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TELEPHONE 212-701-3000

WRITER'S DIRECT NUMBER

(212) 701-3680

March 9, 1990

Re: Des Moines TCE Site - Site Map and Geophysical Investigation of South Parking Lot at Meredith's Locust Street Property

Dear Mr. Curtis:

On behalf of Meredith Corporation ("Meredith"), I have enclosed two copies of (1) a topographical map of Meredith's Parking Lot, prepared by Bishop Engineering Company, Des Moines, Iowa, dated October 25, 1989, and (2) a Report entitled "Geophysical Investigation on the Meredith Corporation South Parking Lot", prepared by Layne GeoSciences, Inc., dated February 1990. These have been prepared under the supervision of Meredith's consultant, Environ Corporation, pursuant to the Proposal For Conducting a Geophysical Investigation of the South Parking Lot, Meredith's Locust Street Property (June 1989), previously submitted to and approved by EPA.

Please direct any technical questions or comments with respect to these materials to John Schroeter at Environ Corporation (415) 655-7400.

Meredith's voluntary conduct of the tasks reflected in these materials and their submission are not intended and should not be construed as an admission or acknowledgment of any fault, liability or responsibility regarding the Des Moines TCE Site or otherwise, and Meredith reserves all rights and defenses, including the right to seek contribution from any responsible party, with respect to such site or otherwise. Meredith believes that if any remediation of the South Parking Lot is undertaken, it should not be Meredith's responsibility.

Yours sincerely,

Robert M. Hallman

Mr. Glenn M. Curtis
Environmental Engineer,
Remedial Project Manager
U.S. Environmental Protection Agency
Region VII, Superfund
726 Minnesota Avenue
Kansas City, KS 66101

[Enclosures]

cc: Jerry L. Hadenfeldt, Esq.
John H. Schroeter, P.E.

LGI

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REMD SECTION

GEOPHYSICAL INVESTIGATION ON THE MEREDITH CORPORATION SOUTH PARKING LOT DES MOINES, IOWA

Submitted to:

ENVIRON CORPORATION
EMERYVILLE, CALIFORNIA

By:

LAYNE GEOSCIENCES, INC.
A SUBSIDIARY OF LAYNE-WESTERN CO., INC.

PROJECT NUMBER 1706

FEBRUARY 1990

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List of Figures

1.0 Introduction

A geophysical survey was conducted by Layne GeoSciences, Inc. on the paved 2-acre south parking lot at the Meredith Corporation in Des Moines, Iowa. The survey was conducted on October 25, 1989 by Layne GeoSciences geophysicists.

The primary objective of the geophysical survey was to identify the potential presence of buried drums and other metallic objects buried beneath the parking lot up to a depth of approximately 15 feet. In addition, the survey was conducted to delineate potential trench boundaries and other areas of disturbed soil. The objectives of the survey were addressed by utilizing an EG&G G-856 proton precession gradiometer and a Geonics EM-31-DL electromagnetic induction terrain conductivity instrument. Standard operating procedures for the instruments were followed during the survey as prescribed in the manufacturers manuals.

2.0 Gradiometer Survey

A total field gradiometer survey was conducted in place of the proposed total field magnetometer survey due to the difficulty in establishing a base station in the immediate vicinity of the parking lot which would be unaffected by railroad traffic and a substantial quantity of large metallic objects surrounding the parking lot. Two sensors mounted vertically on a staff at heights of seven and four feet above the ground surface were used to acquire the gradient data. The gradiometer survey did not require the use of a base station because it inherently eliminates time variations in the data. The gradient measurements are made almost simultaneously and are very closely spaced compared to the source of magnetic storms and diurnal variations. Such effects on the two readings are essentially identical and therefore removed on the differential. The gradient data were processed utilizing EG&G's MAGPAC magnetic software program to derive the vertical magnetic gradient for each station.

The gradiometer survey was conducted on a 10-foot grid over the surface of the parking lot. The data were recorded on 10-foot centers along 20 profiles traversing the length of the parking lot. A 10-foot grid was used in order to detect the possible presence of single 55-gallon drums.

Calibration of the magnetometer for accuracy was not necessary as the sensor operation is based on nuclear precession. The precision or repeatability of the magnetometer was checked by taking successive readings periodically while traversing the profiles. If successive readings were within 1 gamma of each other the readings were considered valid. Successive non-repeating readings were obtained in several areas of the parking lot due to high magnetic field gradients which sharply degraded the signal of the proton precession magnetometer. The high gradients were encountered in the vicinity of the steel stairway and pedestrian bridge used to cross the railroad tracks on the northern boundary of the parking lot and the protective steel posts around the three drains in the eastern portion of the parking lot.

3.0 Electromagnetic (EM) Induction Survey

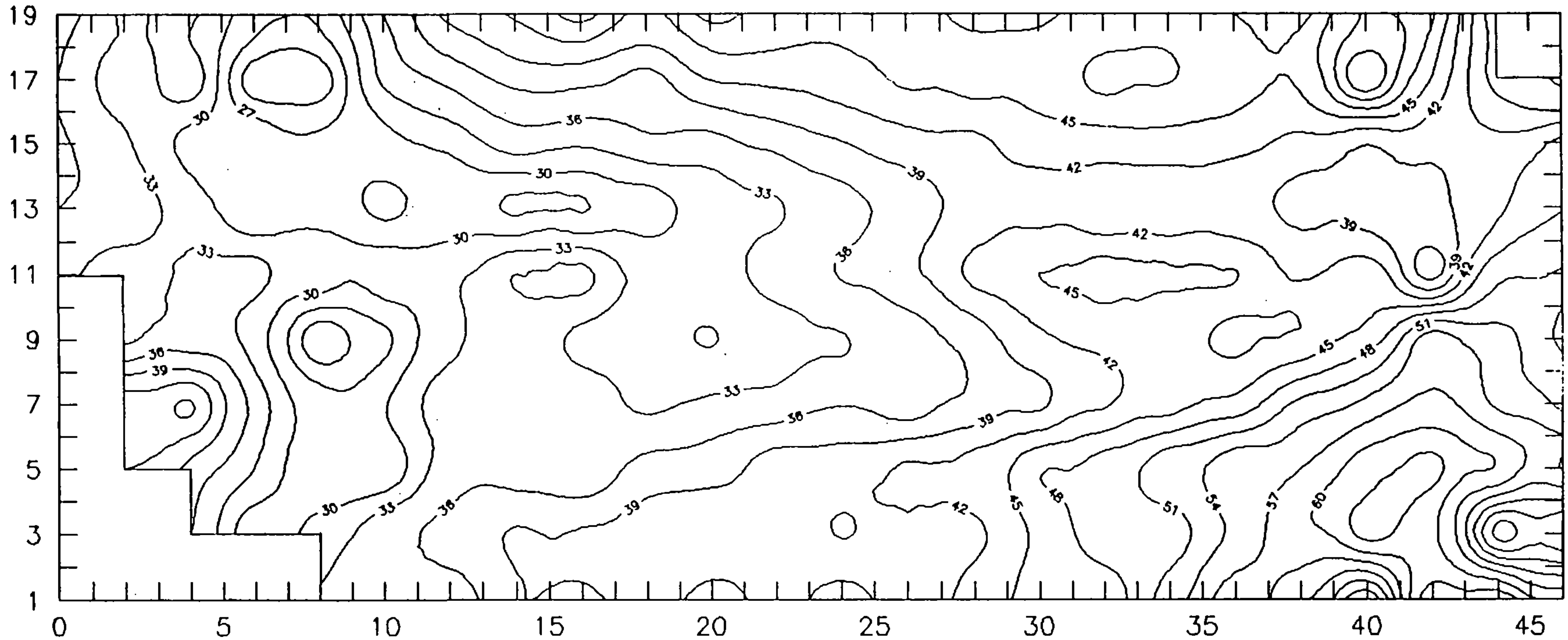
The EM survey was conducted for two primary objectives: 1) to measure lateral changes in subsurface conductivities which may indicate the potential presence of trenches and other areas of disturbed soil and 2) to identify the potential presence of buried drums and other metallic objects buried beneath the parking lot. The survey was conducted in the vertical dipole mode with both the quadrature and in-phase components of the induced magnetic field recorded. The quadrature component of the induced EM field was recorded to determine lateral changes in subsurface conductivities or geologic structure. The in-phase component of the induced EM field is significantly more sensitive to metallic objects and therefore was used to detect the potential presence of buried drums and other metallic objects. The vertical component EM data were downloaded to a computer for analysis utilizing Geonics EM-31 software.

