Ditch Water Samples (continued)

All ditch water samples were analyzed for pH, TDS, conductivity, major ions (no chemical preservation required); barium, cadmium, lead (preserved with nitric acid); and total organic carbon (preserved with sulfuric acid). Samples DW-E and DW-G were also analyzed for priority pollutants: pesticides, PCBs, base neutrals (no chemical preservative required; collected in amber glass jar); phenol (preserved with sulfuric acid, collected in boston round); priority pollutant metals (preserved with nitric acid); cyanide (preserved with sodium hydroxide); 601 scan (no chemical preserved required; collected in 40 ml glass vial); 602 & 603 scans (preserved with hydrochloric acid; collected in 40 ml glass vial).

ECKENFELDER INC.

PROJECT RMI Sodium Plant
SUBJECT Surface Water + Sediment Sampling Observations 01/30-02/01/89
BY MDB DATE _____ PAGE 6 OF 6

Manhole Water Samples - 02/01/89

For MHW-1, -2, and -4, used small drill-powered centrifugal pump to sample. Primed but ends of sample tube with distilled water before each sample. Water-level too low to use drill-powered pump in MH W-5. Activated permanent pump installed in manhole and sampled discharge pipe to pump.

MHW-1	Located near SW corner of Pond 1
MHW-2	Located near SE corner of Pond 2
MHW-3	Distilled water blank
MHW-4	Located near Pond 4
MHW-5	Located near Pond 5
MHW-6	Duplicate of MHW-2

All manhole water samples were analyzed for TDS, pH, conductivity, major ions (no chemical preservation required); primary drinking water metals (preserved with nitric acid); and total organic carbon (preserved with sulfuric acid). All manhole water samples were collected in plastic containers.

APPENDIX 4

HYDRAULIC CONDUCTIVITY RESULTS

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

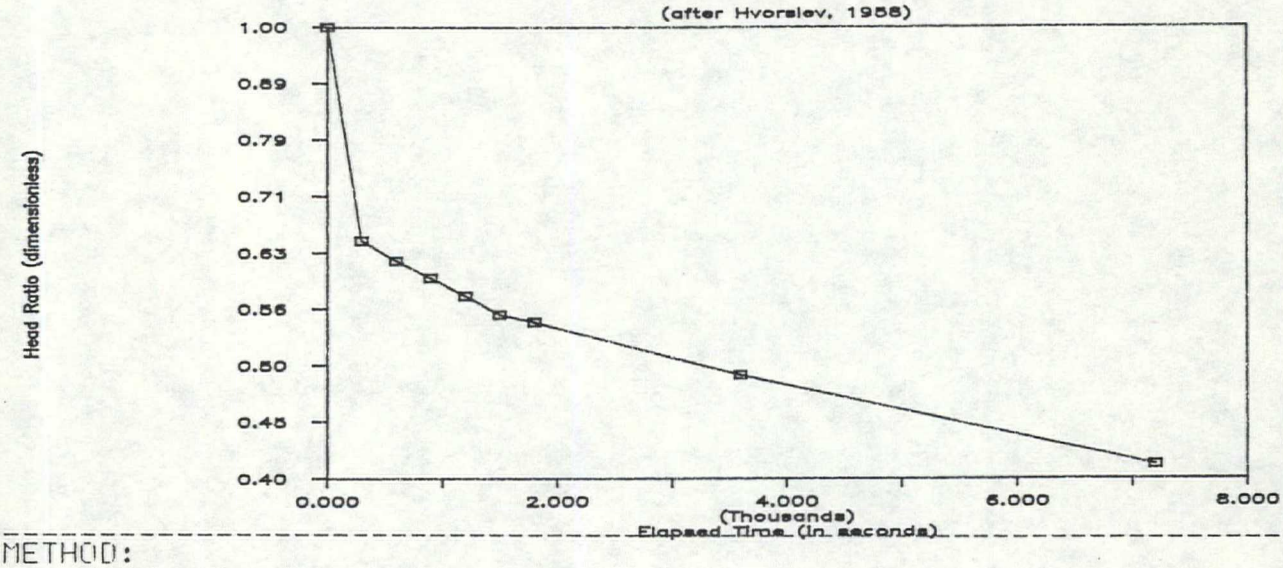
PIEZOMETER NO. 4S

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	GLACIAL TILL
SOIL CLASSIFICATION:	SILT AND CLAY
TESTED BY:	DLP
DATE OF TEST:	11-18-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.65
600.0	0.62
900.0	0.60
1200.0	0.58
1500.0	0.56
1800.0	0.55
3600.0	0.49
7200.0	0.41

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	1.4E-05	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.58			
t2 = elapsed time at H2		1200.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

PIEZOMETER NO. 4D

PROJECT NO: 6120

CLIENT: RMI SODIUM

GEOLOGIC UNIT: BEDROCK

SOIL CLASSIFICATION: SHALE
-

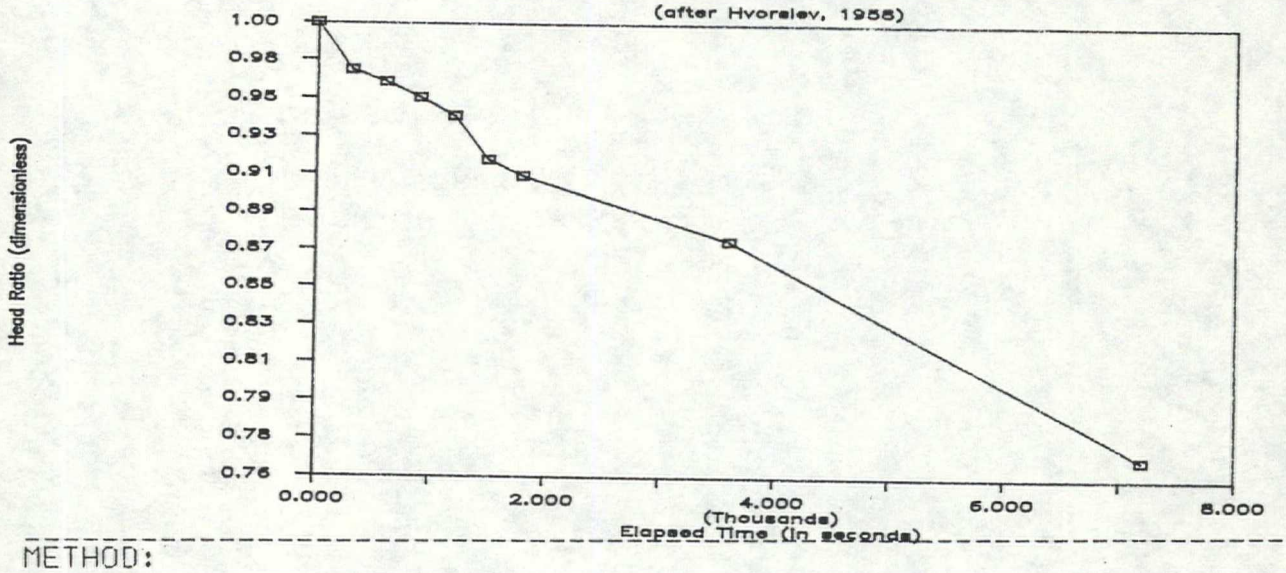
TESTED BY: DLP

DATE OF TEST: 11-18-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.97
600.0	0.96
900.0	0.96
1200.0	0.95
1500.0	0.92
1800.0	0.91
3600.0	0.88
7200.0	0.77

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	1.2E-06	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.77			
t2 = elapsed time at H2		7200.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

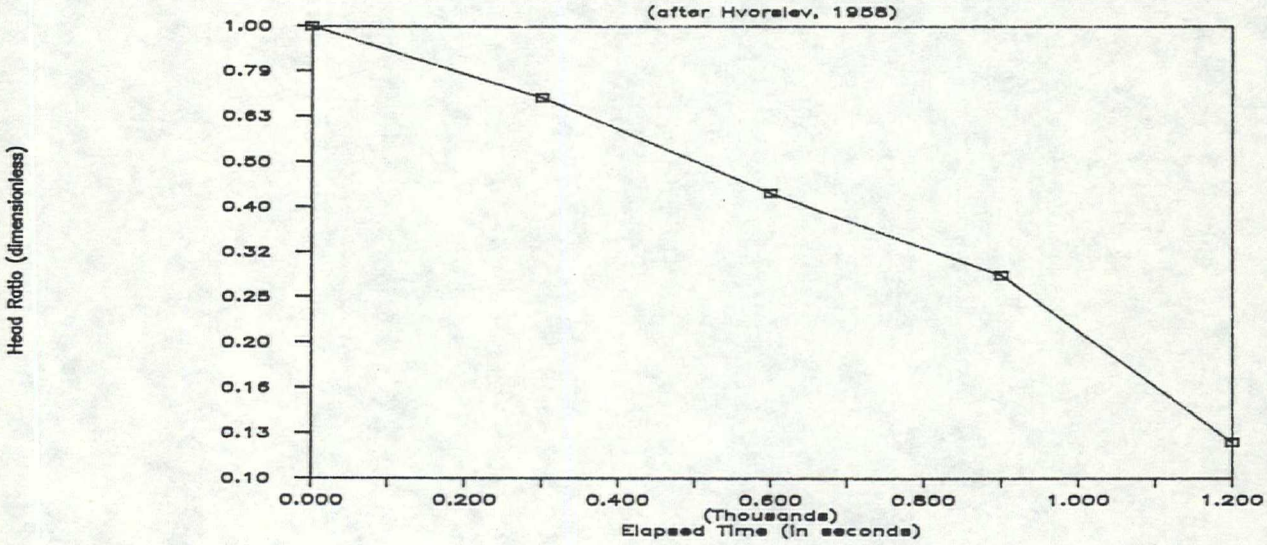
PIEZOMETER NO. 5S

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	GLACIAL TILL
SOIL CLASSIFICATION:	SILT AND CLAY
TESTED BY:	DLP
DATE OF TEST:	11-18-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.69
600.0	0.43
900.0	0.28
1200.0	0.12

