

D. E. R.

JUL 6 1990,

SOUTHWEST DISTRICT
TAMPA

**Manatee County Public Works
Solid Waste Department
Second Set of Responses on Revised
Groundwater Monitoring Plan for
Lena Road Landfill
Manatee County, Florida
DER Permit No's. S041-118353,
SC41-095658 and SC41-095667**



Ardaman & Associates, Inc.

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Ardaman & Associates, Inc.

June 26, 1990
File Number 86-115B

Consultants in Soils, Hydrogeology,
Foundations and Materials Testing

Manatee County Public Works
Solid Waste Department
4501 66th Street West
Bradenton, Florida 34210

Attention: Mr. Daniel Gray

Subject: Second Set of Responses on Revised Groundwater Monitoring Plan for Lena Road
Landfill, Manatee County, Florida
DER Permit Numbers: S041-118353, SC41-095658 and SC41-095667

Gentlemen:

As requested by Mr. Greg Yekaitis, Ardaman & Associates, Inc. submits the following responses to the Florida Department of Environmental Regulation (FDER) letter dated April 20, 1990 on the subject project.

1. According to the review of Ardaman's March 28 report, several items require further clarification. The following information is requested by Mr. Charles Merkun, P.G., of the office:

- a. background water quality data for wells CW-1, CW-2 and SA-2.

The CW-1 well was abandoned October 5, 1988 as explained in the Ardaman & Associates, Inc. (A&A) well completion report dated March 10, 1989. The 1984-1988 chemistry data for this well were provided in the Appendix of the Revised Groundwater Monitoring Plan report of A&A dated January 11, 1990.

The CW-2 well was abandoned January 25, 1989 as explained in the March 10, 1989 A&A report and the 1984-1988 chemistry data were provided in the January 11, 1990 A&A report.

The SA-2 well was improperly referenced as the SA-1 well in the March 28, 1990 A&A report. The County staff have been mislabeling this well in their field and laboratory notes since 1988. The SA-1 well was abandoned October 13, 1988 as explained in the March 10, 1990 A&A report. The 1989 water chemistry data were provided in the March 28, 1990 A&A report as the SA-1 data. In addition the chemistry results from a December 12, 1985 sample are provided in the Appendix of the January 11, 1990 A&A report.

- b. justification for using SMR-1 and SMR-2 as background wells for the surficial and confined aquifers.

The water table and potentiometric surface elevation maps are provided in response to item 1c. below. Two main reasons are provided for the justification of SMR-1 and SMR-2 as the background wells for the surficial and artesian aquifer systems, respectively. First, the wells are

located the furthest away from the enclosed slurry wall system. Second, SMR-1 is in an upgradient position in the surficial aquifer system for the enclosed slurry wall system. A drainway separates the SMR-1 well and the east wall of the slurry wall in Stage II. In other words, seepage from the east edge of the landfill will be intercepted by this north-south drainway before it could reach the SMR-1 well. In the case of the first artesian aquifer system, the justification was that the SMR-2 well is upgradient from the landfill with respect to the regional potentiometric surface of the intermediate aquifer system. The direction of flow in the intermediate aquifer system is primarily west and slightly south across the site according to USGS data. The 1989 onsite potentiometric surface data appears to indicate a potentiometric surface high in the east part of the site as evidenced from high readings in wells SMR-2 and SA-2. From this potentiometric high the flow direction in this first artesian aquifer is west and north away from the Stage II area.

c. water table elevation and piezometric contour maps for evaluating SMR-1, SMR-2, MW-1, CW-5, SA-1 and SA-3.

A revised Table 1 from the March 28, 1990 A&A report is enclosed for your information. The Table now includes water level elevations for all wells and the reference to SA-1 has been changed to SA-2.

The water table elevations of the surficial aquifer system and potentiometric surface elevations of the first artesian aquifer have been plotted for the August and December 1989 county monitoring data from Table 1. Ideally, the water level elevations for a given map should be for the same date to exclude different rainfall conditions between water level readings. The following dates were used for the four enclosed water level maps as a compromise period between the one day ideal and the several days required for sampling:

- August 7-11, 1989 Water Table Elevations of Surficial Aquifer System
- August 7-10, 1989 Potentiometric Surface Elevations of First Artesian Aquifer System
- December 12-14, 1989 Potentiometric Surface Elevations of First Artesian Aquifer System
- December 11-14, 1989 Water Table Elevations of Surficial Aquifer Systems

