1
Traffic Report No.	BZ687	BZ688	BZ689	BZ690	BZ691	BZ692	BZ625	BZ693	BZ627
Matrix	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	WATER	WATER	WATER
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L	ug/L	ug/L
Dilution Factor/GPC Cleanup (Y)	1	1	1	1	1	1	1	1	N/A
Percent Moisture	8	14	7	47	26	14	--	--	N/A
alpha-BHC									NR
beta-BHC									NR
delta-BHC									NR
gamma-BHC (Lindane)									NR
Heptachlor									NR
Aldrin									NR
Heptachlor epoxide									NR
Endosulfan I									NR
Dieldrin									NR
4,4'-DDE									NR
Endrin									NR
Endosulfan II									NR
4,4'-DDD									NR
Endosulfan sulfate									NR
4,4'-DDT									NR
Methoxychlor									NR
Endrin ketone									NR
alpha-Chlordane									NR
gamma-Chlordane									NR
Toxaphene									NR
Aroclor-1016									NR
Aroclor-1221									NR
Aroclor-1232									NR
Aroclor-1242									NR
Aroclor-1248				1200					NR
Aroclor-1254									NR
Aroclor-1260									NR

NOTES:
Blank space - compound analyzed for but not detected
B - compound found in lab blank as well as sample, indicates possible/probable blank contamination
E - estimated value
J - estimated value, compound present below CRQL but above IDL
R - analysis did not pass EPA QA/QC
N - Presumptive evidence of the presence of the material
NR - analysis not required
Detection limits elevated if Dilution Factor >1 and/or percent moisture >0%

SAMPLING TRIP REPORT

SITE NAME:	Maunabo Solid Waste Disposal
TDD NO.:	02-8811-24 / PR22
SAMPLING DATE:	February 2, 1989
EPA CASE NO.:	11335

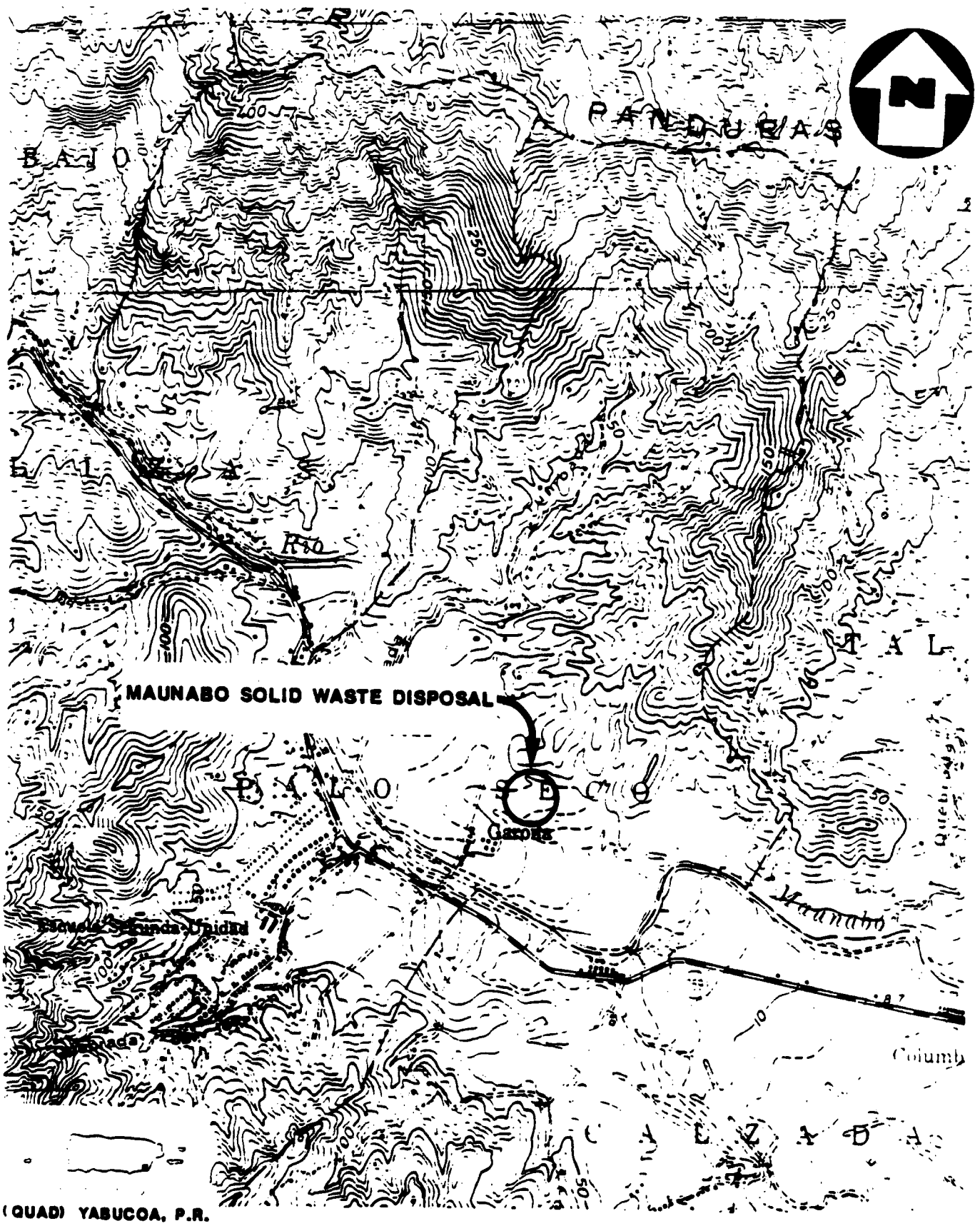
1. Site Location: See Figure 1
2. Sample Locations: See Figure 2
3. Sample Descriptions: See Table 1
4. Laboratories Receiving Samples:

Sample Type	Name and Address of Laboratory
Organic	Compu Chem Labs 3308 Chapel Hill/Nelson Hwy. RTP, NC 27709
Inorganic	Skinner & Sherman, Inc. 300 Second Avenue Waltham, MA 02254

5. Sample Dispatch Data:

A total of three aqueous and six soil/sediment samples for organic analysis were shipped by FIT 2 personnel via Federal Express under Airbill No. 40092113486 to Compu Chem Labs on February 2, 1989 at 1700 hours.

A total of two aqueous and six soil/sediment samples for inorganic analysis were shipped by FIT 2 personnel via Federal Express under Airbill No. 40092113475 to Skinner & Sherman, Inc. on February 2, 1989 at 1700 hours.



(QUAD) YABUCOA, P.R.

SITE LOCATION MAP

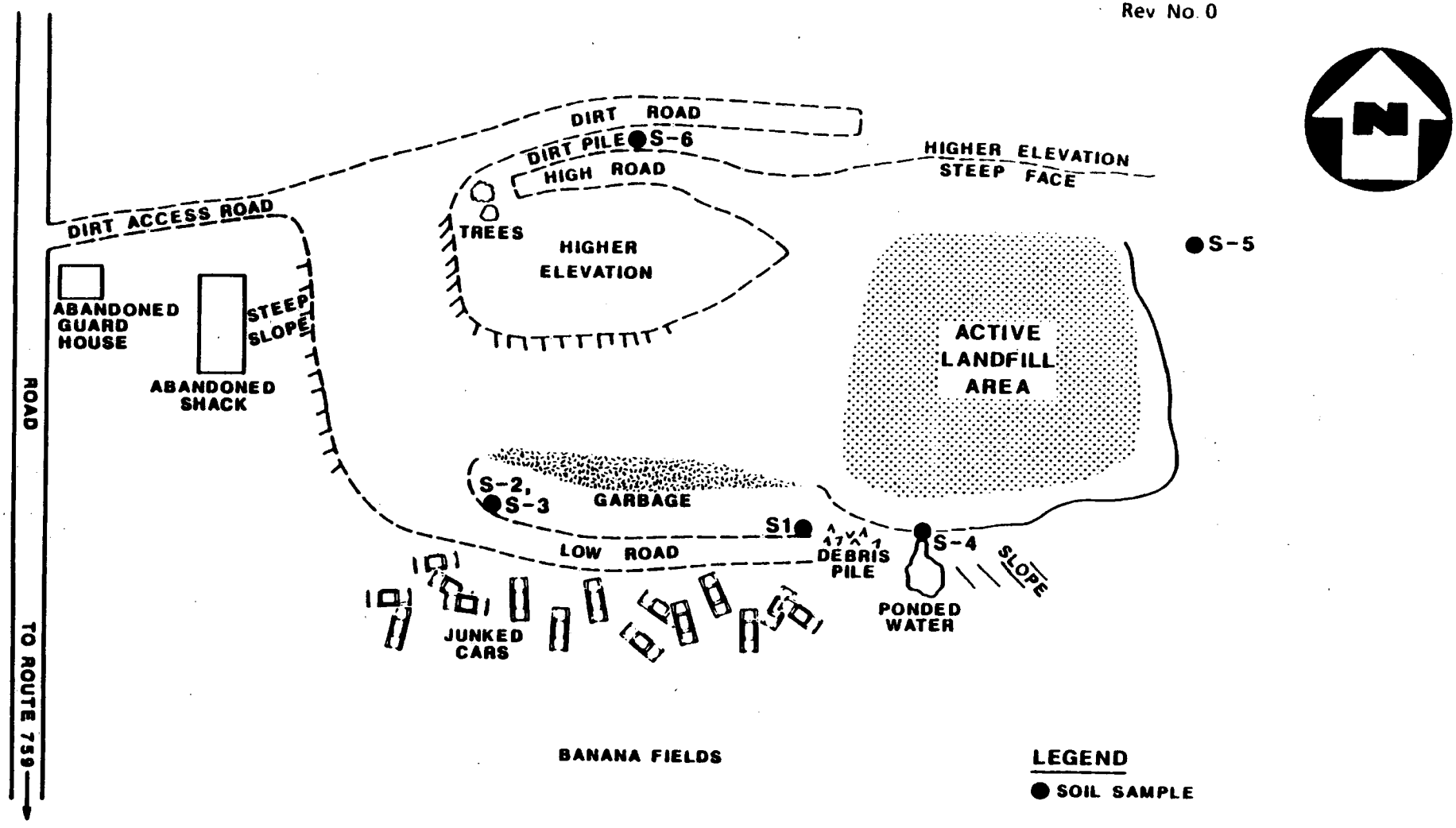
MAUNABO SOLID WASTE DISPOSAL, MAUNABO, P.R.

SCALE: 1" = 1666'

FIGURE 1

NUS CORPORATION

02-8811-24-STR
Rev No. 0



NOTE: ALL SAMPLE NUMBERS ARE PRECEDED BY PR22.

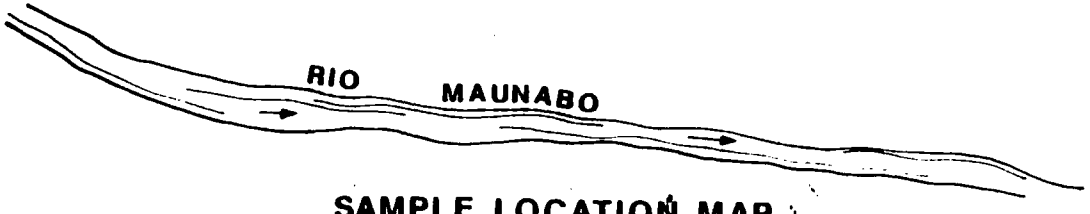


FIGURE 2

SAMPLE LOCATION MAP

MAUNABO SOLID WASTE DISPOSAL, MAUNABO, P.R.