The EM-31 survey was conducted on a 20-foot grid over the surface of the parking lot. The data were recorded on 20-foot centers along 10 profiles traversing the length of the parking lot. The instrument was continuously monitored for anomalies between stations. A 20-foot grid was sufficient grid density to detect the potential presence of trenches and other areas of disturbed soil as well as single 55-gallon drums.

The calibration of the EM instrument is not critical when recording relative changes in the quadrature and in-phase components of the induced field as was done in this survey. However, the instrument was field calibrated according to the manufacturer's specifications to check for "drift" in the instrument's performance during the survey. Instrument "drift" was not observed during the EM survey. The precision or repeatability of the instrument was checked by taking successive readings periodically while traversing the profiles. Measurements were considered valid if successive measurements could be repeated.

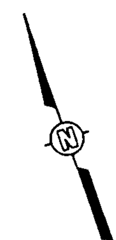
4.0 Survey Results

The data obtained from the electromagnetic induction and magnetic gradient surveys are presented in five plots (Figures 1-5). Profile line numbers are indicated on the vertical or Y-axis of the plots and the station numbers are indicated on the horizontal or X-axis of the plots. The location of anomalies described in this section are given by x,y coordinates (station number, profile line number). The vertical dipole quadrature and in-phase components of the induced magnetic field are shown in Figures 1 and 2, respectively and the magnetic gradient data are presented in Figures 3-5.



Contour Interval: 3 mmho/m

SCALE

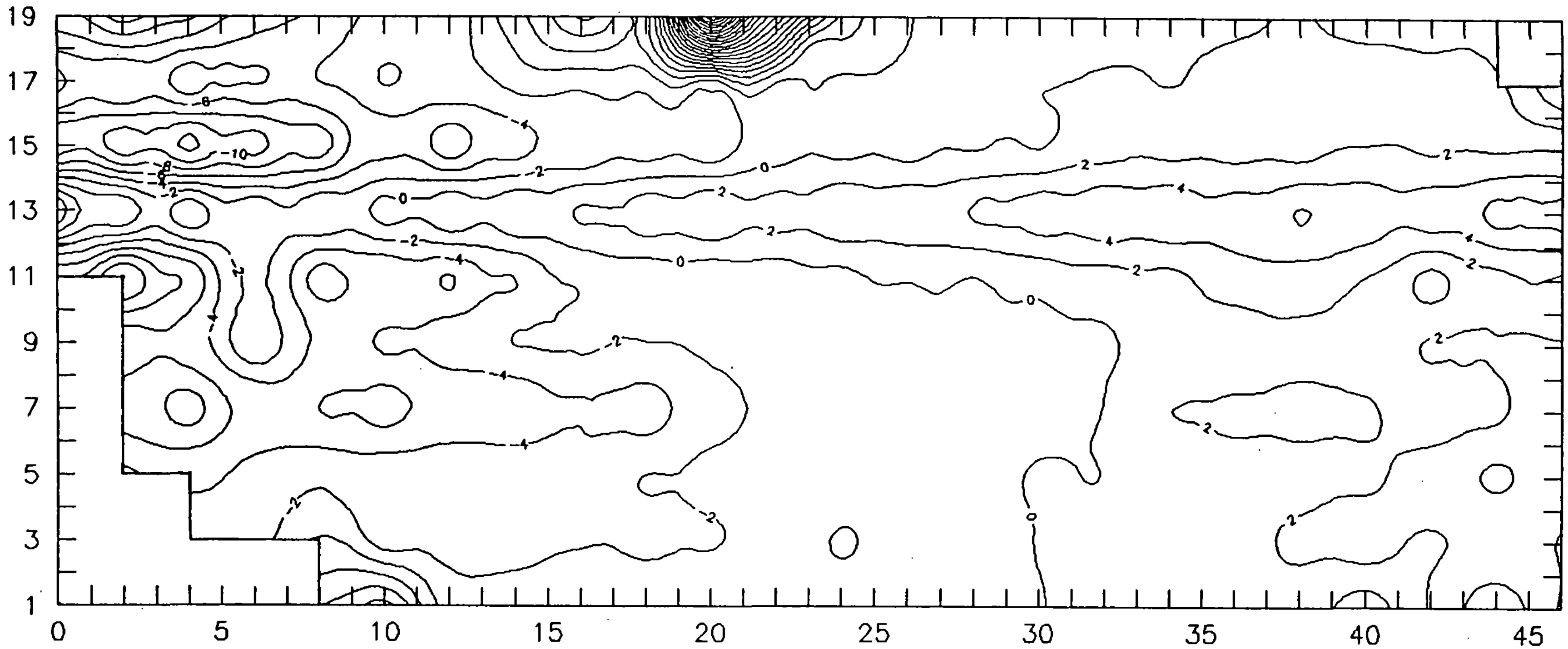


Layne GeoSciences, Inc.
A Subsidiary of LAYNE-WESTERN COMPANY, INC.

Drawn by:	GM 11/2	Checked by:	MS	11/10	Drawing number	1706-1
		Approved by:	PS	11/13		

FIGURE 1

VERTICAL DIPOLE QUADRATURE COMPONENT



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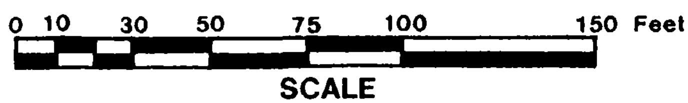

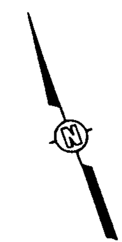

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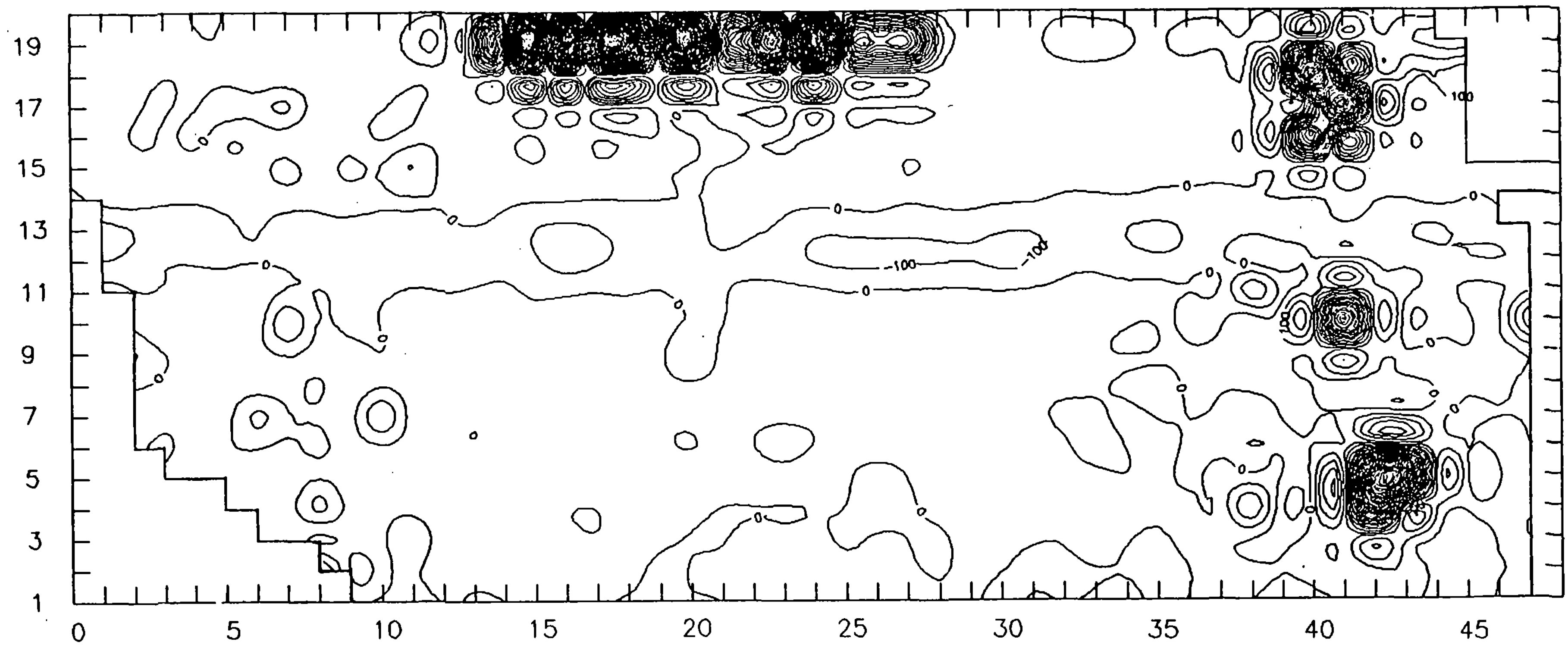
FIGURE 2

