1988 Annual Report
Groundwater Monitoring Program
Grede-Vassar, Inc.
Vassar Facility
Vassar, Michigan

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February 22, 1989

Results of Quarterly Groundwater Assessment Update (November, 1988 Sampling) and One-Year Statistical Review

Grede-Vassar, Inc.
Vassar Facility
Vassar, Michigan
March 6, 1989

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INTRODUCTION

Hunter/Keck, Inc. has been retained by Grede-Vassar, Inc. to conduct quarterly assessments of their groundwater quality monitoring program at the Vassar foundry located in Vassar Township, Tuscola County, Michigan. The purpose of this report is to assess the groundwater quality in the vicinity of the surface impoundments and also to re-evaluate groundwater and surface water flow patterns. This report presents the results of the August and November, 1988 quarterly monitoring at the site as well as a summary of the analytical data and the statistical analyses for the 1988 monitoring period.

EVALUATION OF WATER QUALITY RESULTS

The latest quarterly sampling was conducted on August 18 and November 2, 1988 by Environmental Control Technology Corporation (ENCOTEC) personnel. The sampling and analytical procedures used are described in Appendix A. An original sample protocol was first revised in January, 1984. Further revision occurred in May, 1987 with the inclusion of sample storage and transportation procedures. The analytical results from these quarterly samplings are included in Appendix B of this report. Summary tables of the water quality analytical results for the last seventeen quarterly samplings are included in Appendix C. The locations of the sampled monitoring wells (MWs) are shown in the Figure at

the end of this report. Two surface water samples were collected from the ditch south of the settling reservoir. These sampling points are located near SW-13 (Ditch 1) and near SW-3 (Ditch 2). The locations of SW-13 and SW-3 are also shown in the Figure.

The concentration of each parameter in the wells sampled was compared to the maximum concentrations of constituents for groundwater protection stated in 40 CFR, Part 265, Appendix III and 40 CFR, Part 264.94, Table 1. These maximum concentrations are as follows:

Constituent	Maximum Concentration
Arsenic	0.05 mg/l
Barium	1.0 mg/l
Cadmium	0.01 mg/l
Chromium	0.05 mg/l
Lead	0.05 mg/l
Mercury	0.002 mg/l
Selenium	0.01 mg/l
Silver	0.05 mg/l

The concentrations of the above constituents in the wells sampled were found to be below these maximum concentration limits both for the August and November collections and throughout 1988. The concentrations of the above constituents found at the surface water sampling point were also below the maximum limits for all 1988 collections.

The results of the seventeen quarterly samplings for monitoring wells MW-1 MW-2, MW-3, MW-4, MW-9, MW-10 and MW-11

were analyzed using Cochran's approximation to the Student's t-test at a 0.05 level of significance. The statistical method requires that summary statistics be used in the comparison and it was necessary to obtain the mean ($\bar{x}$) and the variance (s^2) for each parameter for input into the Student's equation. The mean (average) was calculated by the following:

$$x = \frac{(x_i + x_2 \ldots x_n)}{n}$$

where: $\bar{x}$ = mean of the sample set (x_1 to x_n)
n = the number of readings in the sample set
x = the value of individual members of the sample set

The variance (s^2) is a measure of variability and is the average of the squares of the difference between the actual measurements and the calculated mean. The variance is defined as the sum of the squares of the difference between the mean and the actual values, divided by one less than the number of readings. Variance was calculated by:

$$s^2 = \frac{\sum_{i=1}^{n} (x_i - x)^2}{(n - 1)}$$

where: s^2 = sample variance
x_i = value of each measurement
$\bar{x}$ = data set mean
$\sum$ = "the sum of" a set of numbers
n = the number of readings

The Cochran's approximation to the Student's t-test is a statistical method used to determine the significance of differences between data sets. For each data set the mean

($\bar{x}_m$) and variance (s_m^2) are calculated. These data are used for comparison against the mean and variance of a "background" data set represented by $\bar{x}_b$ and s_b^2. These summary data ($\bar{x}_b$, s_b^2, $\bar{x}_m$ and s_m^2) are used to calculate the t-statistic (t*) and the comparison t-statistic (t_c). The t* value is compared to the t_c value in order to reach a conclusion as to whether there has been any significant (statistical) change in the indicator parameter. The t-test was performed using the method of unpaired observations with equal variance as follows:

$$t^* = \frac{x_m - x_b}{\sqrt{\frac{s_m^2}{n_m} + \frac{s_b^2}{n_b}}}$$

The t-statistics (t_c) against which t* will be compared necessitates the use of the formula:

$$t_c = \frac{W_B \; t_B + W_M \; t_M}{W_B - W_M}$$

where:

$$W_B = \frac{S_B^2}{n_B}$$

$$W_M = \frac{S_M^2}{n_M}$$

t_M is found on standard one-tailed tables with (N_M-1) degrees of freedom

t_B is found on standard one-tailed tables with (N_B-1) degrees of freedom

Since RCRA regulations require a level of significance of 0.05, t_B and t_M were determined by locating the value of the level of significance for 0.05 with the appropriate degree of freedom. Refer to Table 1 for the critical t-values for the levels of significance.

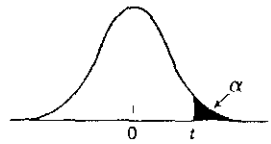
The t-statistic (t*) was then compared to the comparison t-statistic (t_C) using the following decision rules:

- If t* is equal to or larger than t_C, then conclude that there most likely has been an increase in the parameter.

- If t* is less than t_C, then conclude that there has most likely been no change in the parameter.

Statistical comparisons were performed using the guidelines in USEPA Title 40 CFR 265.93(b). This regulation calls for the comparison of results of replicate determinations from all upgradient and downgradient monitoring wells to the background water quality data from the upgradient monitoring well. However, in lieu of replicate analyses, the statistical comparisons were performed using the four most recent data points for each parameter from each monitoring well.

Table 1: The t-distribution



d.f. \ α	.10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

Source: Hoel, Elementary Statistics, 3d ed. (New York: John Wiley and Sons, Inc., 1971 c.).

The "background set" from upgradient MW-9 consisted of the data obtained from the analyses during the first four quarters. The results of the statistical comparisons are contained in Appendix D and are summarized in Tables 2 and 3.

Table 2

Calculated t-Statistic for Each Parameter When Comparing Data Sets from 11/5/87 to 8/18/88 with Background Upgradient Monitor Well (MW-9)

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Arsenic	-1.71	0.53	-1.71	-0.42	1.05	0.44	0.77
Barium	3.92	2.25	3.85	1.31	0.58	-0.50	3.29
Cadmium	0	0	0	0	0	0	0
Chromium	-2.53	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00
Lead	-1.09	-1.15	-1.15	-1.15	-1.15	-1.09	-1.15
Mercury	0	0	0	0	0	0	0
Selenium	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32
Silver	0	0	0	0	0	0	0

Table 3

Calculated t-Statistic for Each Parameter When Comparing 1988 Data Sets with Background Upgradient Well (MW-9)

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Arsenic	-1.71	0.64	-1.71	-0.55	1.53	-0.36	0.77
Barium	3.45	2.07	3.78	0.96	1.41	-0.08	3.32
Cadmium	0	0	0	0	0	0	0
Chromium	-2.90	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

Table 3 con't.