The water table maps indicate water table elevations around and adjacent to the landfill. The water table elevations varied between 26.2 to 38.5 feet (NGVD) in August 1989 and between 26.4 to 38.0 feet (NGVD) in December 1989. The elevations at each well depend upon the location of the well with respect to the basin involved, the distance from mouth and lateral distance from centerline of streambed. The property essentially drains three basins; Cypress Strand along the west part of the landfill; An unnamed tributary at the north end of the site; and a tributary to Gates Creek at the northeast corner of the landfill. The headwaters of Cypress Strand is along the south end of the landfill and has water table elevations over 38.0 feet (NGVD) near the southeast corner of the landfill. The lowest water table elevations along Cypress Strand are at GC-1 and GC-4 wells. In December 1989 the lowest water table elevations in this basin were 26.4 feet (NGVD). The LRII-1, LRII-2, LRII-3 and LRII-4 wells are within the unnamed tributary basin that drains through a structure along State Road 64 just north of the landfill site. The water table elevations in December 1989 for these wells varied between 26.8 to 33.0 feet (NGVD) in this basin. The MW-6, LRII-5 and SMR-1 wells are in the Gates Creek basin. The water table elevations for these wells in December 1989 ranged from 33.5 feet (NGVD) at the MW-6 well to 28.0 feet (NGVD) at the LRII-5 well.

The potentiometric surface elevations typically vary between 10 and 20 feet (NGVD); however, the range in elevations for the August and December 1989 readings were 5.1 to 20.4 feet (NGVD). The highest elevations are at well SA-2 while the lowest elevations appear to be at well SA-7. The direction of flow appears to be west and northwest across the site.

d. comments on the toxicity of the leachate.

The leachate chemistry results from the County were provided in the March 28, 1990 A&A report.

e. explanation of anticipated leachate volumes, possibly using the HELP model.

The monthly leachate quantities from January 1988 through May 1990 are provided in Table 2 based on data provided by the County. The table includes several categories of leachate data. Leachate enters the leachate pond from the Stage I collection system and since September 1989 also from the Stage III collection system. The leachate pond water is pumped to the wastewater treatment plant and/or to the spray irrigation area. Pond water has not gone to the irrigation area since May 1989. For the 130-acre Stage I area, the leachate generated during 1989 was equivalent to 4.5 inches per year. The equivalent of about 4.5 inches per year should be generated at this site until closure of any part of the landfill. The leachate volumes generated in 1989 in Stage I are the order of magnitude volumes expected in the future as the overall area of filling is not expected to significantly change. Considering 4 inches per year of leachate from the 67-acre Stage III area, the leachate quantities would be approximately 7,200,000 gallons.

2. The statement in the March 28 report, "the direction and rate of groundwater movement away from the landfill toward the leachate collection system at anytime in the life of the landfill will depend on the groundwater mound with respect to the water level in the leachate collection system" raises concerns. As we can expect, mounding will occur inside the slurry, and the greater the mounding, the greater the chances are of downward leakage of pollution that does not make it to the collection system. Please describe the monitoring of the mounds to insure that the leachate actually make its way into the collection system and doesn't just keep mounding up into the garbage. A monitoring well toward the center of each slurry wall area is requested to monitor the mounds to verify the effectiveness of each slurry wall system.

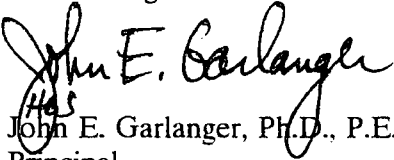
A monitoring well toward the center of each slurry wall area is not possible because of the continuous landfilling activities planned for these areas. A monitoring well at the top of the side slope along one edge of each slurry wall system is possible. This location should work as a satisfactory alternative for monitoring the water table mound within the landfill areas.

These responses should provide sufficient information to these questions. Please do not hesitate to contact us if you have questions or when we can be of further service.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.



Herbert G. Stangland, Jr., P.E.
Senior Water Resources Engineer
Florida Registration No. 16713