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	3.9E-05	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.69			
t2 = elapsed time at H2		300.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

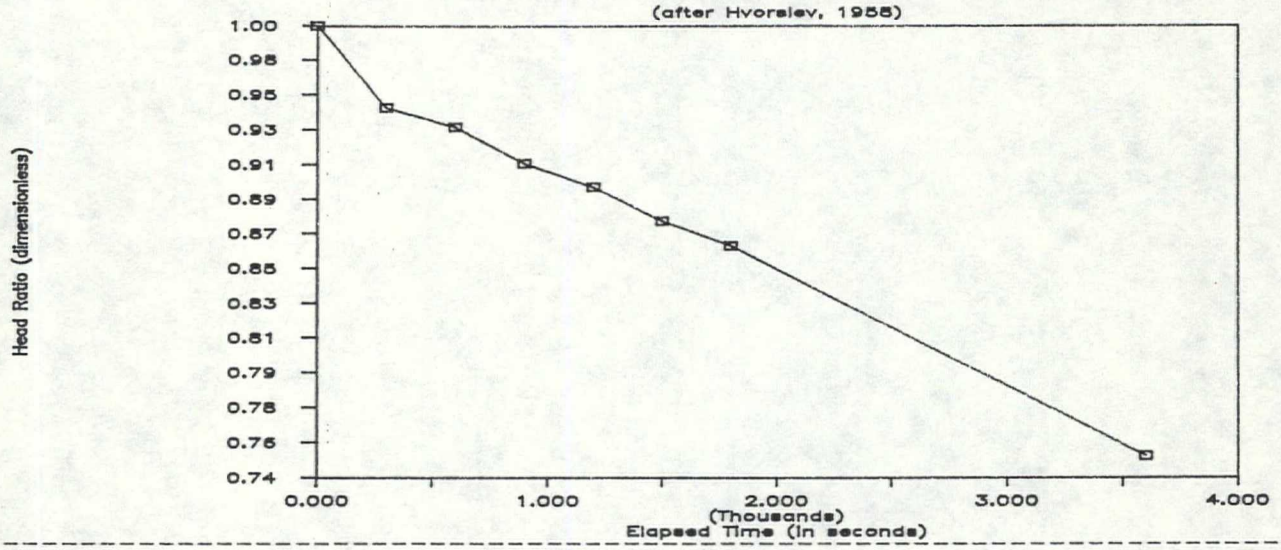
PIEZOMETER NO. 5D

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	BEDROCK
SOIL CLASSIFICATION:	SHALE
TESTED BY:	DLP
DATE OF TEST:	11-18-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.95
600.0	0.93
900.0	0.91
1200.0	0.90
1500.0	0.88
1800.0	0.86
3600.0	0.75

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	2.5E-06	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.75			
t2 = elapsed time at H2		3600.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

PIEZOMETER NO. 7S

PROJECT NO: 6120

CLIENT: RMI SODIUM

GEOLOGIC UNIT: GLACIAL TILL

SOIL CLASSIFICATION: SILT AND CLAY

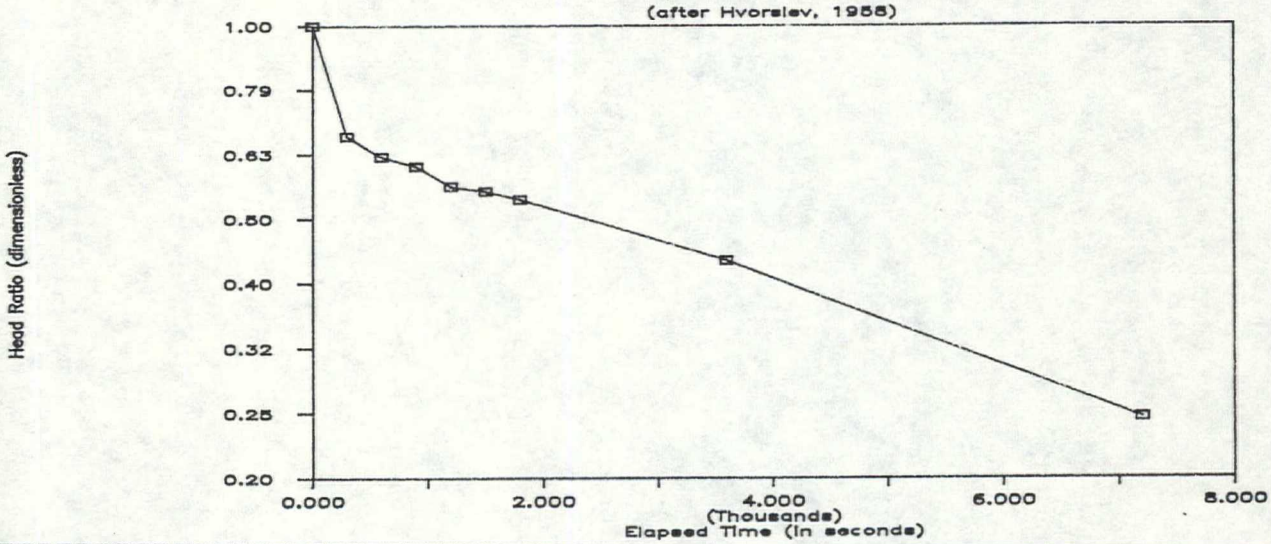
TESTED BY: DLP

DATE OF TEST: 11-17-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.67
600.0	0.63
900.0	0.61
1200.0	0.56
1500.0	0.55
1800.0	0.54
3600.0	0.43
7200.0	0.25

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	1.5E-05	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.56			
t2 = elapsed time at H2		1200.00			

AWARE, INC.

VARIABLE HEAD
PERMEABILITY TEST

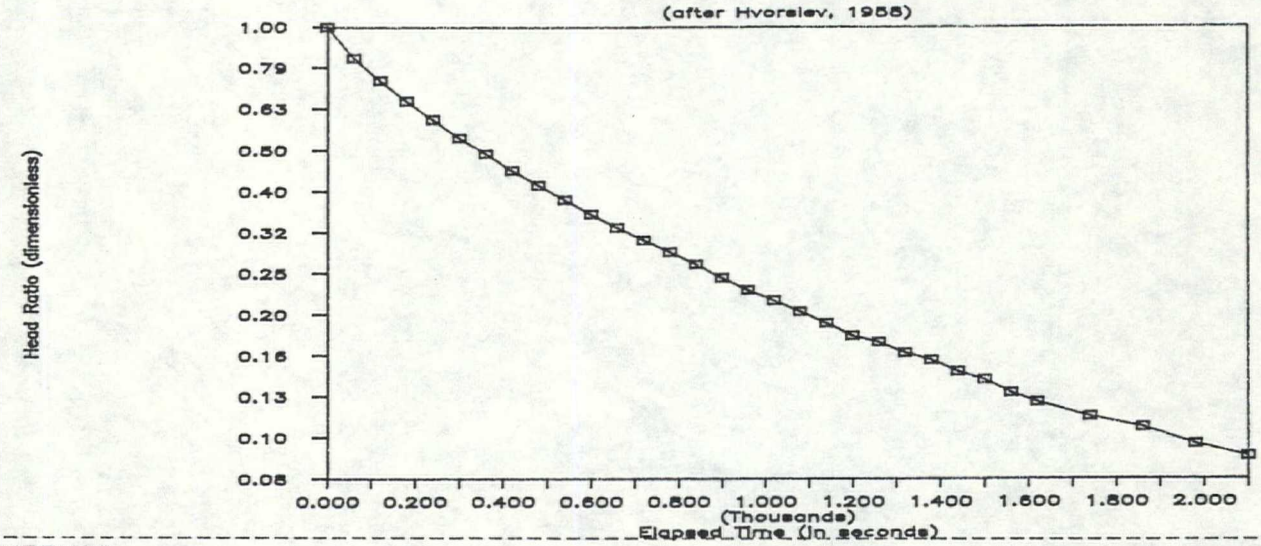
PIEZOMETER NO. 8S

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	GLACIAL TILL
SOIL CLASSIFICATION:	SILT AND CLAY
TESTED BY:	RJG
DATE OF TEST:	1-12-89

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
60.0	0.84
120.0	0.74
180.0	0.66
240.0	0.59
300.0	0.54
360.0	0.49
420.0	0.45
480.0	0.41
540.0	0.38
600.0	0.35

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	6.8E-05	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.59			
t2 = elapsed time at H2		240.00			

AWARE, INC.

VARIABLE HEAD
PERMEABILITY TEST

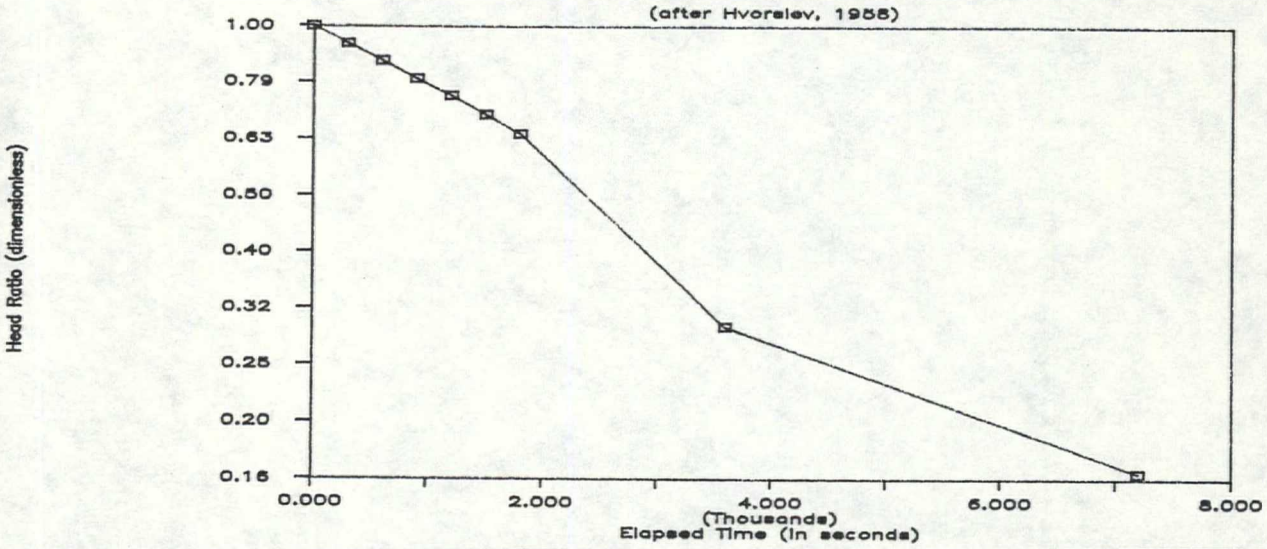
PIEZOMETER NO. 9S

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	GLACIAL TILL
SOIL CLASSIFICATION:	SILT AND CLAY
TESTED BY:	DLP
DATE OF TEST:	11-17-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.93
600.0	0.87
900.0	0.81
1200.0	0.75
1500.0	0.70
1800.0	0.64
3600.0	0.29
7200.0	0.16

