CRA
Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

February 2, 1987 Reference No. 1851

Mr. Robert Mitrey
NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
600 Delaware Avenue
Buffalo, NY 14202

Dear Mr. Mitrey:

Re: Union Carbide Corporation
Solid Waste Management Facility - Data Compilation

As discussed with personnel of the NYSDEC during the meeting of December 23, 1986, CRA has compiled the available hydrogeologic information pertaining to Union Carbide's Solid Waste Management Facility in Niagara Falls, New York. This raw information is being forwarded to the NYSDEC at this time to permit NYSDEC personnel to preliminarily review the data to determine whether there may be some factors that could affect the proposed site closure plan.

The information compiled includes:

° Geologic stratigraphy from the wells installed at the site:
- 3 overburden wells (1978/79)
- 6 bedrock wells (1986)
- 1 waste well (1986)

° Groundwater levels measured at the wells

° Chemical analysis results - groundwater and surface water

In addition, the testing results for the clay that has been selected for use in construction of the site cap have been included.

Five sets of the above information has been prepared and are attached.

Yours very truly,

CONESTOGA-ROVERS & ASSOCIATES

James K. Kay per jd

James K. Kay, P. Eng.

JKK:jd
Enclosures
cc: M. Balent, Union Carbide

ATTACHMENT 1

GEOLOGIC STRATIGRAPHY LOGS

EARTH DYNAMICS, INC.

Test Borings and Logs
797 Center Street • East Aurora, New York 14052 • (716) 655-1717

3178 HOLE NO. 1 SURF. ELEV. _____

PROJECT Union Carbide Corporation
Niagara Falls, New York

LOCATION North side of property
Hyde Park Boulevard

CLIENT RECRA Research, Inc.

DATE STARTED 9/8/78 COMPLETED 9/8/78

DEPTH (feet)	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WATER TABLE & REMARKS
							Slightly moist brown silt loam (CLAYEY-SILT) width 10 to 15% subaugular gravel, firm, nonplastic with fiberous wood.	2 to 4 inch black powdery carbonaceous cap on surface.
	1	25	29	24		53		
							Slightly moist grayish black carbonaceous fill ranging from powder to augular chunks, firm, nonplastic with intermixed fiberous wood, yellowish brick and glass.	Carbonaceous fill material to 12.5 feet over dense glacial till to 19 feet over dolometic bedrock.
5		5	15	17		32		
	2							
							---------Clear transition to ---	Water seeped rapidly into hole at 9.7 feet
10		5	5	7		12	Wet blackish fill material with intermixed carbonaceous wood and brick chunks, loose	
	3							
		12	24	17		41	Moist light reddish brown dense coarse silt loam (SANDY-SILT) width 15% subaugular dolometic gravel, very firm, nonplastic	
	4							
15		18	21	25		46		
	5							Water at 9.5 feet below surface at completion.

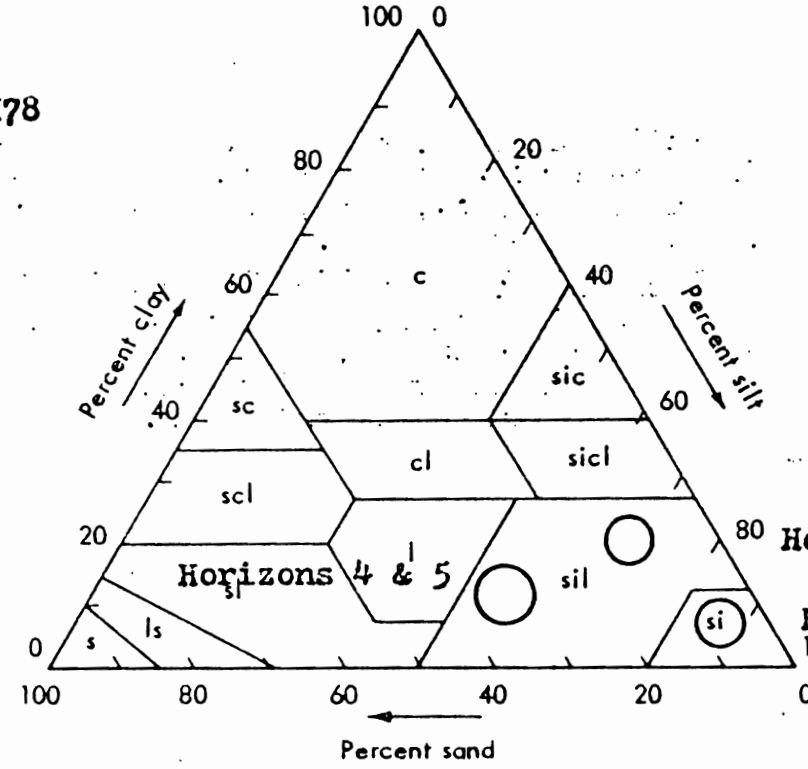
N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

LOGGED BY Lenhardt & Owens

SHEET 1 OF 2

HOLE #1

3178



c	Clay	scl	Sandy clay loam
si	Silt	sicl	Silty clay loam
s	Sand	cl	Clay loam
l	Loam	sil	Silt loam
sc	Sandy clay	sl	Sandy loam
sic	Silty clay	ls	Loamy sand

Textural triangle showing the percentages of clay (less than 0.002 mm), silt (0.002-0.05 mm), and sand (0.05-2.0 mm) in the basic soil textural classes (adapted from Soil Survey Staff, 1951).

EARTH DIMENSIONS, INC.

Test Borings and Logs
797 Center Street • East Aurora, New York 14052 • (716) 655-1717

3178 HOLE NO. 1 Continued SURF. ELEV. _____

PROJECT Union Carbide Corporation
Niagara Falls, New York

LOCATION North side of property
Hyde Park Boulevard

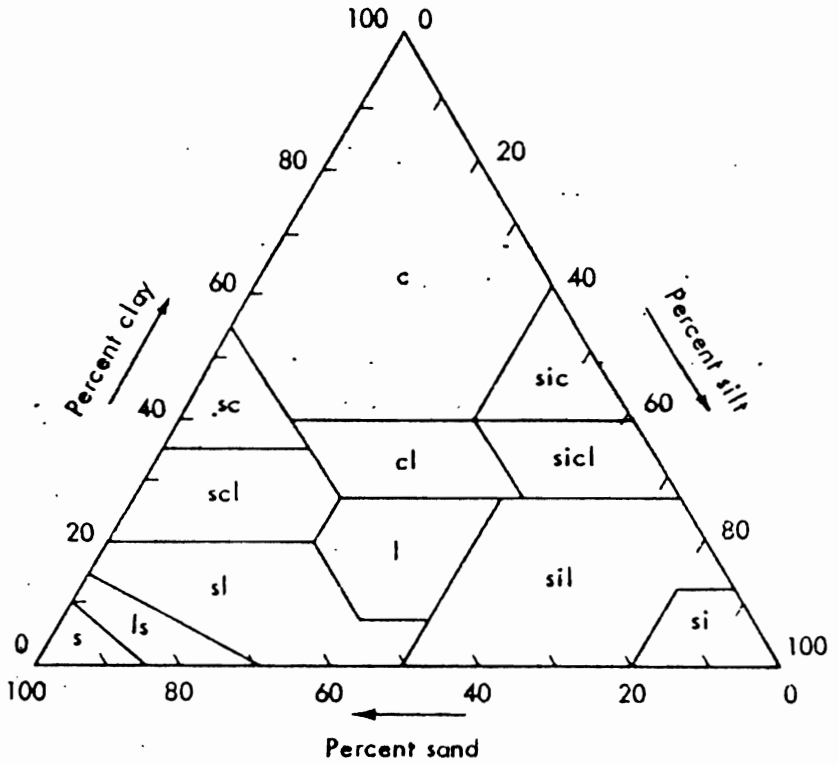
CLIENT RECRA Research Inc.