John E. Garlanger, Ph.D., P.E.
Principal

HGS/JEG/pdc

Enclosures

1-86115B.HGS

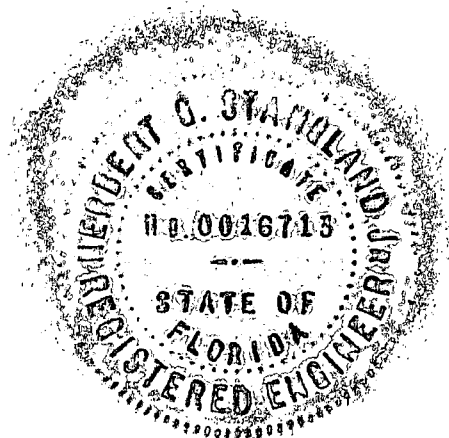


Table 1

1989 WELL WATER LEVEL DATA

<u>Location</u>	<u>Elevation TOC (ft, NGVD)</u>	<u>Date</u>	<u>Depth to Water from TOC (ft)</u>	<u>Water Level Elevation (ft, NGVD)</u>
Artesian Aquifer Wells				
SA-2	37.97	03-20-89	21.02	16.95
		04-24-89	26.00	11.97
		08-07-89	18.25	19.72
		12-12-89	17.60	20.37
SA-3	35.12	03-16-89	24.25	10.87
		04-24-89	27.00	8.12
		08-07-89	22.58	12.54
		12-12-89	17.75	17.37
SA-4	31.28	03-09-89	22.00	9.28
		04-25-89	25.00	6.28
		08-08-89	19.08	12.20
		12-13-89	18.58	12.70
SA-5	37.92	03-06-89	26.16	11.76
		04-26-89	29.50	8.42
		08-08-89	23.58	14.34
		12-12-89	21.80	16.12
SA-6	36.04	03-06-89	23.50	12.54
		04-26-89	25.08	10.96
		08-09-89	25.00	11.04
		12-14-89	21.50	14.54
SA-7	33.27	03-06-89	23.12	10.15
		05-01-89	28.50	4.77
		08-09-89	28.17	5.10
		12-14-89	21.33	11.94
SA-8	34.48	03-08-89	24.30	10.18
		05-01-89	28.25	6.23
		08-09-89	24.75	9.73
		12-14-89	21.79	12.69
SMR-2	36.10	03-16-89	20.63	15.47
		04-27-89	24.88	11.22
		08-10-89	24.30	11.80
		12-18-89	35.00	1.10

Table 1
(continued)

1989 WELL WATER LEVEL DATA

<u>Location</u>	<u>Elevation TOC (ft, NGVD)</u>	<u>Date</u>	<u>Depth to Water from TOC (ft)</u>	<u>Water Level Elevation (ft, NGVD)</u>
Surficial Aquifer Wells				
SMR-1	36.48	03-16-89	6.58	29.90
		04-27-89	7.92	28.56
		08-10-89	5.40	31.08
		12-18-89	5.58	30.90
MW-1	38.93	03-09-89	6.08	32.85
		04-27-89	6.71	32.22
		08-10-89	2.58	36.35
		12-11-89	8.75	30.18
MW-2	39.77	03-07-89	9.08	30.69
		04-25-89	9.29	30.48
		08-11-89	9.75	30.02
		12-11-89	8.82	30.95
MW-3	40.07	03-07-89	7.92	32.15
		04-25-89	9.29	30.78
		08-11-89	7.67	32.40
		12-11-89	7.50	32.57
MW-6 (New)	39.32	03-09-89	6.08	33.24
		04-26-89	7.67	31.65
		08-07-89	6.33	32.99
		12-11-89	5.82	33.50
LRII-1	38.02	03-06-89	4.12	33.90
		04-26-89	5.96	32.06
		08-08-89	5.25	32.77
		12-12-89	5.00	33.02
LRII-2	36.53	03-06-89	6.50	30.03
		04-26-89	8.17	28.36
		08-09-89	6.25	30.28
		12-14-89	5.75	30.78

Table 1
(continued)

1989 WELL WATER LEVEL DATA

<u>Location</u>	<u>Elevation TOC (ft, NGVD)</u>	<u>Date</u>	<u>Depth to Water from TOC (ft)</u>	<u>Water Level Elevation (ft, NGVD)</u>
LRII-3	33.51	03-06-89	6.13	27.38
		05-01-89	7.83	25.68
		08-09-89	5.67	27.84
		12-14-89	6.67	26.84
LRII-4	33.90	03-08-89	5.83	28.07
		05-01-89	7.38	26.52
		08-09-89	5.50	28.40
		12-14-89	6.63	27.27
LRII-5	36.78	03-08-89	6.33	30.45
		04-26-89	7.67	29.11
		08-11-89	5.00	31.78
		12-18-89	8.83	27.95
GC-1	31.36	03-09-89	4.33	27.03
		04-25-89	5.00	26.36
		08-08-89	5.16	26.20
		12-13-89	5.00	26.36
GC-2	38.23	03-20-89	4.83	33.40
		04-24-89	5.63	32.60
		08-07-89	8.08	30.15
		12-12-89	7.33	30.90
GC-3	35.08	03-08-89	4.00	31.08
		04-24-89	5.67	29.41
		08-07-89	7.17	27.91
		12-12-89	4.75	30.33
GC-4	33.98	03-07-89	5.08	28.90
		04-24-89	6.50	27.48
		08-07-89	5.00	28.98
		12-13-89	6.25	27.73
GC-5	36.52	03-07-89	7.50	29.02
		04-25-89	8.00	28.52
		08-08-89	7.50	29.02
		12-13-89	7.83	28.69