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	7.7E-06	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.64			
t2 = elapsed time at H2		1800.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

PIEZOMETER NO. 9D

PROJECT NO: 6120

CLIENT: RMI SODIUM

GEOLOGIC UNIT: BEDROCK

SOIL CLASSIFICATION: SHALE
-

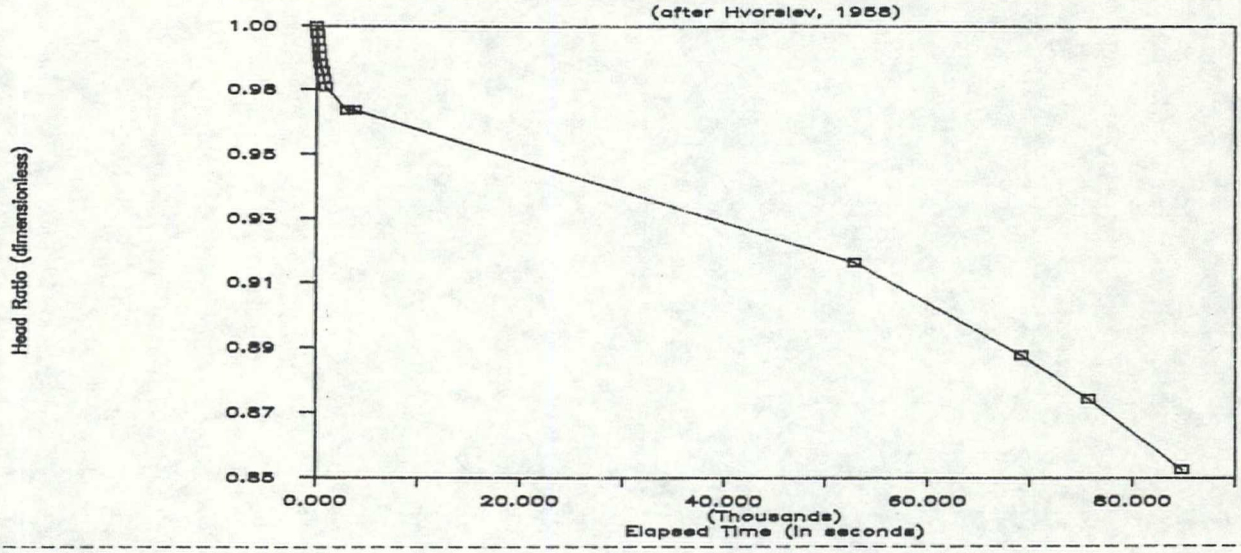
TESTED BY: RJG

DATE OF TEST: 1-10-89

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
60.0	1.00
120.0	1.00
180.0	0.99
240.0	0.99
300.0	0.99
360.0	0.99
420.0	0.99
480.0	0.98
600.0	0.98
720.0	0.98

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	5.6E-08	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		0.99			
t1 = elapsed time at H1		240.00			
H2 = head ratio at t2		0.85			
t2 = elapsed time at H2		84840.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

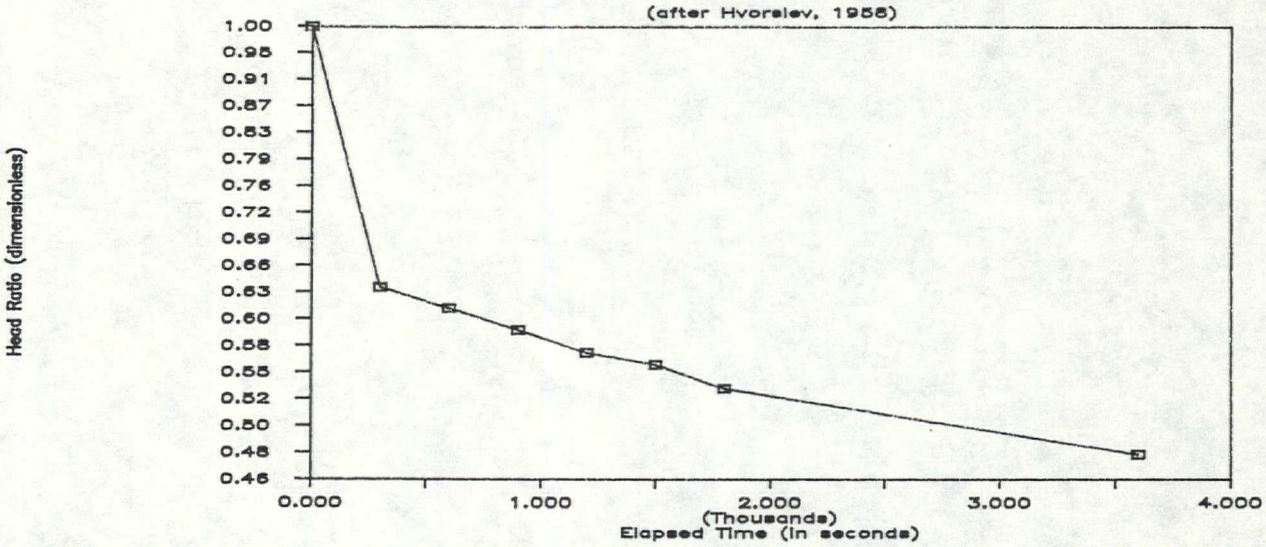
PIEZOMETER NO. 10S

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	GLACIAL TILL
SOIL CLASSIFICATION:	SILT AND CLAY
TESTED BY:	DLP
DATE OF TEST:	11-17-88

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
300.0	0.64
600.0	0.61
900.0	0.59
1200.0	0.57
1500.0	0.56
1800.0	0.53
3600.0	0.48

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	1.5E-05	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		1.00			
t1 = elapsed time at H1		0.00			
H2 = head ratio at t2		0.57			
t2 = elapsed time at H2		1200.00			

AWARE, INC.
VARIABLE HEAD
PERMEABILITY TEST

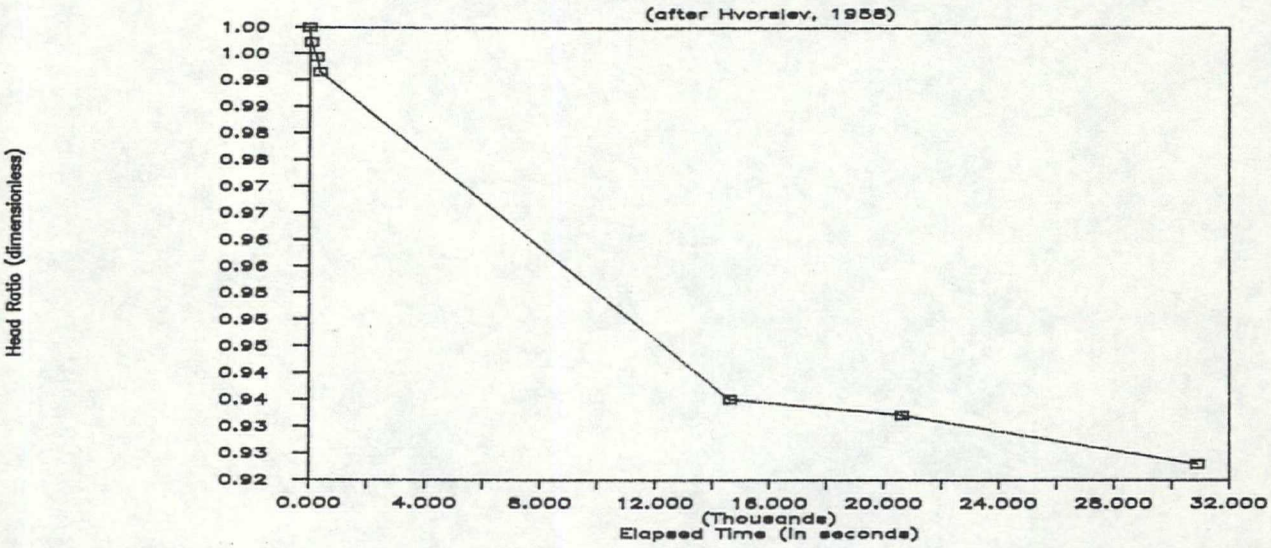
PIEZOMETER NO. 11D

PROJECT NO:	6120
CLIENT:	RMI SODIUM
GEOLOGIC UNIT:	BEDROCK
SOIL CLASSIFICATION:	SHALE -
TESTED BY:	RJG
DATE OF TEST:	1-11-89

TEST DATA (PARTIAL LIST)

ELAPSED TIME	HEAD RATIO
0.0	1.00
60.0	1.00
240.0	0.99
360.0	0.99
14640.0	0.94
20640.0	0.94
30900.0	0.93

GRAPHICAL ANALYSIS
(after Hvorslev, 1958)



METHOD:

$$k = \frac{r^2}{2L(t_2 - t_1)} \ln(L/R) \ln(H_1/H_2)$$

Where:

K = hydraulic cond	(cm/sec)		K =	7.0E-08	cm/sec
r = well radius	(cm)	2.5			
R = bore radius	(cm)	10			
L = effect. length	(cm)	366			
H1 = head ratio at t1		0.99			
t1 = elapsed time at H1		360.00			
H2 = head ratio at t2		0.93			
t2 = elapsed time at H2		30900.00			

APPENDIX 5

WELL YIELD CALCULATION SHEET

AWARE INCORPORATED

PROJECT RMI Sodium Plant
SUBJECT Well Yield Calculation

BY MDB DATE 4/2/89 PAGE 1 OF 2

Well Yield Calculations (Walton, 1979)

checked DRS 4/7/89

$$\frac{Q}{s} = \frac{T}{264 \log\left(\frac{Tt}{2,693\, r_w^2 S}\right) - 65.5}$$

$\frac{Q}{s}$ = specific capacity (gpm/ft)

Q = discharge (gpm)
s = drawdown (ft)
T = transmissivity (gpd/ft)
S = storativity = 0.3 (dimensionless) (Freeze & Cherry, 1979)
r_w = radius of well = 0.5 ft (Walton, 1979)
t = time after pumping started (minutes)

① For upper, weathered till zone

$k = 2.0 \times 10^{-5}$ cm/sec = mean hydraulic conductivity for till wells at RMI Sodium
b = 8 ft = saturated thickness = average maximum saturated thickness at RMI Sodium
s = 8 ft = drawdown = 100 percent of saturated thickness
t = 1 week = 1×10^4 minutes

$T = (K)(b) = (0.4237\ gpd/ft^2)(8\ ft) = 3.4\ gpd/ft$

$$\frac{Q}{s} = \frac{3.4}{264 \log\left(\frac{34,000}{202.0}\right) - 65.5}$$

$\frac{Q}{s} = \frac{3.4}{522}$

$\frac{Q}{s} = 0.006$ gpm/ft

$Q = (0.006\ gpm/ft)(8\ ft)$
$= (0.05\ gpm)(1,440\ min/day) = 75\ gpd$

② For lower, unweathered till zone

$K = 8.1 \times 10^{-8}$ cm/sec = mean hydraulic conductivity for wells screened in unweathered till at the RMI Extrusion Plant

$b = 40$ ft = saturated thickness = average thickness of unweathered till at the Sodium Plant

$s = 32$ ft = 80 percent of saturated thickness

$t = 1$ week $= 1 \times 10^4$ minutes

$T = (0.0017 \text{ gpd/ft}^2)(40 \text{ ft}) = 0.07$ gpd/ft

$$\frac{Q}{s} = \frac{0.07}{264 \log\left(\frac{(0.07)(1 \times 10^4)}{202.0}\right) - 65.5}$$

$$\frac{Q}{s} = \frac{0.07}{77}$$

$\frac{Q}{s} = 0.0009$ gpm/ft ; $Q = (0.0009 \text{ gpm/ft})(32 \text{ ft})$
$= (0.03 \text{ gpm})(1440) = 42$ gpd

∴ Total yield for glacial till =

75 gpd + 42 gpd = 117 gpd

Conversion factor : cm/sec ÷ 4.72×10^{-5} = gpd/ft^2

APPENDIX 6

WATER QUALITY STANDARDS BASED ON USE DESIGNATIONS

APPENDIX 6

WATER QUALITY STANDARDS BASED ON USE DESIGNATIONS
FOR FIELDS BROOK AND THE ASHTABULA RIVER

Parameter[a]	Units	Use Designations: Warm Water Aquatic Life Habitat[b]	Use Designations: Agricultural Water Supply	Industrial Water Supply	Primary Contact Recreation
Ammonia-N				Criteria for the support of the Industrial Water Supply use designation will vary with the type of industry involved.	The only standard for Primary Contract Recreation use designation is Fecal Coliform: Geometric mean based on not less than 5 samples within a 30-day period shall not exceed 1,000 per 100 ml and shall not exceed 2,000 per 100 ml in more than 10 percent of sample taken during any 30-day period.
Maximum	mg/l	--[c]	d		
30-day avg.	mg/l		d		
Arsenic (Total Recoverable)					
Maximum	µg/l	--	100[d]		
30-day avg.	µg/l	190			
Barium (Total Recoverable)					
Maximum	mg/l	NS[e]	NS		
30-day avg.	--	NS	NS		
Beryllium (Total Recoverable)					
Maximum	µg/l	--[f]	100[d]		
30-day avg.	µg/l				
Cadmium (Total Recoverable)					
Maximum	µg/l	--[f]	50[d]		
30-day avg.	µg/l				
Chlorides					
Maximum	mg/l	NS	NS		
30-day avg.	--	NS	NS		
Chlorine (Total Residual)					
Maximum	--	--	--[d]		
30-day avg.	µg/l	2			
Total Chromium (Total Recoverable)					
Maximum	µg/l	NS	100		
30-day avg.	--	NS	--		
Hexavalent Chromium (Total Recoverable)					
Maximum	µg/l	--	d		
30-day avg.	µg/l	10	d		
Trivalent Chromium (Total Recoverable)					
Maximum	µg/l	--[f]	d		
30-day avg.	µg/l		d		
Copper (Total Recoverable)					
Maximum	µg/l	--[f]	500[d]		
30-day avg.	µg/l				

APPENDIX 6 (Cont'd)

WATER QUALITY STANDARDS BASED ON USE DESIGNATIONS
FOR FIELDS BROOK AND THE ASHTABULA RIVER

Parameter[a]	Units	Use Designations: Warm Water Aquatic Life Habitat[b]	Use Designations: Agricultural Water Supply	Industrial Water Supply	Primary Contact Recreation
Cyanide (Free)				Criteria for the support of the Industrial Water Supply use designation will vary with the type of industry involved.	The only standard for Primary Contract Recreation use designation is Fecal Coliform: Geometric mean based on not less than 5 samples within a 30-day period shall not exceed 1,000 per 100 ml and shall not exceed 2,000 per 100 ml in more than 10 percent of sample taken during any 30-day period.
Maximum	µg/l	--	d		
30-day avg.	µg/l	8.1	d		
Dissolved Oxygen					
Minimum at any time	mg/l	4.0	d		
Minimum 24-hr avg.	mg/l	5.0	d		
Dissolved Solids					
Maximum	--	--	--		
30-day avg.	mg/l	1,500[g]	d		
Fluoride					
Maximum	mg/l	NS	2.0		
30-day avg.	--	NS	--		
Iron (Total Recoverable)					
Maximum	mg/l	--	5.0		
30-day avg.	mg/l	1.0	--		
Iron (Soluble)					
Maximum	mg/l	NS	NS		
30-day avg.	--	NS	NS		
Lead (Total Recoverable)					
Maximum	µg/l	--	5,000		
30-day avg.	µg/l	30	--		
Manganese (Total Recoverable)					
Maximum	µg/l	NS	NS		
30-day avg.	--	NS	NS		
MBAS (Foaming Agents)					
Maximum	mg/l	0.50	d		
30-day avg.	--	--	--		
Mercury (Total Recoverable)					
Maximum	µg/l	--	10		
30-day avg.	µg/l	0.2	d		

APPENDIX 6 (Cont'd)

WATER QUALITY STANDARDS BASED ON USE DESIGNATIONS
FOR FIELDS BROOK AND THE ASHTABULA RIVER

Parameter[a]	Units	Use Designations: Warm Water Aquatic Life Habitat[b]	Use Designations: Agricultural Water Supply	Industrial Water Supply	Primary Contact Recreation
Nickel (Total Recoverable)					
Maximum	µg/l	--[f]	200[d]		
30-day avg.	µg/l			Criteria for the support of the Industrial Water Supply use designation will vary with the type of industry involved.	The only standard for Primary Contract Recreation use designation is Fecal Coliform: Geometric mean based on not less than 5 samples within a 30-day period shall not exceed 1,000 per 100 ml and shall not exceed 2,000 per 100 ml in more than 10 percent of sample taken during any 30-day period.
Nitrate-N					
Maximum	mg/l	NS	NS		
30-day avg.	--	NS	NS		
Nitrates + Nitrites					
Maximum	mg/l	NS	100		
30-day avg.	--	NS	--		
Oil & Grease	--	[h]	[d]		
Pesticides					
Maximum	µg/l	--[h]	--[d]		
30-day avg.	µg/l				
pH	--	6.5-9.0	[d]		
Phenolic Compounds			[d]		
Maximum	µg/l	--	[d]		
30-day avg.	µg/l	10			
Phosphorus	--	[i]	[d]		
Phthalate Esters					
Maximum	--	--	--[d]		
30-day avg.	µg/l	3			
Polychlorinated Biphenyls			[d]		
Maximum	µg/l	0.001[j]			
30-day avg.	--	--	--		
Selenium (Total Recoverable)					
Maximum	µg/l	--	50[d]		
30-day avg.	µg/l	34			
Silver (Total Recoverable)			[d]		
Maximum	µg/l	--	[d]		
30-day avg.	µg/l	1.3			

APPENDIX 6 (Cont'd)

WATER QUALITY STANDARDS BASED ON USE DESIGNATIONS
FOR FIELDS BROOK AND THE ASHTABULA RIVER

Parameter[a]	Units	Use Designations: Warm Water Aquatic Life Habitat[b]	Use Designations: Agricultural Water Supply	Industrial Water Supply	Primary Contact Recreation
Sulfates					
Maximum	mg/l	NS	NS	Criteria for the support of the Industrial Water Supply use designation will vary with the type of industry involved.	The only standard for Primary Contract Recreation use designation is Fecal Coliform: Geometric mean based on not less than 5 samples within a 30-day period shall not exceed 1,000 per 100 ml and shall not exceed 2,000 per 100 ml in more than 10 percent of sample taken during any 30-day period.
30-day avg.	--	NS	NS		
Temperature					
Maximum	^{o}F (^{o}C)	k	d		
30-day avg.	^{o}F (^{o}C)	k	d		
Toxic Substances	--	l	d		
Zinc (Total Recovable)					
Maximum	g/l	--[f]	25,000		
30-day avg.	g/l		--		

[a]All values expressed as total concentration unless specified otherwise.