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Lead	-1.09	-1.15	-1.15	-1.15	-1.15	-1.15	-1.15
Mercury	0	0	1.0	0	0	0	0
Selenium	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32
Silver	0	0	0	0	0	0	0

DISCUSSION

An examination of Table 2 reveals that for the pooled data ending with the August collection the calculated t-statistic (t*) only exceeded the comparison t-statistic (t_c) for the barium concentrations in MW-1, MW-2, MW-3 and MW-11. The data summarized in Table 3 similarly indicates that only the barium concentrations in MW-1, MW-3 and MW-11 were calculated in excess of the background concentrations. Similar results were obtained for the second quarter of the 1988 monitoring while the comparisons conducted during the first quarter resulted in none of the calculated values being in excess of background. It may be concluded from these data that the concentrations of all parameters except barium were not significantly increased over "background" concentrations in upgradient MW-9 throughout the 1988 monitoring.

Similar statistical comparisons may be made between the same "background" data set, consisting of the data from the first four sample collections from MW-9, and the single, unpooled, most recent data set from each monitoring well. This

comparison is more sensitive to the recent concentrations detected but does not allow for variability which might be attributable to either seasonal changes, analytical variability or sampling variability. These comparisons were performed using the same statistical formula listed previously with the exception of using the single data point for the recent sample collection. The results of these comparisons are contained in Tables 4 and 5.

An examination of these data indicate that, once again, barium was detected in both the upgradient and several downgradient monitoring wells at concentrations in excess of the upgradient "background" level. It was also determined that arsenic concentrations in excess of "background" were reported in MW-2, MW-9 and MW-11 for the August collection along with only MW-9 in the November collection.

The relevance of these concentrations of arsenic and barium being identified as "significantly increased over background" is tempered by a consideration of three factors. First, both barium and arsenic are naturally occurring compounds, and all of the concentrations of both elements are below the USEPA drinking water standards. Secondly, the concentrations of both parameters have been variable in the past and this comparison provides no allowance for any form of variability. Therefore, this comparison is less reliable

than the comparison utilizing pooled data. Thirdly, increased concentrations were also reported in the upgradient monitoring well (MW-9) which cannot represent site impact.

Table 4

Calculated t-Statistic for Each Parameter When Comparing the August 18, 1988, Unpooled Data Set with the Background Upgradient Data Set from MW-9.

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Arsenic	-1.70	5.13	-1.70	2.09	11.97	-0.95	4.37
Barium	4.37	3.61	3.99	2.85	2.85	1.33	5.13
Cadmium	0	0	0	0	0	0	0
Chromium	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00
Lead	-0.92	-1.15	-1.15	-1.15	-1.15	-1.15	-1.15
Mercury	0	0	0	0	0	0	0
Selenium	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32
Silver	0	0	0	0	0	0	0

Table 5

Calculated t-Statistic for Each Parameter When Comparing the November 2, 1988, Unpooled Data Set with the Background Upgradient Data Set from MW-9.

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Arsenic	-1.70	1.33	-1.70	-1.70	7.42	-0.95	-0.19
Barium	8.17	2.47	3.99	1.33	2.09	-0.19	5.51
Cadmium	0	0	0	0	0	0	0
Chromium	-2.67	-3.00	-3.00	-3.00	-3.00	-3.00	-3.00

Table 5 con't.

Parameter	MW-1	MW-2	MW-3	MW-4	MW-9	MW-10	MW-11
Lead	-1.15	-1.15	-1.15	-1.15	-1.15	-1.15	-1.15
Mercury	0	0	0	0	0	0	0
Selenium	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32	-1.32
Silver	0	0	0	0	0	0	0

As a result, it is possible that the "increased" downgradient concentrations of barium and arsenic are attributable to "increased" concentrations of both parameters in the groundwater influent to the site, rather than a result of site impact. This understanding is reasonable both from the perspective of historically increased concentrations in the upgradient monitoring well, and because barium has not been utilized in the production process at the facility. Therefore, it is not expected that increased concentrations of barium in the groundwater would result from the operation of the holding pond.

Because of these factors it is apparent that the statistical comparisons involving pooled data provide the most reliable comparisons. Throughout 1988, these comparisons have indicated that the concentrations of all parameters, except barium, in all the downgradient monitoring wells are not significantly increased from the "background" levels established from the upgradient monitoring well (MW-9).

GROUND AND SURFACE FLOW PATTERNS

Depth to water measurements in the monitoring wells, test wells and surface monitoring points were taken on August 15, 1988 by Hunter/Keck personnel. These data were used to determine groundwater elevations. The tabulated data are included in the table of Appendix E.

The water level contours prepared using the recent water level elevations are included on the Figure contained in the pocket at the end of this report. No significant change in groundwater flow patterns was found throughout 1988.

Flow rates in the ditch running along the south side of the hazardous waste management area (HWMA) were also determined. These measurements were taken on August 15, 1988. The flow rates were determined at three locations in the ditch running along the south edge of the HWMA. These locations were (1) 240 feet east of MW-5, (2) north of TW-5 near SW-14 and (3) north of TW-1 at SW-3 and are the same as used in the previous evaluations. These gauging sites are shown on the Figure. The flow rates were determined using a portable Parshall flume. No precipitation occurred during the measurement period. The measured flow rates are:

Gauging Point	Flow Rate
1	0 gpm
2	0.02 gpm
3	0.04 gpm

No flow was observed entering the south ditch from the south between gauging points 2 and 3. The HWMA is located between gauging points 2 and 3. These data indicate that 0.02 gpm or approximately 28 gpd may be leaving the settling reservoir and entering the south ditch at the time the measurements were taken.

CONCLUSIONS

The quarterly update of the groundwater quality assessment program for the Grede-Vassar, Inc. facility has revealed no evidence of groundwater concentrations above maximum concentration level standards listed in 40 CFR, Part 265, Appendix III and 40 CFR, Part 264.94, Table 1. The same assessment applies to the entire 1988 monitoring period.

When the recent analytical results are pooled with the prior three quarters and statistically compared to the "background" data set, only barium was determined to be elevated in MW-1, MW-3 and MW-11. Similar statistical analyses of the other 1988 data sets also indicated that barium was the

only element which was detected in the downgradient monitoring wells at concentrations "significantly" higher than background. Several considerations result in a determination that these barium concentrations do not represent site impact. These considerations include the fact that barium is naturally occurring at variable concentrations, the fact that all the concentrations are below the USEPA drinking water criteria, and the fact that barium has not been utilized by the facility in its operations.

The results of analyses performed on the surface water samples from "Ditch 1" and "Ditch 2" resulted in consistent detections below the maximum allowable concentrations listed in 40 CFR, Part 264.94, Table 1 for all the 1988 monitoring events.

The groundwater flow pattern at the facility for all the monitoring events has not changed significantly from previous evaluations.

RECOMMENDATIONS

It is recommended that, in accordance with 40 CFR 265.92(d), monitoring at the Grede-Vassar facility should continue on a semi-annual basis, along with the statistical analysis. Monitoring wells MW-1, MW-2, MW-4, MW-4, MW-9, MW-10 and MW-11 should be sampled along with the two surface water

(Ditch) stations. Each sample should be analyzed for the following metals: arsenic, barium, cadmium, chromium, lead, mercury and silver. It is recommended that analyses for selenium should be discontinued. This metal has not been detected during the previous seventeen quarters and was not used at the facility. Monitoring of the surface water flow rates should continue to enable the assessment of lagoon contribution to surface water flow.