(NOT TO SCALE)

NUS CORPORATION

TABLE I
SAMPLE DESCRIPTIONS
MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO
CASE NO. 11335

NUS Sample Number	CLP Organic Sample ID Number	CLP Inorganic Sample ID Number	Collection Time	Sample Type	Sample Location
PR22-S1* 1-1-1	BZ687 8-8-8	MBX379	0925	Soil	Surface sample taken near the base of a drum at the east end on north side of the dirt road that runs along the south edge of the landfill.
PR22-S2 1-1-1	BZ688 14-14-14	MBX380	0932	Soil	Surface sample taken at the west end on north side of the dirt road that runs along the south edge of the landfill.
PR22-S3** 1-1-1	BZ689 7-7-7	MBX381	0932	Soil	Same location as PR22-S2.
PR22-S4 1-1-1	BZ690 47-47-47	MBX382	1005	Soil	Surface sample taken approximately 25 feet east from sample location PR22-S1, at northern edge of ponded water.
PR22-S5 1-1-1	BZ691 26-26-26	MBX383	1022	Soil	Surface sample taken at the base of a drum located 20 feet east of the northeast corner of the active landfill area.
PR22-S6 1-1-1	BZ692 14-14-14	MBX384	1035	Soil	Surface sample taken at the crest on the north side of the high road along the north edge of the site.
PR22-RIN1* 1-1-1	BZ625 ---	MBX322	0955	Aqueous	Bowl rinsate collected in the field.
PR22-RIN2 1-1-1	BZ693 ---	MBX385	1030	Aqueous	Trowel rinsate collected in the field.

* Indicates that additional sample volume was collected and shipped to the laboratory for matrix spike/matrix spike duplicate (MS/MSD) analysis.

** Indicates that a sample was collected for duplicate analysis.

N/A Not applicable.

Note: Surface soil samples collected from 0-6 inches.

TABLE I (CONT'D)
SAMPLE DESCRIPTIONS
MAUNABO SOLID WASTE DISPOSAL
MAUNABO, PUERTO RICO
CASE NO. 11292

NUS Sample Number	CLP Organic Sample ID Number	CLP Inorganic Sample ID Number	Collection Time	Sample Type	Sample Location
PR22-TBLK1	BZ627	N/A	N/A	Aqueous	Trip blank, demonstrated analyte-free water obtained from NUS FIT 2.
⊢ N/A N/A	-- N/A N/A				

NOTES

N/A Not applicable.

6. Sampling Personnel:

Name	Organization	Duties on Site
Gerald Gilliland	NUS Corporation, FIT 2	Site Manager, Written and Photographic Documentation
Joe Murtaugh	NUS Corporation, FIT 2	Site Safety Officer
Roberta Riccio	NUS Corporation, FIT 2	Sample Management Officer
Jane Bullis	NUS Corporation, FIT 2	Sample Management Assistant
Rich Pagano	NUS Corporation, FIT 2	Sampler
Laura LaForge	NUS Corporation, FIT 2	Sampler

7. Weather Conditions:

80-85° F, mostly sunny, wind estimated at 5-10 mph from northwest.

8. Additional Comments:

All samples except the trip blank will be analyzed for Target Compound List (TCL) organic and inorganic compounds, excluding cyanide. The trip blank will be analyzed for volatile organic compounds only. Eileen Villafane and Annabel Ortiz of the Puerto Rico Environmental Quality Board were present to oversee sampling activities.

9. Report Prepared By: Gerald V. Gilliland Date: 2/17/89

10. Approved By: T. M[illegible] Date: 2/23/89

STANDARD OPERATING PROCEDURE

Date: [illegible]
Number: [illegible]
Revision: [illegible]

Title: Attachment 2 - CLP Data Assessment Checklist
(GC and GC/MS Analysis)
PART II: MMB Review - TOTAL REVIEW

CASE # 11335 LAB Compuchem SITE Manuabo SWD

19.0 Conclusions: (NOTE: Reviewers must red-line unacceptable data on sample data (FORM I) sheets; red-line data does not imply the compound is not present). Only the MMB reviewer has the authority to red-line unacceptable data. The letter J indicates an estimated value. In addition to the two definitions stated in the contract it also implies that the analyte is present but the quantitative value contains an unspecified degree of error. If an accurate quantity is desired, resampling/analysis is recommended.

19.1 Data Assessment 1) In the volatile fraction the samples were qualified due to calibration problems as follows:
(R) reject 2-butanone RRF <0.05 - BZ625, 627, 693, 687, 688, 689, 690, 691, 692
(R) reject acetone %RSD >90% - BZ625, 627, 693, 689
(J) estimated acetone %RSD >50% - BZ690, 691, 692
2) In the volatile fraction the samples were qualified (u) non-detect for methylene chloride, acetone and chloroform due to blank contamination: acetone - BZ687, 688, 690-692;
methylene chloride - BZ687-692
chloroform - BZ687, 688, 689, 690
TIC flagged (R) reject BZ691 - instrument artifact.

19.2 Contract Problems/Non-compliance

Reviewer's Signature: Pamela Greenlaw Date: 4/28/89
Verified By: [illegible] Date: 4/28/89

DATA ASSESSMENT: (cont.) #11335 4/28/89 P. Greenlaw

3) In the semivolatile fraction the samples were qualified due to calibration problems as follows:

(J) estimated %D/%RSD > 50%: bis(2chloroisopropyl)ether - BZ625, 693, 687-692; N-nitroso-di-n-propylamine - BZ687; 4-nitrophenol - BZ688-692; 2,4-dinitrotoluene - BZ688-692

(R) reject %D > 90%: benzoic acid - BZ688-692.

4) In the semivolatile fractions the TIC's were qualified (R) reject either due to blank contamination or aldol condensation products and (N) presumptive evidence

I. SAMPLE DATA SUMMARY PACKAGE

The Sample Data Summary Package shall contain data for samples in one Sample Delivery Group of the Case, as follows:

1. Case Narrative

2. By fraction (VOA, SV, PEST) and by sample within each fraction - tabulated target compound results (Form I) and tentatively identified compounds (Form I, TIC) (VOA and SV only)

3. By fraction (VOA, SV, PEST) - surrogate spike analysis results (Form II) by matrix (Water and/or Soil) and for soil, by concentration (Low or Medium)

4. By fraction (VOA, SV, PEST) - matrix spike/matrix spike duplicate results (Form III)

5. By fraction (VOA, SV, PEST) - blank data (Form IV) and tabulated results (Form I) including tentatively identified compounds (Form I, TIC) (VOA and SV only).

CASE#: 11335 SDG#: BZ625 SAS#

Not Used

1. Case Narrative

SAMPLE DATA SUMMARY

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] BZ625 BZ627 BZ693

[illegible] the pertinent Quality Assurance notices dealing [illegible] [illegible] water samples associated with case [illegible] [illegible] were [illegible] for low level volatile, semivolatile and [illegible] [illegible]

[illegible] samples were [illegible] in good condition [illegible] The appropriate chain-of-custody and traffic report were all in order. The temperature [illegible] was [illegible]. Sample BZ625 (rinsate-cowl) per request of [illegible] was designated as the original (or [illegible]). Sample BZ693 was a designated rinsate (rowel) and sample BZ627 was a designated trip blank scheduled [illegible] volatile analysis only. One VOA for sample BZ625 was broken in house and this occurrence was documented accordingly.

Volatiles

[illegible] volatile fractions were all analyzed within the prescribed holding time considerations. Similar concentrations of chloroform were detected in all three volatile samples. The concentration for each sample was below the contract required quantitation limit (CRQL). There were no tentatively identified compounds present in any of the samples.

SEMIVOLATILES

The semivolatile fractions associated with this case met all holding time requirements. There were no semivolatile target analytes present in any of the samples. There were also no tentatively identified compounds present.

PESTICIDES

The pesticide samples for this case met all holding time criteria. There were no pesticide target compounds present. Sample BZ625, the original for the spike evaluations, was analyzed at a 5:1 dilution.

QC SUMMARY

Surrogate recovery criteria were met for all fractions associated with this case. The matrix/matrix spike duplicate data for the volatile evaluations passed QC requirements excellently. For the semivolatile spike analyses, 2,4-Dinitrotoluene failed percent recovery. The compounds Phenol, 1,1-Dichlorobenzene, N-Nitroso-di-n-propyl (1), 4-chloro-3-Methylphenol, and 4-Nitrophenol all failed percent relative difference. In the pesticide MS/MSD evaluations, Dieldrin, Endrin, and 4,4'-DDT failed percent recovery in the MSD analysis. The pesticide spike compounds Gamma-BHC (Lindane), Aldrin, and Dieldrin failed the percent relative difference criterion. The blanks associated with this case met the QC requirements. There was one target analyte present in each of the volatile and semivolatile blanks. The concentrations for these compounds were below the CRQL. The presence of these compounds were flagged with the "B" footnote accordingly when they were present in the associated samples.

Release of the data contained in this hardcopy data package and in the [illegible] ter-readable data submitted on the floppy diskette has been authorized [illegible]

46

Toney C. Spurell

1. CASE NARRATIVE

This document shall be clearly labeled "Case Narrative" and shall contain: laboratory name; case number; sample numbers in the Sample Delivery Group (SDG), differentiating between initial analyses and re-analyses; SDG number; Contract number; and detailed documentation of any quality control, sample, shipment and/or analytical problems encountered in processing the samples reported in the data package.

Whenever data from sample re-analyses are submitted, the Contractor shall state in the Case Narrative for each re-analysis, whether it considers the re-analysis to be billable, and if so, why.

The contactor must also include documentation of any internal quality control processes used, a summary of corrective actions taken, and the resolution.

EPA CASE NARRATIVE--CASE #11335
Contract No. 68-01-7263 SDG No. BZ687
CompuChem Laboratories, Inc

Sample Numbers: BZ687 BZ688 BZ689 BZ690 BZ691 BZ692

This portion of Case #11335 consisted of 6 soil samples for volatile, semi-volatile, and pesticide analysis. The samples were received on 2-3-89 in proper, sealed shipping containers with traffic reports. The pH values of the samples were within the EPA specified range. Moisture content of the samples ranged from 7% to 47%. The remaining portion of this narrative pertains only to the volatile and semivolatile portions of this case.

VOLATILES:
All volatile fractions were analyzed within holding time requirements. TCL compounds present included methylene chloride, acetone, and chloroform. BZ691 contained one tentatively identified compound, an instrument artifact. None of the other samples contained any tentatively identified compounds. All surrogate recovery criteria were met. The QC matrix spike/matrix spike duplicate results were acceptable.

SEMIVOLATILES:
All semivolatile fractions were extracted and analyzed within holding time requirements. TCL compounds, usually phthalates, were present in all samples except BZ692. Tentatively identified compounds were present in all the samples, some of which were attributable to blank contaminants or aldol condensation. The D5-phenol surrogate recovery in samples BZ687, BZ689, BZ690, BZ691, and BZ692 exceeded QC limits. The D5-nitrobenzene surrogate recovery in sample BZ690 exceeded QC limits. All other surrogate recovery criteria were met. The QC matrix spike/matrix spike duplicate results were acceptable. The recoveries of 4-chloro-3-methylphenol, 4-nitrophenol, and 2,4-dinitrotoluene exceeded QC limits in the MS/MSD.

Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Note: This report was paginated for reference and accountability in decreasing numerical sequence.

Janet C Garrett
Janet C. Garrett 2-23-89
Technical Reviewer

EPA CASE NARRATIVE -- CASE 11335
SDG NO BZ687
Contract No 68-01-7263
Compuchem Laboratories, Inc.

Samples BZ687, BZ688, BZ689, BZ690, BZ691, BZ692

PESTICIDES
All pesticide fractions were extracted and analyzed within the proper holding time requirements. With one exception, there were no reportable levels of EPA Target Compound Lists (TCLs) compounds found in any of the samples. The exception is sample BZ690. TCL compound Aroclor (PCB) 1248 was present in this sample. A second GC column analysis was required for sample BZ690. The second GC column analysis confirmed the presence of TCL compound PCB 1248 in this sample. All samples were analyzed at a 5:1 dilution. There were several outliers present in the %D column of the Form VIIIs of the sequences included in this SDG. All outliers are associated with either hexane blanks or samples not included in this SDG. Surrogate recovery values for all samples met contract required QC limits.