[b]For Fields Brook, Limited Warmwater Habitat Standards are the same as Warmwater Habitat Standards except for total dissolved solids (TDS): 3,500 mg/l from Rt. 11 to confluence with Ashtabula River; remainder of Fields Brook is exempt from TDS Standards.

[c]Varies between 0.1 to 13.0 mg/l depending on pH and temperature.

[d]This criterion is determined by the Aquatic Life Habitat or the Nuisance Prevention use designation assigned to the stream segment.

[e]NS: No standard.

[f]Values (mg/l) vary depending on hardness (mg/l $CaCO_3$): Beryllium - 5.4 to 34 µg/l; Cadmium - 0.8 to 3.1 µg/l; Trivalent Chromium - 44 to 118 µg/l; Copper -7.0 to 21 µg/l; Nickel - 167 to 506 µg/l; and Zinc 99 to 270 µg/l.

[g]Equivalent 25°C specific conductance value is 2,400 µmhos/cm.

[h]Table 9 of Ohio Water Quality Standards 3745-1-07 lists limits for 31 pesticides.

[i]Total phosphorus as P shall be limited to the extent necessary to prevent nuisance growths of algae, weeds, and slimes that result in a violation of the water quality criteria set forth in Chapter 3745-1-04 (E) of the Ohio Administrative Code or, for public water supplies, that result in taste or odor problems. In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the Ohio Environmental Protection Agency shall not exceed a daily average of one milligram per liter as total P, or such stricter requirements as may be imposed by the Ohio Environmental Protection Agency in accordance with the International Joint Commission (United States-Canada agreement).

[j]Any whole sample of any representative aquatic organisms shall not exceed 0.6 mg/kg (wet weight).

[k]Varies on a monthly basis from an average low of 44°F in January to an average high of 82°F from June 16 through Setpember 15. Daily maximums vary from 49°F in January to 85°F from June 16 through September 15.

[1]All pollutants or combinations of pollutants, not specifaclly mentioned in Rule 3745-1-07 of the Ohio Administrative Code, shall not exceed water quality criteria derived according to the procedures set forth in "Draft Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Life and Its Uses", United States Environmental Protection Agency, July 5, 1983 or, if insufficient data prevent the use of this procedure, shall not exceed, at any time, 1/10 or, for pollutants or combinations of pollutants which are known to be persistent toxicants in the aquatic environment, 1/100 of the 96-hr median tolerance limit (TLm) or LC_{50} for any representative aquatic species. However, more stringent application factors shall be imposed where justified by: "Ambient Water Quality Criteria" documents, United States Environmental Protection Agency, 1980; "Quality Criteria for Water", United States Environmental Protection Agency, 1976; "Water Quality Criteria 1972", National Academy of Sciences and National Academy of Engineering, 1973; or other scientifically based publications.

The median tolerance limit (TLm) or LC_{50} shall be determined by static or dynamic bioassays performed in accordance with methods outlined in "Standard Methods for the Examination of Water and Wastewater", 15th edition, American Public Health Association, American Water Works Association and the Water Pollution Control Federation, 1981: or performed in accordance with procedures outlined in "Methods of Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians", United State Environmental Protection Agency 660/3-75-009; or performed in accordance with procedures outlined in the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices", revised June, 1983. Tests will be conducted using actual effluent, receiving water and representative aquatic species whenever possible.

SOURCE: Ohio State Water Quality Standards, Section 3745-1-07, Water Use Designations and Criteria, April 1987, Ohio EPA.

APPENDIX 7

PREVIOUS ANALYSES OF ENVIRONMENTAL MEDIA NEAR SWMUs

SODIUM PLANT

SAMPLE IDENTIFICATION

#1	Northern Arm of DS Tributary prior to confluence with Southern Arm
#2	Southern Arm of DS Tributary prior to confluence with Northern Arm
#6	Leachate emanating from the east side of the landfill
#13	Surface water runoff from Sodium Plant in onsite ditch prior to entering DS Tributary
#17	Water in French Drain System at the wastewater treatment ponds
#18	Water in French Drain System at the wastewater treatment ponds
#19	Water in French Drain System at the wastewater treatment ponds
A8-18	Soil scraping (white residue east of wastewater treatment pond)
B8-18	Soil scraping (white residue south of landfill)
SC8-18	Cell Bath Waste in waste pile

SAMPLE LOCATIONS ARE GIVEN IN DRAWING SP-4

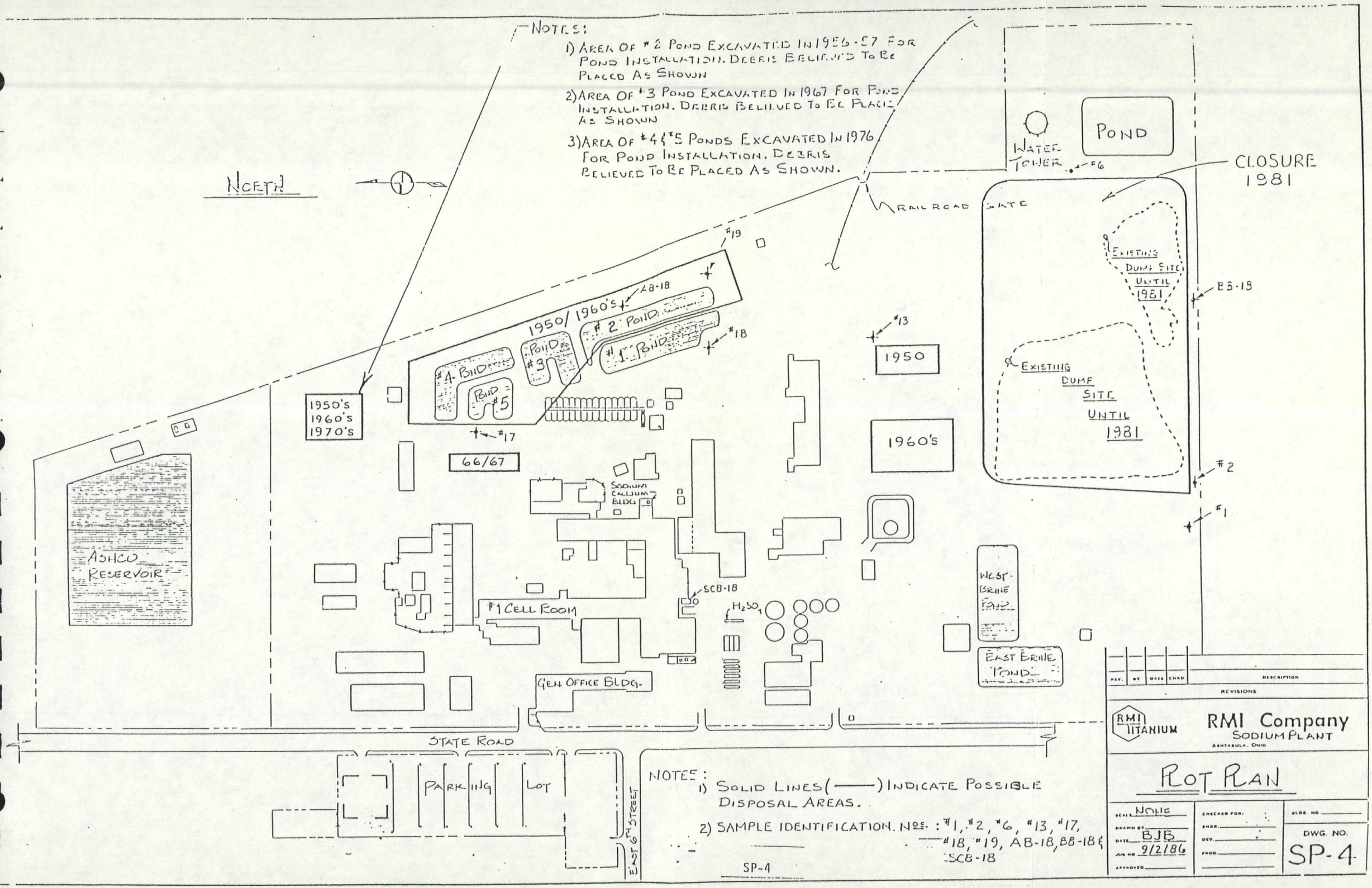
September 24, 1986

NOTES:

1) AREA OF #2 POND EXCAVATED IN 1956-57 FOR POND INSTALLATION. DEBRIS BELIEVED TO BE PLACED AS SHOWN

2) AREA OF #3 POND EXCAVATED IN 1967 FOR POND INSTALLATION. DEBRIS BELIEVED TO BE PLACED AS SHOWN

3) AREA OF #4 & #5 PONDS EXCAVATED IN 1976 FOR POND INSTALLATION. DEBRIS BELIEVED TO BE PLACED AS SHOWN.



NOTES:

1) SOLID LINES (——) INDICATE POSSIBLE DISPOSAL AREAS.

2) SAMPLE IDENTIFICATION. Nos.: #1, #2, #6, #13, #17, #18, #19, AB-18, BB-18 & SCB-18

SP-4

AWARE

consultants in environmental management

August 26, 1986

Mr. Joe Holman
RMI Company
P.O. Box 269
Niles, OH 44446

Dear Joe:

This letter is in regard to the recent analytical results of four (4) surface water samples with varying concentrations of Sodium Chloride that were evaluated by several different analytical methods. After reviewing the data of AWARE Report No. 04986 (copy attached), I believe that it becomes obvious that in most cases the Sodium Chloride content causes an erroneous high concentration of the analyte. It is for this reason that I would highly recommend the following analytical methods be employed on all water samples and EP Toxicity Extracts from soil and waste samples for the RMI Company sodium plant in Ashtabula.