Appendix A

Sampling and Analytical Protocols

SAMPLING AND ANALYTICAL PROTOCOLS

FOR GROUNDWATER MONITORING PROGRAM

GREDE CORPORATION

Foundry Division

Vassar, Michigan

May, 1987

Prepared By

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION

3985 Research Park Drive

Ann Arbor, Michigan 48108

Grede Corporation; Vassar , Michigan

Listed below are procedures for sampling observation wells, sample handling procedures, and analytical protocol. These procedures have been designed expressly for the Grede Corporation; Vassar, Michigan taking into account their study objectives, study site, and existing background data on water quality in the observation wells. This program is written to compliment the proposed groundwater monitoring program developed by Keck.

I. Observation Well Sampling and Sample Preservation

A. Three days prior to sampling the water levels in each of the monitor wells should be measued to within 0.01 feet from the top of the casing.

B. Measure and record the water level in the well before evacuating the casing or collecting a sample. To avoid cross contamination of well it is advisable to use a metal chalk line. It is accurate, easy to use and easy to clean. The chalk line must be cleaned after use in each well. Electric tapes are less desirable because they are somewhat more difficult to clean and the plastics used in the cord and probe may absorb organics.

C. Immediately after measuring the water levels, the water standing in the wells to be sampled should be evacuated completely with a brass or Teflon bailer. Should the water levels recover rapidly, remove at least three times the volume of water

stored in the casing. For those wells that recover very slowly, it may be necessary to bail one casing volume on each of three consecutive days before sampling date.

D. Always insure that any equipment used for sampling is clean. All parts of the equipment, including the bailer, rope or cable, and anything else that might come in contact with the water to be sampled, should be contaminant free. Sampling equipment should cleaned prior to sampling by detergent washing, rinsing with tap water, distilled water and then with solvent. In the field, the equipment should then be thoroughly rinsed with distilled water between sampling each well. The bailer used for sample collection is stainless steel with a teflon bottom check valve.

E. Label the sample containers before filling.

F. Fill one nitric rinsed polyethylene bottle for metals. In addition, fill one glass amber bottle for phenols, and one polyethylene bottle for pH. Be certain that samples are not preserved at this time, until they have been filtered.

G. Filtering for soluble metals determination is performed in the field as follows:

1. A nitric rinsed all glass filter flask and funnel is fitted with a millipore type HA 0.45 um membrane filter.

2. The filtering apparatus must first be pre-leached with 50 ml of 1% HNO_3.

3. The vacuum pump used for filtration will be a normal laboratory vacuum pump. Power for operation (110 V AC) will be supplied by Grede.

4. The first 50 ml of sample is then filtered and discarded to avoid contamination.

5. Filter the remaining 450 ml of sample and collect filtrate.

6. Pour off filtrate into clean (nitric rinsed) polyethylene bottle, and preserve with 1% HNO_3.

H. Prior to filtering the next sample or field duplicate, rinse funnel, frit and flask with distilled water, then 1% HNO_3.

I. Filtering for soluble phenolics is performed in the same manner as metals, using a separate filtering apparatus. The flask and funnel are rinsed with distilled water between samples. Samples are preserved with 0.3% H_2SO_4.

J. "Ditch" samples are collected by dipping sample bottles into the stream to fill them.

K. With each field survey a field blank should be generated. The field blank should be collected sometime after the first sample is taken in order to check for any cross-contamination occurring between samples. To generate the field blank, pour 1 liter of laboratory pure water into rinsed bailer. Pour off, filter and preserve field blank exactly as described for the samples in E through G above.

L. Complete the approprate chain of custody forms and field notes for collected samples.

M. Samples are stored in coolers with ice while awaiting and during transport to the Ann Arbor laboratory. Samples are transported via van or pickup truck with the sample crew returning to Ann Arbor. Sampling generally takes one day so that samples are returned to the laboratory the same day they are collected. Once received by the laboratory the samples are logged according to chain of custody procedures (see below) and then are placed in appropriate refrigerated storage (4 degree C) or for metals in the metals storage cabinet.

II. Chain of Custory Procedures

On-site, at the time of collection, each sample destined for chemical analysis will be labeled and assigned a sample identification number by the field person. A representative sample label is shown in Figure 1. In

ENCOTEC

3985 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48104
313-761-1389

PROJECT # Grede - Vassar 37079

SAMPLE LOCATION MW 1

SAMPLE TYPE Metals

Grab X Composite ___

DATE 5/7/87 to _____ TIME 1000 to _____

PRESERVATIVE 1% HNO_3

Figure 1. ENCOTEC sample label.

ENVIRONMENTAL
CONTROL
TECHNOLOGY
CORPORATION

3985 RESEARCH PARK DRIVE
ANN ARBOR, MICHIGAN 48104
313/761-1389

CHAIN OF CUSTODY RECORD

Project Name Grede - Vassar Project No. 37079

Sampler's (signature) Lisa A. Strong

Sample Type Water - metals, phenols, pH

Example only

Sample Number/I.D.	Location	Sample Date	Time	Remarks: (Preservative & condition of sample)
1	MW1	5/7/87	1000	Metals, Phenols, pH
2	MW 10		1015	filtered and
3	TW 11		1030	preserved
4	TW 13		1045	
5	Ditch 1		1100	
6	Ditch 2		1115	
7	MW 2	5/7/87	1130	
8	MW 3		1145	Metals only
9	MW 4		1200	filtered and preserved
10	MW 9		1215	
11	Field blank		1230	Metals, phenols
				filtered and preserved

L. A. Strong Relinquished by:	5/7/87 Date:	4:30pm Time:	Received by:	5/7/87 Date:	5:00pm Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:

Figure 2. CHAIN OF CUSTODY RECORD.

addition to this I.D. number, the label will indicate the date, time, and location of sample collection, designation of whether the sample is a grab or composite, the preservative used, and the analytical scheme for which the sample is intended.

On-site, the field person will also complete and sign a chain of custody record sheet accounting for each sample collected. The format of the record sheet is depicted in Figure 2. The field person will be responsible for the care and custody of the samples until they are delivered to the designated laboratory. A sample custodian will receive samples for the laboratory and verify that the information on the sample tags matches that on record sheets included with the shipment. The custodian will then sign the custody record and secure the samples in a designated cabinet or refrigerator, as appropriate. Subsequently, the custodian will distribute the samples to the appropriate chemists for analysis.

Once the laboratory and quality assurance checks have been completed, the samples will be retained or disposed of, at the direction of Grede personnel. The identification tags, custody record sheets and laboratory records should be retained as part of the permanent project documentation.

III. Quality Assurance

It is imperative that the integrity of all samples obtained for this project is maintained and that every datum is valid, defensible and generated when the analytical systme is operating within control. To insure the validity

of all data generated in this study, suitable quality control elements are proposed for each phase of field and laboratory work. The nature, purpose, and use frequency of these controls are given in the table below which summarizes the QC elements applicable to all determinations specified in the proposed groundwater quality parameters.