In the pesticide fractions, all recovery and RPD values met QC limits. There were no reportable levels of TCL compounds present in the matrix spike BZ687MS, the matrix spike duplicate, BZ687MSD, or the two associated method blanks, PBLK18 and PBLK21. Method blank PBLK18 required a second GC column analysis because of the sample with which it was associated. Surrogate recovery values for the MS/MSD and the method blanks passed QC limits. All other data generated from the MS/MSD met QC acceptance criteria.

Release of the data contained in this hardcopy data package and in the computer readable data submitted on floppy diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Cynthia E. Edwards
Cynthia E. Edwards 02/23/89
Technical Reviewer

Note: This report is paginated for reference and accountability in decreasing numerical sequence.

Case Narrative-Case#11335
SDG No. BZ625
Contract: 68-01-7263
CompuChem Laboratories, Inc

SAMPLES BZ625, BZ627, BZ693

Attached are pertinent Quality Assurance notices dealing with the analysis of three(3) water samples associated with case 11335 SDG No. BZ625. These samples were scheduled for low level volatile, semivolatile, and pesticide analysis.

The samples were received in good condition on 2-3-89. The appropriate chain-of-custody and traffic report were all in order. The temperature upon receipt was 5C. Sample BZ625(rinsate-bowl) per request of Ann Dabyak was designated as the original for QC. Sample BZ693 was a designated rinsate(trowel), and sample BZ627 was a designated trip blank scheduled for volatile analysis only. One VOA for sample BZ625 was broken in house and this occurance was documented accordingly.

Volatiles
The volatile fractions were all analyzed within the prescribed holding time considerations. Similar concentrations of Chloroform were detected in all three volatile samples. The concentration for each sample was below the contract required quantitation limit(CRQL). There were no tentatively identified compounds present in any of the samples.

SEMIVOLATILES:
The semivolatile fractions associated with this case met all holding time requirements. There were no semivolatile target analytes present in any of the samples. There were also no tentatively identified compounds present.

PESTICIDES:
The pesticide samples for this case met all holding time criteria. There were no pesticide target compounds present. Sample BZ625, the original for the spike evaluations, was analyzed at a 5:1 dilution.

QC SUMMARY:
Surrogate recovery criteria were met for all fractions associated with this case. The matrix/matrix spike duplicate data for the volatile evaluations passed QC requirements excellently. For the semivolatile spike analyses, 2,4-Dinitrotoluene failed percent recovery. The compounds Phenol, 1,4-Dichlorobenzene, N-Nitroso-di-n-prop.(1), 4-chloro-3-Methylphenol, and 4-Nitrophenol all failed percent relative difference. In the pesticide MS/MSD evaluations, Dieldrin, Endrin, and 4,4'-DDT failed percent recovery in the MSD analysis. The pesticide spike compounds Gamma-BHC(Lindane), Aldrin, and Dieldrin failed the percent relative difference criterion. The blanks associated with this case met the QC requirements. There was one target analyte present in each of the volatile and semivolatile blanks. The concentrations for these compounds were below the CRQL. The presence of these compounds were flagged with the "B" footnote accordingly when they were present in the associated samples.

Release of the data contained in this hardcopy data package and in the computer-readable data submitted on the floppy diskette has been authorized by the

ABORATORY MANAGER or his designee, as verified by the following signature

Toney C. Spruell

TONEY C. SPRUELL 02-17-89
TECHNICAL REVIEWER

ote: This report is paginated for reference and accountability in decreasing umerical sequence.

DETECTION LIMIT CALCULATION CLARIFICATION

To protect our GC columns from unnecessary contamination, soil samples prepared according to Caucus Protocol methods are routinely diluted 5:1. Through a series of experiments we have determined that our Instrument Detection Limit for pesticides is 5X lower than the EPA Contract Required Quantitation Limit (CRQL). We, therefore, only adjust our detection limits if the dilution necessary to analyze the sample is greater than 5:1. If the sample is diluted by a factor of X the detection limit is adjusted by $\frac{X}{5}$ instead of X.

Bill DesJardins
Manager, GC Laboratory

Bob Meierer
Director, Quality Assurance

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH043764C12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 Date Analyzed: 02/07/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	11	U
74-83-9	Bromomethane	11	U
75-01-4	Vinyl Chloride	11	U
75-00-3	Chloroethane	11	U
75-09-2	Methylene Chloride	35	~~BU~~
67-64-1	Acetone	38	~~BU~~
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	~~25~~	~~BJU~~
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	11	~~UR~~
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	11	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	11	U
591-78-6	2-Hexanone	11	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH043764C12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 Date Analyzed: 02/07/89

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

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EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH043765A12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 Date Analyzed: 02/07/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	32	~~B~~ d
67-64-1	Acetone	28	~~B~~ d
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	2.0	~~B~~ d
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	~~U~~ R
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Total Xylenes	6	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GH043765A12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 Date Analyzed: 02/07/89

Column (pack/cap) PACK Dilution Factor: 1.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

Number TICs found: 0

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

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EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GR043775B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 Date Analyzed: 02/08/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	11	U
74-83-9	Bromomethane	11	U
75-01-4	Vinyl Chloride	11	U
75-00-3	Chloroethane	11	U
75-09-2	Methylene Chloride	11	U
67-64-1	Acetone	17	~~B~~ J
75-15-0	Carbon Disulfide	9	~~BJ~~ R
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	5	U
107-06-2	1,2-Dichloroethane	~~2~~ 5	~~J~~ U
78-93-3	2-Butanone	5	U
71-55-6	1,1,1-Trichloroethane	11	~~U~~ R
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	5	U
75-27-4	Bromodichloromethane	11	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
591-78-6	2-Hexanone	11	U
127-18-4	Tetrachloroethene	11	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 5.0 (g/mL) G Lab File ID: GR043775B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 Date Analyzed: 02/08/89

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43776B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 Date Analyzed: 02/09/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	19	U
74-83-9	Bromomethane	19	U
75-01-4	Vinyl Chloride	19	U
75-00-3	Chloroethane	19	U
75-09-2	Methylene Chloride	24	~~B~~ 1
67-64-1	Acetone	42	~~B~~ UJ
75-15-0	Carbon Disulfide	9	U
75-35-4	1,1-Dichloroethene	9	U
75-34-3	1,1-Dichloroethane	9	U
540-59-0	1,2-Dichloroethene (total)	9	U
67-66-3	Chloroform	~~2~~ 9	~~J~~ U
107-06-2	1,2-Dichloroethane	9	U
78-93-3	2-Butanone	19	~~UR~~
71-55-6	1,1,1-Trichloroethane	9	U
56-23-5	Carbon Tetrachloride	9	U
108-05-4	Vinyl Acetate	19	U
75-27-4	Bromodichloromethane	9	U
78-87-5	1,2-Dichloropropane	9	U
10061-01-5	cis-1,3-Dichloropropene	9	U
79-01-6	Trichloroethene	9	U
124-48-1	Dibromochloromethane	9	U
79-00-5	1,1,2-Trichloroethane	9	U
71-43-2	Benzene	9	U
10061-02-6	Trans-1,3-Dichloropropene	9	U
75-25-2	Bromoform	9	U
108-10-1	4-Methyl-2-Pentanone	19	U
591-78-6	2-Hexanone	19	U
127-18-4	Tetrachloroethene	9	U
79-34-5	1,1,2,2-Tetrachloroethane	9	U
108-88-3	Toluene	9	U
108-90-7	Chlorobenzene	9	U
100-41-4	Ethylbenzene	9	U
100-42-5	Styrene	9	U
1330-20-7	Total Xylenes	9	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43776B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 Date Analyzed: 02/09/89

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43777B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 Date Analyzed: 02/09/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	14	U
74-83-9	Bromomethane	14	U
75-01-4	Vinyl Chloride	14	U
75-00-3	Chloroethane	14	U
75-09-2	Methylene Chloride	10	~~B~~
67-64-1	Acetone	19	~~B~~ J
75-15-0	Carbon Disulfide	7	U
75-35-4	1,1-Dichloroethene	7	U
75-34-3	1,1-Dichloroethane	7	U
540-59-0	1,2-Dichloroethene (total)	7	U
67-66-3	Chloroform	7	U
107-06-2	1,2-Dichloroethane	7	U
78-93-3	2-Butanone	14	~~U~~ R
71-55-6	1,1,1-Trichloroethane	7	U
56-23-5	Carbon Tetrachloride	7	U
108-05-4	Vinyl Acetate	14	U
75-27-4	Bromodichloromethane	7	U
78-87-5	1,2-Dichloropropane	7	U
10061-01-5	cis-1,3-Dichloropropene	7	U
79-01-6	Trichloroethene	7	U
124-48-1	Dibromochloromethane	7	U
79-00-5	1,1,2-Trichloroethane	7	U
71-43-2	Benzene	7	U
10061-02-6	Trans-1,3-Dichloropropene	7	U
75-25-2	Bromoform	7	U
108-10-1	4-Methyl-2-Pentanone	14	U
591-78-6	2-Hexanone	14	U
127-18-4	Tetrachloroethene	7	U
79-34-5	1,1,2,2-Tetrachloroethane	7	U
108-88-3	Toluene	7	U
108-90-7	Chlorobenzene	7	U
100-41-4	Ethylbenzene	7	U
100-42-5	Styrene	7	U
1330-20-7	Total Xylenes	7	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43777B12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 Date Analyzed: 02/09/89

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 1

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	INSTRUMENT ARTIFACT	0.80	39	JR

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EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43778C12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 Date Analyzed: 02/09/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
74-87-3	Chloromethane	12	U
74-83-9	Bromomethane	12	U
75-01-4	Vinyl Chloride	12	U
75-00-3	Chloroethane	12	U
75-09-2	Methylene Chloride	16	~~BM~~
67-64-1	Acetone	10	~~BJ~~ UJ
75-15-0	Carbon Disulfide	6	U
75-35-4	1,1-Dichloroethene	6	U
75-34-3	1,1-Dichloroethane	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	Chloroform	6	U
107-06-2	1,2-Dichloroethane	6	U
78-93-3	2-Butanone	12	~~U~~ R
71-55-6	1,1,1-Trichloroethane	6	U
56-23-5	Carbon Tetrachloride	6	U
108-05-4	Vinyl Acetate	12	U
75-27-4	Bromodichloromethane	6	U
78-87-5	1,2-Dichloropropane	6	U
10061-01-5	cis-1,3-Dichloropropene	6	U
79-01-6	Trichloroethene	6	U
124-48-1	Dibromochloromethane	6	U
79-00-5	1,1,2-Trichloroethane	6	U
71-43-2	Benzene	6	U
10061-02-6	Trans-1,3-Dichloropropene	6	U
75-25-2	Bromoform	6	U
108-10-1	4-Methyl-2-Pentanone	12	U
591-78-6	2-Hexanone	12	U
127-18-4	Tetrachloroethene	6	U
79-34-5	1,1,2,2-Tetrachloroethane	6	U
108-88-3	Toluene	6	U
108-90-7	Chlorobenzene	6	U
100-41-4	Ethylbenzene	6	U
100-42-5	Styrene	6	U
1330-20-7	Total Xylenes	6	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 5.0 (g/mL) G Lab File ID: G2R43778C12

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 Date Analyzed: 02/09/89

Column (pack/cap) PACK Dilution Factor: 1.0

Number TICs found: 0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ625

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243752

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN043752A03

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ Date Analyzed: 02/04/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	~~U~~ R
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	2	J
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	~~U~~ R
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ693

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243762

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN043762A03

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ Date Analyzed: 02/04/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	UR
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	2	J
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	UR
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ627