Table 1
(continued)

1989 WELL WATER LEVEL DATA

<u>Location</u>	<u>Elevation TOC (ft, NGVD)</u>	<u>Date</u>	<u>Depth to Water from TOC (ft)</u>	<u>Water Level Elevation (ft, NGVD)</u>
GC-6	39.10	03-07-89	8.33	30.77
		04-25-89	8.00	31.10
		08-08-89	7.75	31.35
		12-13-89	8.17	30.93
CW-3	39.33	03-20-89	5.88	33.45
		05-01-89	6.42	32.91
		08-08-89	6.50	32.83
		12-18-89	7.83	31.50
CW-4	37.54	03-20-89	6.71	30.83
		04-27-89	6.58	30.96
		08-10-89	4.63	32.91
		12-11-89	5.00	32.54
CW-5	42.00	03-09-89	6.00	36.00
		04-27-89	7.83	34.17
		08-10-89	3.54	38.46
		12-11-89	4.00	38.00

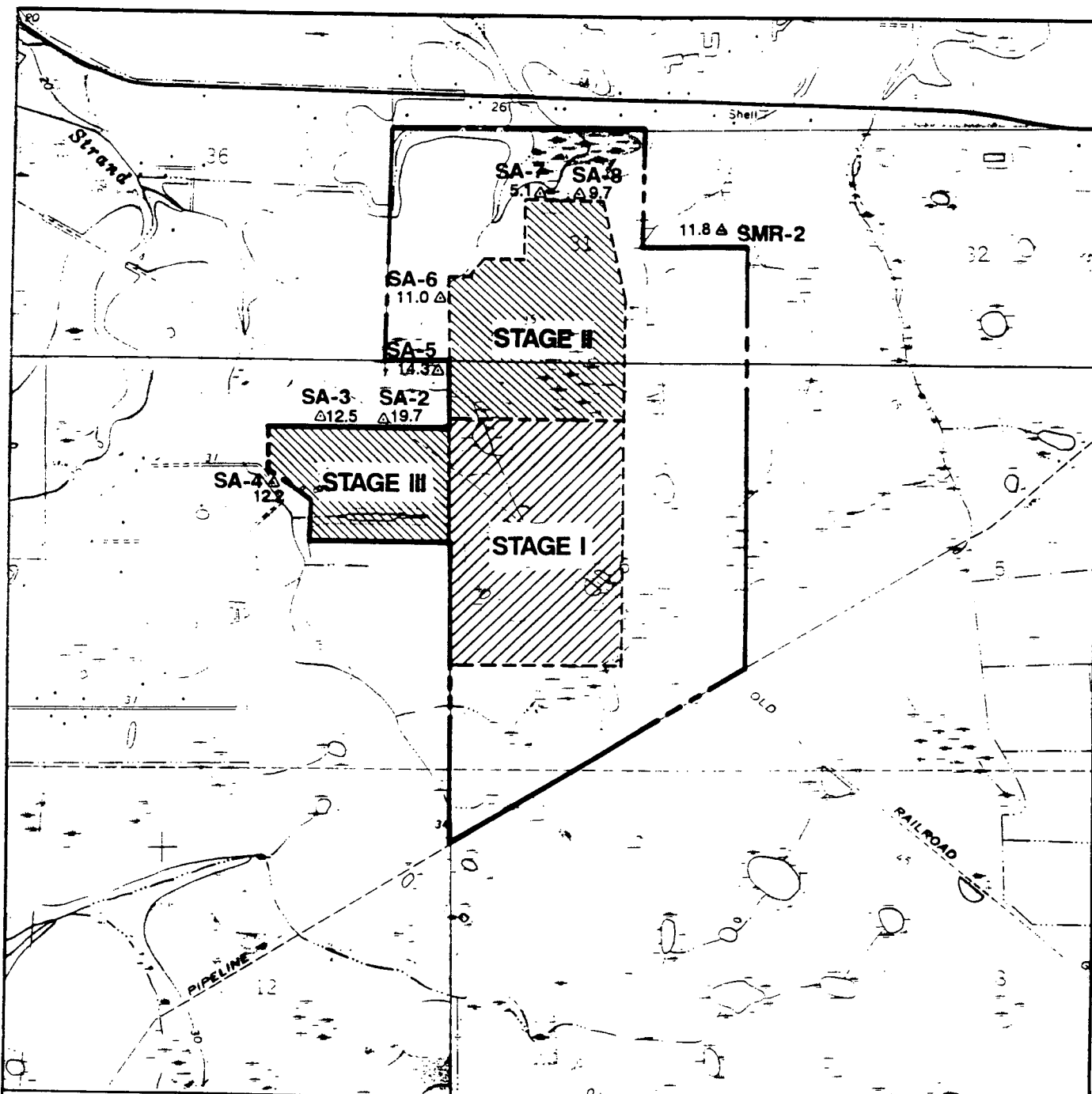
NOTE: TOC - Top of Casing

Table 2

HISTORIC LEACHATE QUANTITIES

<u>Month</u>	<u>Year</u>	<u>Pond Input from Stage I (gallons)</u>	<u>Pond Input from Stage III (gallons)</u>	<u>Pond Output to SEWWTP (gallons)</u>	<u>Rainfall (inches)</u>	<u>Pond Output to Irrigation (gallons)</u>
May	1990	895,415	383,987	12,840,693	2.30	0
April	1990	1,007,390	1,236,125	5,808,200	2.00	0
March	1990	1,214,356	1,735,220	21,193,000	0.00	0
February	1990	931,320	1,621,920	13,57,675	3.70	0