General Quality Control Elements

QC Element	Use Frequency	Purpose
Field Blank	1/survey	Background contamination during sampling
Laboratory Blank	1/analyte/10 samples	Contamination during analysis
Spiked Blank	1/analyte/20 samples	Analyte Recovery
Replicate Sample	1/analyte/10 samples	Precision of detection step
Blind Check Sample	1/analyte/20 samples	Accuracy of detection ste;
Calibration Standards	1 set/analyte/day of analysis	Determine instrument sensitivity and linearity

Quality control data will be reported with the corresponding sample data in the final report. The format for quality assurance data report is given in Figure 3, which is an example of quality assurance data previously generated for Grede-Vassar. All raw data, for samples as well as quality control checks, will be available for inspection at the client's request.

Project [illegible]

Date January, 1982

Quality Assurance Data Summary

Results of QA Samples run concurrently with Project Samples

Duplicate Analyses

Sample	Rep. 1	Rep. 2	Range
Specific Conductance MW 1	2600 μmhos/cm	2600 μmhos/cm	0 μmhos/cm
Barium 1.0 mg/l Standard	1.0 mg/l	0.99 mg/l	0.01 mg/l
2,4-D MW 1	0.1 μg/l	0.1 μg/l	0. μg/l
Cadmium 0.30 mg/l Standard	0.30 mg/l	0.30 mg/l	0 mg/l

Blanks, Spikes and/or Blind QC Check Samples

(all mg/l)

Sample	Known Concentration	Spike Added	Analyzed Concentration	Recovery (Percent)
Total Iron EPA P2C2	Blank	0.80	0.85	106%
Sodium EPA QC2	Blank	8.2	8.3	101%
Total Lead EPA P3C2	Blank	0.060	0.064	107%
Nitrate Nitrogen EPA P2C2	Blank	0.38	0.43	113%
Chromium EPA P2C2	Blank	0.30	0.30	100%
Flouride - Distilled Standard	---	5.0	4.9	98%
Barium EPA P3C2	Blank	1.1	1.0	91%
Cadmium EPA P2C2	Blank	0.059	0.056	95%

Analyzed Values of Calibration Standards

*Available upon request.

Project Eaton Corporation

Date January, 1982

Quality Assurance Data Summary

Results of QA Samples run concurrently with Project Samples

Duplicate Analyses

Sample	Rep. 1	Rep. 2	Range
Total Organic Carbon (2-11-82)	5 mg/l	6 mg/l	1 mg/l

Blanks, Spikes and/or Blind QC Check Samples

(all mg/l)

Sample	Known Concentration	Spike Added	Analyzed Concentration	Recovery (Percent)
2,4,D Spike	Blank	0.040	0.020	50%
Silvex Spike	Blank	0.0045	0.0028	62%
Arsenic P1C1	Blank	0.012	0.009	75%
Total Organic Carbon P2C2	Blank	91	91	100%
Mercury P2C1	Blank	0.0004	0.0004	100%

Analyzed Values of Calibration Standards

*Available upon request.

IV. Report of Data

Results of analyses will be reported within thirty (30) working days after receipt of all samples in the laboratory. Results for each well sample will be compared to existing laboratory procedures will be checked for possible cause. When all data is checked, and no errors detected. A final report is submitted to Grede-Vassar and Keck Consulting Service.

Grede Vassar
Analytical Methods
And Detection Limits

Parameter	Method	Detection Limit (mg/l)
Arsenic	7061	0.002
Barium	7080	0.05
Cadmium	7131	0.002
Chromium	7191	0.002
Lead	7421	0.002
Mercury	7470	0.0002
Selenium	7741	0.002
Silver	7760	0.010
Fluoride	340.2	
Phenolics	420.1	0.10
pH	9040	---
Iron	236.1	0.05
Zinc	7950	0.02

References:

1) USEPA Test Methods for Solid Waste SW-846, 2nd edition, 1984

2) USEPA Methods for Chemical analysis of water and wastes, March 1987

Appendix B

Water Quality Data
Samples Collected August 18, 1988 and
November 2, 1988

August 18, 1988 Sample Collection

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR. • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vasser - 37079

ENCOTEC

DISSOLVED METALS
DATA SUMMARY SHEET

DATE October, 1988

Parameter	Units	Field Blank 8/18/88	MW-1 8/18/88	MW-2 8/18/88	MW-3 8/18/88	MW-4 8/18/88	MW-9 8/18/88	MW-10 8/18/88	MW-11 8/18/88
Arsenic	mg/l	<0.002	<0.002	0.011	<0.002	0.007	0.020	0.003	0.010
Barium	mg/l	<0.05	0.26	0.24	0.25	0.22	0.22	0.18	0.28
Cadmium	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead	mg/l	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/l	<0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium	mg/l	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ECT-40-330

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR. • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vasser - 37079

ENCOTEC

DISSOLVED METALS
DATA SUMMARY SHEET

DATE October, 1988

Parameter	Units	Ditch 1 8/18/88	Ditch 2 8/18/88						
Arsenic	mg/l	0.002	0.005						
Barium	mg/l	0.17	0.22						
Cadmium	mg/l	<0.002	<0.002						
Chromium	mg/l	<0.002	<0.002						
Lead	mg/l	<0.002	<0.002						
Mercury	mg/l	<0.0002	<0.0002						
Selenium	mg/l	<0.002	<0.002						
Silver	mg/l	<0.01	<0.01						

ECT-40-330

ENCOTEC Precision Control Limits

Grede Vassar

October, 1988

Parameter	Conc. Range	ENCOTEC Mean % RPD	LCL (%)	UCL (%)
Arsenic	4-100 ug/l	0.0	10	20
Cadmium	0.002-1 mg/l	0.0	10	20
Chromium	0.002-1 mg/l	3.6	10	20
Lead	0.002-1 mg/l	0.0	10	20
Mercury	0.2-20 ppb	0.0	10	20
Silver	0.01-1 mg/l	0.0	10	20
Barium	0.05-1 mg/l	0.0	10	20
Selenium	0.002-0.100 mg/l	0.0	10	20

Note: 0.0% RPD

Values were not detected for samples. Therefore duplicates gave identical values.

ENCOTEC Accuracy Control Limits

Grede Vassar

October, 1988

Parameter	Conc. Range	ENCOTEC Mean % Rec.	LCL (%)	UCL (%)
Arsenic	1-100 ug/l	108	75	125
Cadmium	0.005-1 mg/l	98	75	125
Chromium	0.02-1 mg/l	102	75	125
Lead	0.02-1 mg/l	95	75	125
Mercury	1-20 ppb	90	75	125
Silver	0.01-1 mg/l	95	80	112
Barium	0.05-1 mg/l	84	80	110
Selenium	0.002-0.100 mg/l	78	75	125

Grede Vassar

Analytical Methods
And Detection Limits

Parameter	Method	Detection Limit (mg/l)
Arsenic	7061	0.002
Barium	7080	0.05
Cadmium	7131	0.002
Chromium	7191	0.002
Lead	7421	0.02
Mercury	7470	0.0002
Selenium	7741	0.002
Silver	7760	0.010
Phenolics	420.1	0.10
pH	9040	----
Iron	236.1	0.05
Zinc	7950	0.02

References:

