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Program	IHS (IHS)
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Du Pont - Kentec

GROUNDWATER INVESTIGATIONS

PRESENTED

NOVEMBER 21, 1990

R-12003-K

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
KINSTON PLANT
KINSTON, NORTH CAROLINA 28501

TEXTILE FIBERS DEPARTMENT

Contact: Tom Mallison
522-6002

Lenoir

FOR IMMEDIATE RELEASE

The Kinston Du Pont Site announced plans for the groundwater remediation phase of its environmental improvement program at its Lenior County Kentec parts cleaning facility.

Since Du Pont purchased the facility and changed contractors several years ago, programs have been completed to deal with odors, noise, and truck traffic problems.

Groundwater contaminants have been found at several places on the site at depths of around 12 feet. The source of the contamination is material used in the cleaning process.

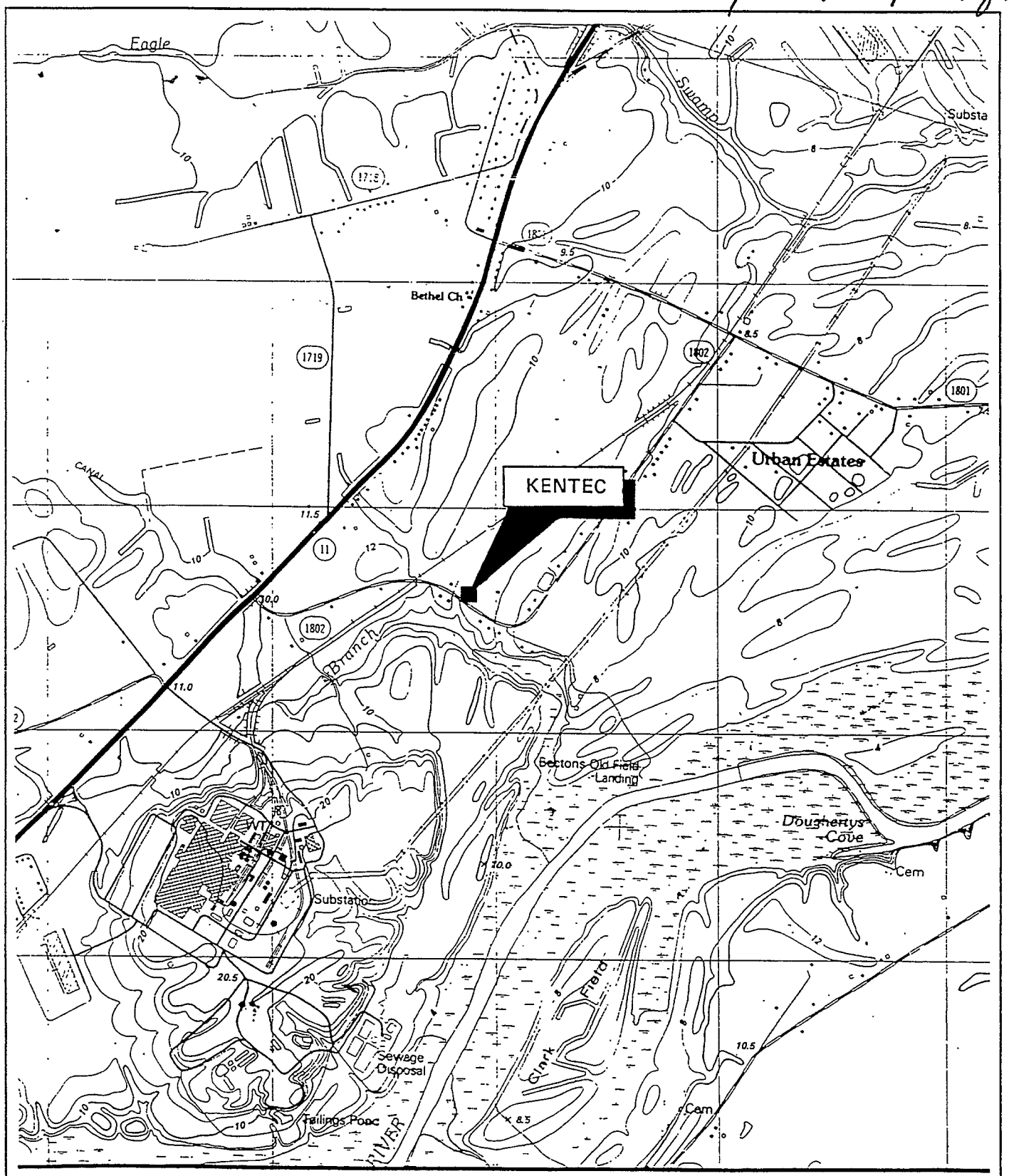
A drain system, which will capture the contaminated groundwater for treatment offsite, is planned to ensure none of this surficial groundwater leaves the Kentec site. Water at this level is not used for drinking water in this area and no traces of the contamination have been found in the Neuse River.