January	1990	1,015,632	1,877,885	8,042,400	0.25	0
December	1989	1,282,500	2,356,659	600,000	3.90	0
November	1989	1,005,975	2,397,080	9,100,000	0.70	0
October	1989	1,434,300	4,476,664	19,500,000	1.85	0
September	1989	2,998,458	300,000e	3,500,000	14.52	0
August	1989	1,813,177	0	1,616,000	8.75	0
July	1989	1,616,873	0	4,107,000	10.55+	0
June	1989	1,360,880	0	2,780,100	8.04	0
May	1989	978,291	0	0	1.75	327,450
April	1989	922,422	0	957,990	2.09	326,100
March	1989	774,510	0	5,885,000	1.45	0
February	1989	678,895	0	0	0.00	0
January	1989	910,369	0	371,310	1.74	0
December	1988	3,333,080	0	4,571,400	0.95	3,330,080
November	1988	6,513,876	0	3,329,908	4.82	94,350
October	1988	5,668,010	0	2,410,000	0.52	809,190
September	1988	10,409,790	0	3,449,000	19.17	310,800
August	1988	8,583,060	0	0	12.64	0
July	1988	5,400,320	0	0	14.37	32,190
June	1988	931,920	0	0	3.22	206,460
May	1988	2,095,985	0	0	2.10	897,990
April	1988	1,601,555	0	0	0.00	1,523,070
March	1988	6,115,858.4	0	0	4.46	169,255
February	1988	9,531,458	0	0	1.90	244,200
January	1988	7,268,660	0	0	2.94	1,041,500