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243763

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: CN043763A03

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ Date Analyzed: 02/04/89

Column: (pack/cap) PACK Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	10	U
74-83-9	Bromomethane	10	U
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-09-2	Methylene Chloride	5	U
67-64-1	Acetone	10	~~UR~~
75-15-0	Carbon Disulfide	5	U
75-35-4	1,1-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
540-59-0	1,2-Dichloroethene (total)	5	U
67-66-3	Chloroform	2	J
107-06-2	1,2-Dichloroethane	5	U
78-93-3	2-Butanone	10	~~UR~~
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
108-05-4	Vinyl Acetate	10	U
75-27-4	Bromodichloromethane	5	U
78-87-5	1,2-Dichloropropane	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-01-6	Trichloroethene	5	U
124-48-1	Dibromochloromethane	5	U
79-00-5	1,1,2-Trichloroethane	5	U
71-43-2	Benzene	5	U
10061-02-6	Trans-1,3-Dichloropropene	5	U
75-25-2	Bromoform	5	U
108-10-1	4-Methyl-2-Pentanone	10	U
591-78-6	2-Hexanone	10	U
127-18-4	Tetrachloroethene	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U
108-88-3	Toluene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethylbenzene	5	U
100-42-5	Styrene	5	U
1330-20-7	Total Xylenes	5	U

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 30.4 (g/mL) G Lab File ID: G3J43764B16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.7 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	350	U
111-44-4	bis(2-Chloroethyl)Ether	350	U
95-57-8	2-Chlorophenol	350	U
541-73-1	1,3-Dichlorobenzene	350	U
106-46-7	1,4-Dichlorobenzene	350	U
100-51-6	Benzyl Alcohol	350	U
95-50-1	1,2-Dichlorobenzene	350	U
95-48-7	2-Methylphenol	350	U
39638-32-9	bis(2-Chloroisopropyl)Ether	350	U
106-44-5	4-Methylphenol	350	U
621-64-7	N-Nitroso-Di-n-Propylamine	350	U
67-72-1	Hexachloroethane	350	U
98-95-3	Nitrobenzene	350	U
78-59-1	Isophorone	350	U
88-75-5	2-Nitrophenol	350	U
105-67-9	2,4-Dimethylphenol	350	U
65-85-0	Benzoic Acid	58	J
111-91-1	bis(2-Chloroethoxy)Methane	350	U
120-83-2	2,4-Dichlorophenol	350	U
120-82-1	1,2,4-Trichlorobenzene	350	U
91-20-3	Naphthalene	350	U
106-47-8	4-Chloroaniline	350	U
87-68-3	Hexachlorobutadiene	350	U
59-50-7	4-Chloro-3-Methylphenol	350	U
91-57-6	2-Methylnaphthalene	350	U
77-47-4	Hexachlorocyclopentadiene	350	U
88-06-2	2,4,6-Trichlorophenol	350	U
95-95-4	2,4,5-Trichlorophenol	1700	U
91-58-7	2-Chloronaphthalene	350	U
88-74-4	2-Nitroaniline	1700	U
131-11-3	Dimethyl Phthalate	350	U
208-96-8	Acenaphthylene	350	U
606-20-2	2,6-Dinitrotoluene	350	U

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1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 30.4 (g/mL) G Lab File ID: G3J43764B16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.7 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
99-09-2	3-Nitroaniline	1700	U
83-32-9	Acenaphthene	350	U
51-28-5	2,4-Dinitrophenol	1700	U
100-02-7	4-Nitrophenol	1700	U
132-64-9	Dibenzofuran	350	U
121-14-2	2,4-Dinitrotoluene	350	U
84-66-2	Diethylphthalate	350	U
7005-72-3	4-Chlorophenyl-phenylether	350	U
86-73-7	Fluorene	350	U
100-01-6	4-Nitroaniline	1700	U
534-52-1	4,6-Dinitro-2-Methylphenol	1700	U
86-30-6	N-Nitrosodiphenylamine (1)	350	U
101-55-3	4-Bromophenyl-phenylether	350	U
118-74-1	Hexachlorobenzene	350	U
87-86-5	Pentachlorophenol	1700	U
85-01-8	Phenanthrene	350	U
120-12-7	Anthracene	350	U
84-74-2	Di-n-Butylphthalate	150	J
206-44-0	Fluoranthene	350	U
129-00-0	Pyrene	350	U
85-68-7	Butylbenzylphthalate	2200	
91-94-1	3,3'-Dichlorobenzidine	710	U
56-55-3	Benzo(a)Anthracene	350	U
218-01-9	Chrysene	350	U
117-81-7	bis(2-Ethylhexyl)Phthalate	1100	
117-84-0	Di-n-Octyl Phthalate	350	U
205-99-2	Benzo(b)Fluoranthene	350	U
207-08-9	Benzo(k)Fluoranthene	350	U
50-32-8	Benzo(a)Pyrene	350	U
193-39-5	Indeno(1,2,3-cd)Pyrene	350	U
53-70-3	Dibenzo(a,h)Anthracene	350	U
191-24-2	Benzo(g,h,i)Perylene	350	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 30.4 (g/mL) G Lab File ID: G3J43764B16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.7 Dilution Factor: 1.0

Number TICs found: 12

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.72	430	~~BJ~~ R
2.	BLANK CONTAMINANT	4.80	540	~~BJ~~ R
3.	UNKNOWN SUBST. HYDROCARBON	5.52	500	JN
4.	ALDOL	5.68	860	AJ R
5.	UNKNOWN SUBST. HYDROCARBON	6.12	290	JN
6.	UNKNOWN	6.70	250	J
7.	UNKNOWN	15.55	180	J
8.	UNKNOWN	16.39	250	J
9.	UNKNOWN	17.09	210	J
10.	UNKNOWN	17.39	430	J
11.	UNKNOWN	19.20	210	J
12.	UNKNOWN	19.94	250	JN

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1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 30.5 (g/mL) G Lab File ID: GH043765C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.3 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	380	U
111-44-4	bis(2-Chloroethyl)Ether	380	U
95-57-8	2-Chlorophenol	380	U
541-73-1	1,3-Dichlorobenzene	380	U
106-46-7	1,4-Dichlorobenzene	380	U
100-51-6	Benzyl Alcohol	380	U
95-50-1	1,2-Dichlorobenzene	380	U
95-48-7	2-Methylphenol	380	U
39638-32-9	bis(2-Chloroisopropyl)Ether	380	U
106-44-5	4-Methylphenol	380	UJ
621-64-7	N-Nitroso-Di-n-Propylamine	380	U
67-72-1	Hexachloroethane	380	U
98-95-3	Nitrobenzene	380	U
78-59-1	Isophorone	380	U
88-75-5	2-Nitrophenol	380	U
105-67-9	2,4-Dimethylphenol	380	U
65-85-0	Benzoic Acid	380	U
111-91-1	bis(2-Chloroethoxy)Methane	1800	UB
120-83-2	2,4-Dichlorophenol	380	U
120-82-1	1,2,4-Trichlorobenzene	380	U
91-20-3	Naphthalene	380	U
106-47-8	4-Chloroaniline	380	U
87-68-3	Hexachlorobutadiene	380	U
59-50-7	4-Chloro-3-Methylphenol	380	U
91-57-6	2-Methylnaphthalene	380	U
77-47-4	Hexachlorocyclopentadiene	380	U
88-06-2	2,4,6-Trichlorophenol	380	U
95-95-4	2,4,5-Trichlorophenol	380	U
91-58-7	2-Chloronaphthalene	1800	U
88-74-4	2-Nitroaniline	380	U
131-11-3	Dimethyl Phthalate	1800	U
208-96-8	Acenaphthylene	380	U
606-20-2	2,6-Dinitrotoluene	380	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 30.5 (g/mL) G Lab File ID: GH043765C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.3 Dilution Factor: 1.0

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND		Q
99-09-2	3-Nitroaniline	1800	U
83-32-9	Acenaphthene	380	U
51-28-5	2,4-Dinitrophenol	1800	U
100-02-7	4-Nitrophenol	1800	UJ
132-64-9	Dibenzofuran	380	U
121-14-2	2,4-Dinitrotoluene	380	UJ
84-66-2	Diethylphthalate	380	U
7005-72-3	4-Chlorophenyl-phenylether	380	U
86-73-7	Fluorene	380	U
100-01-6	4-Nitroaniline	1800	U
534-52-1	4,6-Dinitro-2-Methylphenol	1800	U
86-30-6	N-Nitrosodiphenylamine (1)	380	U
101-55-3	4-Bromophenyl-phenylether	380	U
118-74-1	Hexachlorobenzene	380	U
87-86-5	Pentachlorophenol	1800	U
85-01-8	Phenanthrene	380	U
120-12-7	Anthracene	380	U
84-74-2	Di-n-Butylphthalate	380	U
206-44-0	Fluoranthene	380	U
129-00-0	Pyrene	380	U
85-68-7	Butylbenzylphthalate	210	J
91-94-1	3,3'-Dichlorobenzidine	760	U
56-55-3	Benzo(a)Anthracene	380	U
218-01-9	Chrysene	380	U
117-81-7	bis(2-Ethylhexyl)Phthalate	130	J
117-84-0	Di-n-Octyl Phthalate	380	U
205-99-2	Benzo(b)Fluoranthene	380	U
207-08-9	Benzo(k)Fluoranthene	380	U
50-32-8	Benzo(a)Pyrene	380	U
193-39-5	Indeno(1,2,3-cd)Pyrene	380	U
53-70-3	Dibenzo(a,h)Anthracene	380	U
191-24-2	Benzo(g,h,i)Perylene	380	U

(1) - Cannot be separated from Diphenylamine

1F
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 30.5 (g/mL) G Lab File ID: GH043765C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.3 Dilution Factor: 1.0

Number TICs found: 7

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.95	420	~~BJ~~ R
2.	UNKNOWN SUBST. HYDROCARBON	5.65	840	JN
3.	ALDOL	5.82	380	~~BAJ~~ R
4.	ALDOL	6.25	340	~~AJ~~ R
5.	UNKNOWN SUBST. HYDROCARBON	6.85	380	JN
6.	UNKNOWN	21.39	530	JN
7.	UNKNOWN	22.09	840	JN