The only sign of contamination below the 12 feet level was a trace amount found at the base of a 100-feet abandoned site well with an apparent faulty well casing. Other similar wells in this vicinity have shown no contamination but additional testing will be performed.

North Carolina regulatory authorities have been informed of this situation and must approve any remedial action plan.

"Du Pont will continue this groundwater investigation until the impact of contamination is fully understood and resolved," said Site Environmental Manager Jerry Henderson.

54/7-9044 1 of 2



LEGEND

Source: USGS Grifton Quadrangle
North Carolina, 1983

Contour Interval — 2 Meters

SCALE:

1000 0 1000

1 inch equals 1000 feet

N

35° 20' 33"
77° 27' 57"

Figure 1-1
KENTEC SITE LOCATION

CH2M HILL

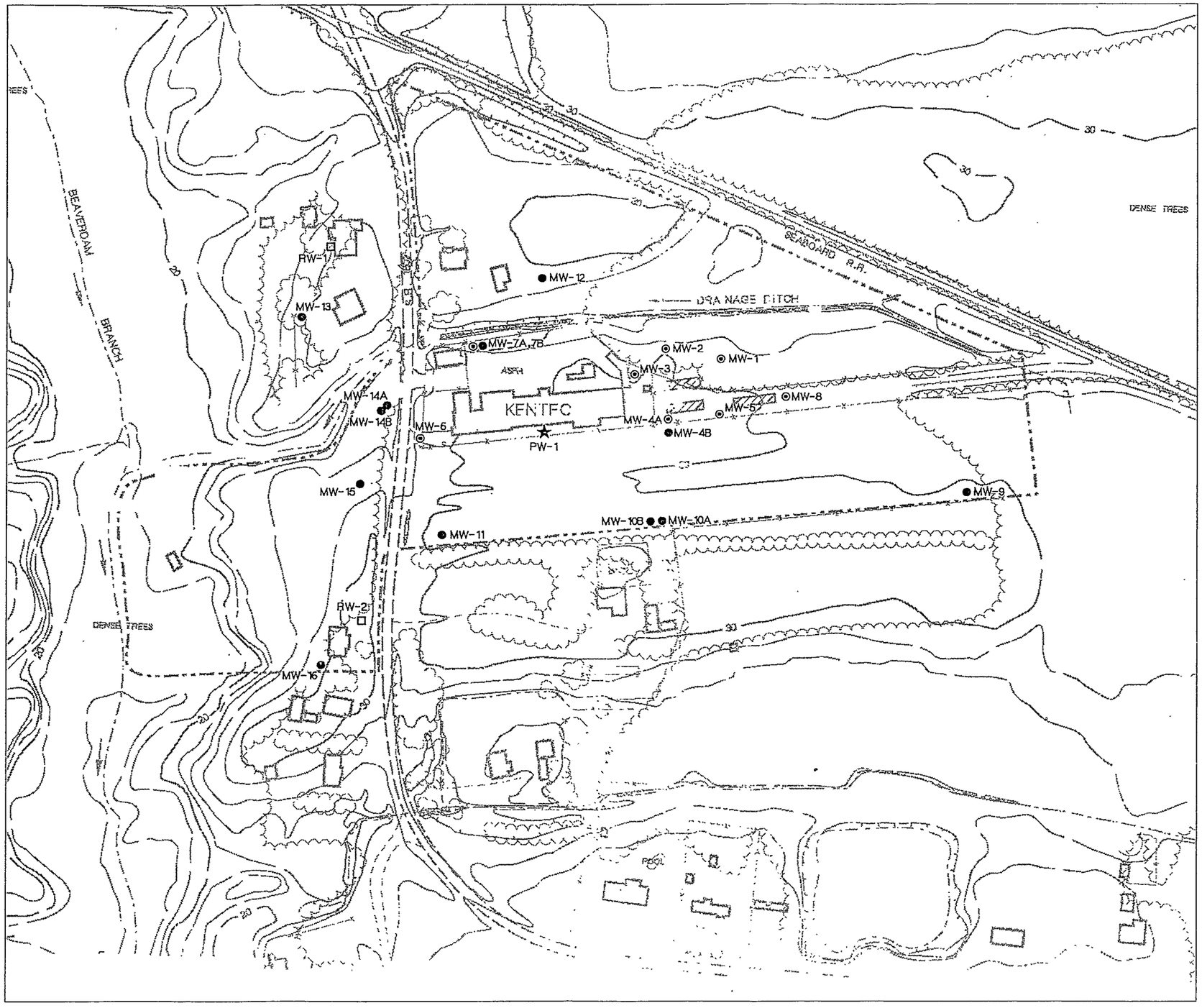
SUMMARY OF INVESTIGATIONS

- **Phase 1 (1987) - Identification of problem**
  - **6 shallow monitoring wells installed**
  - **groundwater and surface water sampling**

- **Phase 2 (1988) - Verification and limited characterization of problem**
  - **2 shallow monitoring wells installed**
  - **groundwater and surface water sampling**
  - **hydraulic conductivity measurements**

- **Phase 3 (1989/1990) - Characterization of onsite problem**
  - **topographic map**
  - **4 deep and 8 shallow monitoring wells installed**
  - **2 rounds of groundwater and surface water samplings**
  - **biomonitoring study**
  - **facility audit**
  - **begin investigations of remediation options**

11-19-90; 2398fc03.dgn



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LEGEND

- ⊙ PHASE 1 AND 2 MONITORING WELL
- ● PHASE 3 MONITORING WELL
- □ RESIDENTIAL WELL
- ★ PRODUCTION WELL (NOT IN USE)