e - value estimated



**POTENTIOMETRIC SURFACE ELEVATIONS
FROM FIRST ARTESIAN AQUIFER -
AUGUST 7-10, 1989**


SECTION 1, TOWNSHIP 35 S, RANGE 18E
SECTION 6 AND 7, TOWNSHIP 35 S, RANGE 19 E
SECTION 31, TOWNSHIP 34 S, RANGE 19 E



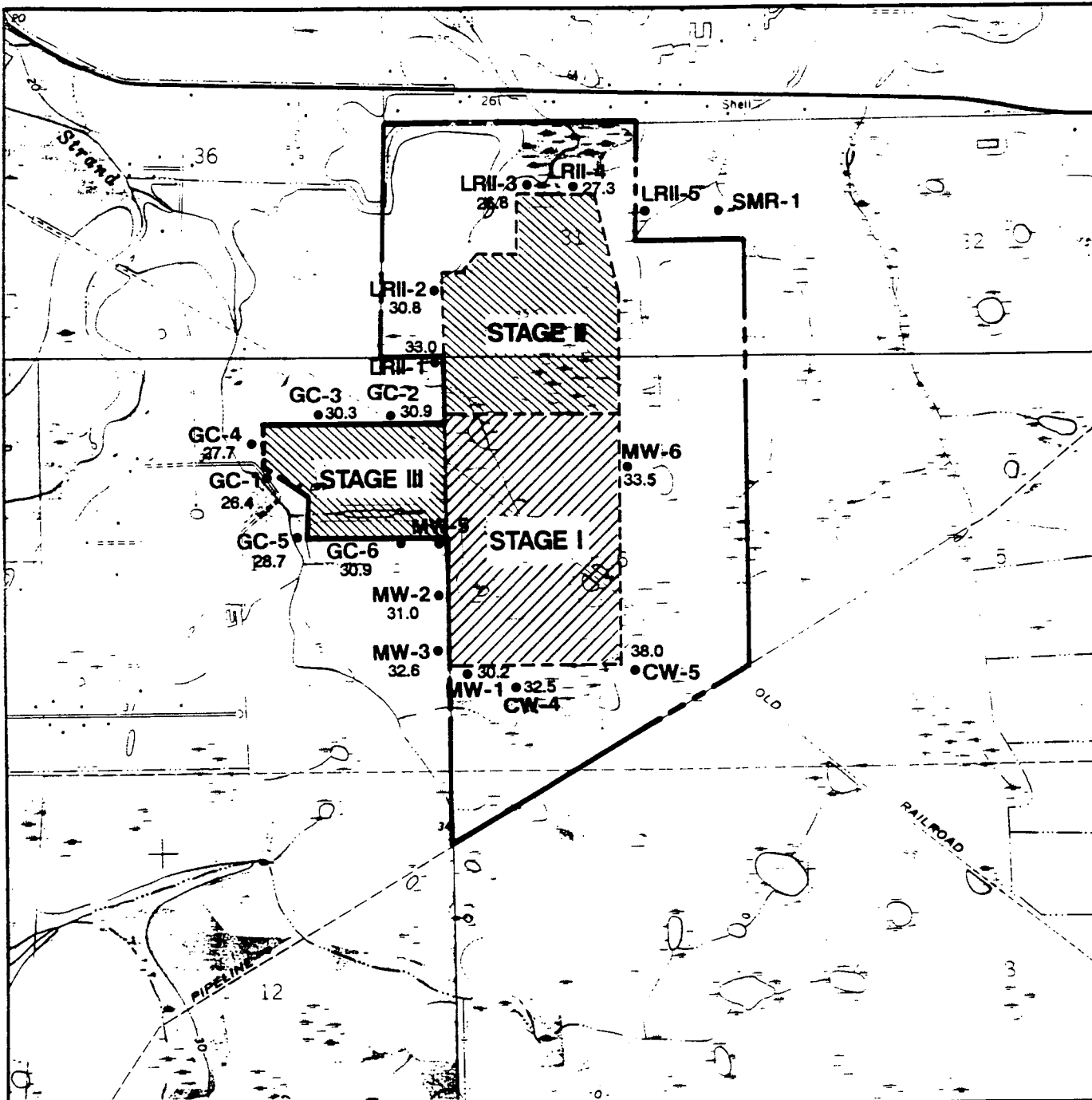
0 1000 2000
SCALE — FEET

LEGEND

- △ ARTESIAN AQUIFER MONITOR WELL
- 11.0 △ POTENTIOMETRIC SURFACE ELEVATION IN FEET NGVD

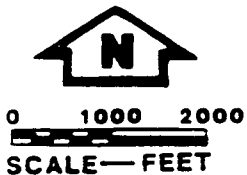
 Ardaman & Associates, Inc. Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing	
REVISED GROUNDWATER MONITORING PLAN LENA ROAD LANDFILL MANATEE COUNTY, FLORIDA	
DRAWN BY: SEF FILE NO: 86-115B	CHECKED BY: HGS DATE: 01/09/90 APPROVED BY: <i>H.G. Stangland</i>