VERTICAL DIPOLE IN-PHASE COMPONENT



Contour Interval: 100 gammas

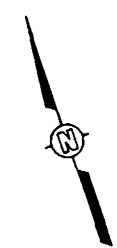


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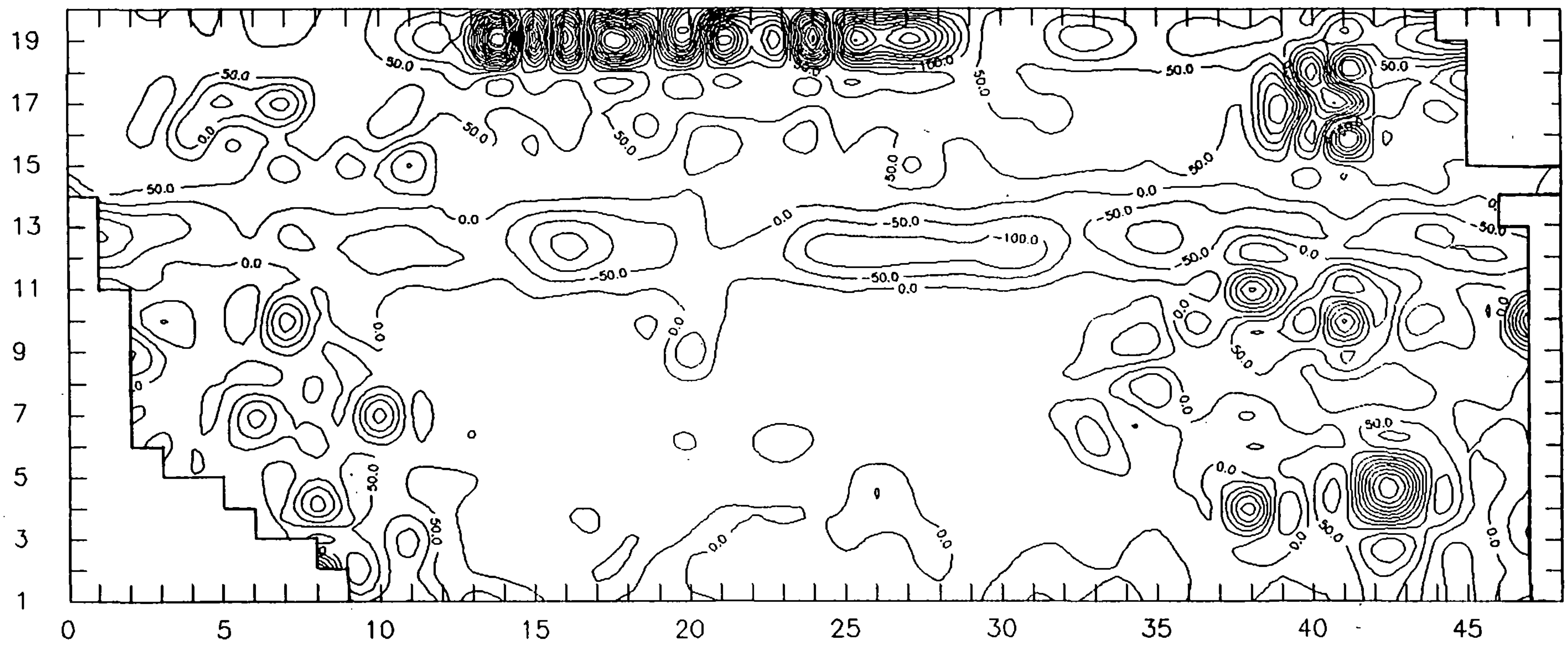
FIGURE 3

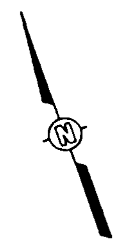
VERTICAL MAGNETIC GRADIENT



Contour Interval: 50 gammas

0 10 30 50 75 100 150 Feet

SCALE



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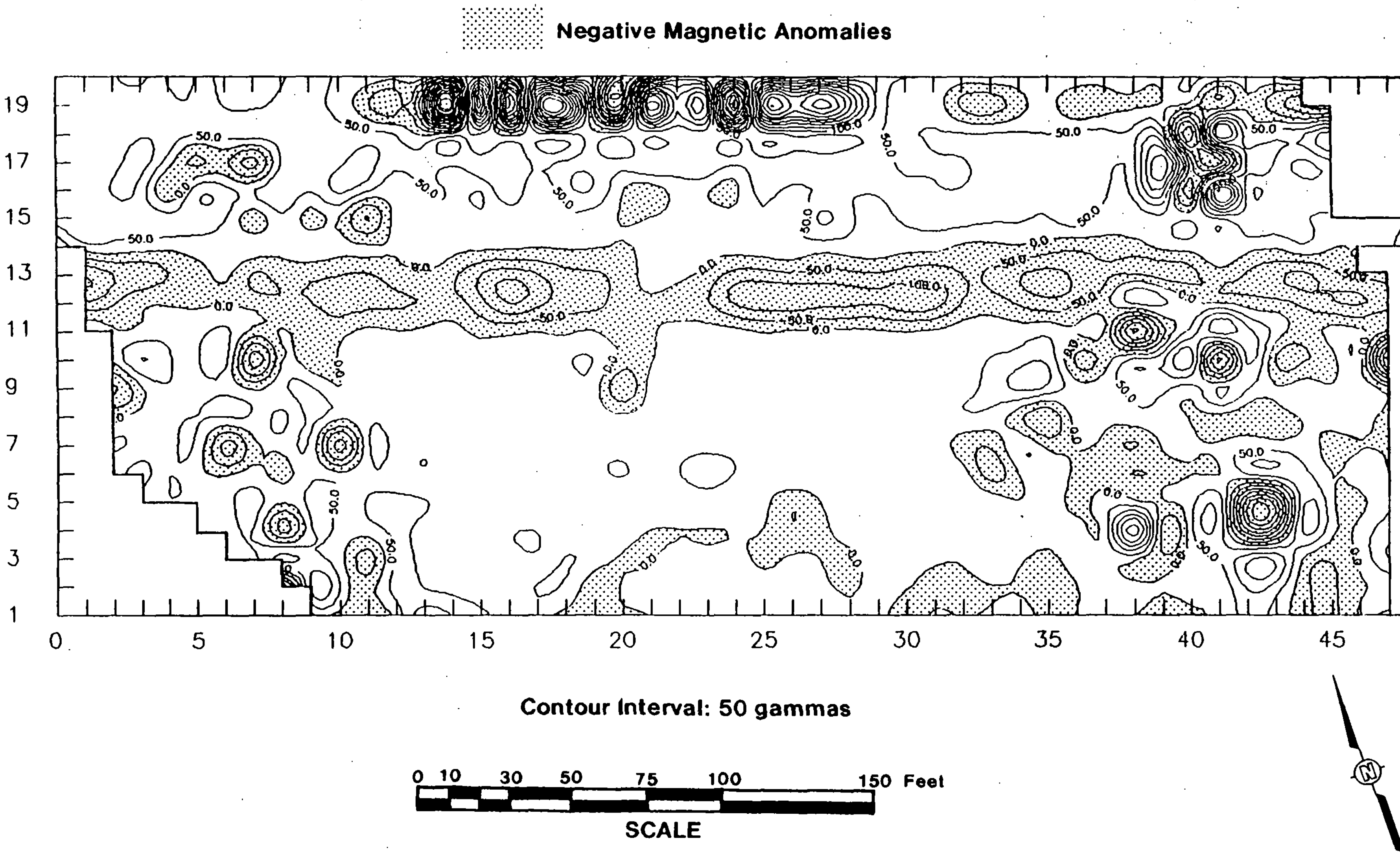
	11/7	Approved by:	PS	11/13		