Arsenic:	206.4 (SDDC) or 206.5 (Hydride)
Barium:	208.1 (Direct Aspiration - Matrix Match)
Cadmium:	213.1 (Direct Aspiration After APDC Chelation)
Chromium:	218.3 (Direct Aspiration After APDC Chelation)
Lead:	239.1 (Direct Aspiration After APDC Chelation)
Mercury:	245.1 (Cold Vapor)
Selenium:	270.3 (Hydride)
Silver:	272.1 (Direct Aspiration After APDC Chelation)

Note: The APDC (ammonium pyrrolidine dithiocarbamate) method has been referenced for no other reason than it seems to be the most common; many other chelating agents can be used with satisfactory results.

I have also attached the information that Mr. John Morris had requested on August 21, 1986 regarding the oxidation states of the spike solutions that were used to generate QC/QA data. Appropriate analytical methods that Mr. Morris had requested are listed in the above table.

521 Mainstream Drive • Suite 200 Metro Center • Nashville, TN 37228 • Phone (615) 255-2288

If further information is required, please feel free to contact me at your earliest convience at (615) 255-2288 ext. 246.

Sincerely,

AWARE Incorporated

D. Rick Davis

D. Rick Davis
Vice President/Analytical & Testing Services

DRD/jmf

Attachment

cc: Jeffrey L. Pintenich
John Morris
Chris Frazier
Francine Norling

STANDARD COMPOSITION FOR ATOMIC ABSORPTION

Arsenic:	Fisher Scientific - Arsenic Trioxide in dilute nitric acid
Barium:	Fisher Scientific - Barium Chloride in distilled water
Cadmium:	Fisher Scientific - Cadmium Metal in dilute nitric acid
Chromium:	Fisher Scientific - Potassium Dichromate in distilled water
Lead:	Fisher Scientific - Lead Nitrate in dilute nitric acid
Mercury:	Fisher Scientific - Mercuric Chloride in distilled water
Selenium:	Aldrich Chemical - Selenious Acid in 2 percent nitric acid
Silver:	Fisher Scientific - Silver Nitrate in distilled water

RMI COMPANY

REPORT #:04986
SAMPLE NO.: 8053-8056
DATE RECEIVED: 8/11/86

	D/L	#1 8053	#6 8054	#13 8055	#18 8056
As-Graphite	5.0	41	31	43	1,500/360[a]
As- SDDC	30	BMDL	BMDL	BMDL	BMDL
Ba-Flame	100	560	BMDL	750	BMDL
Cd-Graphite	0.1	0.9	0.5	0.9	59/51[a]
Cd-Chelation	0.5	BMDL	BMDL	BMDL	26
Cr-Flame	50	BMDL	BMDL	BMDL	81/BMDL[a]
Pb-Graphite	5.0	BMDL	BMDL	BMDL	BMDL[b]/15[a]
Pb-Chelation	5.0	BMDL	BMDL	BMDL	34
Hg-Cold Vapor	0.4	BMDL	BMDL	BMDL	BMDL
Se-Graphite	2.0	11	53	64	1,500/165[a]
Se-Hydride	2.0	BMDL	4.0	BMDL	BMDL
Ag-Flame	20	BMDL	BMDL	BMDL	BMDL
Ag-Chelation	2.0	4.0	BMDL	2.0	7.0

[a]Matrix Match

[b]Detection limit increased 10 x due to salt matrix.

D/L = Detection Limit.

BMDL = Below Minimum Detection Limit.

Results in ppb unless otherwise specified.

Method Reference: Methods for Chemical Analysis of Water and Wastes, USEPA, 1979.

RMI COMPANY

REPORT #:04986
SAMPLE NO: 8053-8056
DATE RECEIVED: 8/11/86

METHOD PERFORMANCE DATA

	Conc. Added	Conc. Found	% Rec.	Type
As-Graphite	43	43	100	a
As-Graphite	35	30	86	b
Ba-Flame	344	374	109	a
Ba-Flame	5,400	5,400	100	b
Cd-Graphite	4.6	5.5	120	a
Cd-Graphite	3.3	3.6	109	a
Cd-Graphite	3.5	3.7	106	b
Cd-Chelation	4.6	4.7	102	a
Cd-Chelation	23	20	87	b
Cr-Flame	261	263	101	a
Cr-Flame	2,500	1,800	72	b
Cr-Flame	1,300	820	63	b
Cr-Chelation	45	39	87	a
Cr-Chelation	21	23	110	b
Pb-Graphite	22	21	95	b
Pb-Graphite	45	45	100	a
Pb-Chelation	117	135	115	b
Hg-Cold Vapor	5.0	5.5	110	b
Hg-Cold Vapor	5.0	5.5	110	b
Hg-Cold Vapor	1.8	1.9	106	a
Hg-Cold Vapor	1.8	2.1	117	a
Se-Graphite	53	45	85	a
Se-Hydride	50	47	94	a
Se-Hydride	10	14	140	b (#1)
Se-Hydride	14	15	107	b (#6)
Se-Hydride	10	11	110	b (#13)
Se-Hydride	11	11	100	b
Ag-Flame	68	71	104	a
Ag-Chelation	47	57	121	b

[a]EPA Reference.

[b]Sample Matrix (#18) unless otherwise specified.

Concentration units are ppb

AWARE

consultants in environmental management

September 15, 1986

Mr. Joe Holman
RMI Company
P.O. Box 269
1000 Warren Avenue
Niles, OH 44446

Dear Mr. Holman:

Enclosed are the analytical results for samples received at AWARE Laboratory on August 20, 1986.

If you have any questions, please feel free to contact me at your earliest convenience at (615) 255-2288 Ext. 246.

Sincerely,.

AWARE Incorporated

D. Rick Davis

D. Rick Davis
Vice President/Analytical & Testing Services

Enclosure

DRD/hdp

cc: Chris Frazier
Julius Martin
Francine Norling
Jeff Pintenich

621 Mainstream Drive • Suite 200 Metro Center • Nashville, TN 37228 • Phone (615) 255-2288

SAMPLE IDENTIFIER
CLIENT: RMI CO.
JOB NO.: 6382
SAMPLE NO.: 8310-8320
ANALYTICAL REPORT

	D/L	No. 1 AL #8310	No. 2 AL #8311	No. 6 AL #8312	No. 13 AL #8313	No. 17 AL #8314	No. 18 AL #8315	No. 19 AL #8316
As-Hydride	10	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Ag-Chelation	2.0	BMDL	BMDL	BMDL	BMDL	3.3	3.8	BMDL
Ba-Flame	100	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Cd-Chelation	0.5	BMDL	BMDL	BMDL	BMDL	5.5	30	26
Cr-Chelation	5.0	5.8	BMDL	BMDL	BMDL	BMDL	6.7	5.8
Hg-Cold Vapor	0.4	BMDL	BMDL	BMDL	BMDL[a]	BMDL	BMDL[a]	BMDL[a]
Pb-Chelation	5.0	BMDL	BMDL	BMDL	BMDL	BMDL	23	BMDL
Se-Hydride	4.0	BMDL/BMDL[b]	BMDL/BMDL[b]	BMDL	6.1	BMDL	8.3	4.1

[a]Detection Limit increased 10 times due to salt concentration.

[b]Duplicate
D/L - Detection Limit
BMDL = Below Minimum Detection Limit
Results are expressed in ppb unless otherwise specified.

The determination of Arsenic by SDDC was found to be inappropriate due to low recoveries on sample matrix spikes.

ANALYTICAL REPORT

	D/L	EP Extract A8-18 AL #8319	EP Extract B8-18 AL #8320	EP Extract SC8-18 AL #8318	Total S8-18 AL #8320 (mg/kg)
Ag-Chelation	2.0	BMDL	BMDL	4.3	<0.20
Ag-Flame	20	NA	NA	BMDL	<0.10
As-Hydride	10	BMDL	BMDL	BMDL	0.14
As-Furnace	5.0	NA	NA	NA	1,210/1,240[c]
Ba-Flame	100	BMDL	BMDL	225,000	38.4
Cd-Chelation	0.5	89	5.1	62	0.05[b]
Cd-Flame	5.0	NA	NA	56	0.19
Cr-Chelation	5.0	16	BMDL	28/26[c]	1.7
Cr-Flame	50	NA	NA	BMDL	5.45
Pb-Chelation	5.0	BMDL	BMDL	220	4.16
Pb-Furnace	5.0	NA	NA	173/176[c]	8.08
Hg-Cold Vapor	0.4	BMDL	BMDL	BMDL[a]	NA
Se-Hydride	4.0	BMDL	BMDL	BMDL	0.09
Se-Furnace	2.0	NA	NA	500/430[c]	0.15

[a] Detection increased 10 times due to salt content.

[b] QC/QA data showed 0.0 percent recovery for matrix spike.

[c] Duplicate

BMDL = Below Minimum Detection Limit

D/L = Detection Limit

NA = Not Analyzed

Results are expressed in ppb unless otherwise specified.

The determination of Arsenic by SDDC was found to be inappropriate due to low recoveries on sample matrix spikes.