DATE STARTED 9/9/78 COMPLETED 9/9/78

DEPTH (feet)	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WATER TABLE & REMARKS
							(Same horizon as described on previous page)	
20							Gray microcrystalline dolomite bedrock	
							Sampling discontinued at 20.5 feet	PIPE NOTES Used two 10.5 foot sections of carbon steel pipe with one-4 inch coupling sealed with pipe dope. Well end packed with 1½ feet of greater than 1.5 mm well graded coarse sand and gravel below pipe and 1½ feet above pipe end. End of pipe double screened with 0.5 mm stainless steel screening. Bentonite used between 6 and 18½ foot depths to seal vertical water movement along outside of pipe. The top 6 feet was back filled with SILT-CLAY lake sediment considering the porous nature of the carbonaceous fil at this depth. Bottom of pipe 18.3 fee below surface. Pipe protruding 2.8 feet above surface.

dew N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

LOGGED BY Owens & Lenhardt



c	Clay	scl	Sandy clay loam
si	Silt	sicl	Silty clay loam
s	Sand	cl	Clay loam
l	Loam	sil	Silt loam
sc	Sandy clay	sl	Sandy loam
sic	Silty clay	ls	Loamy sand

Textural triangle showing the percentages of clay (less than 0.002 mm), silt (0.002-0.05 mm), and sand (0.05-2.0 mm) in the basic soil textural classes (adapted from Soil Survey Staff, 1951).

EARTH DIMENSIONS, INC.

Test Borings and Logs
797 Center Street • East Aurora, New York 14052 • (716) 655-1717

3178 HOLE NO. 2 SURF. ELEV. ______

PROJECT: Union Carbide Corporation
Niagara Falls, New York

LOCATION: South side of fill area
Near Hyde Park Blvd.

CLIENT: RECRA Research, Inc.

DATE STARTED: 9/9/78 COMPLETED: 9/9/78

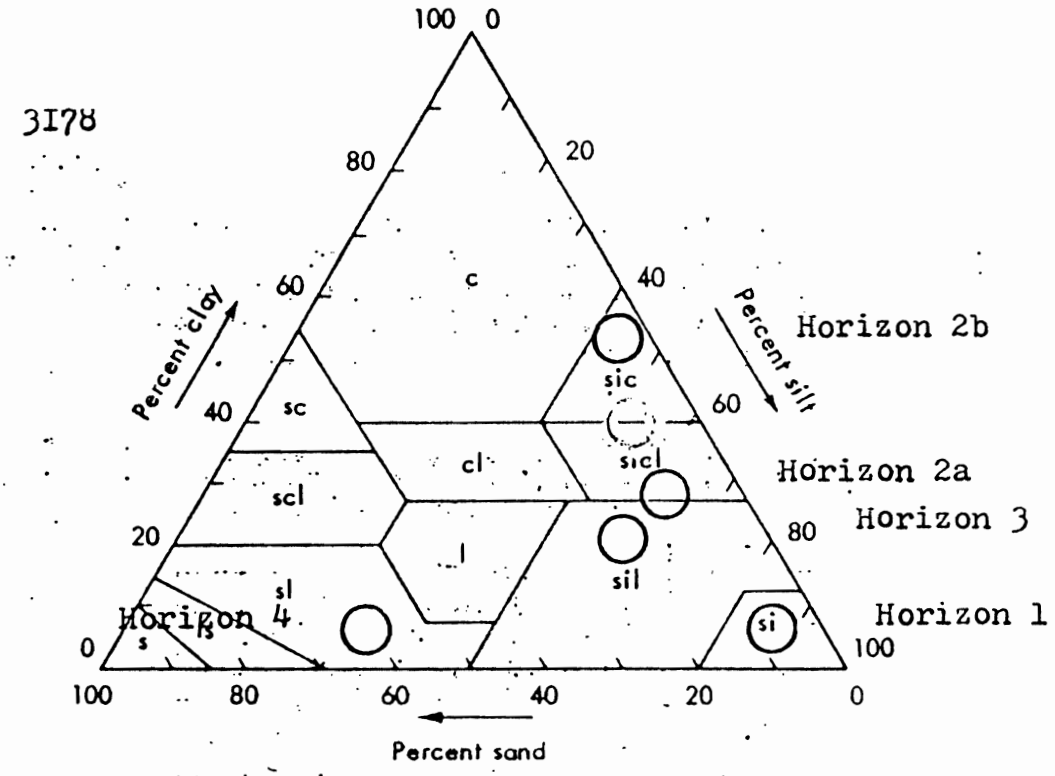
DEPTH Feet	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WATER TABLE & REMARKS
	1	7	7	10		17	Slightly moist, grayish-black carbonaceous fill material ranging from powder to angular chunks with intermixed wood, bricks, and gravelly soil, loose to very friable, nonplastic.	Carbonaceous fill to 4.(feet over silty and clayey lake sediments to 15 feet over sandy glacial till to 19.8 feet over dolomitic bedrock
5	2	9	17	21		38	Moist, highly mottled grayish-brown silty clay loam (SILTY-CLAY) friable. ------Clear transition to -------- Moist distinctly mottled reddish-brown SILTY-CLAY with vertical dessication cracks, finely laminated structure, very firm, plastic. -------grades downwards to--------	No water observed at fil - original soil contact Sample #2 spans contact.
10	3	13	15	18		33	Moist to extremely moist, brown heavy silt loam (CLAYEY-SILT) with very thin, very fine sandy lenses, finely laminated, firm, slightly plastic.	
15	4	12	20	22		42	Extremely moist to wet reddish-brown sandy loam (SILTY-SAND) w/ 10 to 15% predominantly fine and medium subangular dolometic gravel, firm, nonplastic	Water at 13.5 feet belo surface at completion.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

LOGGED BY Lenhardt & [illegible] SHEET 1 OF 2

HOLE #2

3178



c	Clay	scl	Sandy clay loam
si	Silt	sicl	Silty clay loam
s	Sand	cl	Clay loam
l	Loam	sil	Silt loam
sc	Sandy clay	sl	Sandy loam
sic	Silty clay	ls	Loamy sand

Textural triangle showing the percentages of clay (less than 0.002 mm), silt (0.002-0.05 mm), and sand (0.05-2.0 mm) in the basic soil textural classes (adapted from Soil Survey Staff, 1951).

EARTH DIMENSIONS, INC.
Test Borings and Logs
797 Center Street • East Aurora, New York 14052 • (716) 655-1717

3178

HOLE NO. 2 Continued SURF. ELEV. _____

PROJECT Union Carbide Corporation, Niagara Falls, New York LOCATION South side of fill area, Near Hyde Park Blvd.

CLIENT RECRA Research, Inc. DATE STARTED 9/9/78 COMPLETED 9/9/78

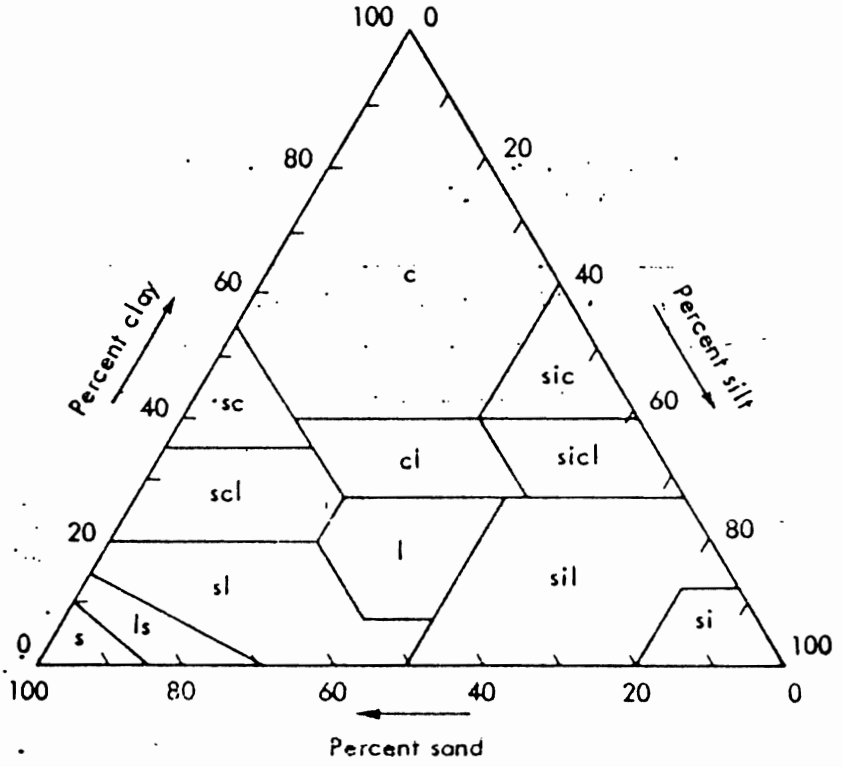
DEPTH (feet)	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	WATER TABLE & REMARKS
							(Same horizon as described on previous page)	
20	5	120					Gray, microcrystalline dolomite bedrock	
							Sampling discontinued at 20.1 feet	

PIPE NOTES
Used one 10.0 feet and two 5.0 feet sections of carbon steel pipe with 2-4 inch couplings sealed with pipe dope. Well end packed with 1 foot of greater than 1.5 mm well graded coarse sand and gravel below pipe and 1½ feet above pipe end. End of pipe double screened with 0.5 mm stainless steel screening. Bentonite used to plug the surface. One foot of pipe protruded above surface.