FIGURE 4

VERTICAL MAGNETIC GRADIENT



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	11/7	Approved by:	PS	11/13		

FIGURE 5

VERTICAL MAGNETIC GRADIENT

An average ground conductivity of approximately 30-40 mmho/m (millimhos/meter) was determined from the data. The conductivities are in the range for silt and clay-rich soil. Two areas of relatively high conductivity (>45 mmho/m) are present in the northeast and southeast portions of the parking lot. The areas of elevated conductivity centered about coordinates (40,17) and (40,4) on Figure 1 may indicate the presence of disturbed or altered soil. The only potential trench boundary detected by the quadrature component is apparently associated with the most recently installed city sewer line beneath Profile 13.

The magnetic gradient data were initially contoured with a contour interval of 100 gammas as shown in Figure 3. The magnitude of the large positive and negative anomalies were decreased by a factor of 10 to improve the resolution of these anomalies at a contour interval of 50 gammas (Figure 4). The negative magnetic anomalies have been shaded to ease in distinguishing between areas of positive and negative magnetic relief as shown in Figure 5. The shape of the gradient anomalies associated with the surface run-off drains is a function of the proximity of station locations to the steel posts and cross bars.

Most of the anomalies detected by the surveys are evident on the quadrature, in-phase and gradient plots and can be directly correlated to surface and subsurface cultural features. The cultural features and coordinates of their related anomalies are described below:

- Steel stairway and pedestrian bridge on the north boundary of the parking lot.
  (14,19) to (22,19) Quadrature Plot
  (12,19) to (26,19) In-phase Plot
  (11,20) to (29,20) Gradient Plot

- Approximate alignment of most recently constructed city sewer line and trench. The in-phase and gradient data suggest that the sewer is constructed with steel reinforced concrete.
  (0,13) to (46,13) Quadrature
  (0,13) to (46,13) and (0,15) to (7,15) In-phase Plots
  (0,13) to (48,13) Gradient Plot

- Protective steel posts and cross bars around the surface run-off drain in the northeast corner of the parking lot.
  (41,17) Quadrature Plot
  (41,17) Gradient Plot

- Protective steel posts and cross bars around the surface run-off drain in the east-central portion of the parking lot.
  (41,10) Quadrature Plot
  (41,11) In-phase Plot
  (41,10) Gradient Plot

- Protective steel posts and cross bars around the surface run-off drain in the southeast corner of the parking lot.*
  (41,4) Quadrature Plot
  (41,4) In-phase Plot
  (42,4) Gradient Plot

  *The actual location of the surface run-off drain in the southeast corner of the parking lot is approximately 20 feet north of the location shown on the Bishop Engineering base map.

- Light pole guy wire and guy anchor in west-central portion of the parking lot.
  (8,9) Quadrature Plot
  (8,10) In-phase Plot
  (8,10) Gradient Plot

- Light pole in east-central portion of the parking lot.
  (36,9) Quadrature Plot
  (36,9) In-phase Plot
  (36,10) Gradient Plot

- Steel protective casings for monitoring wells in the southwest corner of the parking lot.
  (10,1) In-phase Plot
  (10,1) Gradient Plot

- Manhole cover in northwest portion of the parking lot.
  (7,15) Gradient Plot

- Gradient anomalies along the north boundary of the parking lot that are not associated with the stairway and bridge appear to result from the proximity of the railroad tracks to the parking lot.
  (0,20) to (46,20) Gradient Plot

- Power pole and overhead lines
  (47,10) Gradient Plot

A few of the anomalies present on the in-phase and gradient plots could not be correlated to known cultural features and may indicate the potential presence of buried metallic objects or objects containing metal. The locations of these anomalies are described by the following coordinates:

- (3,17) to (8,17)
  In-phase and Gradient Plots

- (11,15) to (12,15)
  In-phase and Gradient Plots

- (4,7) to (17,7) In-phase Plot
  (4,7) to (12,7) Gradient Plot
- (8,4) In-phase and Gradient Plots
- (38,11) Gradient Plot
- (38,4) Gradient Plot

It is important to note, however, that the proximity of the magnetic gradient anomaly located at coordinates (38,11) to the alignment of the new city sewer line suggests that the source of this anomaly may be related to metallic materials used in the construction of the sewer line.

In addition to the anomalies listed above that could not be correlated to known cultural features, the elevated conductivity and numerous small magnetic anomalies in the southeastern portion of the parking lot may indicate the presence of disturbed or altered soil containing small metallic objects. The elevated conductivity may also result from one or more of the following geologic and hydrologic conditions:

- increased clay content of the sediment
- increased moisture content of the sediment
- higher groundwater conductivity

The gradual increase in conductivity from west to east across the parking lot suggests that the increase is the result of a lateral change in geologic conditions and is not the result of subsurface cultural materials.

The amplitude (approximately 260 gammas above background) and shape of the magnetic gradient anomaly located at coordinates (38,4) may indicate the presence of a single 55-gallon steel drum buried at a shallow depth beneath the parking lot surface. A 55-gallon drum buried at a depth of approximately 5 feet can produce an anomaly with an amplitude greater than several hundred gammas, depending on the orientation of the drum. The amplitude and shape of the smaller magnetic gradient anomalies in the southeastern portion of the parking lot do not suggest the presence of other buried drums or metallic objects with a similar mass. The sources of the smaller anomalies may be small pieces of scrap metal or reinforcement bar used in the construction of the surface run-off drain and parking lot. The EM and magnetic gradient data do not indicate the possible presence of numerous buried drums or trench boundaries in the southeastern portion of the parking lot.

Appendix A

Quadrature and In-phase Electromagnetic Induction Data

LGI

---> Line : 1
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 80   Final station : 460   Increament : 20

Station	Conductivity		In-phase	
8	33.600	mS/m	3.962	ppt
10	34.400	mS/m	6.743	ppt
12	33.600	mS/m	-0.867	ppt
14	38.800	mS/m	-0.072	ppt
16	38.400	mS/m	-0.012	ppt
18	40.000	mS/m	-0.024	ppt
20	37.800	mS/m	-0.217	ppt
22	39.800	mS/m	0.000	ppt
24	37.800	mS/m	-0.301	ppt
26	40.200	mS/m	-0.506	ppt
28	43.200	mS/m	-0.145	ppt
30	46.600	mS/m	-0.024	ppt
32	46.000	mS/m	0.157	ppt
34	52.600	mS/m	1.228	ppt
36	59.400	mS/m	1.313	ppt
38	54.600	mS/m	0.999	ppt
40	45.200	mS/m	-1.313	ppt
42	65.400	mS/m	2.143	ppt
44	65.600	mS/m	5.840	ppt
46	59.400	mS/m	1.830	ppt

---> Line : 3
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 460   Final station : 40   Increament :-20

Station	Conductivity		In-phase	
46	45.200	mS/m	1.891	ppt
44	43.800	mS/m	2.047	ppt
---> Comment : ST.POST				
42	60.600	mS/m	1.734	ppt
40	64.200	mS/m	3.071	ppt
38	59.400	mS/m	2.432	ppt
36	54.600	mS/m	1.469	ppt
34	48.800	mS/m	0.963	ppt
32	49.800	mS/m	0.289	ppt
30	45.600	mS/m	0.036	ppt
28	41.200	mS/m	-0.590	ppt
26	40.000	mS/m	-0.795	ppt
24	42.200	mS/m	0.120	ppt
22	39.600	mS/m	-1.361	ppt
20	41.400	mS/m	-2.192	ppt
18	41.200	mS/m	-2.673	ppt
16	39.400	mS/m	-2.192	ppt
14	39.400	mS/m	-3.504	ppt
12	37.600	mS/m	-3.179	ppt
10	35.800	mS/m	-3.083	ppt
8	31.200	mS/m	0.181	ppt
6	27.400	mS/m	-2.902	ppt
4	36.000	mS/m	-3.348	ppt

---> Line : 5

Mode V Component B Contains 1 segments.