METHOD PERFORMANCE DATA

Parameter	Concentration Added	Concentration Found	Percent Rec.	Type
Hg	2.0	2.3	110	b(8316 EP Ext.)
Hg	2.0	2.1	105	b(8319 EP Ext.)
Hg	2.1	2.1	100	b(8320 EP Ext.)
Cr-Chelation	46	17	37	a
Cr-Chelation	23	22	96	b(8315)
Cr-Chelation	23	21	91	b(8316)
Cr-Chelation	34	40	118	b(8318)
Cr-Chelation	28	27	96	b(8319)
Cr-Chelation	29	34	117	b(8320)
Cr-Chelation	261	284	109	a
Cr-Flame	1270	1220	96	b(8318 EP Ext.)
Cr-Flame	1520	1430	94	b(8320 Total)
Cd-Chelation	4.6	4.2	91	a
Cd-Chelation	25	26	104	b(8315)
Cd-Chelation	23	27	117	b(8316)
Cd-Chelation	41	44	107	b(8318)
Cd-Chelation	55	59	107	b(8319)
Cd-Chelation	10	0	0	b(8320 Total)
Cd-Flame	39	34	87	a
Cd-Flame	1030	1130	110	b(8318 EP Ext.)
Ag-Chelation	34	35	103	a
Ag-Chelation	22	24	109	b(8315)
Ag-Chelation	20	20	100	b(8316)
Ag-Chelation	22	18	82	b(8318 EP Ext.)
Ag-Chelation	20	22	110	b(8319 EP Ext.)
Ag-Chelation	21	20	95	b(8320 Total)
Ag-Flame	68	59	87	a
Ag-Flame	2000	2200	110	b(8318 EP Ext.)
Ag-Flame	2000	1900	95	b(8320 Total)
Ba-Flame	344	345	101	a
Ba-Flame	5000	5000	100	b(8316)
Ba-Flame	9500	9100	96	b(8320 EP Ext.)
Ba-Flame	6900	6500	94	b(8320 Total)
Pb-Chelation	45	51	113	a
Pb-Chelation	112	125	113	b(8315)
Pb-Chelation	100	112	112	b(8316)
Pb-Chelation	100	108	108	b(8318 EP Ext.)
Pb-Chelation	121	56	46	b(8320 Total)
Pb-Flame (ppm)	5.41	5.20	96	b(8320 Total)
As-Hydride	43	45	105	a
As-Hydride	43	43	100	a
As-Hydride	2.5	2.5	100	b(8315 EP Ext.)
As-Hydride	2.5	2.3	92	b(8316 EP Ext.)
As-Hydride	2.5	2.9	116	b(8318 EP Ext.)
As-Hydride	2.5	1.3	52	b(8319 EP Ext.)
As-Hydride	16	20	125	b(8320 Total)
As-Hydride	43	43	100	a
As-Hydride	27	27	100	a
As-Hydride	27	24	89	a
As-Furnace	43	44	102	a
As-Furnace	25	21	84	b(8320 Total)
Se-Furnace	24	27	113	a
Se-Furnace	8.7	7.4	85	b(8320 Total)
Se-Furnace	61	43	70	b(8318 EP Ext.)
Se-Hydride	7.6	8.6	113	a
Se-Hydride	7.6	8.9	117	a

[a]EPA Reference Sample

[b]Sample Matrix

Concentration units are ppb unless otherwise specified.

AWARE

consultants in environmental management

September 26, 1986 6382

Mr. Joe Holman
RMI Company
P.O. Box 269
Niles, Ohio 44446

Dear Mr. Holman:

Enclosed are the analytical results for samples received at AWARE Laboratory on August 26, 1986.

If you have any questions, please feel free to contact me at your earliest convenience at (615) 255-2288 Ext. 246.

Sincerely,

AWARE Incorporated

D. Rick Davis

D. Rick Davis
Vice President/Analytical & Testing Services

Enclosure

DRD/hdp

cc: Chris Frazier
Julius Martin
Francine Norling
Jeff Pintenich

621 Mainstream Drive • Suite 200 Metro Center • Nashville, TN 37228 • Phone (615) 255-2288

SAMPLE IDENTIFIER
CLIENT: RMI CO.
JOB NO.: 6382
SAMPLE NO.: 8485-8491
ANALYTICAL REPORT

	D/L	No. 1 AL #8485	No. 2 AL #8486	No. 13 AL #8487	No. 17 AL #8488	No. 18 AL #8489	No. 19 AL #8490
As-Hydride	10	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Ag-Chelation	2.0	BMDL	BMDL	BMDL	BMDL	BMDL/BMDL[b]	BMDL/BMDL[b]
Ba-Flame	100	BMDL	BMDL	350	430	430	BMDL
Cd-Chelation	0.5	BMDL	BMDL	BMDL	5.4	27/26[b]	27/29[b]
Cr-Chelation	5.0	8.2	5.4	15	BMDL	BMDL/BMDL[b]	BMDL/BMDL[b]
Hg-Cold Vapor	0.4	BMDL	BMDL	BMDL[a]	BMDL	BMDL[a]	BMDL[a]
Pb-Chelation	5.0	BMDL	BMDL	BMDL	BMDL	38/38[b]	BMDL/BMDL[b]
Se-Hydride	2.0	BMDL	BMDL	BMDL	BMDL	2.7	BMDL

[a]Detection Limit increased 10 times due to salt concentration.

[b]Duplicate
D/L = Detection Limit
BMDL = Below Minimum Detection Limit
Results are expressed in ppb unless otherwise specified.

ANALYTICAL REPORT

	D/L	Soil Southside EP Extract AL #8491
Ag-Flame	20	BMDL
As-Hydride	10	BMDL
Ba-Flame	100	740
Cd-Flame	5.0	30
Cr-Flame	50	BMDL
Pb-Flame	100	BMDL
Hg-Cold Vapor	0.4	BMDL
Se-Hydride	2.0	BMDL

BMDL = Below Minimum Detection Limit
D/L = Detection Limit
NA = Not Analyzed
Results are expressed in ppb unless otherwise specified.

METHOD PERFORMANCE DATA

Parameter	Concentration Added	Concentration Found	Percent Rec.	Type
Hg	2.0	1.9	95	b(8491 EP Ext.)
Hg	4.0	4.3	108	b(8491 EP Ext.)
Hg	6.0	6.2	103	b(8491 EP Ext.)
Cr-Chelation	21.8	24.8	114	b(8488)
Cr-Flame	261	249	95	a
Cr-Flame	1250	1190	95	b(8491)
Cd-Chelation	4.6	4.4	96	a
Cd-Chelation	4.6	4.2	91	a
Cd-Chelation	13	14	108	b(8488)
Ag-Chelation	33	34	103	a
Ag-Chelation	31	34	110	a
Ag-Chelation	20	17	85	b(8488)
Ba-Flame	5170	4790	93	b(8487)
Pb-Chelation	50	45	90	a
Pb-Chelation	100	108	108	b(8488)
As-Hydride	2.7	3.2	119	a
As-Hydride	4.3	4.9	114	a
As-Hydride	2.7	3.1	115	b(8491 EP Ext.)
Se-Hydride	7.6	8.6	113	a
Se-Hydride	7.6	8.9	113	a
Se-Hydride	5.15	3.78	73	b(8489)
Se-Hydride	10	9.8	98	b(8490)

[a]EPA Reference Sample

[b]Sample Matrix

Concentration units are ppb unless otherwise specified.

APPENDIX 8

EFFLUENT AND SLUDGE ANALYTICAL DATA
WASTEWATER TREATMENT PONDS

AWARE
INCORPORATED

consultants in environmental management

August 24, 1988 6696

Richard Mason, Supervisor
Environmental Safety & Health
RMI Company
Extrusion Plant
P.O. Box 579
Ashtabula, OH 44004

Dear Mr. Mason:

Attached are the results of the toxicity tests conducted on your effluent. A 96 hour static, nonrenewal test with fathead minnows and a 48 hour static, nonrenewal test with Ceriodaphnia dubia were conducted at 10, 18, 32, 56, and 100 percent effluent concentrations. The C. dubia acute test was started 24 hours after the sample was received due to lack of <24 hour old young. The control and dilution waters were Percy Priest lake water and reconstituted hard water, respectively. There were no mortalities in any effluent concentration tested with fathead minnows. However, there was 45 percent mortality (9 out of 20 organisms) over a 48 hour period with Ceriodaphnia dubia. No LC_{50} values were calculated, since 50 percent mortality was not observed in either test.

If you have any questions or we can be of further assistance, please contact me at (615) 255-2288.

Sincerely,

AWARE Incorporated

Richard J. Mirenda, Ph.D.
Senior Aquatic Toxicologist

227 French Landing Drive • MetroCenter • Nashville, TN 37228 • Phone (615) 255-2288

TOXICITY TEST DATA

PLANT INFORMATION

Industry: RMI

Permit No. _____

Type of Plant: Sodium Plant

Contact: Richard Mason

Plant Operating Schedule: 24 hours

Final Products:

FINAL EFFLUENT

Source: Final Discharge

Collection Period: --

Type Collection: Composite

Alkalinity (mg/l as $CaCO_3$): 88

Hardness (mg/l $CaCO_3$): 76

Conductivity (μmhos/cm): 2,520

pH (standard units): 8.5

Flow:

Receiving Stream:

DILUTION WATER

Source: Laboratory water

Collection Period: --

Type Collection: Grab

Pretreatment:

Alkalinity (mg/l as $CaCO_3$): 112

Hardness (mg/l $CaCO_3$): 78

Conductivity (μmhos/cm): 240

pH (standard units): 8.4

TEST TYPE

Toxicity Test

____ Renewal	____ 24 hr	X static
X Nonrenewal	X 48 hr	____ flowthrough
	X 96 hr	
	____ 7 day	

TEST METHOD - Reference Material

Methods of Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA, Third edition, March 1985.