N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

dew

LOGGED BY Lenhardt & Owens SHEET 2 OF 2



c	Clay	scl	Sandy clay loam
si	Silt	sicl	Silty clay loam
s	Sand	cl	Clay loam
l	Loam	sil	Silt loam
sc	Sandy clay	sl	Sandy loam
sic	Silty clay	ls	Loamy sand

Textural triangle showing the percentages of clay (less than 0.002 mm), silt (0.002-0.05 mm), and sand (0.05-2.0 mm) in the basic soil textural classes (adapted from Soil Survey Staff, 1951).

EARTH DIMENSIONS, INC.

Test Borings and Logs
797 Center Street • East Aurora, New York 14052 • (716) 655-1717

HOLE NO. 3 SURF. ELEV. _____

6C79 PROJECT Union Carbide Corporation
Niagara Falls, New York
CLIENT Recra Research, Inc.

LOCATION Southeastern portion of site, approximately 120 ft. north of south fence, 100 ft. west of east fence.
DATE STARTED 3/20/79 COMPLETED 3/20/79

DEPTH (feet)	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	DESCRIPTION & CLASSIFICATION	Well	WATER TABLE & REMARKS
							Moist dark grayish brown heavy silt loam (CLAYEY-SILT) topsoil, friable, slightly sticky 0.5		Clayey lake sediments to 13.4 ft. over very dense loamy glacial till to 14.0 ft. over dolomitic rock.
	1	14	12	18		30			
5	2	13	19	26		45	Moist distinctly mottled reddish brown SILTY-CLAY with vertical gray desiccation cracks and very thin coarse silt and very fine sand lenses, extremely firm (stiff), plastic, sticky		PIPE NOTES: 15 ft. of 2 in. ID carbon steel pipe installed with 2 ft. stickup above surface, bentonite with clay cuttings placed from surface to 8.0 ft. depth, gravel between 8.0 and 14.1 ft depths.
10	3	10	11	15		26	- - - - grading downward to - - - - 10.0 Moist grading to extremely moist brown SILTY-CLAY, thinly laminated clays with very thin silt lenses, very firm grading to firm, plastic, sticky	2" carbon steel pipe with bottom 1½' slotted and screened; Bentonite with clay cuttings; Gravel	
		120					13.4 Extremely moist reddish brown gravelly sandy loam (SILTY-SAND) with 15-20% subrounded dark gray dolomitic gravel, very firm in place, massive soil structure, nonplastic 14.0 Gray microcrystalline dolomite 14.1		
							Description discontinued at 14.1 ft.		Water table was 13.5 ft. below surface at completion.

dew N = NUMBER OF BLOWS TO DRIVE 2 " SPOON 12 " WITH 140 lb. WT. FALLING 30 " PER BLOW.

STRATIGRAPHIC AND INSTRUMENTATION LOG

(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW1-86

PROJECT NO.: 9-1851
DATE COMPLETED: JUNE 9, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: NORTH SIDE SOLID WASTE MANAGEMENT FACILITY
CRA SUPERVISOR: C. PADGINTON

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS	ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		610.62	Locking cap			
		608.72	Cover			
0		608.1				
-	Gray, black & red-orange GRAVEL, CARBON PIECES, BRICK (FILL) Wet		Protective casing	1	SS	8
-						28
-				2	SS	10
-	Black, gray, red-orange & green CARBON DUST & PIECES, BRICK - some gravel, trace clay (FILL) Wet					20
-			4" Ø SC	3	SS	5
- 5	Black & brown-red sandy SILT - NP, some gravel, green plastic clay 4.9'-5.1' (FILL) Wet					10
-			CEM/BEN BKFL	4	SS	20
-						32
-			6 3/4" Ø BH	5	SS	5
-	Black CARBON - non-plastic, some orange color, some gravel decreasing with depth, some silt, at 8.0-10.0' some wood, becoming saturated, 10.0'-12.0' becoming sandy, no gravel (FILL) Wet					8
- 10				6	SS	2
-						5
-				7	SS	14
-						5
-	CI - Red-brown CLAY - laminated, high plasticity, silt seams at 17.0' & 17.2' (NATIVE) Saturated			8	SS	3
- 15						5
-				9	SS	4
-						5
-	Red-brown sandy SILT - some clay some gravel, low to NP, subangular gravel Saturated			10	SS	4
-		588.6				100+
- 20	Gray DOLOMITE					

NOTES:
Log continued on Stratigraphy & Instrumentation Log (Bedrock) OW1-86.

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG

(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: NORTHEAST CORNER SOLID WASTE MANAGEMENT FACILITY

HOLE DESIGNATION: BW1-86

DATE COMPLETED: JULY 22, 1986

DRILLING METHOD: 3" DIAMETER NX CORE

CRA SUPERVISOR: C. PADGINTON

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOVERY	RQD	DRILLING WATER RETURN	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%	cm/s	ft AMSL	
-									
		1	19.5	86.0	62.4	10		588.6	
- 20									
	Gray DOLOMITE - very fine to fine grained, vuggy, thin bedded, weathered fractures brown-gray, stylolites, pitted, shaly partings								
									3" Ø NX
		2	24.5	97.6	71.8	12.5		583.6	
- 25									
		3	26.2	97.8	72.0	0		581.9	
- 30	Gray DOLOMITE - fine to medium grained, thin to medium bedded, shaly partings with calcite replacement								
	Gray DOLOMITE - fine grained, thin bedded, shaly partings weathered to brown-gray & gray, vuggy, highly fractured 34.1' -34.6'								
			34.5					573.6	
- 35									

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG

(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW2-86

PROJECT NO.: 9-1851
DATE COMPLETED: JULY 8, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: SOUTH SIDE SOLID WASTE MANAGEMENT FACILITY
CRA SUPERVISOR: C. PADGINTON

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS	ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		608.43	Locking cap			
0		607.00	Cover			
		606.1		1	SS	11
-			Protec-tive casing			5
-	Black CARBON DUST & PIECES - vegetative inclusions, non-plastic (FILL) Moist			2	SS	9
-						17
-				3	SS	5
- 5	CL - Red-brown silty CLAY - gray mottling, plastic, increasing silt and moisture with depth, pockets of pea gravel beginning at 7.4' (NATIVE) Moist-wet		4" Ø SC			17
-				4	SS	13
-						30
-			CEM/BEN BKFL	5	SS	9
-						15
- 10	CL - Brown-red silty CLAY - plastic, silt seams every 0.3', laminated, 10.0'-12.0' trace pea gravel, red & gray laminations (NATIVE) Wet			6	SS	10
-			6 3/4" Ø BH			13
-				7	SS	5
-	Red-brown clayey SILT - red & gray laminations Wet					11
-				8	SS	14
- 15	Red-brown gravelly, clayey, sandy SILT - gravel subangular, becoming brown at 16.0', moisture increasing to saturated at 16.0' Wet					8
-				9	SS	10
-						17
-	Brown gravelly, clayey, silty SAND Saturated			10	SS	100+
- 20		586.1				
	Light gray & brown-gray DOLOMITE					
	NOTES: Log continued on Stratigraphy & Instrumentation Log (Bedrock) OW2-86.					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: SOUTH SIDE SOLID WASTE MANAGEMENT FACILITY