Segment : 1

Initial station : 20 Final station : 460 Increament : 20

Station	Conductivity		In-phase	
2	42.000	mS/m	-3.637	ppt
4	38.000	mS/m	-4.636	ppt
6	32.800	mS/m	-3.143	ppt
8	27.000	mS/m	-2.420	ppt
10	27.400	mS/m	-2.950	ppt
12	34.600	mS/m	-1.975	ppt
14	34.600	mS/m	-2.661	ppt
16	33.000	mS/m	-2.432	ppt
18	37.200	mS/m	-1.975	ppt
20	37.800	mS/m	-1.385	ppt
22	41.000	mS/m	-1.156	ppt
24	40.800	mS/m	-0.373	ppt
26	42.600	mS/m	-0.470	ppt
28	43.600	mS/m	-0.807	ppt
30	47.800	mS/m	0.205	ppt
32	49.800	mS/m	0.024	ppt
34	53.600	mS/m	1.228	ppt
36	56.600	mS/m	1.264	ppt
38	57.000	mS/m	1.313	ppt
40	62.000	mS/m	1.686	ppt
---> Comment : ST.POST				
42	64.200	mS/m	3.179	ppt
44	59.800	mS/m	4.371	ppt
46	57.200	mS/m	2.721	ppt

---> Line : 7

Mode V Component B Contains 1 segments.

Segment : 1

Initial station : 460 Final station : 20 Increament :-20

Station	Conductivity		In-phase	
46	50.200	mS/m	3.817	ppt
44	53.400	mS/m	1.698	ppt
42	58.000	mS/m	0.470	ppt
40	54.800	mS/m	2.240	ppt
38	51.800	mS/m	2.541	ppt
36	46.000	mS/m	2.324	ppt
34	43.600	mS/m	1.987	ppt
32	41.600	mS/m	0.036	ppt
30	38.400	mS/m	-0.735	ppt
28	36.800	mS/m	-1.024	ppt
26	34.000	mS/m	-1.276	ppt
24	35.800	mS/m	-1.529	ppt
22	34.200	mS/m	-1.854	ppt
20	33.600	mS/m	-2.709	ppt
18	32.400	mS/m	-5.154	ppt
16	35.200	mS/m	-4.203	ppt
14	34.000	mS/m	-5.816	ppt
12	35.800	mS/m	-5.913	ppt
10	29.800	mS/m	-6.912	ppt
8	28.200	mS/m	-6.045	ppt
6	35.000	mS/m	-5.395	ppt
4	45.400	mS/m	-8.959	ppt
2	43.600	mS/m	-6.936	ppt

---> Line : 9
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 20   Final station : 460   Increament : 20

Station	Conductivity		In-phase	
2	32.400	mS/m	-4.684	ppt
4	34.600	mS/m	-5.046	ppt
---> Comment : GUY.LINE				
6	31.400	mS/m	-0.012	ppt
8	21.400	mS/m	-4.359	ppt
10	26.200	mS/m	-3.697	ppt
12	32.200	mS/m	-2.830	ppt
14	34.400	mS/m	-1.903	ppt
16	32.200	mS/m	-1.602	ppt
18	30.200	mS/m	-2.023	ppt
20	29.800	mS/m	-1.541	ppt
22	31.200	mS/m	-1.385	ppt
24	32.800	mS/m	-0.879	ppt
26	33.800	mS/m	-0.578	ppt
28	37.200	mS/m	-0.530	ppt
30	41.400	mS/m	-0.638	ppt
32	42.800	mS/m	-0.361	ppt
34	42.800	mS/m	1.301	ppt
36	41.000	mS/m	0.542	ppt
38	42.400	mS/m	1.590	ppt
40	46.200	mS/m	0.747	ppt
42	55.600	mS/m	2.192	ppt
44	52.400	mS/m	2.168	ppt
46	47.400	mS/m	2.059	ppt

---> Line : 11
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 460   Final station : 0   Increament :-20

Station	Conductivity		In-phase	
46	48.200	mS/m	1.662	ppt
44	47.200	mS/m	1.325	ppt
42	34.600	mS/m	-0.735	ppt
---> Comment : ST.POST				
40	43.800	mS/m	1.879	ppt
38	41.800	mS/m	3.155	ppt
36	45.200	mS/m	3.035	ppt
34	45.400	mS/m	1.421	ppt
32	46.400	mS/m	1.144	ppt
30	45.000	mS/m	0.590	ppt
28	42.800	mS/m	-0.036	ppt
26	38.400	mS/m	0.145	ppt
24	36.200	mS/m	-0.542	ppt
22	34.600	mS/m	-1.132	ppt
20	31.800	mS/m	-1.313	ppt
18	32.400	mS/m	-1.301	ppt
16	37.000	mS/m	-1.722	ppt
14	36.000	mS/m	-3.986	ppt
12	32.400	mS/m	-6.141	ppt
10	31.800	mS/m	-5.804	ppt
8	32.000	mS/m	-6.876	ppt
6	34.200	mS/m	-1.674	ppt
4	34.400	mS/m	-7.647	ppt
2	30.800	mS/m	-12.042	ppt
	33.600	mS/m	-7.598	ppt

---> Line : 13
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 0   Final station : 540   Increament : 20

Station	Conductivity		In-phase	
0	36.000	mS/m	5.515	ppt
2	35.600	mS/m	1.614	ppt
4	31.400	mS/m	1.433	ppt
6	27.000	mS/m	-0.421	ppt
8	29.000	mS/m	-0.397	ppt
10	26.200	mS/m	0.879	ppt
12	27.600	mS/m	1.758	ppt
14	26.400	mS/m	1.782	ppt
16	26.600	mS/m	2.300	ppt
18	28.200	mS/m	3.324	ppt
20	31.000	mS/m	3.998	ppt
22	32.600	mS/m	2.830	ppt
24	34.600	mS/m	3.769	ppt
26	36.800	mS/m	3.528	ppt
28	40.000	mS/m	4.191	ppt
30	41.000	mS/m	5.202	ppt
32	39.200	mS/m	5.720	ppt
34	39.600	mS/m	5.636	ppt
36	39.800	mS/m	4.889	ppt
38	37.600	mS/m	6.190	ppt
40	37.800	mS/m	5.527	ppt
42	38.200	mS/m	4.973	ppt
44	41.400	mS/m	6.695	ppt
46	44.800	mS/m	6.924	ppt
48	48.600	mS/m	9.345	ppt
50	53.600	mS/m	11.970	ppt
52	42.600	mS/m	8.742	ppt
54	46.200	mS/m	8.477	ppt

---> Line : 15
Mode V   Component B   Contains 1 segments.
Segment : 1
Initial station : 460   Final station : 0   Increament :-20

Station	Conductivity		In-phase	
46	43.000	mS/m	1.903	ppt
44	39.600	mS/m	1.770	ppt
42	39.800	mS/m	1.686	ppt
40	39.200	mS/m	2.107	ppt
38	41.000	mS/m	1.180	ppt
36	43.000	mS/m	1.216	ppt
34	43.800	mS/m	1.301	ppt
32	43.600	mS/m	1.036	ppt
30	43.400	mS/m	-0.072	ppt
28	41.200	mS/m	-0.169	ppt
26	40.800	mS/m	-0.867	ppt
24	38.800	mS/m	-0.686	ppt
22	36.800	mS/m	-0.987	ppt
20	34.800	mS/m	-3.588	ppt
18	35.200	mS/m	-3.071	ppt
16	33.400	mS/m	-3.938	ppt
14	34.400	mS/m	-4.949	ppt
12	30.800	mS/m	-7.225	ppt
10	28.800	mS/m	-4.696	ppt
8	27.600	mS/m	-9.043	ppt
6	29.800	mS/m	-10.850	ppt
4	29.000	mS/m	-12.656	ppt
2	33.400	mS/m	-11.247	ppt
0	36.600	mS/m	-9.332	ppt

---> Line : 17

Mode V Component B Contains 1 segments.