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043775C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	350	U
111-44-4	bis(2-Chloroethyl)Ether	350	U
95-57-8	2-Chlorophenol	350	U
541-73-1	1,3-Dichlorobenzene	350	U
106-46-7	1,4-Dichlorobenzene	350	U
100-51-6	Benzyl Alcohol	350	U
95-50-1	1,2-Dichlorobenzene	350	U
95-48-7	2-Methylphenol	350	U
39638-32-9	bis(2-Chloroisopropyl)Ether	350	UJ
106-44-5	4-Methylphenol	350	U
621-64-7	N-Nitroso-Di-n-Propylamine	350	U
67-72-1	Hexachloroethane	350	U
98-95-3	Nitrobenzene	350	U
78-59-1	Isophorone	350	U
88-75-5	2-Nitrophenol	350	U
105-67-9	2,4-Dimethylphenol	350	U
65-85-0	Benzoic Acid	1700	UR
111-91-1	bis(2-Chloroethoxy)Methane	350	U
120-83-2	2,4-Dichlorophenol	350	U
120-82-1	1,2,4-Trichlorobenzene	350	U
91-20-3	Naphthalene	350	U
106-47-8	4-Chloroaniline	350	U
87-68-3	Hexachlorobutadiene	350	U
59-50-7	4-Chloro-3-Methylphenol	350	U
91-57-6	2-Methylnaphthalene	350	U
77-47-4	Hexachlorocyclopentadiene	350	U
88-06-2	2,4,6-Trichlorophenol	350	U
95-95-4	2,4,5-Trichlorophenol	1700	U
91-58-7	2-Chloronaphthalene	350	U
88-74-4	2-Nitroaniline	1700	U
131-11-3	Dimethyl Phthalate	350	U
208-96-8	Acenaphthylene	350	U
606-20-2	2,6-Dinitrotoluene	350	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043775C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
99-09-2	3-Nitroaniline	1700	U
83-32-9	Acenaphthene	350	U
51-28-5	2,4-Dinitrophenol	1700	U
100-02-7	4-Nitrophenol	1700	U
132-64-9	Dibenzofuran	350	U
121-14-2	2,4-Dinitrotoluene	350	U
84-66-2	Diethylphthalate	350	U
7005-72-3	4-Chlorophenyl-phenylether	350	U
86-73-7	Fluorene	350	U
100-01-6	4-Nitroaniline	1700	U
534-52-1	4,6-Dinitro-2-Methylphenol	1700	U
86-30-6	N-Nitrosodiphenylamine (1)	350	U
101-55-3	4-Bromophenyl-phenylether	350	U
118-74-1	Hexachlorobenzene	350	U
87-86-5	Pentachlorophenol	1700	U
85-01-8	Phenanthrene	350	U
120-12-7	Anthracene	350	U
84-74-2	Di-n-Butylphthalate	64	J
206-44-0	Fluoranthene	350	U
129-00-0	Pyrene	350	U
85-68-7	Butylbenzylphthalate	350	U
91-94-1	3,3'-Dichlorobenzidine	700	U
56-55-3	Benzo(a)Anthracene	350	U
218-01-9	Chrysene	350	U
117-81-7	bis(2-Ethylhexyl)Phthalate	350	U
117-84-0	Di-n-Octyl Phthalate	350	U
205-99-2	Benzo(b)Fluoranthene	350	U
207-08-9	Benzo(k)Fluoranthene	350	U
50-32-8	Benzo(a)Pyrene	350	U
193-39-5	Indeno(1,2,3-cd)Pyrene	350	U
53-70-3	Dibenzo(a,h)Anthracene	350	U
191-24-2	Benzo(g,h,i)Perylene	350	U

(1) - Cannot be separated from Diphenylamine

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043775C16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 1.00

Number TICs found: 14

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.83	210	~~BJ~~ R
2.	BLANK CONTAMINANT	4.93	460	BJ R
3.	UNKNOWN SUBST. HYDROCARBON	5.63	1100	JN
4.	ALDOL	5.80	500	~~BAJ~~ R
5.	ALDOL	6.25	500	~~AJ~~ R
6.	ALDOL	6.45	390	~~AJ~~ R
7.	UNKNOWN SUBST. HYDROCARBON	6.83	570	JN
8.	UNKNOWN HYDROCARBON	14.00	360	J
9.	UNKNOWN	17.29	210	J
10.	UNKNOWN	17.59	250	J
11.	UNKNOWN	19.64	360	J
12.	UNKNOWN	21.35	1100	J
13.	UNKNOWN	22.09	1700	J
14.	UNKNOWN	23.17	460	JN

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043776A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	620	
111-44-4	bis(2-Chloroethyl)Ether	620	U
95-57-8	2-Chlorophenol	620	U
541-73-1	1,3-Dichlorobenzene	620	U
106-46-7	1,4-Dichlorobenzene	620	U
100-51-6	Benzyl Alcohol	620	U
95-50-1	1,2-Dichlorobenzene	620	U
95-48-7	2-Methylphenol	620	U
39638-32-9	bis(2-Chloroisopropyl)Ether	620	U
106-44-5	4-Methylphenol	620	U
621-64-7	N-Nitroso-Di-n-Propylamine	620	U
67-72-1	Hexachloroethane	620	U
98-95-3	Nitrobenzene	620	U
78-59-1	Isophorone	620	U
88-75-5	2-Nitrophenol	620	U
105-67-9	2,4-Dimethylphenol	620	U
65-85-0	Benzoic Acid	2100	JR
111-91-1	bis(2-Chloroethoxy)Methane	620	U
120-83-2	2,4-Dichlorophenol	620	U
120-82-1	1,2,4-Trichlorobenzene	620	U
91-20-3	Naphthalene	620	U
106-47-8	4-Chloroaniline	620	U
87-68-3	Hexachlorobutadiene	620	U
59-50-7	4-Chloro-3-Methylphenol	620	U
91-57-6	2-Methylnaphthalene	620	U
77-47-4	Hexachlorocyclopentadiene	620	U
88-06-2	2,4,6-Trichlorophenol	620	U
95-95-4	2,4,5-Trichlorophenol	3000	U
91-58-7	2-Chloronaphthalene	620	U
88-74-4	2-Nitroaniline	3000	U
131-11-3	Dimethyl Phthalate	620	U
208-96-8	Acenaphthylene	620	U
606-20-2	2,6-Dinitrotoluene	620	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043776A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
99-09-2	3-Nitroaniline	3000	U
83-32-9	Acenaphthene	620	U
51-28-5	2,4-Dinitrophenol	3000	U
100-02-7	4-Nitrophenol	3000	U
132-64-9	Dibenzofuran	620	U
121-14-2	2,4-Dinitrotoluene	620	U
84-66-2	Diethylphthalate	620	U
7005-72-3	4-Chlorophenyl-phenylether	620	U
86-73-7	Fluorene	620	U
100-01-6	4-Nitroaniline	3000	U
534-52-1	4,6-Dinitro-2-Methylphenol	3000	U
86-30-6	N-Nitrosodiphenylamine (1)	620	U
101-55-3	4-Bromophenyl-phenylether	620	U
118-74-1	Hexachlorobenzene	200	J
87-86-5	Pentachlorophenol	3000	U
85-01-8	Phenanthrene	620	U
120-12-7	Anthracene	620	U
84-74-2	Di-n-Butylphthalate	470	J
206-44-0	Fluoranthene	620	U
129-00-0	Pyrene	620	U
85-68-7	Butylbenzylphthalate	620	U
91-94-1	3,3'-Dichlorobenzidine	1200	U
56-55-3	Benzo(a)Anthracene	620	U
218-01-9	Chrysene	620	U
117-81-7	bis(2-Ethylhexyl)Phthalate	2500	
117-84-0	Di-n-Octyl Phthalate	620	U
205-99-2	Benzo(b)Fluoranthene	620	U
207-08-9	Benzo(k)Fluoranthene	620	U
50-32-8	Benzo(a)Pyrene	620	U
193-39-5	Indeno(1,2,3-cd)Pyrene	620	U
53-70-3	Dibenzo(a,h)Anthracene	620	U
191-24-2	Benzo(g,h,i)Perylene	620	U

(1) - Cannot be separated from Diphenylamine

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 30.2 (g/mL) G Lab File ID: GH043776A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00

Number TICs found: 25

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.83	370	~~BJ~~ R
2.	BLANK CONTAMINANT	4.92	940	~~BJ~~ R
3. 694-87-1	BICYCLO[4.2.0]OCTA-1,3,5-TRI	5.25	810	J N
4.	UNKNOWN SUBST. HYDROCARBON	5.62	1400	J N
5.	ALDOL	5.78	3200	~~AJ~~ R
6.	ALDOL	6.00	500	~~AJ~~ R
7.	ALDOL	6.23	750	~~AJ~~ R
8.	UNKNOWN SUBST. HYDROCARBON	6.83	870	J N
9.	UNKNOWN HYDROCARBON	9.85	870	J
10.	UNKNOWN SUBST. HYDROCARBON	11.60	560	J
11.	UNKNOWN HYDROCARBON	12.19	870	J
12.	UNKNOWN SUBST. HYDROCARBON	13.12	2100	J
13.	UNKNOWN SUBST. HYDROCARBON	13.35	1100	J
14.	UNKNOWN SUBST. HYDROCARBON	13.47	2600	J
15.	UNKNOWN	13.99	620	J
16.	UNKNOWN	14.15	750	J
17.	UNKNOWN HYDROCARBON	15.75	810	J
18.	UNKNOWN	16.24	1200	J
19.	UNKNOWN	16.29	1900	J
20.	UNKNOWN	16.35	1200	J
21.	UNKNOWN	17.29	870	J
22.	UNKNOWN	19.90	2400	J
23.	UNKNOWN	21.02	2300	J
24.	UNKNOWN	21.39	2700	J
25.	UNKNOWN	22.12	3500	J N

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 30.3 (g/mL) G Lab File ID: GH043777A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	440	U
111-44-4	bis(2-Chloroethyl)Ether	440	U
95-57-8	2-Chlorophenol	440	U
541-73-1	1,3-Dichlorobenzene	440	U
106-46-7	1,4-Dichlorobenzene	440	U
100-51-6	Benzyl Alcohol	440	U
95-50-1	1,2-Dichlorobenzene	440	U
95-48-7	2-Methylphenol	440	U
39638-32-9	bis(2-Chloroisopropyl)Ether	440	U
106-44-5	4-Methylphenol	440	U
621-64-7	N-Nitroso-Di-n-Propylamine	440	U
67-72-1	Hexachloroethane	440	U
98-95-3	Nitrobenzene	440	U
78-59-1	Isophorone	440	U
88-75-5	2-Nitrophenol	440	U
105-67-9	2,4-Dimethylphenol	440	U
65-85-0	Benzoic Acid	2100	UR
111-91-1	bis(2-Chloroethoxy)Methane	440	U
120-83-2	2,4-Dichlorophenol	440	U
120-82-1	1,2,4-Trichlorobenzene	440	U
91-20-3	Naphthalene	440	U
106-47-8	4-Chloroaniline	440	U
87-68-3	Hexachlorobutadiene	440	U
59-50-7	4-Chloro-3-Methylphenol	440	U
91-57-6	2-Methylnaphthalene	440	U
77-47-4	Hexachlorocyclopentadiene	440	U
88-06-2	2,4,6-Trichlorophenol	440	U
95-95-4	2,4,5-Trichlorophenol	2100	U
91-58-7	2-Chloronaphthalene	440	U
88-74-4	2-Nitroaniline	2100	U
131-11-3	Dimethyl Phthalate	440	U
208-96-8	Acenaphthylene	440	U
606-20-2	2,6-Dinitrotoluene	440	U

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1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 30.3 (g/mL) G Lab File ID: GH043777A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
99-09-2	3-Nitroaniline	2100	U
83-32-9	Acenaphthene	440	U
51-28-5	2,4-Dinitrophenol	2100	U
100-02-7	4-Nitrophenol	2100	UJ
132-64-9	Dibenzofuran	440	U
121-14-2	2,4-Dinitrotoluene	440	UJ
84-66-2	Diethylphthalate	440	U
7005-72-3	4-Chlorophenyl-phenylether	440	U
86-73-7	Fluorene	440	U
100-01-6	4-Nitroaniline	2100	U
534-52-1	4,6-Dinitro-2-Methylphenol	2100	U
86-30-6	N-Nitrosodiphenylamine (1)	440	U
101-55-3	4-Bromophenyl-phenylether	440	U
118-74-1	Hexachlorobenzene	440	U
87-86-5	Pentachlorophenol	2100	U
85-01-8	Phenanthrene	440	U
120-12-7	Anthracene	440	U
84-74-2	Di-n-Butylphthalate	440	U
206-44-0	Fluoranthene	440	U
129-00-0	Pyrene	440	U
85-68-7	Butylbenzylphthalate	440	U
91-94-1	3,3'-Dichlorobenzidine	880	U
56-55-3	Benzo(a)Anthracene	440	U
218-01-9	Chrysene	440	U
117-81-7	bis(2-Ethylhexyl)Phthalate	680	
117-84-0	Di-n-Octyl Phthalate	440	U
205-99-2	Benzo(b)Fluoranthene	440	U
207-08-9	Benzo(k)Fluoranthene	440	U
50-32-8	Benzo(a)Pyrene	440	U
193-39-5	Indeno(1,2,3-cd)Pyrene	440	U
53-70-3	Dibenzo(a,h)Anthracene	440	U
191-24-2	Benzo(g,h,i)Perylene	440	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-2

1/87 Rev.