1) USEPA Test Methods for Solid Waste SW-846, 2nd edition, 1984

2) USEPA Methods for chemical analysis of water and wastes, March 1987

November 2, 1988 Sample Collection

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar
37079

Dissolved Metals
DATA SUMMARY SHEET

DATE December 1988

Parameter	Units	Field Blank 11/2/88	MW-1 11/2/88	MW-2 11/2/88	MW-3 11/2/88	MW-4 11/2/88	MW-9 11/2/88	MW-10 11/2/88	MW-11 11/2/88
Arsenic	mg/L	<0.002	<0.002	0.006	<0.002	0.002	0.014	0.003	0.004
Barium	mg/L	0.06	0.36	0.21	0.25	0.18	0.20	0.14	0.29
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	mg/L	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002
Selenium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002
Silver	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

ECT-40-330

SHEET ___ OF ___

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar
37079

DATA SUMMARY SHEET

DATE December 1988

Parameter	Units	Field Blank 11/2/88	MW-1 11/2/88	MW-2 11/2/88	MW-3 11/2/88	MW-4 11/2/88	MW-9 11/2/88	MW-10 11/2/88	MW-11 11/2/88
pH	S.U.	---	6.9	---	---	---	---	7.3	7.2
Total Phenolics	mg/L	---	<0.10	---	---	---	---	<0.10	<0.10
Dissolved Iron	mg/L	<0.05	3.4	0.20	0.15	<0.05	0.05	0.26	1.6
Dissolved Zinc	mg/L	<0.02	0.03	0.03	0.06	<0.02	0.03	0.02	0.02

ECT-40-330

SHEET ___ OF ___

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar

Dissolved Metals

37079

DATA SUMMARY SHEET

DATE December 1988

Parameter	Unit	Ditch #1 11/2/88	Ditch #2 11/2/88						
Arsenic	mg/L	0.013	<0.002						
Barium	mg/L	0.20	0.18						
Cadmium	mg/L	<0.002	<0.002						
Chromium	mg/L	<0.002	<0.002						
Lead	mg/L	<0.02	<0.02						
Mercury	mg/L	<0.0002	<0.0002						
Selenium	mg/L	<0.002	<0.002						
Silver	mg/L	<0.01	<0.01						

ECT-40-330

SHEET ___ OF ___

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar
37079

ENCOTEC

DATA SUMMARY SHEET

DATE December 1988

Parameter	Unit	Ditch #1 11/2/88	Ditch #2 11/2/88						
pH	S.U.	7.4	7.8						
Total Phenolics	mg/L	<0.10	<0.10						
Dissolved Iron	mg/L	0.26	0.15						
Dissolved Lead	mg/L	<0.02	0.15						

ECT-40-330

SHEET ___ OF ___

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar

37079

Dissolved Metals
DATA SUMMARY SHEET

DATE December 1988

Parameter	Unit	TW-11 11/2/88	TW-13 11/2/88						
Arsenic	mg/L	0.011	<0.002						
Barium	mg/L	0.38	0.13						
Cadmium	mg/L	<0.002	<0.002						
Chromium	mg/L	0.003	<0.002						
Lead	mg/L	<0.02	<0.02						
Mercury	mg/L	<0.0002	<0.0002						
Selenium	mg/L	<0.002	<0.002						
Silver	mg/L	<0.01	<0.01						

ECT-40-330

SHEET ___ OF ___

ENVIRONMENTAL CONTROL TECHNOLOGY CORPORATION
3985 RESEARCH PARK DR • ANN ARBOR, MI 48108 • 313/761-1389

PROJECT Grede Vassar
37079

DATA SUMMARY SHEET

DATE December 1988

Parameter	Unit	TW-11 11/2/88	TW-13 11/2/88						
pH	S.U.	7.0	8.5						
Total Phenolics	mg/L	<0.1	<0.1						
Dissolved Iron	mg/L	9.4	<0.05						
Dissolved Zinc	mg/L	0.04	<0.02						

ECT-40-330

SHEET ___ OF ___

ENLUTE

PROJECT NO.	CLIENT NAME
37079	GREDE VASSAR

SAMPLERS (Signature)	PROJECT NAME
J Rogers MK Mooney	WELLS

STA. NO.	DATE	TIME	Comp.	Grab	STATION LOCATION	NO. OF CONTAINERS / Check if Preserved	DISS METALS	pH	PHENOLS										REMARKS
	11-2				DITCH 1		✓	✓	✓										Circle Matrix SOIL/WATER/AIR SEDIMENT/SLUDGE WATER
					DITCH 2	✓	✓	✓	✓	✓									
					MW-9	✓	✓												
					MW-11	✓	✓	✓	✓										
					TW-13	✓	✓	✓	✓										
					MW-1	✓	✓	✓	✓										
					TW-11	✓	✓	✓	✓										
					MW-2	✓	✓												
					MW-3	✓	✓												
					MW-4	✓	✓												
					MW-10	✓	✓	✓	✓										

RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)
Joe Rogers	11-3-88	[illegible] 5:30 pm 11/3/88			
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)			
RELINQUISHED BY: (Signature)	DATE/TIME	RECEIVED BY: (Signature)			

NOTES METALS FILTERED ONSITE & PRESERVED ONSITE.

007

ENCOTEC Accuracy Control Limits

Grede Vassar

December, 1988

Parameter	Conc. Range	ENCOTEC Mean % Rec.	LCL (%)	UCL (%)
Arsenic	1-100 ug/l	103	75	125
Cadmium	0.005-1 mg/l	88	75	125
Chromium	0.02-1 mg/l	103	75	125
Lead	0.02-1 mg/l	98	75	125
Mercury	1-20 ppb	91	75	125
Silver	0.01-1 mg/l	104	80	112
Barium	0.05-1 mg/l	98	80	110
Selenium	0.002-0.100 mg/l	111	75	125

ENCOTEC Precision Control Limits

Grede Vassar

December, 1988

Parameter	Conc. Range	ENCOTEC Mean % RPD	LCL (%)	UCL (%)
Arsenic	4-100 ug/l	0.0	10	20
Cadmium	0.002-1 mg/l	0.0	10	20
Chromium	0.002-1 mg/l	10	10	20
Lead	0.002-1 mg/l	0.0	10	20
Mercury	0.2-20 ppb	0.0	10	20
Silver	0.01-1 mg/l	1.9	10	20
Barium	0.05-1 mg/l	0.0	10	20
Selenium	0.002-0.100 mg/l	0.0	10	20

Note: 0.0% RPD

Values were not detected for samples. Therefore duplicates gave identical values.