Segment : 1

Initial station : 0 Final station : 460 Increament : 20

Station	Conductivity		In-phase	
0	36.000	mS/m	-3.444	ppt
2	30.800	mS/m	-3.962	ppt
4	35.000	mS/m	-2.661	ppt
6	22.200	mS/m	-3.733	ppt
8	22.000	mS/m	-3.986	ppt
10	33.600	mS/m	-1.806	ppt
12	36.800	mS/m	-2.709	ppt
14	40.000	mS/m	-1.252	ppt
16	40.000	mS/m	-1.361	ppt
18	37.800	mS/m	-1.252	ppt
20	42.200	mS/m	-0.831	ppt
22	42.800	mS/m	0.048	ppt
24	43.800	mS/m	-0.349	ppt
26	45.600	mS/m	-0.421	ppt
28	46.200	mS/m	-0.313	ppt
30	46.400	mS/m	-0.072	ppt
32	49.000	mS/m	0.265	ppt
34	48.200	mS/m	-0.048	ppt
36	46.800	mS/m	0.325	ppt
38	45.400	mS/m	0.313	ppt

---> Comment : ST.POST

40	56.800	mS/m	0.855	ppt
42	45.000	mS/m	0.795	ppt
44	34.800	mS/m	0.373	ppt
46	28.800	mS/m	-4.070	ppt

---> Line : 19

Mode V Component B Contains 1 segments.

Segment : 1

Initial station : 440 Final station : 0 Increament :-20

Station	Conductivity		In-phase	
44	34.200	mS/m	-0.409	ppt
42	49.000	mS/m	-0.735	ppt
40	51.200	mS/m	-0.397	ppt
38	43.800	mS/m	0.048	ppt
36	45.000	mS/m	-0.096	ppt
34	47.400	mS/m	-0.072	ppt
32	45.800	mS/m	-0.723	ppt
30	44.400	mS/m	-1.590	ppt
28	44.400	mS/m	-0.674	ppt
26	45.600	mS/m	0.120	ppt

---> Comment : CAR

24	45.800	mS/m	3.408	ppt

---> Comment : CAR

skipped or deleted

---> Comment : STAIRS

20	49.000	mS/m	42.074	ppt
18	44.200	mS/m	2.842	ppt

---> Comment : VAN

16	49.200	mS/m	6.358	ppt

---> Comment : CAR

skipped or deleted

12	42.800	mS/m	-3.179	ppt
10	36.000	mS/m	-3.215	ppt
8	27.600	mS/m	-5.587	ppt
6	28.600	mS/m	-7.032	ppt
4	33.600	mS/m	-10.452	ppt
2	32.600	mS/m	-12.969	ppt
	38.000	mS/m	-9.164	ppt

Appendix B

Vertical Magnetic Gradient Data

Profile No.	Station No.	Gammas
1	9	-12.4
1	10	-19.200001
1	11	-52.5
1	12	17.799999
1	13	133.5
1	14	96.599998
1	15	60.200001
1	16	28.6
1	17	18.700001
1	18	-16
1	19	-6.6
1	20	-6.8
1	21	1.5
1	22	19.799999
1	23	34.400002
1	24	13.5
1	25	20.700001
1	26	9.9
1	27	34.099998
1	28	14.6
1	29	14.1
1	30	-26.4
1	31	7.4
1	32	-4.9
1	33	13.8
1	34	17.700001
1	35	-14.3
1	36	2.8
1	37	8.7
1	38	1.1
1	39	-48
1	40	-14.7
1	41	14.4
1	42	66.300003
1	43	30.200001
1	44	-35.5
1	45	-60.900002
1	46	13.8
1	47	68.099998

Profile No.	Station No.	Gammas
2	47	9.7
2	46	-3.8
2	45	-57.5
2	44	-37.799999
2	43	76.800003
2	42	111.099998
2	41	14.1
2	40	20.700001
2	39	6.1
2	38	16.200001
2	37	21.299999
2	36	0.6
2	35	-19.299999
2	34	-5.6
2	33	-2.9
2	32	-17.5
2	31	-13.7
2	30	2.6
2	29	15.5
2	28	-5.9
2	27	8.7
2	26	19.200001
2	25	19.700001
2	24	24.4
2	23	25.1
2	22	15.7
2	21	9.4
2	20	5.3
2	19	-25.799999
2	18	38.099998
2	17	53.400002
2	16	27.200001
2	15	27.9
2	14	35.599998
2	13	47.099998
2	12	70.599998
2	11	-21.1
2	10	46.900002
2	9	115.5
2	8	-239.100006

Profile No.	Station No.	Gammas
3	6	10.1
3	7	40.900002
3	8	124.900002
3	9	68.699997
3	10	18.5
3	11	-74.900002
3	12	58.200001
3	13	28
3	14	24.9
3	15	13
3	16	15.3
3	17	8.7
3	18	52.900002
3	19	22.4
3	20	-4.7
3	21	-3.4
3	22	18.700001
3	23	13.7
3	24	15.4
3	25	-10.3
3	26	7.8
3	27	-1.1
3	28	-8.7
3	29	22.5
3	30	12.5
3	31	6.5
3	32	8.6
3	33	40
3	34	7.1
3	35	-8.8
3	36	21.200001
3	37	16.799999
3	38	9
3	39	-38.099998
3	40	19.799999
3	41	48.099998
3	42	138.699997
3	43	136.100006
3	44	-8.1
3	45	-42.799999
3	46	13.3
3	47	102.400002

Profile No.	Station No.	Gammas
4	47	76.099998
4	46	20.200001
4	45	9.3
4	44	114.599998
4	43	-159.899994
4	42	-2045
4	41	74.699997
4	40	41.099998
4	39	-84.699997
4	38	282.5
4	37	36.099998
4	36	18.1
4	35	16.9
4	34	40.099998
4	33	17
4	32	17.1
4	31	15
4	30	14.1
4	29	25.700001
4	28	20.4
4	27	-12.9
4	26	-40.799999
4	25	-1.9
4	24	2.9
4	23	-2.7
4	22	-1.2
4	21	-1.3
4	20	27.200001
4	19	39.5
4	18	20
4	17	1.3
4	16	2.1
4	15	9.8
4	14	12.5
4	13	32.700001
4	12	59.200001
4	11	26.9
4	10	31.9
4	9	46.299999
4	8	-120.900002
4	7	44.400002
4	6	20.6
4	5	16.6

Profile No.	Station No.	Gammas
5	3	32.900002
5	4	48.400002
5	5	38.599998
5	6	37.900002
5	7	69.199997
5	8	-0.4
5	9	67.099998
5	10	38.200001
5	11	52.599998
5	12	57.099998
5	13	52.799999
5	14	25.4
5	15	28
5	16	31.200001
5	17	18.799999
5	18	2.1
5	19	31.299999
5	20	38.200001
5	21	40.200001
5	22	32.400002
5	23	29.299999
5	24	35
5	25	12.3
5	26	-36.599998
5	27	4.1
5	28	34.5
5	29	23.5
5	30	22.5
5	31	15.6
5	32	28.799999
5	33	28.299999
5	34	2.2
5	35	27.4
5	36	-18.9
5	37	30.799999
5	38	4.7
5	39	-1.2
5	40	33.599998
5	41	71.400002
5	42	-2889.399902
5	43	-2570.899902
5	44	98.300003
5	45	5.2
5	46	-9.8
5	47	37.700001