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

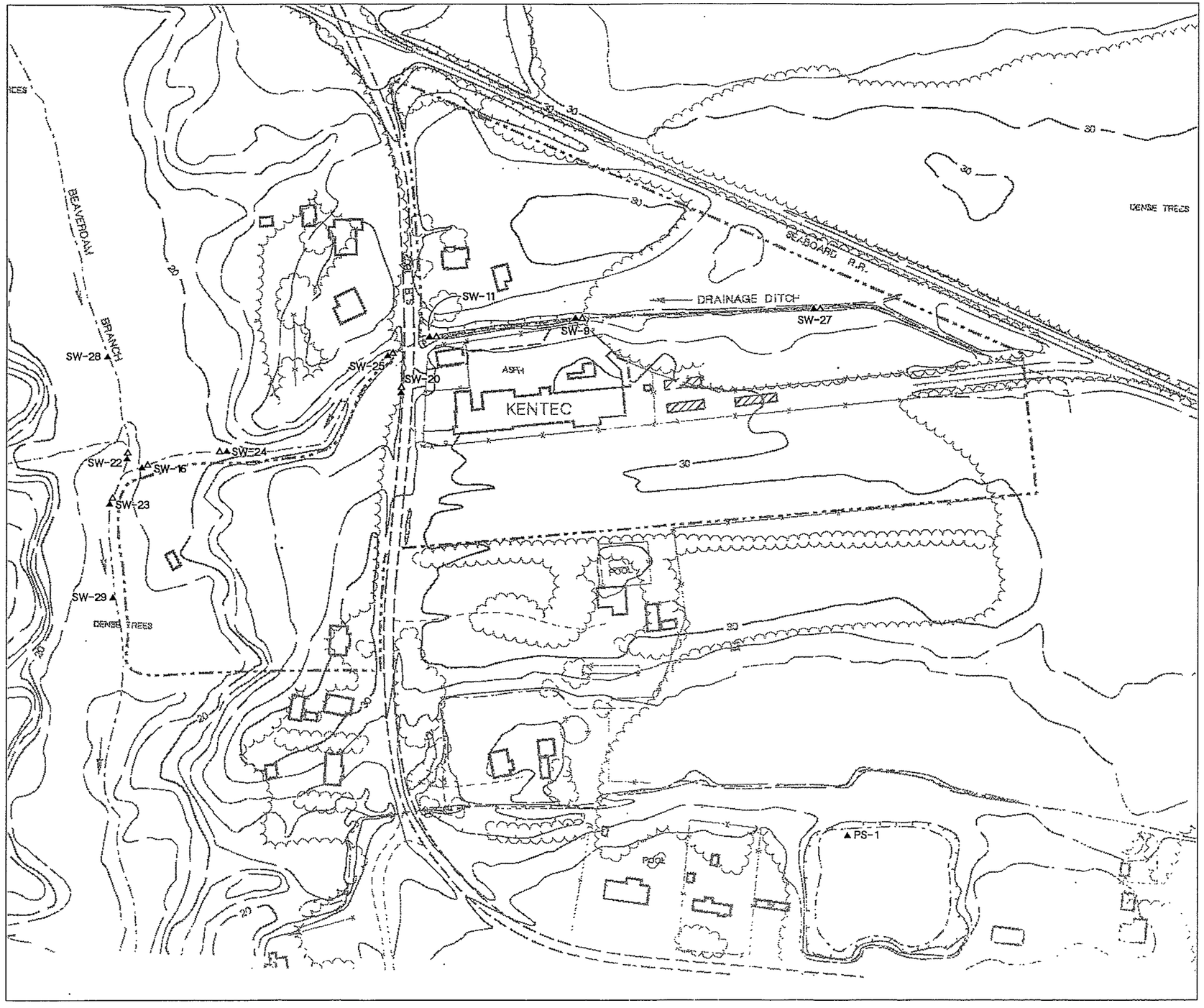
0 100 200 300

SCALE: 1"=200'

Figure 1-3

MONITORING WELL SYSTEM
Du Pont Kentec Facility

CH2M HILL



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LEGEND

▲ SURFACE WATER SAMPLE

△ SEDIMENT OR SOIL SAMPLE

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

0 100 200 300

SCALE: 1"=200'