HOLE DESIGNATION: BW2-86

DATE COMPLETED: JULY 22, 1986

DRILLING METHOD: 3" DIAMETER NX CORE

CRA SUPERVISOR: C. PADGINTON

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOVERY	RQD	DRILLING WATER RETURN	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%	cm/s	ft AMSL	
- 20	Light gray & brown-gray DOLOMITE - fine grained, thin bedded, stylolites, shaly partings, highly fractured 20.75'-21.50', pitted	1	20.0	83.6	45.0	0		586.1	
- 25	Brown-gray DOLOMITE - fractures weathered to medium gray, vuggy, sandy deposits in fractures, secondary calcite deposits, medium bedded at 24.6', highly fractured zones 24.1'-24.3', 26.1'-26.5', 29.1'-29.9'	2	29.0	94.2	72.8	10		577.1	3" Ø NX
- 30	Light gray DOLOMITE - fine to medium grained, thick bedded, pitted								
- 35	Light gray DOLOMITE - fine grained, medium bedded							571.1	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: EAST SIDE SOLID WASTE MANAGEMENT FACILITY

HOLE DESIGNATION: BW3-86

DATE COMPLETED: JULY 7, 1986

DRILLING METHOD: HOLLOW STEM AUGER

CRA SUPERVISOR: C. PADGINTON

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS	ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		604.67	Locking cap			
		603.51	Cover			
0		602.2				
-	Black CARBON DUST & SMALL PIECES - small amount vegetation (FILL) Moist		Protective casing	1	SS	3
-						3
-				2	SS	10
-	CL - Red-brown silty CLAY - red & gray mottling, some carbonized inclusions, increasing silt with depth, at bottom sand appears in deposits surrounding pea gravel (NATIVE) (TILL) Moist		4" Ø SC			33
-			CEM/BEN BKFL	3	SS	6
- 5						12
-			6 3/4" Ø BH	4	SS	39
-	Red-brown silty SAND - fine to medium sand at 6.8'-7.1', some rock Wet					100+
-	Light gray & brown-gray DOLOMITE	594.8				
	NOTES: Log continued on Stratigraphy & Instrumentation Log (Bedrock) OW3-86.					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG

(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: EAST SIDE SOLID WASTE MANAGEMENT FACILITY

HOLE DESIGNATION: BW3-86

DATE COMPLETED: JULY 23, 1986

DRILLING METHOD: 3" DIAMETER NX CORE

CRA SUPERVISOR: C. PADGINTON

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOVERY	RQD	DRILLING	WATER RETURN	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%		cm/s	ft AMSL	
-										
-		1	7.5	98.0	80.0				594.8	
-	Light gray & brown-gray DOLOMITE - fine grained,									
- 10	shaly partings, medium bedded, pitted, becoming thin bedded at 8.4', vuggy, few stylolites, highly fractured zones 9.2'-9.6', 11.9'-12.3',									
-		2	12.4	98.0	50.4				589.9	3" Ø NX
-	calcite deposits, fine to medium grained at 10.2', fractures weathered medium gray & brown-gray, grading to very fine grained at 14.0'									
- 15										
-		3	16.6	100	56.0				585.6	
-										
-										
-										
- 20	Light gray DOLOMITE - very fine grained, stylolites, thin bedded, few pits, no vugs, fractured & weathered	4	20.2	98.0	60.0				582.1	
-										
-			22.5						579.8	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG

(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW4-86

PROJECT NO.: 9-1851
DATE COMPLETED: JULY 11, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: NORTHEAST CORNER SOLID WASTE MANAGEMENT FACILITY
CRA SUPERVISOR: D. OSCAR

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS	ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		607.06	Locking cap			
		605.61	Cover			
0		604.5				
-	Augered through - Road fill		Protective casing			
-	Brown & black GRAVEL, ASH & CARBON - trace glass, stone fragments (FILL) Moist		4" Ø SC	1	SS	6
-	Gray & brown-gray medium-fine SAND, GRAVEL - trace ash, carbon, glass,		CEM/BEN BKFL			13
- 5	stone fragments (FILL) Wet			2	SS	4
-						10
-	Red-brown, gray & olive-gray SILT - some clay, trace gravel, carbon,		6 3/4" Ø BH	3	SS	7
-	ash (FILL) Moist-wet					16
-				4	SS	8
- 10	Red-brown fine to medium SAND - some silt, fine to medium subangular gravel, trace stone fragments (NATIVE) Moist					22
-	No recovery	593.1		5	SS	50+
-	Brown-gray DOLOMITE					
	NOTES: Log continued on Stratigraphy & Instrumentation Log (Bedrock) OW4-86.					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG

(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: NORTHEAST CORNER SOLID WASTE MANAGEMENT FACILITY

HOLE DESIGNATION: BW4-86

DATE COMPLETED: JULY 23, 1986

DRILLING METHOD: 3" DIAMETER NX CORE

CRA SUPERVISOR: C. PADGINTON

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOVERY	RQD	DRILLING WATER RETURN	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%	cm/s	ft AMSL	
-									
-	Brown-gray DOLOMITE - fine to medium grained, thin bedded, pitted, weathered fractures	1	11.4	97.0	81.7			593.1	
-									
-									
- 15									
-	Brown-gray DOLOMITE - medium bedded, weathered fractures, pitted, interconnected voids at 17.4', thin bedded at 17.7' -22.6', calcite deposits, shaly partings, pitting increases with depth								3" Ø NX
-									
- 20									
-		2	21.4	84.0	68.0			583.1	
-									
-									
-									
- 25			25.0					579.5	
	NOTES: Drilling water return was not recorded.								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG

(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: NORTHEAST CORNER OF SWMF PROPERTY

HOLE DESIGNATION: BW5-86

DATE COMPLETED: OCTOBER 22, 1986

DRILLING METHOD: HOLLOW STEM AUGER

CRA SUPERVISOR: R. HOEKSTRA

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS	ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
		603.33 600.43	Locking cap Cover			
0		599.7				
-	Dark brown clayey TOPSOIL & GRAVEL - some vegetation (NATIVE) Moist			1	SS	3
-	Red-brown CLAY -some wood fragments, some small root fibers Moist		4" Ø BS	2	SS	8 7
-	Red-brown CLAY -plastic, some root fibers Moist					23
-			Protec-tive casing	3	SS	9
- 5						16
-	Red-brown silty CLAY - plastic Moist-wet		CEM/BEN BKFL	4	SS	7
-						17
-			6 3/4" Ø BH	5	SS	11
-						100+
-	Red-brown CLAY & GRAVEL Wet					
- 10	Spoon & auger refusal (9.9')	589.8				
-						
-						
-	NOTES:					
-	Log continued on Stratigraphy & Instrumentation Log (Bedrock) BW5-86.					
- 15						
-						
-						
-						
-						
- 20						
-						
-						
-						
-						
- 25						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG

(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW5-86

PROJECT NO.: 9-1851
DATE COMPLETED: OCTOBER 31, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: 3" DIAMETER NX CORE

LOCATION: NORTHEAST CORNER OF SWMF PROPERTY
CRA SUPERVISOR: R. HOEKSTRA

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOVERY	RQD	DRILLING RATE	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%	cm/s	ft AMSL	
-									
- 10	Brown-gray DOLOMITE - very fine, aphanitic, thin to medium bedded, some stylolites, some fractures, weathered, becoming gray with depth	1	10.0	88	58	100		589.7	
- 15	Black, brown & gray DOLOMITE saccaroidal, aphanitic, medium bedded, few weathered fractures, trace sphalerite	2	16.0	115	75	10		583.7	3" Ø NX
		3	18.0	144	100	0		581.7	
	Brown-gray DOLOMITE - aphanitic, saccharoidal, thin to medium bedded, stylolites, very fine at 18.9' with weathered fractures, secondary calcite deposits, few voids & pits with sphalerite deposits, carbonaceous partings	4	18.9	99	50	0		580.8	
- 20									
- 25			24.9					574.8	

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG

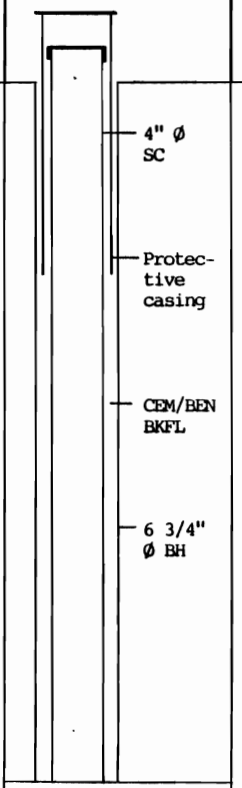
(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW6-86