Profile No.	Station No.	Gammas
6	47	-0.1
6	46	24.299999
6	45	-1.8
6	44	64.400002
6	43	87.099998
6	42	57.299999
6	41	0
6	40	-0.7
6	39	-10.9
6	38	3.4
6	37	-27.200001
6	36	-15.1
6	35	38.400002
6	34	9.2
6	33	-76.599998
6	32	19.6
6	31	21.200001
6	30	11.6
6	29	1.5
6	28	13.2
6	27	25.799999
6	26	41.099998
6	25	15.3
6	24	3.9
6	23	-30.299999
6	22	1.9
6	21	21.9
6	20	-3.7
6	19	9.5
6	18	6.8
6	17	12.1
6	16	12.6
6	15	5.5
6	14	15.1
6	13	5.2
6	12	31.6
6	11	43.299999
6	10	13.9
6	9	41.400002
6	8	-18.799999
6	7	17
6	6	-6.1
6	5	15.3
6	4	49.400002
6	3	-16.299999
6	2	21.700001

Profile No.	Station No.	Gammas
7	2	54.599998
7	3	30.5
7	4	37.5
7	5	37.599998
7	6	-122.599998
7	7	-7
7	8	10.7
7	9	42.799999
7	10	-178.899994
7	11	45.099998
7	12	25
7	13	8.4
7	14	21.299999
7	15	13.7
7	16	10.4
7	17	7.2
7	18	21.200001
7	19	11.6
7	20	21.6
7	21	28.9
7	22	17.799999
7	23	18.299999
7	24	11.9
7	25	14.5
7	26	20.1
7	27	4.1
7	28	15.2
7	29	9.4
7	30	7.3
7	31	19.799999
7	32	-25.700001
7	33	-36.200001
7	34	44.900002
7	35	-20.700001
7	36	4.4
7	37	-18.9
7	38	-55.700001
7	39	7.7
7	40	7.1
7	41	8.3
7	42	38.299999
7	43	16.4
7	44	15.5
7	45	-13
7	46	-3.7
7	47	-8.9

Profile No.	Station No.	Gammas
8	47	-35.400002
8	46	36.099998
8	45	17.4
8	44	5.6
8	43	-19.299999
8	42	-30.700001
8	41	-17.9
8	40	-4.1
8	39	28.6
8	38	38
8	37	18.4
8	36	31.5
8	35	-93.699997
8	34	-39.700001
8	33	31.5
8	32	45.200001
8	31	29
8	30	34.900002
8	29	20.200001
8	28	26
8	27	27.6
8	26	22.200001
8	25	34.299999
8	24	22.200001
8	23	21.799999
8	22	17.5
8	21	18.4
8	20	11
8	19	17.200001
8	18	22.5
8	17	28.6
8	16	18.200001
8	15	16.799999
8	14	22.799999
8	13	30.700001
8	12	24.700001
8	11	45.400002
8	10	19.6
8	9	62.900002
8	8	-10.6
8	7	39.900002
8	6	54.599998
8	5	50.5
8	4	44.200001
8	3	21.700001
8	2	-10.2

Profile No.	Station No.	Gammas
9	2	-107.5
9	3	-1.8
9	4	48.099998
9	5	40.299999
9	6	35.099998
9	7	-10.1
9	8	41.099998
9	9	57.099998
9	10	1.1
9	11	40.400002
9	12	23.700001
9	13	22.299999
9	14	20.299999
9	15	7.3
9	16	24.9
9	17	27.799999
9	18	17.4
9	19	26
9	20	-93.800003
9	21	20.200001
9	22	31
9	23	27
9	24	23.9
9	25	32
9	26	20.799999
9	27	26.5
9	28	32.700001
9	29	28
9	30	39.200001
9	31	33
9	32	35.200001
9	33	69.5
9	34	115.699997
9	35	88.599998
9	36	23.5
9	37	38.599998
9	38	59
9	39	63.099998
9	40	33.5
9	41	103.800003
9	42	55.599998
9	43	4.5
9	44	23.6
9	45	6.2
9	46	31
9	47	-46.700001

Profile No.	Station No.	Gammas
10	47	-370.899994
10	46	14
10	45	-18.4
10	44	-54.5
10	43	-53.5
10	42	108.099998
10	41	-1632.099976
10	40	174
10	39	87.599998
10	38	56
10	37	-21.6
10	36	-63.599998
10	35	80.900002
10	34	75.699997
10	33	51.599998
10	32	35.299999
10	31	10
10	30	23.799999
10	29	20.799999
10	28	26.799999
10	27	28.799999
10	26	25.6
10	25	30.4
10	24	24
10	23	8.8
10	22	42.299999
10	21	-6.1
10	20	-13.5
10	19	48.700001
10	18	43.900002
10	17	24.799999
10	16	31.5
10	15	22.299999
10	14	16.700001
10	13	16.799999
10	12	32.299999
10	11	44.700001
10	10	4.1
10	9	-40.299999
10	8	-0.3
10	7	-180.300003
10	6	61.599998
10	5	44.299999
10	4	53.599998
10	3	102.5
10	2	18.5

Profile No.	Station No.	Gammas
11	1	36.700001
11	2	5.1
11	3	10.4
11	4	30.5
11	5	30.700001
11	6	58.599998
11	7	-11.1
11	8	3.2
11	9	-27.4
11	10	-20.700001
11	11	10.3
11	12	-0.3
11	13	7.8
11	14	13.5
11	15	-14.7
11	16	-14.8
11	17	-3.8
11	18	-11.1
11	19	-0.3
11	20	-33.400002
11	21	-8.2
11	22	15.6
11	23	15
11	24	11.2
11	25	-6.4
11	26	1.9
11	27	-0.6
11	28	7.7
11	29	2.5
11	30	-3.1
11	31	5.3
11	32	24.200001
11	33	31.1
11	34	21.700001
11	35	31.9
11	36	8.3
11	37	-5.8
11	38	-262.600006
11	39	-68
11	40	58.900002
11	41	182.899994
11	42	118.699997
11	43	34
11	44	-27.1
11	45	18.6
11	46	9.6
11	47	-53.5

Profile No.	Station No.	Gammas
12	47	-77.199997
12	46	-106.5
12	45	-97.099998
12	44	-65.400002
12	43	-39.799999
12	42	-31.200001
12	41	-7.6
12	40	-0.8
12	39	63.799999
12	38	71.800003
12	37	-12.8
12	36	-70.699997
12	35	-89.5
12	34	-63.400002
12	33	-30.799999
12	32	-48
12	31	-125.699997
12	30	-135.100006
12	29	-108.199997
12	28	-114.699997
12	27	-116.800003
12	26	-131.899994
12	25	-127.900002
12	24	-110.400002
12	23	-45.099998
12	22	-20.4
12	21	-7
12	20	-27.4
12	19	-66.099998
12	18	-74.800003
12	17	-120.800003
12	16	-155
12	15	-85.099998
12	14	-35
12	13	-46.5
12	12	-58.900002
12	11	-68.099998
12	10	-73.400002
12	9	-49
12	8	-46.200001
12	7	-23.1
12	6	-3.5
12	5	-9.9
12	4	-7.2
12	3	-9
12	2	-57.700001
12	1	-94.599998