SOURCE: U.S.G.S. QUAD MAP, LORRAINE FL. 1973




**WATER TABLE ELEVATIONS
FROM SURFICIAL AQUIFER SYSTEM -
DECEMBER 11-14, 1989**

SECTION 1, TOWNSHIP 35 S, RANGE 18E
SECTION 6 AND 7, TOWNSHIP 35 S, RANGE 19 E
SECTION 31, TOWNSHIP 34 S, RANGE 19 E

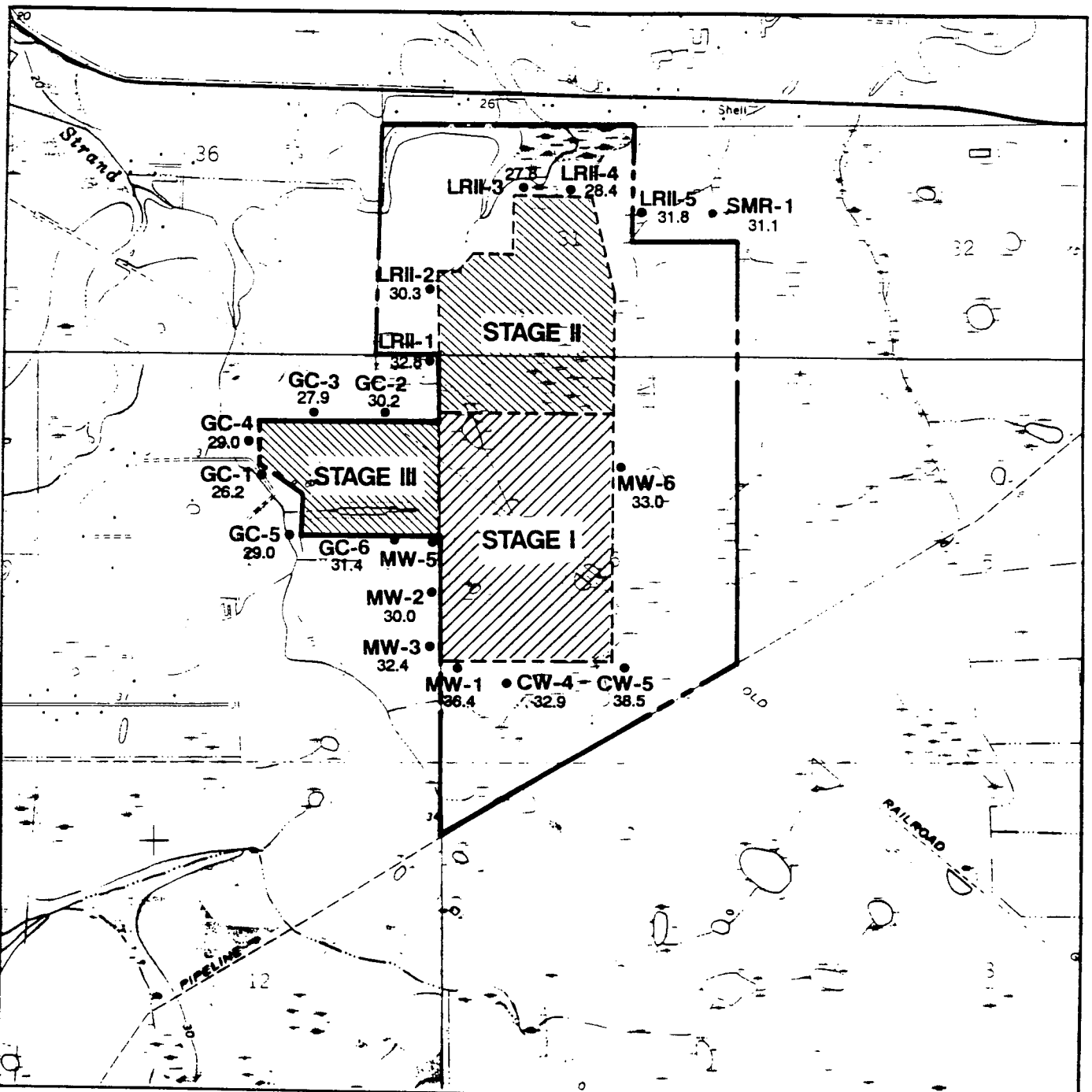


LEGEND

- SURFICIAL AQUIFER MONITOR WELL
- 30.8 ● WATER TABLE ELEVATION IN FEET NGVD

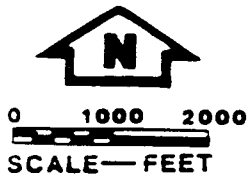
 Ardaman & Associates, Inc. Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing		
REVISED GROUNDWATER MONITORING PLAN LENA ROAD LANDFILL MANATEE COUNTY, FLORIDA		
DRAWN BY: SEF FILE NO.: 86-115B	CHECKED BY: HGS APPROVED BY: <i>H.G. Stangland</i>	DATE: 01/09/90