Other:

TEST ORGANISM

Common Name: fathead minnow

Scientific Name: Pimephales promelas

Age: 22 days

Source: AWARE cultures

Observed Diseases: None

Treatment: None

Acclimation: Held in culture water prior to test

TEST CHAMBERS:

Composition: Glass

Depth: 195 mm

Size (L): 1.0

Test Volume per Chamber: 750 ml

LOADING TECHNIQUE:

Organisms per concentration: 20

Replicate per concentration: 2

Organisms per replicate: 10

SUMMARY OF TEST OBSERVATIONS:

A. Most sensitive index:

LOEC:

NOEC:

ChV:

LC_{50}: not calculated; no mortalities

Upper Limit:

Method:

B. Survival Rate (%) Fathead minnow

	Concentration (% Effluent)	Survival Rate (%)
1)	Control	95
2)	10	100
3)	18	100
4)	32	100
5)	56	100
6)	100	100
7)		
8)		
9)		
10)		

C. Comments

ATTACHMENTS

X Data Summary Sheets

____ Other:

By: Richard Miranda

Date: 8/24/88

AWARE Incorporated
227 French Landing Drive
Nashville, TN 37228

INDUSTRY/TOXICANT: RMI
ADDRESS: Ashtabula, OHIO
CONTACT: Rick Mason
EFFLUENT SERIAL NO.:
NPDES PERMIT NO.:
SAMPLE TYPE
GRAB: CONDUCTED AM/PM: __/__/__ (DATE)
COMPOSITE: COLLECTED FROM AM/PM: __/__/__ (DATE)
TO AM/PM: __/__/__ (DATE)

Temperatures
0 HRS 21°C
24 " 21°C
48 " 21°C
72 " 21°C
96 " 21°C

PERSON CONDUCTING TEST: RJM
BEGINNING: DATE 8/17 TIME 10:00AM
ENDING: DATE 8/21 TIME 11:00AM.
TEST ORGANISM:
SPECIES: Pimephales promelas
AGE: 22 days
LENGTH: (± 1 SD)
WEIGHT: (± 1 SD)
DILUTION WATER USED: Perry Priest Lake

Conc. or %	Test Container Number	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Total Alkalinity (mg/l as $CaCO_3$) 0	24	48	72	96	Total Hardness (mg/l as $CaCO_3$) 0	24	48	72	96	Conductivity (umho's/cm) Salinity (ppm) 0	24	48	72	96
Control	A	10	10	10	9	9	8.6	8.4	8.4	7.8	7.7	8.4					112					64					239				
	B	10	10	10	10	10																										
10	A	10	10	10	10	10	8.5	8.5	8.3	7.3	7.3																					
	B	10	10	10	10	10																										
18	A	10	10	10	10	10	8.5	8.5	8.3	7.3	7.2																					
	B	10	10	10	10	10																										
32	A	10	10	10	10	10	8.5	8.4	8.1	7.4	7.5																					
	B	10	10	10	10	10																										
56	A	10	10	10	10	10	8.5	8.3	8.0	7.6	7.4																					
	B	10	10	10	10	10																										
100	A	10	10	10	10	10	8.6	7.9	7.9	8.0	8.0	8.5					88					76					252				
	B	10	10	10	10	10																										

ORGANISM LENGTH (mm): ____, ____, ____, ____, ____, ____, ____, ____, ____, ____; MEAN = ____; SD = ____

ORGANISM WEIGHT (gms): ____, ____, ____, ____, ____, ____, ____, ____, ____, ____; MEAN = ____; SD = ____

TEST METHOD - Reference Material

Methods of Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA, Third edition, March 1985.

Other:

TEST ORGANISM

Common Name: Water flea

Scientific Name: *Ceriodaphnia dubia*

Age: <24 hours

Source: AWARE cultures

Observed Diseases: None

Treatment: None

Acclimation: Held in culture water prior to testing

TEST CHAMBERS:

Composition: plastic

Depth: 20 mm

Size (L): 250 ml

Test Volume per Chamber: 50 ml

LOADING TECHNIQUE:

Organisms per concentration: 20

Replicate per concentration: 4

Organisms per replicate: 5

SUMMARY OF TEST OBSERVATIONS:

A. Most sensitive index:

LOEC:

NOEC:

ChV:

LC_{50}: not calculated, <50 percent mortality

Upper Limit:

Method:

B. Survival Rate (%) Ceriodaphnia dubia

Concentration (% Effluent)	Survival Rate (%)
1) Control	95
2) 10	100
3) 18	100
4) 32	100
5) 56	100
6) 100	55
7)	
8)	
9)	
10)	

C. Comments

ATTACHMENTS

X Data Summary Sheets

____ Other:

By: Richard Mueinda Date: 8/24/88

AWARE Incorporated
227 French Landing Drive
Nashville, TN 37228

INDUSTRY/TOXICANT: RMI
ADDRESS: Ashtabula, OHIO
CONTACT: Rick Mason
EFFLUENT SERIAL NO.:
NPDES PERMIT NO.:
SAMPLE TYPE
GRAB:-COLLECTED AM/PM: / / (DATE)
COMPOSITE: COLLECTED FROM AM/PM: / / (DATE)
TO AM/PM: / / (DATE)

Temperatures
0 HRS 21°C
24 " 21°C
48 " 21°C
72 "
96 "

PERSON CONDUCTING TEST: RJM
BEGINNING: DATE 8/18 TIME 10:30am.
ENDING: DATE 8/20 TIME 11:30am.
TEST ORGANISM:
SPECIES: Ceriodaphnia dubia
AGE: < 24 hours
LENGTH: (± 1 SD)
WEIGHT: (± 1 SD)
DILUTION WATER USED: Recon Hard H2O

Conc. or %	Test Container Number	Number of Live Organisms 0	24	48	72	96	Dissolved Oxygen (mg/l) 0	24	48	72	96	pH 0	24	48	72	96	Total Alkalinity (mg/l as CaCO3) 0	24	48	72	96	Total Hardness (mg/l as CaCO3) 0	24	48	72	96	Conductivity (umho's/cm) Salinity (ppm) 0	24	48	72	96
	A, B	5/5	4/5	4/5			8.6	8.5	8.5			8.4					110					200					240				
	C, D	5/5	5/5	5/5																											
10	A, B	5/5	5/5	5/5																											
	C, D	5/5	5/5	5/5																											
18	A, B	5/5	5/5	5/5																											
	C, D	5/5	5/5	5/5																											
32	A, B	5/5	5/5	5/5																											
	C, D	5/5	5/5	5/5																											
56	A, B	5/5	5/5	5/5																											
	C, D	5/5	5/5	5/5																											
100	A, B	5/5	4/4	3/2			8.6	8.5	8.5			8.5					88					76					2600				
	C, D	5/5	5/5	3/3																											

ORGANISM LENGTH (mm): ____, ____, ____, ____, ____, ____, ____, ____, ____, ____: MEAN = ____; SD = ____

ORGANISM WEIGHT (gms): ____, ____, ____, ____, ____, ____, ____, ____, ____, ____: MEAN = ____; SD = ____

AWARE INCORPORATED

consultants in environmental management

CLIENT: RMI COMPANY
DATE RECEIVED: 9/2/88

effluent sample

AWARE SAMPLE DESCRIPTION	5284
CLIENT SAMPLE DESCRIPTION	

	DETECTION LIMITS	CONC
pH (UNITS)	-----	7.00
BOD	1.0	7.5
COD	20	BMDL
CHLORIDE	1.0	164
CONDUCTIVITY (UMHOS/CM)	1.0	730
CYANIDE	0.02	BMDL
NITRATE	0.01	0.14
NITRITE	0.01	0.015
AMMONIA	0.10	BMDL
PHENOL	0.05	BMDL
HARDNESS	1.0	124
OIL & GREASE	5.0	BMDL
TOTAL PHOSPHORUS	0.01	0.04
RESIDUAL CHLORINE	0.01	BMDL
ARSENIC	0.001	BMDL
CALCIUM	0.01	29.6
CADMIUM	0.005	BMDL
CHROMIUM	0.05	BMDL
COPPER	0.02	BMDL
IRON	0.03	0.13
LEAD	0.10	BMDL
MAGNESIUM	1.0	8.6
NICKEL	0.04	BMDL
SODIUM	0.10	104
ZINC	0.005	BMDL
MANGANESE	0.01	BMDL
CACO3	1.0	61.4

ALL RESULTS EXPRESSED IN PPM.

ND = NONE DETECTED
BMDL = BELOW METHOD DETECTION LIMIT

DATE 10/7/88 BY D. Rich

227 French Landing Drive • MetroCenter • Nashville, TN 37228 • Phone (615) 255-2288

AWARE INCORPORATED

consultants in environmental management

CLIENT: RMI COMPANY
DATE RECEIVED: 9/2/88

AWARE SAMPLE DESCRIPTION	5284
CLIENT SAMPLE DESCRIPTION	OUTFALL METALS PLANT
VOLATILE ORGANIC COMPOUNDS	DETECTION LIMITS	CONC
ACROLEIN	100	ND
ACRYLONITRILE	100	ND
BENZENE	10	ND
BIS (CHLOROMETHYL) ETHER	10	ND
BROMOFORM	10	ND
CARBON TETRACHLORIDE	10	ND
CHLOROBENZENE	10	ND
CHLORODIBROMOMETHANE	10	ND
CHLOROETHANE	10	ND
2-CHLOROETHYLVINYL ETHER	10	ND
CHLOROFORM	10	ND
DICHLOROBROMOMETHANE	10	ND
DICHLORODIFLUOROMETHANE	10	ND
1,1-DICHLOROETHANE	10	ND
1,2-DICHLOROETHANE	10	ND
1,1-DICHLOROEHTYLENE	10	ND
1,2-DICHLOROPROPANE	10	ND
1,3-DICHLOROPROPYLENE's	10	ND
ETHYLBENZENE	10	ND
METHYL BROMIDE	10	ND
METHYL CHLORIDE	10	ND
METHYLENE CHLORIDE	10	ND
1,1,2,2-TETRACHLOROETHANE	10	ND
TETRACHLOROETHYLENE	10	ND
TOLUENE	10	ND
1,2-TRANS-DICHLOROETHYLENE	10	ND
1,1,1-TRICHLOROETHANE	10	ND
1,1,2-TRICHLOROETHANE	10	ND

ALL RESULTS EXPRESSED IN PPB.

ND = NONE DETECTED
BMDL = BELOW METHOD DETECTION LIMIT

227 French Landing Drive • MetroCenter • Nashville, TN 37228 • Phone (615) 255-2288

AWARE
INCORPORATED

consultants in environmental management

CLIENT: RMI COMPANY
DATE RECEIVED: 9/2/88

AWARE SAMPLE DESCRIPTION	5284
CLIENT SAMPLE DESCRIPTION	OUTFALL METALS PLANT

VOLATILE ORGANIC COMPOUNDS CONT'D	DETECTION LIMITS	CONC
TRICHLOROETHYLENE	10	ND
TRICHLOROFLUOROMETHANE	10	ND
VINYL CHLORIDE	10	ND
1,2-DICHLOROBENZENE	10	ND
1,3-DICHLOROBENZENE	10	ND
1,4-DICHLOROBENZENE	10	ND

ALL RESULTS EXPRESSED IN PPB.

ND = NONE DETECTED
BMDL = BELOW METHOD DETECTION LIMIT

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