PROJECT NO.: 9-1851
DATE COMPLETED: OCTOBER 24, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: HOLLOW STEM AUGER

LOCATION: 100' WEST OF WEST EDGE OF LANDFILL
CRA SUPERVISOR: R. HOEKSTRA

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS		ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
			607.09				
0			603.67				
			603.5				
-	Dark brown clayey TOPSOIL & VEGETATION - some silt (FILL)	Dry			1	SS	8
							17
-	Black CARBON - some silt, some ash, trace orange brick (FILL)	Dry		4" Ø SC	2	SS	3
-	Black SILT - some carbon, some clay, trace ash, trace vegetation (FILL)	Saturated					5
-					3	SS	1
- 5				Protective casing			9
-	Red-brown CLAY - slightly mottled, stiff (NATIVE)	Moist			4	SS	12
-							25
-	Red-brown CLAY - slightly mottled, silt lense, stiff	Moist		CEM/BEN BKFL	5	SS	14
-							25
- 10					6	SS	7
-	Red-brown CLAY - slightly mottled, some gray-green silt lenses, stiff	Moist		6 3/4" Ø BH			14
-	Red-brown CLAY - some mottling, trace silt, very stiff	Moist			7	SS	2
-	Red-brown silty CLAY	Wet					8
-					8	SS	2
- 15	Brown SAND - some gravel, some clay, trace silt	Wet					9
-					9	SS	17
-	Brown clayey SAND - some large gravel	Wet	586.5				100+
-							
	Auger refusal (17.0') Spoon refusal (17.7')						
	NOTES: Log continued on Stratigraphy & Instrumentation Log (Bedrock) BW6-86.						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

STRATIGRAPHIC AND INSTRUMENTATION LOG

(BEDROCK)

PROJECT NAME: UNION CARBIDE CORPORATION
HOLE DESIGNATION: BW6-86

PROJECT NO.: 9-1851
DATE COMPLETED: OCTOBER 28, 1986

CLIENT: UNION CARBIDE CORPORATION
DRILLING METHOD: 3" DIAMETER NX CORE

LOCATION: 100' WEST OF WEST EDGE OF LANDFILL
CRA SUPERVISOR: R. HOEKSTRA

DEPTH	DESCRIPTION OF STRATA	RUN NO.	INTERVAL	RECOOVERY	RQD	DRILLING RATE RETURN	WATER PRESSURE TEST	ELEVATION	MONITOR INSTALLATION
ft BG				%	%	%	cm/s	ft AMSL	
	Brown-gray DOLOMITE - very fine, aphanitic, thin bedding many weathered fractures, carbonaceous partings	1	17.7	83	0			585.8	
20									
	Gray-brown DOLOMITE - very fine, aphanitic, thin to medium bedding, some weathered fractures, few pits with sphalerite	2	22.4	42	29			581.1	3" Ø NX
25									
	Black-gray DOLOMITE - very fine, aphanitic, thin to medium bedded, highly fractured, weathered, many carbonaceous partings, several zones of sandy grain size	3	27.2	82	26			576.3	
30									
			32.9					570.6	
35									

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

WATER FOUND STATIC WATER LEVEL

NM - NOT MEASURED

STRATIGRAPHIC AND INSTRUMENTATION LOG

(OVERBURDEN)

PROJECT NAME: UNION CARBIDE CORPORATION

PROJECT NO.: 9-1851

CLIENT: UNION CARBIDE CORPORATION

LOCATION: TOP OF LANDFILL

HOLE DESIGNATION: MW1-86

DATE COMPLETED: NOVEMBER 3, 1986

DRILLING METHOD: HOLLOW STEM AUGER

CRA SUPERVISOR: R. HOEKSTRA

DEPTH ft/m BG	STRATIGRAPHY DESCRIPTION & REMARKS		ELEVATION ft/m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
			631.36	Locking cap			
0			626.6				
-	Black CARBON -some flyash (FILL)	Dry			1	SS	21
							16
-	Red-brown CLAY -some carbon, trace silt, some green, gray & red mottling (FILL)	Dry		2" Ø BS	2	SS	8
-	Black CARBON -some flyash (FILL)	Dry					13
-	Red-brown CLAY & CARBON -trace silt, trace orange brick (FILL)	Dry			3	SS	6
				CEM/BEN BKFL			
- 5	Black CARBON -some clay, trace silt, piece of plastic at 6.0' (FILL)	Dry					5
-					4	SS	6
-	Black CARBON -trace silt, trace sand, pieces of plastic (FILL)	Dry					7
-				6 3/4" Ø BH	5	SS	21
-	Black CARBON -some silt, some plastic, trace sand, piece of wood in tip of spoon (FILL)	Dry					21
- 10					6	SS	13
-	Black CARBON -some wood fragments (FILL)	Dry					19
-					7	SS	9
-	Black CARBON -large wood fragment (FILL)	Dry					6
-			613.1	BEN seal	8	SS	25
- 15	Black CARBON & WOOD fragments - some paper, pressed putrified wood/ash, trace clay at bottom (FILL)	Dry	611.0				22
-					9	SS	13
-	Black CARBON & WOOD fragments (FILL)	Dry					12
-					10	SS	15
-	Black CARBON & WOOD fragments - trace orange brick (FILL)	Dry	607.9	SD pack			10
- 20				SS screen	11	SS	9
-	Black CARBON & WOOD -orange brick fragment in tip of spoon (FILL)	Dry					20
-					12	SS	20
-	Black CARBON & WOOD fragments - trace clay (FILL)	Dry					23
			602.9				
-	Black CARBON & WOOD fragments - some silt (FILL)	Dry	602.4	BEN Seal	13	SS	15
- 25	Mottled red-brown, green, gray, red, & orange CLAY - trace silt (NATIVE)	Moist	601.6				
	Spoon refusal 25.0' Auger refusal 24.2'						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS WATER FOUND STATIC WATER LEVEL

ATTACHMENT 2

GROUNDWATER ELEVATIONS

WATER LEVEL ELEVATIONS
UNION CARBIDE CORPORATION

Well Number	Date	Top of Casing Elevation	Water Level
OW1-86	7/10/86	608.99	593.22
	7/11/86	"	592.97
	7/15/86	610.62	592.45
	7/21/86	"	592.85
	7/29/86	"	592.59
	8/13/86	"	592.26
	12/8/86	"	597.80
	1/23/87	"	598.64
OW2-86	7/10/86	607.00	594.61
	7/11/86	"	593.80
	7/15/86	608.43	593.57
	7/21/86	"	593.82
	7/29/86	"	593.59
	8/12/86	"	593.22
	12/8/86	608.49	597.83
	1/23/87	"	598.52
OW3-86	7/10/86	603.54	591.27
	7/11/86	"	591.22
	7/15/86	604.67	591.11
	7/21/86	"	591.19
	7/29/86	"	590.89
	12/8/86	"	597.58
	1/23/87	"	598.01
OW4-86	7/15/86	607.06	594.21
	7/21/86	"	594.29
	7/29/86	"	594.00
	8/13/86	"	593.48
	12/8/86	607.05	599.50
	1/23/87	"	599.80
OW5-86	12/8/86	603.33	597.52
	1/23/87	"	597.40

WATER LEVEL ELEVATIONS
UNION CARBIDE CORPORATION

Well Number	Date	Top of Casing Elevation	Water Level
OW6-86	12/8/86	607.09	601.49
	1/23/87	"	601.67
WW1-86	12/8/86	Dry	
	1/23/87	Dry	

ATTACHMENT 3

CHEMICAL ANALYSIS RESULTS
(GROUNDWATER & SURFACE WATER)