ECT-40-300

Appendix C

Water Quality Summary Tables for
Last Seventee Quarterly Samplings

Grede-Vassar, Inc.
Water Quality Summary Table
MW-1

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	0.006	0.012	0.010	0.009	0.007	0.008	<0.002	<0.002	<0.002	<0.002
Barium (mg/l)	0.08	0.09	0.41	0.17	0.23	0.24	0.20	0.15	<0.1	0.12
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	0.003	0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	0.011	0.010	0.015	0.013	0.010	0.028	0.004	0.015	0.005
Lead (mg/l)	0.03	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	0.004
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-1
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Barium (mg/l)	0.07	0.27	0.24	0.25	0.24	0.26	0.36
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	0.002	0.004	0.006	<0.002	<0.002	<0.002	0.003
Lead (mg/l)	0.003	0.002	<0.002	<0.002	<0.002	0.003	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-2

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	<0.002	<0.002	<0.002	0.009	<0.002	0.002	0.004	0.009	0.005	<0.002
Barium (mg/l)	0.19	0.15	0.31	0.17	0.27	0.29	0.23	0.40	<0.10	0.10
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	0.012	0.009	0.015	0.011	0.012	0.009	0.002	<0.002	0.003
Lead (mg/l)	0.03	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.012
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-2
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.004	0.012	0.005	0.002	0.004	0.011	0.006
Barium (mg/l)	0.09	0.26	0.24	0.21	0.17	0.24	0.21
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	0.009	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-3

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002
Barium (mg/l)	0.21	0.20	0.34	0.18	0.25	0.26	0.21	0.38	0.14	0.26
Cadmium (mg/l)	0.004	<0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	0.016	0.013	0.011	0.014	0.012	0.010	0.002	0.002	0.002
Lead (mg/l)	0.03	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-3
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002
Barium (mg/l)	0.10	0.22	0.27	0.24	0.24	0.25	0.25
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-4

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	----	<0.002	<0.002	<0.002	<0.002	0.004	0.004	0.006	0.003	<0.002
Barium (mg/l)	----	0.10	0.26	0.17	0.12	0.25	0.23	0.50	<0.10	0.13
Cadmium (mg/l)	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	----	0.006	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002
Mercury (mg/l)	----	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	----	<0.002	0.004	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-4
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.003	0.008	0.003	<0.002	0.002	0.007	0.002
Barium (mg/l)	0.05	0.16	0.26	0.14	0.16	0.22	0.18
Cadmium (mg/l)	0.005	0.004	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	0.003	0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-9

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	0.008	0.004	0.003	<0.002	<0.001	0.016	0.022	0.011	0.015	0.003
Barium (mg/l)	0.10	0.14	0.22	0.12	0.24	0.21	0.20	0.19	<0.10	0.14
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	0.008	0.008	0.008	0.009	0.010	0.006	0.002	<0.002	0.017
Lead (mg/l)	<0.02	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.031
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	0.010	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-9
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.010	0.008	0.005	0.005	0.010	0.020	0.014
Barium (mg/l)	0.09	0.19	0.11	0.17	0.16	0.22	0.20
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-10

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	0.006	<0.002	<0.002	<0.002	<0.002	0.007	0.011	0.009	0.011	<0.002
Barium (mg/l)	0.10	0.09	0.21	0.12	0.20	0.19	0.16	0.10	<0.10	0.11
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	<0.002	0.003	0.003	0.005	0.007	0.007	0.002	0.003	0.006
Lead (mg/l)	<0.02	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	0.003	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-10
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.004	0.010	0.008	0.004	0.005	0.003	0.003
Barium (mg/l)	<0.05	0.14	0.08	0.10	0.15	0.18	0.14
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	0.006	0.003	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
MW-11

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	0.007	0.003	<0.002	<0.002	<0.002	0.008	0.009	0.006	0.004	<0.002
Barium (mg/l)	<0.05	<0.05	0.20	0.12	<0.10	0.10	0.11	0.32	<0.10	0.21
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.02	0.003	0.004	0.004	0.006	0.005	0.006	0.002	<0.002	0.003
Lead (mg/l)	<0.02	<0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.011
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
MW-11
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.005	0.009	0.004	0.004	0.005	0.010	0.004
Barium (mg/l)	0.12	0.29	0.30	0.22	0.22	0.28	0.29
Cadmium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	0.003	0.003	0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
Ditch #1

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	----	----	<0.002	----	<0.002	0.013	0.012	0.010	0.012	0.009
Barium (mg/l)	----	----	0.15	----	0.18	0.16	0.17	0.12	<0.10	0.09
Cadmium (mg/l)	----	----	<0.002	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	----	----	0.002	----	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
Lead (mg/l)	----	----	<0.002	----	0.003	0.004	<0.002	<0.002	<0.002	<0.002
Mercury (mg/l)	----	----	<0.0002	----	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	----	----	<0.002	----	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002
Silver (mg/l)	----	----	<0.01	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
Ditch #1
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.005	Dry	0.010	0.03	0.004	0.002	0.013
Barium (mg/l)	<0.05		0.21	0.17	0.19	0.17	0.20
Cadmium (mg/l)	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002
Lead (mg/l)	0.003		<0.002	<0.002	<0.002	<0.002	<0.02
Mercury (mg/l)	<0.0002		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01

Grede-Vassar, Inc.
Water Quality Summary Table
Ditch #2

Parameter	Concentration									
	9/6/84	2/13/85	5/7/85	8/15/85	11/7/85	2/6/86	5/8/86	8/7/86	11/7/86	2/10/87
Arsenic (mg/l)	----	----	<0.002	----	<0.002	0.005	<0.002	0.002	0.003	<0.002
Barium (mg/l)	----	----	0.10	----	0.73	0.13	0.15	0.16	<0.10	0.09
Cadmium (mg/l)	----	----	<0.002	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium (mg/l)	----	----	<0.002	----	<0.002	<0.002	0.003	0.002	<0.002	<0.002
Lead (mg/l)	----	----	<0.002	----	<0.002	<0.002	<0.002	0.003	<0.002	<0.002
Mercury (mg/l)	----	----	<0.0002	----	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	----	----	<0.002	----	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver (mg/l)	----	----	<0.01	----	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Water Quality Summary Table
Ditch #2
Page 2

	Concentration						
Parameter	5/7/87	8/7/87	11/5/87	2/4/88	5/12/88	8/18/88	11/2/88
Arsenic (mg/l)	0.002	0.010	0.003	----	<0.002	0.005	<0.002
Barium (mg/l)	0.05	0.54	0.14	----	0.14	0.22	0.18
Cadmium (mg/l)	<0.002	<0.002	<0.002	----	<0.002	<0.002	<0.002
Chromium (mg/l)	<0.002	<0.002	<0.002	----	<0.002	<0.002	<0.002
Lead (mg/l)	0.002	0.009	<0.002	----	<0.002	<0.002	<0.02
Mercury (mg/l)	<0.0002	<0.0002	<0.0002	----	<0.0002	<0.0002	<0.0002
Selenium (mg/l)	<0.002	<0.002	<0.002	----	<0.002	<0.002	<0.002
Silver (mg/l)	<0.01	<0.01	<0.01	----	<0.01	<0.01	<0.01

Appendix D

Statistical Analyses for Quarterly Samplings

August 18, 1988 Data

Grede-Vassar, Inc.
Monitor Well #1

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.002	-----		
Background MW-9	4	0.00425	0.00000692	-1.71	2.35
Barium (mg/l)	4	0.25	0.000092		
Background MW-9	4	0.145	0.00277	3.92	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	2.35
Chromium (mg/l)	4	0.0030	0.0000040		
Background MW-9	4	0.0110	0.0000360	-2.53	2.35
Lead (mg/l)	4	0.00225	0.0000003		
Background MW-9	4	0.0070	0.0000760	-1.09	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #2

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.0055	0.000015		
Background MW-9	4	0.00425	0.00000692	0.53	2.35
Barium (mg/l)	4	0.215	0.0011		
Background MW-9	4	0.145	0.00277	2.25	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----		
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #3