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 30.3 (g/mL) G Lab File ID: GH043777A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

Number TICs found: 23

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.90	450	~~BJ~~ R
2.	UNKNOWN SUBST. HYDROCARBON	5.60	1200	J N
3.	ALDOL	5.77	800	~~AJ~~ R
4.	ALDOL	6.22	1500	~~AJ~~ R
5.	UNKNOWN	6.80	620	J N
6.	UNKNOWN HYDROCARBON	15.25	710	J
7.	UNKNOWN HYDROCARBON	15.69	490	J
8.	UNKNOWN HYDROCARBON	16.10	540	J
9.	UNKNOWN HYDROCARBON	16.54	710	J
10.	UNKNOWN HYDROCARBON	17.02	580	J
11.	UNKNOWN	17.25	490	J
12.	UNKNOWN	17.37	310	J
13.	UNKNOWN HYDROCARBON	17.55	890	J
14.	UNKNOWN HYDROCARBON	18.20	450	J
15.	UNKNOWN HYDROCARBON	18.99	1000	J
16.	UNKNOWN	19.60	710	J
17.	UNKNOWN	19.85	1800	J
18.	UNKNOWN	20.32	400	J
19.	UNKNOWN	20.99	1800	J
20.	UNKNOWN	21.30	1700	J
21.	UNKNOWN	22.04	1400	J
22.	UNKNOWN	22.29	540	J N
23.	UNKNOWN	23.10	620	J N

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1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 30.4 (g/mL) G Lab File ID: GH043778A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 5.9 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
108-95-2	Phenol	380	U
111-44-4	bis(2-Chloroethyl)Ether	380	U
95-57-8	2-Chlorophenol	380	U
541-73-1	1,3-Dichlorobenzene	380	U
106-46-7	1,4-Dichlorobenzene	380	U
100-51-6	Benzyl Alcohol	380	U
95-50-1	1,2-Dichlorobenzene	380	U
95-48-7	2-Methylphenol	380	U
39638-32-9	bis(2-Chloroisopropyl)Ether	380	U
106-44-5	4-Methylphenol	380	UJ
621-64-7	N-Nitroso-Di-n-Propylamine	380	U
67-72-1	Hexachloroethane	380	U
98-95-3	Nitrobenzene	380	U
78-59-1	Isophorone	380	U
88-75-5	2-Nitrophenol	380	U
105-67-9	2,4-Dimethylphenol	380	U
65-85-0	Benzoic Acid	380	U
111-91-1	bis(2-Chloroethoxy)Methane	1800	UR
120-83-2	2,4-Dichlorophenol	380	U
120-82-1	1,2,4-Trichlorobenzene	380	U
91-20-3	Naphthalene	380	U
106-47-8	4-Chloroaniline	380	U
87-68-3	Hexachlorobutadiene	380	U
59-50-7	4-Chloro-3-Methylphenol	380	U
91-57-6	2-Methylnaphthalene	380	U
77-47-4	Hexachlorocyclopentadiene	380	U
88-06-2	2,4,6-Trichlorophenol	380	U
95-95-4	2,4,5-Trichlorophenol	380	U
91-58-7	2-Chloronaphthalene	1800	U
88-74-4	2-Nitroaniline	380	U
131-11-3	Dimethyl Phthalate	1800	U
208-96-8	Acenaphthylene	380	U
606-20-2	2,6-Dinitrotoluene	380	U
		380	U

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1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 30.4 (g/mL) G Lab File ID: GH043778A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 5.9 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
99-09-2	3-Nitroaniline	1800	U
83-32-9	Acenaphthene	380	U
51-28-5	2,4-Dinitrophenol	1800	U
100-02-7	4-Nitrophenol	1800	U
132-64-9	Dibenzofuran	380	U
121-14-2	2,4-Dinitrotoluene	380	U
84-66-2	Diethylphthalate	380	U
7005-72-3	4-Chlorophenyl-phenylether	380	U
86-73-7	Fluorene	380	U
100-01-6	4-Nitroaniline	1800	U
534-52-1	4,6-Dinitro-2-Methylphenol	1800	U
86-30-6	N-Nitrosodiphenylamine (1)	380	U
101-55-3	4-Bromophenyl-phenylether	380	U
118-74-1	Hexachlorobenzene	380	U
87-86-5	Pentachlorophenol	1800	U
85-01-8	Phenanthrene	380	U
120-12-7	Anthracene	380	U
84-74-2	Di-n-Butylphthalate	380	U
206-44-0	Fluoranthene	380	U
129-00-0	Pyrene	380	U
85-68-7	Butylbenzylphthalate	380	U
91-94-1	3,3'-Dichlorobenzidine	760	U
56-55-3	Benzo(a)Anthracene	380	U
218-01-9	Chrysene	380	U
117-81-7	bis(2-Ethylhexyl)Phthalate	380	U
117-84-0	Di-n-Octyl Phthalate	380	U
205-99-2	Benzo(b)Fluoranthene	380	U
207-08-9	Benzo(k)Fluoranthene	380	U
50-32-8	Benzo(a)Pyrene	380	U
193-39-5	Indeno(1,2,3-cd)Pyrene	380	U
53-70-3	Dibenzo(a,h)Anthracene	380	U
191-24-2	Benzo(g,h,i)Perylene	380	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-2 1/87 Rev.

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 30.4 (g/mL) G Lab File ID: GH043778A16

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/09/89

GPC Cleanup: (Y/N) N pH: 5.9 Dilution Factor: 1.0

Number TICs found: 6

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	BLANK CONTAMINANT	4.88	460	~~BJ~~ R
2.	BLANK CONTAMINANT	4.95	730	~~BJ~~ R
3.	ALDOL	5.83	770	~~AJ~~ R
4.	ALDOL	6.27	540	~~AJ~~ R
5.	UNKNOWN SUBST. HYDROCARBON	6.87	570	J N
6.	UNKNOWN	21.34	420	J N

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ625

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243752

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH043752A15

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/07/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
100-51-6	Benzyl Alcohol	10	U
95-50-1	1,2-Dichlorobenzene	10	U
95-48-7	2-Methylphenol	10	U
39638-32-9	bis(2-Chloroisopropyl)Ether	10	U
106-44-5	4-Methylphenol	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
65-85-0	Benzoic Acid	50	U
111-91-1	bis(2-Chloroethoxy)Methane	10	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
106-47-8	4-Chloroaniline	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
91-57-6	2-Methylnaphthalene	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
95-95-4	2,4,5-Trichlorophenol	50	U
91-58-7	2-Chloronaphthalene	10	U
88-74-4	2-Nitroaniline	50	U
131-11-3	Dimethyl Phthalate	10	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U

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1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ625

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243752

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH043752A15

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/07/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
99-09-2	3-Nitroaniline	50	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	50	U
100-02-7	4-Nitrophenol	50	U
132-64-9	Dibenzofuran	10	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	10	U
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
100-01-6	4-Nitroaniline	50	U
534-52-1	4,6-Dinitro-2-Methylphenol	50	U
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	50	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	20	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenzo(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-2 1/87 Rev.

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ693

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243762

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH043762B15

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/07/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
108-95-2	Phenol	10	U
111-44-4	bis(2-Chloroethyl)Ether	10	U
95-57-8	2-Chlorophenol	10	U
541-73-1	1,3-Dichlorobenzene	10	U
106-46-7	1,4-Dichlorobenzene	10	U
100-51-6	Benzyl Alcohol	10	U
95-50-1	1,2-Dichlorobenzene	10	U
95-48-7	2-Methylphenol	10	U
39638-32-9	bis(2-Chloroisopropyl)Ether	10	U
106-44-5	4-Methylphenol	10	U
621-64-7	N-Nitroso-Di-n-Propylamine	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
78-59-1	Isophorone	10	U
88-75-5	2-Nitrophenol	10	U
105-67-9	2,4-Dimethylphenol	10	U
65-85-0	Benzoic Acid	10	U
111-91-1	bis(2-Chloroethoxy)Methane	50	U
120-83-2	2,4-Dichlorophenol	10	U
120-82-1	1,2,4-Trichlorobenzene	10	U
91-20-3	Naphthalene	10	U
106-47-8	4-Chloroaniline	10	U
87-68-3	Hexachlorobutadiene	10	U
59-50-7	4-Chloro-3-Methylphenol	10	U
91-57-6	2-Methylnaphthalene	10	U
77-47-4	Hexachlorocyclopentadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
95-95-4	2,4,5-Trichlorophenol	10	U
91-58-7	2-Chloronaphthalene	50	U
88-74-4	2-Nitroaniline	10	U
131-11-3	Dimethyl Phthalate	50	U
208-96-8	Acenaphthylene	10	U
606-20-2	2,6-Dinitrotoluene	10	U
		10	U

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1/87 Rev.

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ693

Lab Name: COMPUCHEM LABS Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243762

Sample wt/vol: 1000 (g/mL) ML Lab File ID: GH043762B15

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. ____ dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/07/89

GPC Cleanup: (Y/N) N pH: ____ Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
99-09-2	3-Nitroaniline	50	U
83-32-9	Acenaphthene	10	U
51-28-5	2,4-Dinitrophenol	50	U
100-02-7	4-Nitrophenol	50	U
132-64-9	Dibenzofuran	10	U
121-14-2	2,4-Dinitrotoluene	10	U
84-66-2	Diethylphthalate	10	U
7005-72-3	4-Chlorophenyl-phenylether	10	U
86-73-7	Fluorene	10	U
100-01-6	4-Nitroaniline	50	U
534-52-1	4,6-Dinitro-2-Methylphenol	50	U
86-30-6	N-Nitrosodiphenylamine (1)	10	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	50	U
85-01-8	Phenanthrene	10	U
120-12-7	Anthracene	10	U
84-74-2	Di-n-Butylphthalate	10	U
206-44-0	Fluoranthene	10	U
129-00-0	Pyrene	10	U
85-68-7	Butylbenzylphthalate	10	U
91-94-1	3,3'-Dichlorobenzidine	20	U
56-55-3	Benzo(a)Anthracene	10	U
218-01-9	Chrysene	10	U
117-81-7	bis(2-Ethylhexyl)Phthalate	10	U
117-84-0	Di-n-Octyl Phthalate	10	U
205-99-2	Benzo(b)Fluoranthene	10	U
207-08-9	Benzo(k)Fluoranthene	10	U
50-32-8	Benzo(a)Pyrene	10	U
193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
53-70-3	Dibenzo(a,h)Anthracene	10	U
191-24-2	Benzo(g,h,i)Perylene	10	U

(1) - Cannot be separated from Diphenylamine

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ687

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243764

Sample wt/vol: 30.4 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 8 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/10/89

GPC Cleanup: (Y/N) N pH: 7.7 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	8.6	U
319-85-7	beta-BHC	8.6	U
319-86-8	delta-BHC	8.6	U
58-89-9	gamma-BHC (Lindane)	8.6	U
76-44-8	Heptachlor	8.6	U
309-00-2	Aldrin	8.6	U
1024-57-3	Heptachlor epoxide	8.6	U
959-98-8	Endosulfan I	8.6	U
60-57-1	Dieldrin	17.	U
72-55-9	4,4'-DDE	17.	U
72-20-8	Endrin	17.	U
33213-65-9	Endosulfan II	17.	U
72-54-8	4,4'-DDD	17.	U
1031-07-8	Endosulfan sulfate	17.	U
50-29-3	4,4'-DDT	17.	U
72-43-5	Methoxychlor	86.	U
53494-70-5	Endrin ketone	17.	U
5103-71-9	alpha-Chlordane	86.	U
5103-74-2	gamma-Chlordane	86.	U
8001-35-2	Toxaphene	170	U
12674-11-2	Aroclor-1016	86.	U
11104-28-2	Aroclor-1221	86.	U
11141-16-5	Aroclor-1232	86.	U
53469-21-9	Aroclor-1242	86.	U
12672-29-6	Aroclor-1248	86.	U
11097-69-1	Aroclor-1254	170	U
11096-82-5	Aroclor-1260	170	U