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W1 3/29/79	W1 4/30/79	W1 11/21/79	W1 6/09/80	W1 11/17/80	
Ammonia	mg/l	0.63	10.0	14.4	9.1	28	
Nitrite	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrate	mg/l	2.0	4.8	<0.2	0.45	0.32	
BOD (5 Day)	mg/l	37.5	13	22		6	
COD	mg/l	344	71.8	160	67	48	
Kjeldahl Nitrogen	mg/l	1.1	7.7	24.0	--	—	
Phosphorus	mg/l	1.1	5.0	0.62	<0.02	0.45	
Sulfate	mg/l	7.8	<1	6.0	11	3.0	
Methylene	mg/l	<0.4	—	<0.4	<0.1	<0.1	
Alkalinity	mg/l	330	780	898	770	850	
Total Solids	mg/l	1,870	1,570	1,500	1,400	1,200	
Color		--	100	—	27	35	
Total Hardness	mg/l	1,260	920	775	560	540	
Chloride	mg/l	260	190	145	103	85	
Total Coliform	MPN	430	750	2	<2	0	
Organic Carbon	mg/l	93	26.1	70	19	210	
Phenols	mg/l	0.09	<0.01	0.080	0.025	0.03	
pH	Std.	7.84	8.13	8.52	8.10	8.33	
Conductance	umhos	1,540	1,480	1,310	1,520	2,150	
Carbon Chloroform	mg/l	10.8	26.9	2.0	3.1	<1	
Chlorinated Hydrocarbons	ug/l	2.1	6.5				
Aluminum	mg/l	52	7.4	56	4.6	0.3	
Arsenic	ug/l	11.4	6.4	5.3	10	8.0	
Chromium	mg/l	0.088	0.026	0.090	0.008	<0.005	
Copper	mg/l	0.635	0.103	0.783	0.043	0.006	
Lead	mg/l	.60	0.07	0.72	0.07	0.03	
Mercury	ug/l	36.6	17	13	3.0	<2	
Iron	mg/l	170	6.5	280	27	1.9	
Potassium	mg/l	70	110	66	64	330	
Sodium	mg/l	200	160	180	200	3,500	
Calcium	mg/l	66	46	99	28	110	
Silver	mg/l	0.011	<0.003	0.052	<0.005	<0.005	
Hexavalent Chromium	mg/l			0.090	--	--	
Halogenated Organic Scan	ug/l			1.80	4.6	0.91	

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W1 6/09/81	W1 12/9/81	W1 6/03/82	W1 12/3/82	W1 6/14/83	
Ammonia	mg/l	--	10				
Nitrite	mg/l	0.016	0.19				
Nitrate	mg/l	<0.1	0.47				
BOD (5 Days)	mg/l	<5	<2	<5	8	7.3	
COD	mg/l	41	33				
Kjeldahl Nitrogen	mg/l	2.4	9				
Phosphorus	mg/l	<0.02	0.16	1.6	<0.02	0.062	
Sulfate	mg/l	35	3.9	12	<1		
Methylene	mg/l	<0.03	<0.1				
Alkalinity	mg/l	890	660				
Total Solids	mg/l	1,100	1,100	1,400	975	960	
Color		40	20				
Total Hardness	mg/l	630	410				
Chloride	mg/l	87	75	95	100	82	
Total Coliform	100ml	<3	3.6				
Organic Carbon	mg/l	16	11	17	15	28	
Phenols	mg/l	<0.01	0.012	0.090	<0.01	<0.01	
pH	Std.	7.77	8.63				
Conductance	umhos	1,730	1,250	1,400	1,200	1,500	
Carbon Chloroform	mg/l	14	7.2				
Chlorinated Hydrocarbons	ug/l						
Aluminum	mg/l	<0.2	0.4				
Arsenic	ug/l	6.1	<5				
Chromium	mg/l	<0.005	<0.005				
Copper	mg/l	0.054	0.010				
Lead	mg/l	<0.03	0.05				
Mercury	ug/l	<3	<1	8.0	<0.0008	<0.0006	
Iron	mg/l	16	3.0	230	26	18	
Potassium	mg/l	2.2	59				
Sodium	mg/l	47	170				
Calcium	mg/l	32	10				
Silver	mg/l	0.015	<0.005				
Hexavalent Chromium	mg/l	<0.005	<0.005				
Halogenated Organic Scan	ug/l	21	1.3				

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W1 12/2/83	W1 6/08/84	W1 12/5/84	W1 6/14/85	W1 9/11/85	W1 12/5/85
Ammonia	mg/l						
Nitrite	mg/l						
Nitrate	mg/l						
BOD (5 Days)	mg/l	<2	13	<2		8.2	2.0
COD	mg/l						
Kjeldahl Nitrogen	mg/l						
Phosphorus	mg/l	0.33	0.44	0.24		0.40	0.28
Sulfate	mg/l	19	1.2	8.8		<1	5.5
Methylene	mg/l						
Alkalinity	mg/l						
Total Solids	mg/l	950	1,070	1,010		918	1,040
Color							
Total Hardness	mg/l						
Chloride	mg/l	93	100	<1		75	81
Total Coliform	MPN						
Organic Carbon	mg/l	13	23	15	12	40	111
Phenols	mg/l	0.011	<0.01	<0.01	<0.01	0.011	1.69
pH	Std.			7.68		8.19	7.63
Conductance	umhos	1,440	1,900	1,400	760	1,300	1,700
Carbon Chloroform	mg/l						
Chlorinated Hydrocarbons	ug/l						
Aluminum	mg/l						
Arsenic	ug/l						
Chromium	mg/l						
Copper	mg/l						
Lead	mg/l						
Mercury	ug/l	<0.001	<0.001	<0.0005		0.0022	0.0009
Iron	mg/l	2.6	6.4	1.5		4.0	3.75
Potassium	mg/l						
Sodium	mg/l						
Calcium	mg/l						
Silver	mg/l						
Hexavalent Chromium	mg/l						
Halogenated Organic Scan	ug/l						

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W2 3/29/79	W2 11/21/79	W2 6/09/80	W2 6/09/81	W2 12/9/81	W2 5/28/82
Ammonia	mg/l	1.8	<0.5	<1	<0.5	—	
Nitrite	mg/l	<0.01	<0.01	<0.01	<0.01	0.19	
Nitrate	mg/l	4.5	0.3	4.1	<0.1	2.7	
BOD (5 Days)	mg/l	<50	8	140	<5	—	--
COD	mg/l	38.4	174	180	32	--	
Kjeldahl Nitrogen	mg/l	—	2.8	<1	<0.5	—	
Phosphorus	mg/l	0.25	0.56	<0.02	<0.02	—	0.74
Sulfate	mg/l	700	750	830	330	130	69
Methylene	mg/l	<0.4	<0.4	<0.2	0.058	—	
Alkalinity	mg/l	820	804	560	170	190	
Total Solids	mg/l	—	2,480	4,600	960	—	3,700
Color		—	--	50	17.5	30	
Total Hardness	mg/l	1,630	1,750	1,680	550	--	
Chloride	mg/l	180	121	109	83	45	170
Total Coliform	MPN	<30	<2	<2	9	43	
Organic Carbon	mg/l	16.7	130	72	13	--	15
Phenolics	mg/l	0.01	0.040	0.26	<0.01	<0.01	--
pH	Std.	6.83	7.91	7.61	7.13	7.32	
Conductance	umhos	1,370	3,120	2,200	1,050	580	470
Carbon Chloroform	mg/l	—	1.6	8.0	<2	--	
Chlorinated Hydrocarbons	ug/l	0.7					
Aluminum	mg/l	5.0	0.6	3.1	<0.2	0.4	
Arsenic	ug/l	<1.7	<1.4	<2	<5	<5	
Chromium	mg/l	0.008	<0.002	<0.003	<0.005	<0.005	
Copper	mg/l	0.028	<0.003	0.008	0.050	<0.01	
Lead	mg/l	<0.02	0.03	<0.02	<0.03	<0.04	
Mercury	ug/l	<0.7	<0.4	2.9	<3	2.6	11
Iron	mg/l	33	11.7	80	9.3	29	2,100
Potassium	mg/l	6.5	6.4	7.9	54	4.5	
Sodium	mg/l	68	85	100	51	17	
Calcium	mg/l	17	275	100	70	50	
Silver	mg/l	<0.003	<0.005	<0.005	0.016	<0.005	
Hexavalent Chromium	mg/l		<0.002	--	<0.005	<0.005	
Halogenated Organic Scan	ug/l		1.47	8.8	—	--	