Profile No.	Station No.	Gammas
13	1	-145.399994
13	2	-98.099998
13	3	-85.599998
13	4	-48.900002
13	5	-25.200001
13	6	10.4
13	7	-53.700001
13	8	-28.200001
13	9	-33.5
13	10	-46
13	11	-52.200001
13	12	-20.200001
13	13	-6.1
13	14	-34.5
13	15	-95.800003
13	16	-130.300003
13	17	-100
13	18	-65.400002
13	19	-55.400002
13	20	-28.799999
13	21	18.700001
13	22	12.5
13	23	-13.6
13	24	-66.5
13	25	-67.5
13	26	-56.599998
13	27	-69.199997
13	28	-60.599998
13	29	-53.400002
13	30	-75.699997
13	31	-83.400002
13	32	-48.299999
13	33	-58.200001
13	34	-96.300003
13	35	-112.5
13	36	-88.800003
13	37	-59
13	38	-54.400002
13	39	-75.400002
13	40	-63.5
13	41	-21.1
13	42	-53.099998
13	43	-85.800003
13	44	-109.300003
13	45	-55.299999
13	46	-33.700001

Profile No.	Station No.	Gammas
14	48	89.300003
14	47	40
14	46	11.5
14	45	5
14	44	46.299999
14	43	13.8
14	42	21.4
14	41	29.4
14	40	27.9
14	39	18.299999
14	38	-15.1
14	37	-19.9
14	36	-35.299999
14	35	-19.4
14	34	-2.7
14	33	-7.7
14	32	-6.4
14	31	18.799999
14	30	19.700001
14	29	30.1
14	28	29
14	27	27.9
14	26	35
14	25	34.400002
14	24	22.6
14	23	21.799999
14	22	22.9
14	21	9.5
14	20	-1.5
14	19	5.4
14	18	8.3
14	17	7
14	16	13.5
14	15	17.6
14	14	21.299999
14	13	40.400002
14	12	7.9
14	11	5.6
14	10	16.9
14	9	31.4
14	8	16.4
14	7	27.5
14	6	33.799999
14	5	31.799999
14	4	17.6
14	3	28.4
14	2	37.700001
14	1	37.900002
14	0	-45.599998

Profile No.	Station No.	Gammas
15	0	79.300003
15	1	90.900002
15	2	72
15	3	79.400002
15	4	70.5
15	5	74.599998
15	6	51.900002
15	7	-28.700001
15	8	39.200001
15	9	-18.4
15	10	1
15	11	-105.300003
15	12	16.700001
15	13	24.299999
15	14	40.599998
15	15	14
15	16	21.6
15	17	25.799999
15	18	40
15	19	24.799999
15	20	-2.8
15	21	0.1
15	22	21.9
15	23	29.700001
15	24	20.5
15	25	43.599998
15	26	22.9
15	27	108.800003
15	28	62.099998
15	29	34.700001
15	30	57.700001
15	31	63.299999
15	32	69.599998
15	33	58.700001
15	34	55.299999
15	35	49.700001
15	36	81.099998
15	37	28.4
15	38	19.6
15	39	38.099998
15	40	39.900002
15	41	53.200001
15	42	87.5
15	43	78.599998
15	44	54.099998
15	45	44.099998
15	46	50.400002
15	47	34
15	48	57.799999

Profile No.	Station No.	Gammas
16	45	65.699997
16	44	71.199997
16	43	79.199997
16	42	90.199997
16	41	352.899994
16	40	-1369.199951
16	39	188.199997
16	38	66.300003
16	37	56.900002
16	36	71.099998
16	35	66.099998
16	34	54.900002
16	33	76.300003
16	32	52.700001
16	31	56.799999
16	30	69.400002
16	29	58.200001
16	28	60
16	27	61
16	26	33.099998
16	25	72.099998
16	24	-13.2
16	23	7.1
16	22	23.6
16	21	-32.200001
16	20	7.9
16	19	98.699997
16	18	78.699997
16	17	16.200001
16	16	88.400002
16	15	1.6
16	14	43.400002
16	13	41.200001
16	12	18.799999
16	11	61.299999
16	10	110.599998
16	9	56.400002
16	8	98.5
16	7	46
16	6	66.800003
16	5	76.199997
16	4	-47.799999
16	3	82.800003
16	2	103.800003
16	1	65.900002
16	0	92.5

Profile No.	Station No.	Gammas
17	0	76.5
17	1	86.099998
17	2	83.199997
17	3	119.599998
17	4	22.9
17	5	-62.400002
17	6	-38.099998
17	7	-122.599998
17	8	58.599998
17	9	75.900002
17	10	87.5
17	11	117.599998
17	12	66.199997
17	13	73
17	14	61.099998
17	15	77.699997
17	16	82.099998
17	17	43.400002
17	18	57.700001
17	19	85.5
17	20	85
17	21	100.400002
17	22	75.400002
17	23	88.099998
17	24	63.700001
17	25	72.199997
17	26	88.199997
17	27	89.800003
17	28	95.699997
17	29	84.5
17	30	35
17	31	44.900002
17	32	43.099998
17	33	79.300003
17	34	66.199997
17	35	53.900002
17	36	60
17	37	64.900002
17	38	86.699997
17	39	286.600006
17	40	-69.099998
17	41	-2389.800049
17	42	104.599998
17	43	98.099998
17	44	41.5
17	45	89.199997

Profile No.	Station No.	Gammas
18	44	173.600006
18	43	94.599998
18	42	84.199997
18	41	74.800003
18	40	228.399994
18	39	-2896.600098
18	38	92.5
18	37	73
18	36	64.800003
18	35	60.599998
18	34	49.700001
18	33	58.400002
18	32	56
18	31	54.5
18	30	54.599998
18	29	46.299999
18	28	51.400002
18	27	51.599998
18	26	55.799999
18	25	30.700001
18	24	46.900002
18	23	70.300003
18	22	69.800003
18	21	61.700001
18	20	83.300003
18	19	63
18	18	45.200001
18	17	28.4
18	16	-15.5
18	15	43.099998
18	14	24.200001
18	13	-9.5
18	12	49
18	11	68.099998
18	10	63.900002
18	9	67.699997
18	8	70.400002
18	7	81.400002
18	6	64.800003
18	5	47.900002
18	4	84.199997
18	3	95.400002
18	2	76.199997
18	1	75.900002
18	0	82

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Profile No.	Station No.	Gammas
19	0	97.800003
19	1	73.199997
19	2	67.199997
19	3	83.5
19	4	92.400002
19	5	92.5
19	6	46.900002
19	7	37.599998
19	8	62.5
19	9	57.900002
19	10	38.200001
19	11	-38.5
19	12	-83.400002
19	13	-190.800003
19	14	-741.799988
19	15	4281.299805
19	16	-4842.299805
19	17	3428
19	18	4972.899902
19	19	-52.299999
19	20	-3953
19	21	431.700012
19	22	1614.199951
19	23	2400.399902
19	24	-5233
19	25	388.399994
19	26	1400.900024
19	27	1481.400024
19	28	331.799988
19	29	96.300003
19	30	27.4
19	31	31.200001
19	32	-57.900002
19	33	-76.800003
19	34	-21.1
19	35	17.299999
19	36	-41.5
19	37	-19.299999
19	38	-5.8
19	39	1.6
19	40	-25.1
19	41	-76.300003
19	42	-8.3
19	43	-78.699997
19	44	-139.5
19	45	-171.800003

Profile No.	Station No.	Gammas
20	44	70.800003
20	43	43
20	42	33.700001
20	41	33.599998
20	40	58
20	39	7.3
20	38	37.200001
20	37	27.299999
20	36	42.5
20	35	48.299999
20	34	41.200001
20	33	42.900002
20	32	35.299999
20	31	47.099998
20	30	51.799999
20	29	59.299999
20	28	59.299999
20	27	51.700001
20	26	33.200001
20	25	-5
20	24	-24.200001
20	23	-28.6
20	22	29.700001
20	21	-210
20	20	-383.399994
20	19	-114.800003
20	18	-242.300003
20	17	44.299999
20	16	-120.199997
20	15	89.099998
20	14	-45.700001
20	13	13.8
20	12	16.5
20	11	39.700001
20	10	40.5
20	9	84.800003
20	8	42.900002
20	7	40.299999
20	6	30.700001
20	5	97.900002
20	4	104.800003
20	3	33.799999
20	2	58
20	1	83.5
20	0	97.5