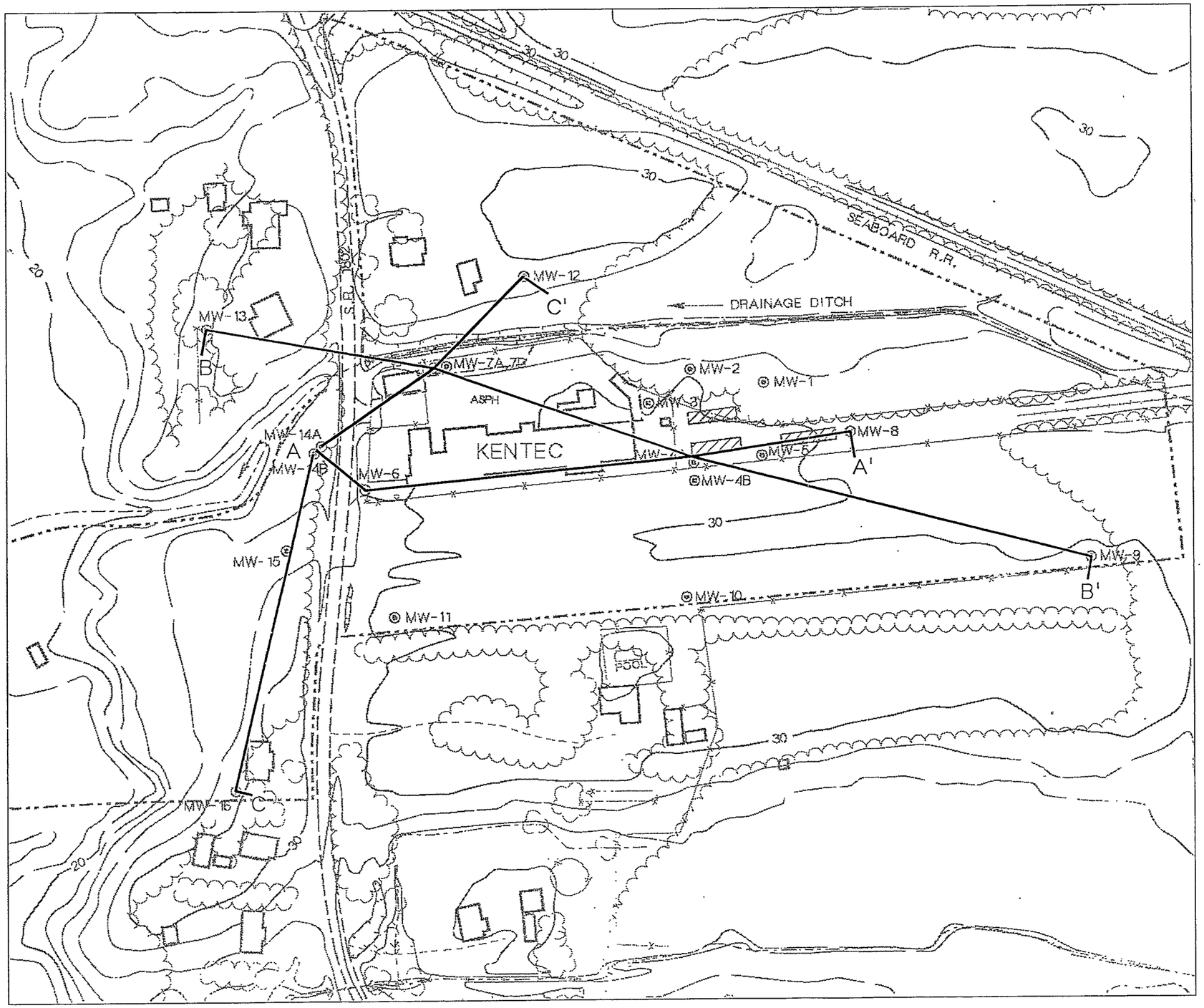
Figure 1-4

SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
Du Pont Kentec Facility

CH2M HILL

SITE GEOLOGY

- **Surficial deposits**
  - **sand with some clay and silt**
  - **5 to 10-feet thick**
- **Upper Peedee formation**
  - **silt with some clay and sand**
  - **20-feet thick**
- **Peedee aquifer**
  - **sands with some silt and clay**
  - **approximately 70 to 100-feet thick**



N

LEGEND

◎ MONITORING WELLS

0 75 150 225

SCALE: 1"=150'