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W3 3/29/79	W3 11/21/79	W3 6/09/80	W3 6/09/81	W3 12/9/81	
Ammonia	mg/l	0.47	0.5	<0.5	<0.5	<0.1	
Nitrite	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrate	mg/l	1.0	<0.2	0.17	<0.1	2.7	
BOD (5 Days)	mg/l	<50	5	<2	<5	<2	
COD	mg/l	<10	30	<10	6.8	8	
Kjeldahl Nitrogen	mg/l	0.56	2.0	<0.50	<0.5	0.2	
Phosphorus	mg/l	0.04	0.06	0.03	<0.02	<0.02	
Sulfate	mg/l	650	400	260	120	110	
Methylene	mg/l	<0.4	<0.4	<0.1	<0.2	<0.1	
Alkalinity	mg/l	275	260	280	240	240	
Total Solids	mg/l	1,360	952	700	440	600	
Color		70	—	0	30	50	
Total Hardness	mg/l	940	540	480	270	270	
Chloride	mg/l	22	14	9.3	5.8	7.5	
Total Coliform	MPN	>24,000	2	<2	15	9.1	
Organic Carbon	mg/l	9.0	35	24	3.1	<1	
Phenolics	mg/l	<0.01	<0.010	0.053	<0.01	<0.01	
pH	Std.	7.38	7.93	7.94	7.90	8.23	
Conductance	umhos	2,100	1,340	890	540	560	
Carbon Chloroform	mg/l	--	<1.0	5.2	<1	<2	
Chlorinated Hydrocarbons	ug/l	1.0					
Aluminum	mg/l	1.2	<0.1	1.4	<0.2	0.4	
Arsenic	ug/l	<1.7	<1.4	<1	<5	<5	
Chromium	mg/l	<0.003	<0.002	<0.003	<0.005	<0.005	
Copper	mg/l	0.008	<0.003	0.007	0.042	<0.01	
Lead	mg/l	<0.02	<0.02	<0.02	<0.03	<0.04	
Mercury	ug/l	<0.7	<1.0	<1	<3	<1	
Iron	mg/l	8.8	0.27	6.4	70	3.0	
Potassium	mg/l	5.5	4.2	4.1	6.0	3.8	
Sodium	mg/l	30	75	66	14	61	
Calcium	mg/l	55	14	39	42	28	
Silver	mg/l	<0.003	<0.005	<0.005	<0.005	<0.005	
Hexavalent Chromium	mg/l		<0.002	--	<0.005	<0.005	
Halogenated Organic Scan	ug/l		1.54	0.81	22	1.1	

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W3 6/03/82	W3 12/6/82	W3 6/14/83	W3 12/02/83	W3 6/08/84	W3 12/4/84
Ammonia	mg/l						
Nitrite	mg/l						
Nitrate	mg/l						
BOD (5 Days)	mg/l	<5	<4	<2	<2	9.6	<2
COD	mg/l						
Kjeldahl Nitrogen	mg/l						
Phosphorus	mg/l	0.03	<0.02	0.048	0.78	<0.05	<0.05
Sulfate	mg/l	74	180		9.2	45	121
Methylene	mg/l						
Alkalinity	mg/l						
Total Solids	mg/l	350	850	500	500	383	518
Color							
Total Hardness	mg/l						
Chloride	mg/l	6.7	11	3.7	5.4	2.4	2.6
Total Coliform	MPN						
Organic Carbon	mg/l	5	4.0	23	2.5	9.0	1.0
Phenolics	mg/l	<0.1	<0.01	<0.01	0.050	<0.01	<0.01
pH	Std.						6.60
Conductance	umhos	520	1,080	550	580	680	740
Carbon Chloroform	mg/l						
Chlorinated Hydrocarbons	ug/l						
Aluminum	mg/l						
Arsenic	ug/l						
Chromium	mg/l						
Copper	mg/l						
Lead	mg/l						
Mercury	ug/l	<0.5	<0.0008	<0.0006	<0.001	<0.001	<0.0005
Iron	mg/l	22	35	28	16	5.3	3.3
Potassium	mg/l						
Sodium	mg/l						
Calcium	mg/l						
Silver	mg/l						
Hexavalent Chromium	mg/l						
Halogenated Organic Scan	ug/l						

ANALYTICAL RESULTS
UNION CARBIDE CORPORATION - WELL MONITORING

ANALYTICAL PARAMETER	UNITS	W3 6/14/85	W3 12/5/85				
Ammonia	mg/l						
Nitrite	mg/l						
Nitrate	mg/l						
BOD (5 Days)	mg/l		<2				
COD	mg/l						
Kjeldahl Nitrogen	mg/l						
Phosphorus	mg/l		0.085				
Sulfate	mg/l		44				
Methylene	mg/l						
Alkalinity	mg/l						
Total Solids	mg/l		608				
Color							
Total Hardness	mg/l						
Chloride	mg/l		<1				
Total Coliform	MPN						
Organic Carbon	mg/l	2.3	44				
Phenolics	mg/l	<0.01	0.085				
pH	Std.		7.70				
Conductance	umhos	1,860	510				
Carbon Chloroform	mg/l						
Chlorinated Hydrocarbons	ug/l						
Aluminum	mg/l						
Arsenic	ug/l						
Chromium	mg/l						
Copper	mg/l						
Lead	mg/l						
Mercury	ug/l		0.0017				
Iron	mg/l		10				
Potassium	mg/l						
Sodium	mg/l						
Calcium	mg/l						
Silver	mg/l						
Hexavalent Chromium	mg/l						
Halogenated Organic Scan	ug/l						

ANALYTICAL RESULTS - UNION CARBIDE CORPORATION

ANALYTICAL PARAMETER	UNITS	OW1 8/14/86		OW2 8/14/86		OW3 8/22/86		OW4 8/22/86		BW5-86 11/8/86		BW6-86 11/13/86	
BENZENE	ug/l	<2		<2		<2		<2		<10		<10	
BROMODICHLOROMETHANE	ug/l	<2		<2		<2		<2		<10		<10	
BROMOFORM	ug/l	<4		<4		<4		<4		<10		<10	
BROMOETHANE	ug/l	<2		<2		<2		<2		<10		<10	
CARBON TETRACHLORIDE	ug/l	<4		<4		<4		<4		<10		<10	
CHLOROBENZENE	ug/l	<2		<2		<2		<2		<10		<10	
CHLOROETHANE	ug/l	24		<4		<4		<4		<10		<10	
2-CHLOROETHYLVINYL ETHER	ug/l	<4		<4		<4		<4		<10		<10	
CHLOROFORM	ug/l	<2		<2		<2		<2		8		<10	
CHLOROMETHANE	ug/l	<2		<2		<2		<2		<10		<10	
DIBROMOCHLOROMETHANE	ug/l	<2		<2		<2		<2		<10		<10	
1,2-DICHLOROBENZENE	ug/l	<2		<2		<2		<2		<10		<10	
1,4-DICHLOROBENZENE	ug/l	<2		<2		<2		<2		<10		<10	
1,1-DICHLOROETHANE	ug/l	<4		<4		<4		<4		<10		<10	
1,2-DICHLOROETHANE	ug/l	<2		<2		<2		<2		<10		<10	
1,1-DICHLOROETHENE	ug/l	<2		<2		<2		<2		<10		<10	
TRANS-1,2-DICHLOROETHENE	ug/l	<2		<2		4		32		<10		<10	
1,2-DICHLOROPROPANE	ug/l	<2		<2		<2		<2		<10		<10	
CIS-1,3-DICHLOROPROPENE	ug/l	<3		<3		<3		<3		<10		<10	
TRANS-1,3-DICHLOROPROPRENE	ug/l	<3		<3		<3		<3		<10		<10	
ETHYLBENZENE	ug/l	<2		<2		<2		<2		<10		<10	
METHYLENE CHLORIDE	ug/l	<5		<5		<5		<5		<10		<10	
1,1,2,2-TETRACHLOROETHANE	ug/l	<2		<2		<2		<2		<10		<10	
TETRACHLOROETHENE	ug/l	<2		<2		<2		52		<10		<10	
TOLUENE	ug/l	<2		<2		<2		<2		<10		<10	
1,1,1-TRICHLOROETHANE	ug/l	<2		<2		<2		<2		<10		<10	
1,1,2-TRICHLOROETHANE	ug/l	<2		<2		<2		<2		<10		<10	
TRICHLOROETHENE	ug/l	<2		<2		<2		9		<10		<10	
VINYL CHLORIDE	ug/l	<2		<2		8		52		<10		<10	
ACETONE	ug/l	<10		<10		<10		<10		—		—	
2-BUTANONE	ug/l	<10		<10		<10		<10		—		—	
CARBON DISULFIDE	ug/l	<2		<2		<2		<2		—		—	
2-HEXANONE	ug/l	<10		<10		<10		<10		—		—	
4-METHYL-2-PENTANONE	ug/l	<10		<10		<10		<10		—		—	
STYRENE	ug/l	<2		<2		<2		<2		—		—	
VINYL ACETATE	ug/l	<2		<2		<2		<2		—		—	
O,P-XYLENES	ug/l	<5		<5		<5		<5		—		—	
M-XYLENES	ug/l	<5		<5		<5		<5		—		—	