SOURCE: U.S.G.S. QUAD MAP, LORRAINE FL 1973




**WATER TABLE ELEVATIONS
FROM SURFICIAL AQUIFER SYSTEM
AUGUST 7-11, 1989**

SECTION 1, TOWNSHIP 35 S, RANGE 18 E
SECTION 6 AND 7, TOWNSHIP 35 S, RANGE 19 E
SECTION 31, TOWNSHIP 34 S, RANGE 19 E

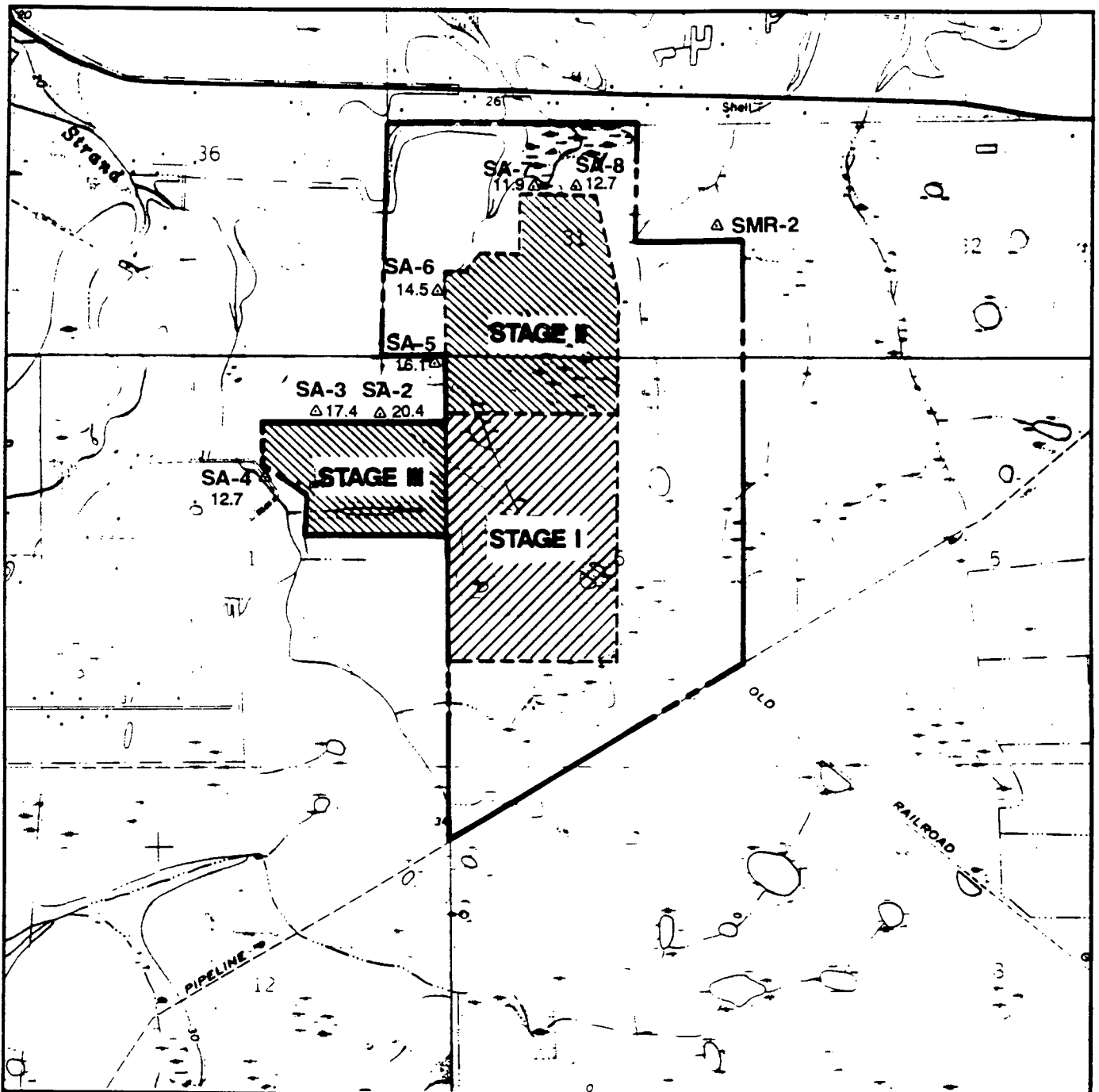


LEGEND

- SURFICIAL AQUIFER MONITOR WELL
- 30.3 ● WATER TABLE ELEVATION IN FEET NGVD

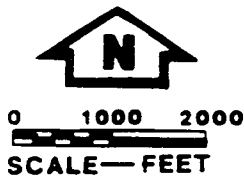
 Ardaman & Associates, Inc. Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing	
REVISED GROUNDWATER MONITORING PLAN LENA ROAD LANDFILL MANATEE COUNTY, FLORIDA	
DRAWN BY: SEF FILE NO: 86-1158	CHECKED BY: HGS APPROVED BY: <i>H.G. Stangland</i> DATE 01/09/90

SOURCE: U.S.G.S. QUAD MAP, LORRAINE FL 1973



**POTENTIOMETRIC SURFACE ELEVATIONS
FROM FIRST ARTESIAN AQUIFER -
DECEMBER 12-14, 1989**

SECTION 1, TOWNSHIP 35 S, RANGE 18 E
SECTION 6 AND 7, TOWNSHIP 35 S, RANGE 19 E
SECTION 31, TOWNSHIP 34 S, RANGE 19 E



LEGEND

- △ ARTESIAN AQUIFER MONITOR WELL
- 14.5 △ POTENTIOMETRIC SURFACE ELEVATION
IN FEET NGVD

Ardaman & Associates, Inc. Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing	
REVISED GROUNDWATER MONITORING PLAN LENA ROAD LANDFILL MANATEE COUNTY, FLORIDA	
DRAWN BY: SEF FILE NO: 86-115B	CHECKED BY: HGS APPROVED BY: <i>H.G. Stangland</i>
DATE: 01/09/90	

SOURCE: U.S.G.S. QUAD MAP, LORRAINE FL. 1973