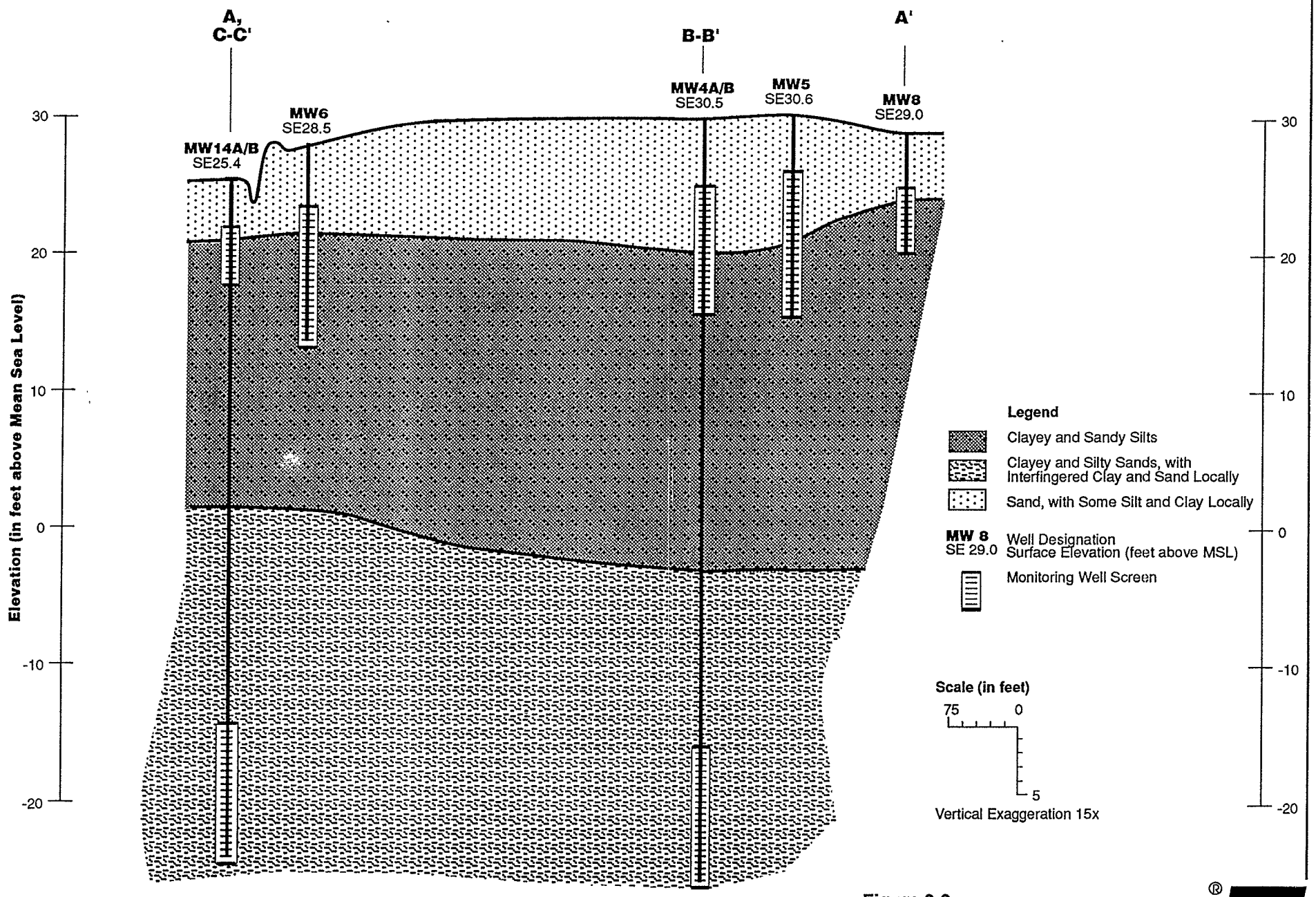
NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