ANALYTICAL RESULTS - UNION CARBIDE CORPORATION

ANALYTICAL PARAMETER	UNITS	OW1 8/14/86		OW2 8/14/86		OW3 8/22/86		OW4 8/22/86		BW5-86 11/8/86		BW6-86 11/13/86	
ACENAPHTHENE	ug/l	<10		<10		<10		<10		<10		<10	
ACENAPHTHALENE	ug/l	<10		<10		<10		<10		<10		<10	
ANTHRACENE	ug/l	<10		<10		<10		<10		<10		<10	
BENZIDINE	ug/l	<50		<50		<50		<50		<50		<50	
BENZO(A)ANTHRACENE	ug/l	<10		<10		<10		<10		<10		<10	
BENZO(B)FLUORANTHENE	ug/l	<10		<10		<10		<10		<10		<10	
BENZO(K)FLUORANTHENE	ug/l	<10		<10		<10		<10		<10		<10	
BENZO(GHI)PERYLENE	ug/l	<10		<10		<10		<10		<10		<10	
BENZO(A)PYRENE	ug/l	<10		<10		<10		<10		<10		<10	
BIS(2-CHLOROETYOXY)METHANE	ug/l	<10		<10		<10		<10		<10		<10	
BIS(2-CHLOROETHYL) ETHER	ug/l	<10		<10		<10		<10		<10		<10	
BIS(2-CHLOROISOPROPYL) ETHER	ug/l	<10		<10		<10		<10		<10		<10	
BIS(2-ETHYLHEXYL)PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
4-BROMOPHENYL PHENYL ETHER	ug/l	<10		<10		<10		<10		<10		<10	
BUTYL BENZYL PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
2-CHLORONAPHTHALENE	ug/l	<10		<10		<10		<10		<10		<10	
4-CHLOROPHENYL PHENYL ETHER	ug/l	<10		<10		<10		<10		<10		<10	
CHRYSENE	ug/l	<10		<10		<10		<10		<10		<10	
DIBENZO(A,H)ANTHRACENE	ug/l	<10		<10		<10		<10		<10		<10	
BI-N-BUTYL PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
1,2-DICHLOROBENZENE	ug/l	<10		<10		<10		<10		<10		<10	
1,3-DICHLOROBENZENE	ug/l	<10		<10		<10		<10		<10		<10	
1,4-DICHLOROBENZENE	ug/l	<10		<10		<10		<10		<10		<10	
3,3'-DICHLOROBENZIDINE	ug/l	<50		<50		<50		<50		<50		<50	
DIETHYL PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
DIMETHYL PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
2,4-DINITROTOLUENE	ug/l	<10		<10		<10		<10		<10		<10	
2,6-DINITROTOLUENE	ug/l	<10		<10		<10		<10		<10		<10	
DI-N-OCTYL PHTHALATE	ug/l	<10		<10		<10		<10		<10		<10	
FLUORANTHENE	ug/l	<10		<10		<10		<10		<10		<10	
FLUORENE	ug/l	<10		<10		<10		<10		<10		<10	
HEXACHLOROBENZENE	ug/l	<10		<10		<10		<10		<10		<10	
HEXACHLOROBUTADIENE	ug/l	<10		<10		<10		<10		<10		<10	
HEXACHLOROCYCLOPENTADIENE	ug/l	<10		<10		<10		<10		<10		<10	
HEXACHLOROETHANE	ug/l	<10		<10		<10		<10		<10		<10	
IDENO(1,2,3-CD)PYRENE	ug/l	<10		<10		<10		<10		<10		<10	
ISOPHORONE	ug/l	<10		<10		<10		<10		<10		<10	
NAPHTHALENE	ug/l	<10		<10		<10		<10		<10		<10	
NITROBENZENE	ug/l	<10		<10		<10		<10		<10		<10	
N-NITROSODIMETHYLAMINE	ug/l	<10		<10		<10		<10		<10		<10	
N-NITRODOSIPHENYLAMINE	ug/l	<10		<10		<10		<10		<10		<10	
N-NITROSODI-N-PROPYLAMINE	ug/l	<10		<10		<10		<10		<10		<10	

ANALYTICAL RESULTS - UNION CARBIDE CORPORATION

ANALYTICAL PARAMETER	UNITS	OW1 8/14/86		OW2 8/14/86		OW3 8/22/86		OW4 8/22/86		BW5-86 11/8/86		BW6-86 11/13/86	
4-CHLORO-3-METHYLPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
2-CHLOROPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
2,4-DICHLOROPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
2,4-DIMETHYLPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
2,4-DINITROPHENOL	ug/l	<50		<50		<50		<50		<50		<50	
2-METHYL-4,6-DINITROPHENOL	ug/l	<50		<50		<50		<50		<50		<50	
2-NITROPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
4-NITROPHENOL	ug/l	<50		<50		<50		<50		<50		<50	
PENTACHLOROPHENOL	ug/l	<50		<50		<50		<50		<50		<50	
PHENOL	ug/l	<10		<10		<10		<10		<10		<10	
2,4,6-TRICHLOROPHENOL	ug/l	<10		<10		<10		<10		<10		<10	
ALDRIN	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ALPHA-BHC	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
BETA-BHC	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
LINDANE	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
DELTA-BHC	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
CHLORDANE	ug/l	<15		<5		<2		<2		<2		<1	
4,4'-DDD	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
4,4'-DDE	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
4,4'-DDT	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
DIELDRIN	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ENDOSULFAN I	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ENDOSULFAN II	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ENDOSULFAN SULFATE	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ENDRIN	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
ENDRIN ALDEHYDE	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
HEPTACHLOR	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
HEPTACHLOR EPOXIDE	ug/l	<2		<1		<0.5		<0.5		<0.2		<0.5	
TOXAPHENE	ug/l	<15		<5		<2		<2		<2		<5	
METHOXYCHLOR	ug/l	<2		<1		<2		<2		<2		--	
PCB-1016	ug/l	<1		<2		<1		<2		<1		<1	
PCB-1221	ug/l	<1		<2		<1		<2		<1		<1	
PCB-1232	ug/l	<1		<2		<1		<2		<1		<1	
PCB-1242	ug/l	<1		<2		<1		<2		<1		<1	
PCB-1248	ug/l	<1		<2		<1		<2		<1		<1	
PCB-1260	ug/l	<1		<2		<1		<2		<1		<1	

* Metals figures as filtered, according to Mike [illegible] 12/23/86 mm

ANALYTICAL RESULTS - UNION CARBIDE CORPORATION

ANALYTICAL PARAMETER	UNITS	OW1 8/14/86	OW2 8/14/86	OW3 8/22/86	OW4 8/22/86	BW5-86 11/8/86	BW6-86 11/13/86
SILVER	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
ARSENIC	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
BERYLLIUM	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
CADMIUM	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CHROMIUM	mg/L	0.05	0.05	<0.02	<0.02	<0.02	<0.02
HEXAVALENT CHROME	mg/L	<0.02	<0.02	--	—	<0.02	<0.02
COPPER	mg/L	<0.01	0.02	<0.1	<0.01	<0.01	<0.01
MERCURY	mg/L	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
NICKEL	mg/L	0.05	<0.04	<0.04	<0.04	<0.04	<0.04
LEAD	mg/L	0.10	0.19	<0.05	<0.05	<0.05	<0.05
ANTIMONY	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
SELENIUM	mg/L	0.9	0.008	<0.005	<0.005	<0.005	<0.005
THALLIUM	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
ZINC	mg/L	4.9	25	0.37	0.30	0.17	0.03
CYANIDE	mg/L	0.01	<0.01	<0.005	<0.005	<0.005	<0.005
PHENOLS	mg/L	<0.25	<0.25	<0.005	<0.005	0.006	<0.005