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ688

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243765

Sample wt/vol: 30.5 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/10/89

GPC Cleanup: (Y/N) N pH: 7.3 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	9.1	U
319-85-7	beta-BHC	9.1	U
319-86-8	delta-BHC	9.1	U
58-89-9	gamma-BHC (Lindane)	9.1	U
76-44-8	Heptachlor	9.1	U
309-00-2	Aldrin	9.1	U
1024-57-3	Heptachlor epoxide	9.1	U
959-98-8	Endosulfan I	9.1	U
60-57-1	Dieldrin	18.	U
72-55-9	4,4'-DDE	18.	U
72-20-8	Endrin	18.	U
33213-65-9	Endosulfan II	18.	U
72-54-8	4,4'-DDD	18.	U
1031-07-8	Endosulfan sulfate	18.	U
50-29-3	4,4'-DDT	18.	U
72-43-5	Methoxychlor	91.	U
53494-70-5	Endrin ketone	18.	U
5103-71-9	alpha-Chlordane	91.	U
5103-74-2	gamma-Chlordane	91.	U
8001-35-2	Toxaphene	180	U
12674-11-2	Aroclor-1016	91.	U
11104-28-2	Aroclor-1221	91.	U
11141-16-5	Aroclor-1232	91.	U
53469-21-9	Aroclor-1242	91.	U
12672-29-6	Aroclor-1248	91.	U
11097-69-1	Aroclor-1254	180	U
11096-82-5	Aroclor-1260	180	U

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ689

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243775

Sample wt/vol: 30.2 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 7 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/10/89

GPC Cleanup: (Y/N) N pH: 7.8 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	8.5	U
319-85-7	beta-BHC	8.5	U
319-86-8	delta-BHC	8.5	U
58-89-9	gamma-BHC (Lindane)	8.5	U
76-44-8	Heptachlor	8.5	U
309-00-2	Aldrin	8.5	U
1024-57-3	Heptachlor epoxide	8.5	U
959-98-8	Endosulfan I	8.5	U
60-57-1	Dieldrin	17.	U
72-55-9	4,4'-DDE	17.	U
72-20-8	Endrin	17.	U
33213-65-9	Endosulfan II	17.	U
72-54-8	4,4'-DDD	17.	U
1031-07-8	Endosulfan sulfate	17.	U
50-29-3	4,4'-DDT	17.	U
72-43-5	Methoxychlor	85.	U
53494-70-5	Endrin ketone	17.	U
5103-71-9	alpha-Chlordane	85.	U
5103-74-2	gamma-Chlordane	85.	U
8001-35-2	Toxaphene	170	U
12674-11-2	Aroclor-1016	85.	U
11104-28-2	Aroclor-1221	85.	U
11141-16-5	Aroclor-1232	85.	U
53469-21-9	Aroclor-1242	85.	U
12672-29-6	Aroclor-1248	85.	U
11097-69-1	Aroclor-1254	170	U
11096-82-5	Aroclor-1260	170	U

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ690

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243776

Sample wt/vol: 30.2 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 47 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/10/89

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	15.	U
319-85-7	beta-BHC	15.	U
319-86-8	delta-BHC	15.	U
58-89-9	gamma-BHC (Lindane)	15.	U
76-44-8	Heptachlor	15.	U
309-00-2	Aldrin	15.	U
1024-57-3	Heptachlor epoxide	15.	U
959-98-8	Endosulfan I	15.	U
60-57-1	Dieldrin	30.	U
72-55-9	4,4'-DDE	30.	U
72-20-8	Endrin	30.	U
33213-65-9	Endosulfan II	30.	U
72-54-8	4,4'-DDD	30.	U
1031-07-8	Endosulfan sulfate	30.	U
50-29-3	4,4'-DDT	30.	U
72-43-5	Methoxychlor	150	U
53494-70-5	Endrin ketone	30.	U
5103-71-9	alpha-Chlordane	150	U
5103-74-2	gamma-Chlordane	150	U
8001-35-2	Toxaphene	300	U
12674-11-2	Aroclor-1016	150	U
11104-28-2	Aroclor-1221	150	U
11141-16-5	Aroclor-1232	150	U
53469-21-9	Aroclor-1242	150	U
12672-29-6	Aroclor-1248	1200	
11097-69-1	Aroclor-1254	300	U
11096-82-5	Aroclor-1260	300	U

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ691

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243777

Sample wt/vol: 30.3 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 26 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/10/89

GPC Cleanup: (Y/N) N pH: 7.0 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	11.	U
319-85-7	beta-BHC	11.	U
319-86-8	delta-BHC	11.	U
58-89-9	gamma-BHC (Lindane)	11.	U
76-44-8	Heptachlor	11.	U
309-00-2	Aldrin	11.	U
1024-57-3	Heptachlor epoxide	11.	U
959-98-8	Endosulfan I	11.	U
60-57-1	Dieldrin	21.	U
72-55-9	4,4'-DDE	21.	U
72-20-8	Endrin	21.	U
33213-65-9	Endosulfan II	21.	U
72-54-8	4,4'-DDD	21.	U
1031-07-8	Endosulfan sulfate	21.	U
50-29-3	4,4'-DDT	21.	U
72-43-5	Methoxychlor	110	U
53494-70-5	Endrin ketone	21.	U
5103-71-9	alpha-Chlordane	110	U
5103-74-2	gamma-Chlordane	110	U
8001-35-2	Toxaphene	210	U
12674-11-2	Aroclor-1016	110	U
11104-28-2	Aroclor-1221	110	U
11141-16-5	Aroclor-1232	110	U
53469-21-9	Aroclor-1242	110	U
12672-29-6	Aroclor-1248	110	U
11097-69-1	Aroclor-1254	210	U
11096-82-5	Aroclor-1260	210	U

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PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ692

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ687

Matrix: (soil/water) SOIL Lab Sample ID: 243778

Sample wt/vol: 30.4 (g/mL) G Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. 14 dec. ____ Date Extracted: 02/07/89

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 02/12/89

GPC Cleanup: (Y/N) N pH: 5.9 Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	9.2	U
319-85-7	beta-BHC	9.2	U
319-86-8	delta-BHC	9.2	U
58-89-9	gamma-BHC (Lindane)	9.2	U
76-44-8	Heptachlor	9.2	U
309-00-2	Aldrin	9.2	U
1024-57-3	Heptachlor epoxide	9.2	U
959-98-8	Endosulfan I	9.2	U
60-57-1	Dieldrin	18.	U
72-55-9	4,4'-DDE	18.	U
72-20-8	Endrin	18.	U
33213-65-9	Endosulfan II	18.	U
72-54-8	4,4'-DDD	18.	U
1031-07-8	Endosulfan sulfate	18.	U
50-29-3	4,4'-DDT	18.	U
72-43-5	Methoxychlor	92.	U
53494-70-5	Endrin ketone	18.	U
5103-71-9	alpha-Chlordane	92.	U
5103-74-2	gamma-Chlordane	92.	U
8001-35-2	Toxaphene	180	U
12674-11-2	Aroclor-1016	92.	U
11104-28-2	Aroclor-1221	92.	U
11141-16-5	Aroclor-1232	92.	U
53469-21-9	Aroclor-1242	92.	U
12672-29-6	Aroclor-1248	92.	U
11097-69-1	Aroclor-1254	180	U
11096-82-5	Aroclor-1260	180	U

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ625

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243752

Sample wt/vol: 1000 (g/mL) ML Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 02/06/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/06/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
319-84-6	alpha-BHC	0.050	U
319-85-7	beta-BHC	0.050	U
319-86-8	delta-BHC	0.050	U
58-89-9	gamma-BHC (Lindane)	0.050	U
76-44-8	Heptachlor	0.050	U
309-00-2	Aldrin	0.050	U
1024-57-3	Heptachlor epoxide	0.050	U
959-98-8	Endosulfan I	0.050	U
60-57-1	Dieldrin	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	Endrin	0.10	U
33213-65-9	Endosulfan II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	Endosulfan sulfate	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	Methoxychlor	0.50	U
53494-70-5	Endrin ketone	0.10	U
5103-71-9	alpha-Chlordane	0.50	U
5103-74-2	gamma-Chlordane	0.50	U
8001-35-2	Toxaphene	1.0	U
12674-11-2	Aroclor-1016	0.50	U
11104-28-2	Aroclor-1221	0.50	U
11141-16-5	Aroclor-1232	0.50	U
53469-21-9	Aroclor-1242	0.50	U
12672-29-6	Aroclor-1248	0.50	U
11097-69-1	Aroclor-1254	1.0	U
11096-82-5	Aroclor-1260	1.0	U

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

BZ693

Lab Name: COMPUCHEM LABORATORIES Contract: 68-01-7263

Lab Code: COMPU Case No.: 11335 SAS No.: _____ SDG No.: BZ625

Matrix: (soil/water) WATER Lab Sample ID: 243762

Sample wt/vol: 1000 (g/mL) ML Lab File ID: _____

Level: (low/med) LOW Date Received: 02/03/89

% Moisture: not dec. _____ dec. _____ Date Extracted: 02/06/89

Extraction: (SepF/Cont/Sonc) SEPF Date Analyzed: 02/06/89

GPC Cleanup: (Y/N) N pH: _____ Dilution Factor: 1.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
319-84-6	alpha-BHC	0.050	U
319-85-7	beta-BHC	0.050	U
319-86-8	delta-BHC	0.050	U
58-89-9	gamma-BHC (Lindane)	0.050	U
76-44-8	Heptachlor	0.050	U
309-00-2	Aldrin	0.050	U
1024-57-3	Heptachlor epoxide	0.050	U
959-98-8	Endosulfan I	0.050	U
60-57-1	Dieldrin	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	Endrin	0.10	U
33213-65-9	Endosulfan II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	Endosulfan sulfate	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	Methoxychlor	0.50	U
53494-70-5	Endrin ketone	0.10	U
5103-71-9	alpha-Chlordane	0.50	U
5103-74-2	gamma-Chlordane	0.50	U
8001-35-2	Toxaphene	1.0	U
12674-11-2	Aroclor-1016	0.50	U
11104-28-2	Aroclor-1221	0.50	U
11141-16-5	Aroclor-1232	0.50	U
53469-21-9	Aroclor-1242	0.50	U
12672-29-6	Aroclor-1248	0.50	U
11097-69-1	Aroclor-1254	1.0	U
11096-82-5	Aroclor-1260	1.0	U

FORM I PEST 1/87 Rev.

Case# 11335 Site MANUABO SWD Matrix: Soil 6

Reviewer JOHN BULICH JB Lab SKINNER Water 2

Contractor NUS (FIT 2) Other —

A.2.1 All data are of acceptable quality? Yes ____ No ____

If no, exceptions are noted below with reason(s) for rejection or qualification as estimated value (J).

A) The following analytes are qualified as rejected (red-lined) because they do not meet the criteria for:

1) Spiked Samples (<10% Rec.) Tl → MBX 379-384

B) The following analytes are qualified as estimated (flagged with "J"). because they do not meet the criteria for:

1) Calib. Std (<0.995) Se → MBX 322, 379-385

2) CRDL Std (>110% Rec) Se (was previously flagged)

(<90% Rec) Cd → MBX 382 Cr → MBX 379, 383, 385

Tl → MBX 322, 379-385

3) Spiked Samples (10-74% Rec) Sb, Cu, Mn → MBX 379-384

4) ICP Ser. Dil (>10% Dif.) Ca, Fe, Mg, V → MBX 379-384

Cu and Mn was previously flagged.

5) MSA (coef. of corr <0.995) Se was previously flagged.

EPA - CLP

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE No.