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.002	-----		
Background MW-9	4	0.00425	0.00000692	-1.72	2.35
Barium (mg/l)	4	0.25	0.00020		
Background MW-9	4	0.145	0.00277	3.85	2.36
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.0020	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #4

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.0035	0.0000057		
Background MW-9	4	0.00425	0.00000692	-0.42	2.35
Barium (mg/l)	4	0.195	0.00303		
Background MW-9	4	0.145	0.00277	1.31	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #9

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.010	0.000050		
Background MW-9	4	0.00425	0.0000692	1.05	2.35
Barium (mg/l)	4	0.165	0.00203		
Background MW-9	4	0.145	0.00277	0.58	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #10

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.0050	0.0000047		
Background MW-9	4	0.00425	0.00000692	0.44	2.36
Barium (mg/l)	4	0.1275	0.00209		
Background MW-9	4	0.145	0.00277	-0.50	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.36
Lead (mg/l)	4	0.00225	0.0000003		
Background MW-9	4	0.0070	0.0000760	-1.09	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #11

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.00575	0.0000082		
Background MW-9	4	0.00425	0.00000692	0.77	2.35
Barium (mg/l)	4	0.255	0.0017		
Background MW-9	4	0.145	0.00277	3.29	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002			
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

November 2, 1988 Data

Grede-Vassar, Inc.
Monitor Well #1

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.002	-----		
Background MW-9	4	0.00425	0.00000692	-1.71	2.35
Barium (mg/l)	4	0.277	0.00309		
Background MW-9	4	0.145	0.00277	3.45	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	2.35
Chromium (mg/l)	4	0.00225	0.0000003		
Background MW-9	4	0.0110	0.0000360	-2.90	2.35
Lead (mg/l)	4	0.00225	0.0000003		
Background MW-9	4	0.0070	0.0000760	-1.09	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #2

Parameter	n	x	s^2	t*	t_c
Arsenic (mg/l)	4	0.00575	0.0000149		
Background MW-9	4	0.00425	0.00000692	0.64	2.35
Barium (mg/l)	4	0.207	0.000825		
Background MW-9	4	0.145	0.00277	2.07	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----		
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #3

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.002	-----		
Background MW-9	4	0.00425	0.00000692	-1.72	2.35
Barium (mg/l)	4	0.245	0.0000333		
Background MW-9	4	0.145	0.00277	3.78	2.36
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.0020	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.00025	1.0×10^{-8}		
Background MW-9	4	0.0002	-----	1.0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #4

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.00325	0.0000063		
Background MW-9	4	0.00425	0.00000692	-0.55	2.35
Barium (mg/l)	4	0.175	0.001167		
Background MW-9	4	0.145	0.00277	0.96	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #9

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.01225	0.0000403		
Background MW-9	4	0.00425	0.0000692	1.53	2.35
Barium (mg/l)	4	0.187	0.000758		
Background MW-9	4	0.145	0.00277	1.41	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #10

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.00375	0.0000009		
Background MW-9	4	0.00425	0.00000692	-0.36	2.36
Barium (mg/l)	4	0.1425	0.00109		
Background MW-9	4	0.145	0.00277	-0.08	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.36
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002	-----		
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Grede-Vassar, Inc.
Monitor Well #11

Parameter	n	$\bar{x}$	s^2	t*	t_c
Arsenic (mg/l)	4	0.00575	0.0000082		
Background MW-9	4	0.00425	0.00000692	0.77	2.35
Barium (mg/l)	4	0.2525	0.001425		
Background MW-9	4	0.145	0.00277	3.32	2.35
Cadmium (mg/l)	4	0.002	-----		
Background MW-9	4	0.002	-----	0	0
Chromium (mg/l)	4	0.002	-----		
Background MW-9	4	0.0110	0.0000360	-3.00	2.35
Lead (mg/l)	4	0.002	-----		
Background MW-9	4	0.0070	0.0000760	-1.15	2.35
Mercury (mg/l)	4	0.0002			
Background MW-9	4	0.0002	-----	0	0
Selenium (mg/l)	4	0.002	-----		
Background MW-9	4	0.00450	0.0000143	-1.32	2.35
Silver (mg/l)	4	0.01	-----		
Background MW-9	4	0.01	-----	0	0

Appendix E

Groundwater Elevation Data Tables
August 15, 1988 Measurements

DATE August 15, 1988 PROJECT #0091-1403 Grede-Vassar, Inc.

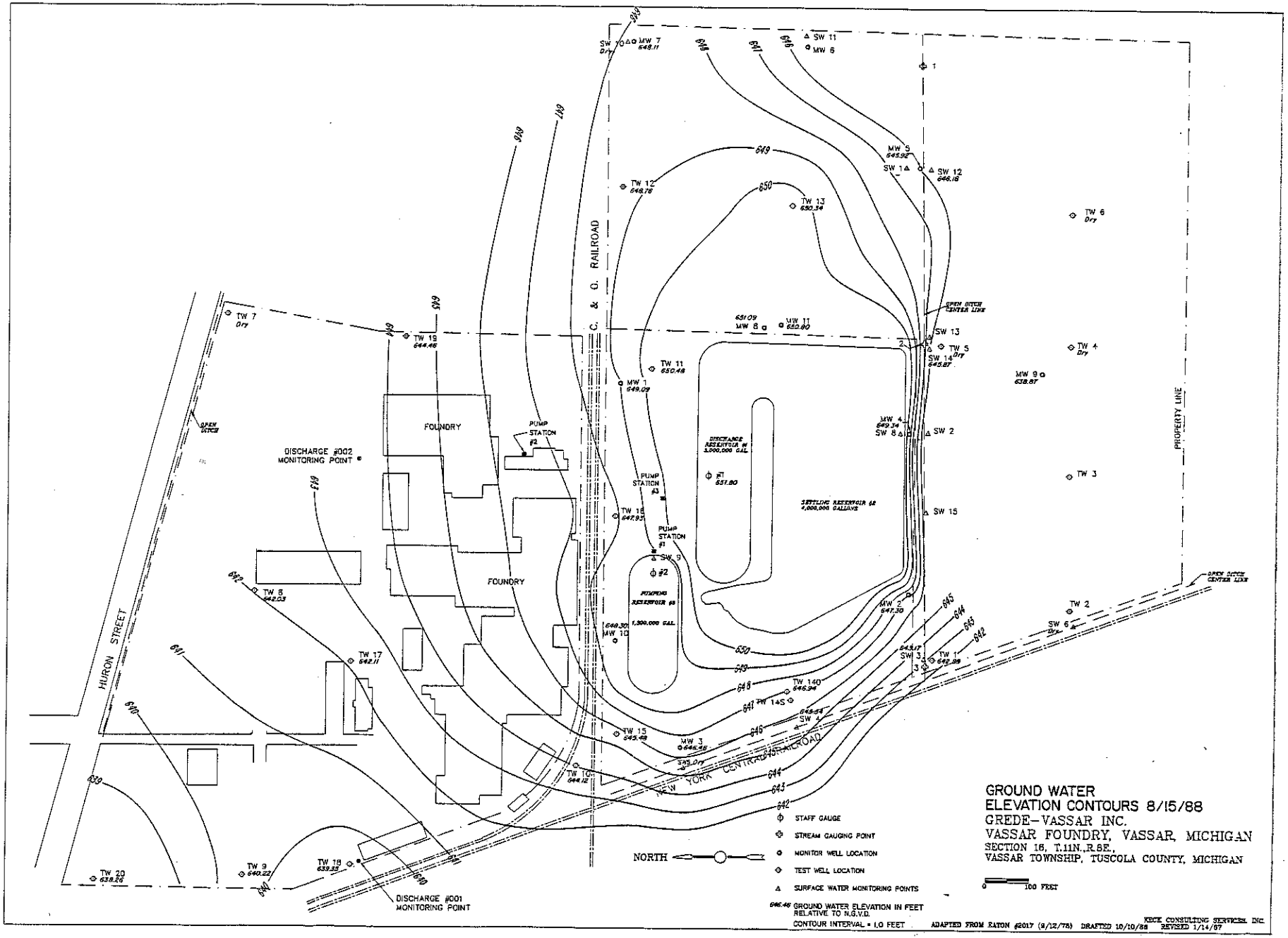
WELL#	GROUND ELEVATION	MEASURING POINT	MEASURING POINT A.G.L.	MEASURING POINT ELEVATION	DEPTH TO WATER	WATER-TABLE ELEVATION
MW-1	650.71	Top of Locking Cap Housing	4.34	655.05	5.96	649.09
MW-2	649.59	Top of Locking Cap Housing	3.38	652.97	5.67	647.30
MW-3	650.43	Top of Locking Cap Housing	4.10	654.53	8.07	646.46
MW-4	652.08	Top of Locking Cap Housing	1.13	653.21	3.87	649.34
MW-5	647.96	TOC	4.03	651.99	6.07	645.92
MW-6	655.42	TOC	4.66	660.08	BURIED UNDER	FOUNDRY SAND
MW-7	651.30	TOC	2.98	654.28	6.17	648.11
MW-8	650.20	TOC	2.79	652.99	1.90	651.09
MW-9	647.75	Top of Locking Cap Housing	2.86	650.61	11.74	638.87
MW-10	651.60	Top of Locking Cap Housing	2.91	654.51	6.21	648.30
MW-11	652.04	Top of Locking Cap Housing	2.53	654.57	3.77	650.80
TW-1	645.54	TOC at "M.P.∧"	3.39	648.93	6.04	642.89
TW-2	646.57	CASING BROKEN - WELL PLUGGED				
TW-3	646.80	CASING BROKEN - WELL PLUGGED				
TW-4	647.41	Top of 2 x 2 Next to Well	1.15	648.56	Dry	-----
TW-5	648.06	TOC	2.75	650.81	Dry	-----
TW-6	648.46	TOC	5.35	653.81	Dry	-----