MB[illegible]

Lab Name: SKINNER & SHERMAN LABS Contract: 68-W8-0006

Lab Code: SKINNER Case No.: [illegible] SAS No.: SDG No.: MB[illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 96.9

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9970.00			P
7440-36-0	Antimony	3.70	U	N	P
7440-38-2	Arsenic	2.10			F
7440-39-3	Barium	147.00			P
7440-41-7	Beryllium	0.13	B	E	P
7440-41-7	Cadmium	0.56	U		P
7440-70-2	Calcium	7180.00		E	P
7440-47-3	Chromium	2.50			P
7440-48-4	Cobalt	3.30	B		P
7440-50-8	Copper	98.60		N*E	P
7439-89-6	Iron	23400.00		E	P
7439-92-1	Lead	16.00		*S	F
7439-95-4	Magnesium	3890.00		E	P
7439-96-5	Manganese	337.00		NE	P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	1.90	B		P
7440-09-7	Potassium	817.00	B		P
7782-49-2	Selenium	0.45	U	J	F
7440-22-4	Silver	1.60	U		P
7440-23-5	Sodium	305.00	B		P
7440-28-0	Thallium	0.26	U	NW	F
7440-62-2	Vanadium	74.20		E	P
7440-66-6	Zinc	65.10		*	P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: YES

Comments:

STONES AND ROOTS

003

U.S. EPA - CLP

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MBX750

Lab Name: SKINNER & SHERMAN LABS Contract: 68-W8-0006

Lab Code: SKINER Case No.: 11335 SAS No.: SDG No.: MBX7

Matrix (soil/water): SOIL Lab Sample ID: 02022-036

Level (low/med): LOW Date Received: 01/03/89

% Solids: 94.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3480.00			P
7440-36-0	Antimony	3.90	U	N	P
7440-38-2	Arsenic	2.20			F
7440-39-3	Barium	145.00			P
7440-41-7	Beryllium	0.13	B	E	P
7440-41-7	Cadmium	0.63	B		P
7440-70-2	Calcium	6170.00		E	P
7440-47-3	Chromium	1.30	U		P
7440-48-4	Cobalt	7.60	B		P
7440-50-8	Copper	58.60		N*E	P
7439-89-6	Iron	17800.00		E	P
7439-92-1	Lead	3.70		*	F
7439-95-4	Magnesium	3130.00		E	P
7439-96-5	Manganese	274.00		NE	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.80	U		P
7440-09-7	Potassium	831.00	B		P
7782-49-2	Selenium	0.46	U	J	F
7440-22-4	Silver	1.70	U		P
7440-23-5	Sodium	307.00	B		P
7440-28-0	Thallium	0.26	U	NW	F
7440-62-2	Vanadium	62.10		E	P
7440-66-6	Zinc	33.50		*	P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: YES

Comments:

STONES AND ROOTS

CC4

EPA - [illegible]

INORGANIC ANALYSIS DATA SHEET

EPA Sample No.: [illegible]

MB[illegible]

Lab Name: SKINNER & SHERMAN LABS Contract: 61-W8-0006

Lab Code: SKINER Case No.: 11335 SAS No.: SDG No.: MB[illegible]

Matrix (soil/water): SOIL Lab Sample ID: 00000-01[illegible]

Level (low/med): LOW Date Received: 01/07/89

% Solids: 93.8

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8200.00			P
7440-36-0	Antimony	3.70	U	N	P
7440-38-2	Arsenic	2.10		S	F
7440-39-3	Barium	131.00			P
7440-41-7	Beryllium	0.26	B	E	P
7440-41-7	Cadmium	0.56	U		P
7440-70-2	Calcium	5910.00		E	P
7440-47-3	Chromium	1.80	U		P
7440-48-4	Cobalt	7.50	B		P
7440-50-8	Copper	58.10		N*E	P
7439-89-6	Iron	16000.00		E	P
7439-92-1	Lead	2.50		*S	F
7439-95-4	Magnesium	3500.00		E	P
7439-96-5	Manganese	232.00		NE	P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	1.70	U		P
7440-09-7	Potassium	324.00	B		P
7782-49-2	Selenium	0.49	B	+J	F
7440-22-4	Silver	1.60	U		P
7440-23-5	Sodium	316.00	B		P
7440-28-0	Thallium	0.27	U	NW	F
7440-62-2	Vanadium	50.50		E	P
7440-66-6	Zinc	35.10		*	P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: BROWN Clarity After: _____ Artifacts: YES

Comments:

STONES AND ROOTS

CC5

FEA - [illegible]

INORGANIC ANALYSIS DATA SHEET

FEA SAMPLE [illegible]

MBX[illegible]

Lab Name: SKINNER & SHERMAN LABS Contract: [illegible]-W3-0006

Lab Code: SKINER Case No.: 11335 SAS No.: SDG No.: MBX[illegible]

Matrix (soil/water): SOIL Lab Sample ID: 02021-05[illegible]

Level (low/med): LOW Date Received: 02/07/89

% Solids: 61.5

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10600.00			P
7440-36-0	Antimony	5.70	U	N	P
7440-38-2	Arsenic	5.00			F
7440-39-3	Barium	118.00			P
7440-41-7	Beryllium	0.00	B	E	P
7440-41-7	Cadmium	2.30			P
7440-70-2	Calcium	9110.00		E	P
7440-47-3	Chromium	11.20			P
7440-48-4	Cobalt	6.60	B		P
7440-50-8	Copper	127.00		N*E	P
7439-89-6	Iron	25800.00		E	P
7439-92-1	Lead	88.60		*	F
7439-95-4	Magnesium	3410.00		E	P
7439-96-5	Manganese	345.00		NE	P
7439-97-6	Mercury	0.44			CV
7440-02-0	Nickel	43.50			P
7440-09-7	Potassium	1330.00			P
7782-49-2	Selenium	0.93	B	WJ	F
7440-22-4	Silver	2.50	U		P
7440-23-5	Sodium	524.00	B		P
7440-28-0	Thallium	0.38	U	NW	F
7440-62-2	Vanadium	52.40		E	P
7440-66-6	Zinc	212.00		*	P
	Cyanide				NR

Color Before: BLACK Clarity Before: _____ Texture: FINE

Color After: BLACK Clarity After: _____ Artifacts: YES

Comments:

STONES

CCB

[illegible] EPA - [illegible]

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE No.

MBX383

Lab Name: SKINNER & SHERMAN LABS Contract: [illegible]-WS-0006

Lab Code: SKINER Case No.: 11335 SAS No.: SDG No.: MBX[illegible]

Matrix (soil/water): SOIL Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: 02/07/89

% Solids: 81.9

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	17000.00			P
7440-36-0	Antimony	4.50	U	N	P
7440-38-2	Arsenic	3.30			F
7440-39-3	Barium	130.00			P
7440-41-7	Beryllium	0.48	B	E	P
7440-41-7	Cadmium	0.90	B		P
7440-70-2	Calcium	6420.00		E	P
7440-47-3	Chromium	6.20			P
7440-48-4	Cobalt	11.60	B		P
7440-50-8	Copper	34.80		N*E	P
7439-89-6	Iron	24100.00		E	P
7439-92-1	Lead	4.30		*S	F
7439-95-4	Magnesium	4380.00		E	P
7439-96-5	Manganese	611.00		NE	P
7439-97-6	Mercury	0.14			CV
7440-02-0	Nickel	3.20	B		P
7440-09-7	Potassium	864.00	B		P
7782-49-2	Selenium	0.56	U	J	F
7440-22-4	Silver	2.00	U		P
7440-23-5	Sodium	341.00	B		P
7440-28-0	Thallium	0.32	U	NW	F
7440-62-2	Vanadium	77.20		E	P
7440-66-6	Zinc	71.40		*	P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: YES

Comments:

STONES

007

EPA

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MB-[illegible]

Lab Name: SKINNER & SHERMAN LABS Contract: [illegible]

Lab Code: SKINER Case No.: [illegible] SAS No.: SDG No.: [illegible]

Matrix: [illegible] Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: [illegible]

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	21000.00			P
7440-36-0	Antimony	4.10	U	N	P
7440-38-2	Arsenic	3.40			F
7440-39-3	Barium	198.00			P
7440-41-7	Beryllium	0.29	B	E	P
7440-41-7	Cadmium	0.62	U		P
7440-70-2	Calcium	3580.00		E	P
7440-47-3	Chromium	1.90	U		P
7440-48-4	Cobalt	9.90	B		P
7440-50-8	Copper	84.50		N*E	P
7439-89-6	Iron	20900.00		E	P
7439-92-1	Lead	2.40		*	F
7439-95-4	Magnesium	3300.00		E	P
7439-96-5	Manganese	397.00		NE	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.90	U		P
7440-09-7	Potassium	644.00	B		P
7782-49-2	Selenium	0.48	B	W	F
7440-22-4	Silver	1.80	U		P
7440-23-5	Sodium	214.00	B		P
7440-28-0	Thallium	0.27	U	NW	F
7440-62-2	Vanadium	70.40		E	P
7440-66-6	Zinc	33.20		*	P
	Cyanide				NR

Color Before: BROWN Clarity Before: _____ Texture: FINE

Color After: BROWN Clarity After: _____ Artifacts: YES

Comments:

STONES

U.S. EPA - CLP

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MBX3[illegible]

Lab Name: SKINNER & SHERMAN LABS Contract: 68-W8-0006

Lab Code: SKINER Case No.: 11335 SAS No.: SDG No.: MBX3[illegible]

Matrix (soil/water): WATER Lab Sample ID: 02022-018

Level (low/med): LOW Date Received: 02/03/89

% Solids: 0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.40	U		P
7440-36-0	Antimony	18.70	U		P
7440-38-2	Arsenic	1.50	U		F
7440-39-3	Barium	9.20	U		P
7440-41-7	Beryllium	0.00	B		P
7440-41-7	Cadmium	2.30	U		P
7440-70-2	Calcium	88.50	U		P
7440-47-3	Chromium	8.30	U	*	P
7440-48-4	Cobalt	5.80	U		P
7440-50-8	Copper	6.20	U		P
7439-89-6	Iron	38.40	B		P
7439-92-1	Lead	1.50	U	W	F
7439-95-4	Magnesium	126.00	U		P
7439-96-5	Manganese	1.30	U		P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	8.70	U		P
7440-09-7	Potassium	267.00	U		P
7782-49-2	Selenium	2.30	U	WJ	F
7440-22-4	Silver	8.10	U		P
7440-23-5	Sodium	214.00	U		P
7440-28-0	Thallium	1.30	U		F
7440-62-2	Vanadium	4.30	U		P
7440-66-6	Zinc	9.80	B		P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MB[illegible]

Lab Name: SKINNER & SHERMAN LAB Contract: 68-W8-0006

Lab Code: SKINER Case No.: [illegible] SAS No.: SDG No.: MB[illegible]

Matrix (soil/water): WATER Lab Sample ID: [illegible]

Level (low/med): LOW Date Received: [illegible]

% Solids: 0

Concentration Units (ug/l or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	23.40	U		P
7440-36-0	Antimony	18.70	U		P
7440-38-[illegible]	Arsenic	1.50	U		F
7440-39-3	Barium	[illegible]	U		P
7440-41-7	Beryllium	0.00	B		F
7440-41-7	Cadmium	2.60	U		P
7440-70-2	Calcium	33.50	U		P
7440-47-3	Chromium	14.70			P
7440-48-4	Cobalt	5.30	U		P
7440-50-8	Copper	6.20	U		P
7439-89-6	Iron	34.90	B		P
7439-92-1	Lead	1.50	U		F
7439-95-4	Magnesium	126.00	U		P
7439-96-5	Manganese	1.30	U		P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	3.70	U		F
7440-09-7	Potassium	306.00	B		P
7782-49-2	Selenium	2.30	U	J	F
7440-22-4	Silver	3.10	U		P
7440-23-5	Sodium	214.00	U		P
7440-28-0	Thallium	1.30	U		F
7440-62-2	Vanadium	6.40	B		P
7440-66-6	Zinc	7.30	U		P
	Cyanide				NR

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: ___

Comments:

CC9