DATE August 15, 1988 PROJECT #0091-1403 Grede-Vassar, Inc.

WELL#	GROUND ELEVATION	MEASURING POINT	MEASURING POINT A.G.L.	MEASURING POINT ELEVATION	DEPTH TO WATER	WATER-TABLE ELEVATION
TW-7	645.23	TOC	4.62	649.85	Dry	-----
TW-8	644.86	TOC	3.81	648.67	6.64	642.03
TW-9	642.35	TOC	4.61	646.96	6.74	640.22
TW-10	647.07	TOC	4.63	651.70	7.58	644.12
TW-11	652.52	Top of Locking Cap Housing	3.32	655.84	5.36	650.48
TW-12	650.22	TOC	3.26	653.48	4.72	648.76
TW-13	654.87	Top of Locking Cap Housing	4.51	659.38	9.04	650.34
TW-14s	652.87	TOC	3.16	656.03	8.40	647.63
TW-14d	653.17	TOC	2.26	655.43	8.49	646.94
TW-15	650.07	TOC	4.67	654.74	9.26	645.48
TW-16	650.71	TOC	4.25	654.96	7.03	647.93
TW-17	645.96	TOC	3.06	649.02	6.91	642.11
TW-18	644 09	TOC	3.54	647.63	8.28	639.35
TW-19	648.61	TOC	4.58	653.19	8.73	644.46
TW-20	642.04	TOC	2.63	644.67	6.41	638.26
SW-1		Top of 2 x 2		648.69	COVERED WITH FILL	
SW-2		Top of 2 x 2		646.37	GONE	-----

DATE August 15 ,1988 PROJECT #0091-1403 Grede-Vassar, Inc.

WELL#	GROUND ELEVATION	MEASURING POINT	MEASURING POINT A.G.L.	MEASURING POINT ELEVATION	DEPTH TO WATER	WATER-TABLE ELEVATION
SW-3		Top of 2 x 2		644.90	1.73	643.17
SW-4		Top of 2 x 2		646.26	.72	645.54
SW-5		Top of 2 x 2		647.21	Dry	-----
SW-6		Top of 2 x 2		644.24	Dry	-----
SW-8		Top of 2 x 2		650.39	COULD NOT LOCATE	-----
SW-9		Top of 2 x 2		648.98	COULD NOT LOCATE	-----
SW-10		Top of 2 x 2		649.14	Dry	-----
SW-11		Top of 2 x 2		649.10	BURIED BY FOUNDRY	SAND
SW-12		Top of 2 x 2		646.85	.69	646.16
SW-13		Top of 2 x 2		647.11	GONE	-----
SW-14		Top of 2 x 2		646.89	1.02	645.87
SW-15		Top of 2 x 2		645.77	COULD NOT LOCATE	-----
Staff Gauge #1	W.L.=3.78	(0.00' = 648.02)	WATER LEVEL ON STAFF GAUGE		3.78	651.80
Staff Gauge #2	WATER LEVELS NOT DETERMINED, STAFF GAUGE DOWN			ASSUME 648.90		-----
STREAM FLOW - 1 - DRY						
STREAM FLOW - 2 - .02						
STREAM FLOW - 3 - .04						


GROUND WATER
ELEVATION CONTOURS 8/15/88
GREDE-VASSAR INC.
VASSAR FOUNDRY, VASSAR, MICHIGAN
SECTION 16, T.11N.,R.8E.,
VASSAR TOWNSHIP, TUSCOLA COUNTY, MICHIGAN
0 100 FEET
STAFF GAUGE
STREAM GAUGING POINT
MONITOR WELL LOCATION
TEST WELL LOCATION
SURFACE WATER MONITORING POINTS
646.46 GROUND WATER ELEVATION IN FEET RELATIVE TO N.G.V.D.
CONTOUR INTERVAL = 1.0 FEET
NORTH
HURON STREET
C. & O. RAILROAD
NEW YORK CENTRAL RAILROAD
PROPERTY LINE
FOUNDRY
FOUNDRY
DISCHARGE #002
MONITORING POINT
DISCHARGE #001
MONITORING POINT
PUMP STATION #2
PUMP STATION #3
PUMP STATION #1
OPEN DITCH
OPEN DITCH CENTER LINE
SETTLING RESERVOIR #2
4,000,000 GALLONS
DISCHARGE RESERVOIR #1
3,000,000 GAL.
PUMPING RESERVOIR #3
1,500,000 GAL.
KECK CONSULTING SERVICES, INC.
ADAPTED FROM EATON #2017 (9/12/75) DRAFTED 10/10/88 REVISED 1/14/97
YD6377