Figure 2-1

LOCATION OF GEOLOGIC CROSS SECTIONS

Du Pont Kentec Facility

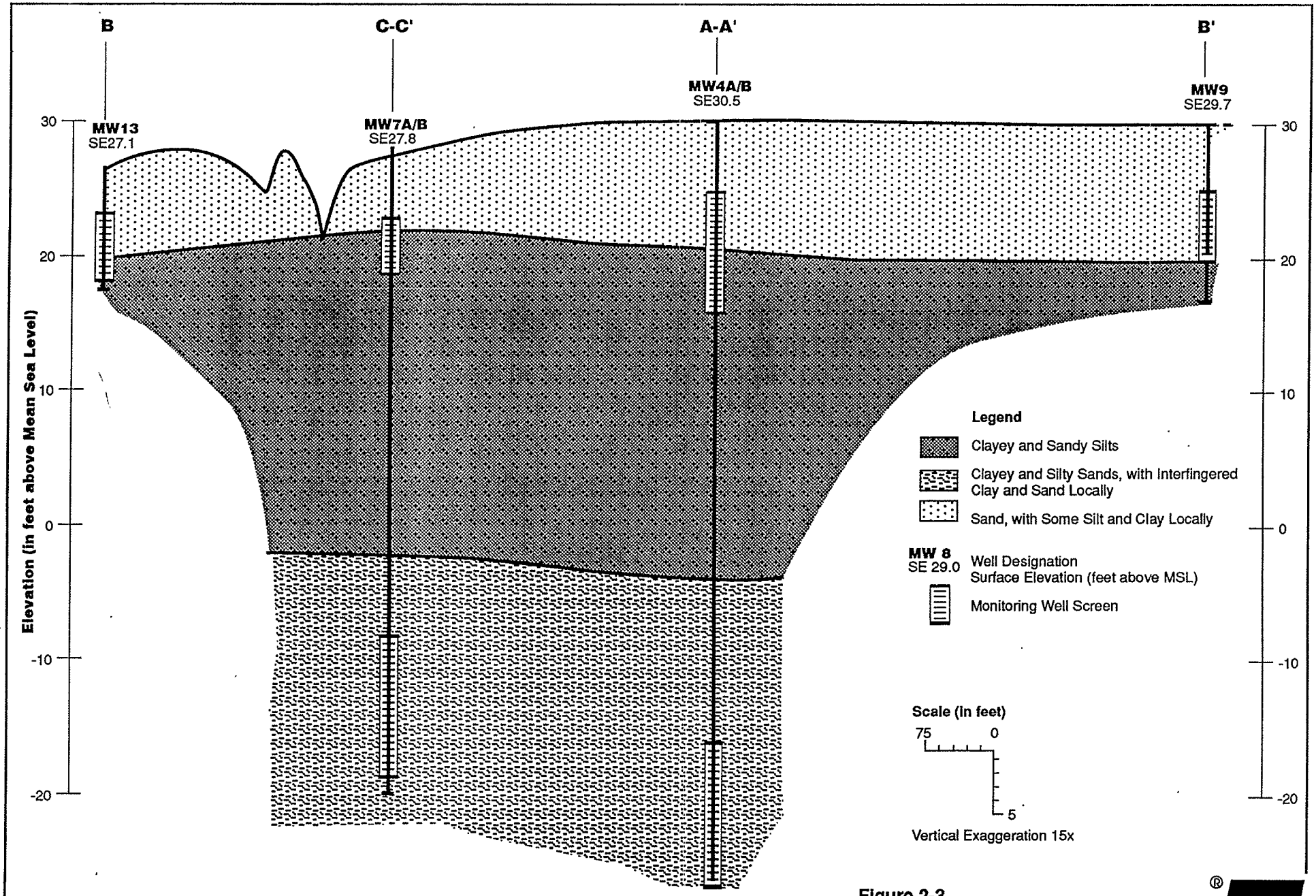
CH2M HILL



Note: This cross-section was interpolated between boring locations.
Actual conditions between boring may differ from those shown here.

Figure 2-2
GEOLOGIC UNIT CROSS SECTION A-A'
DuPont Kentec Facility

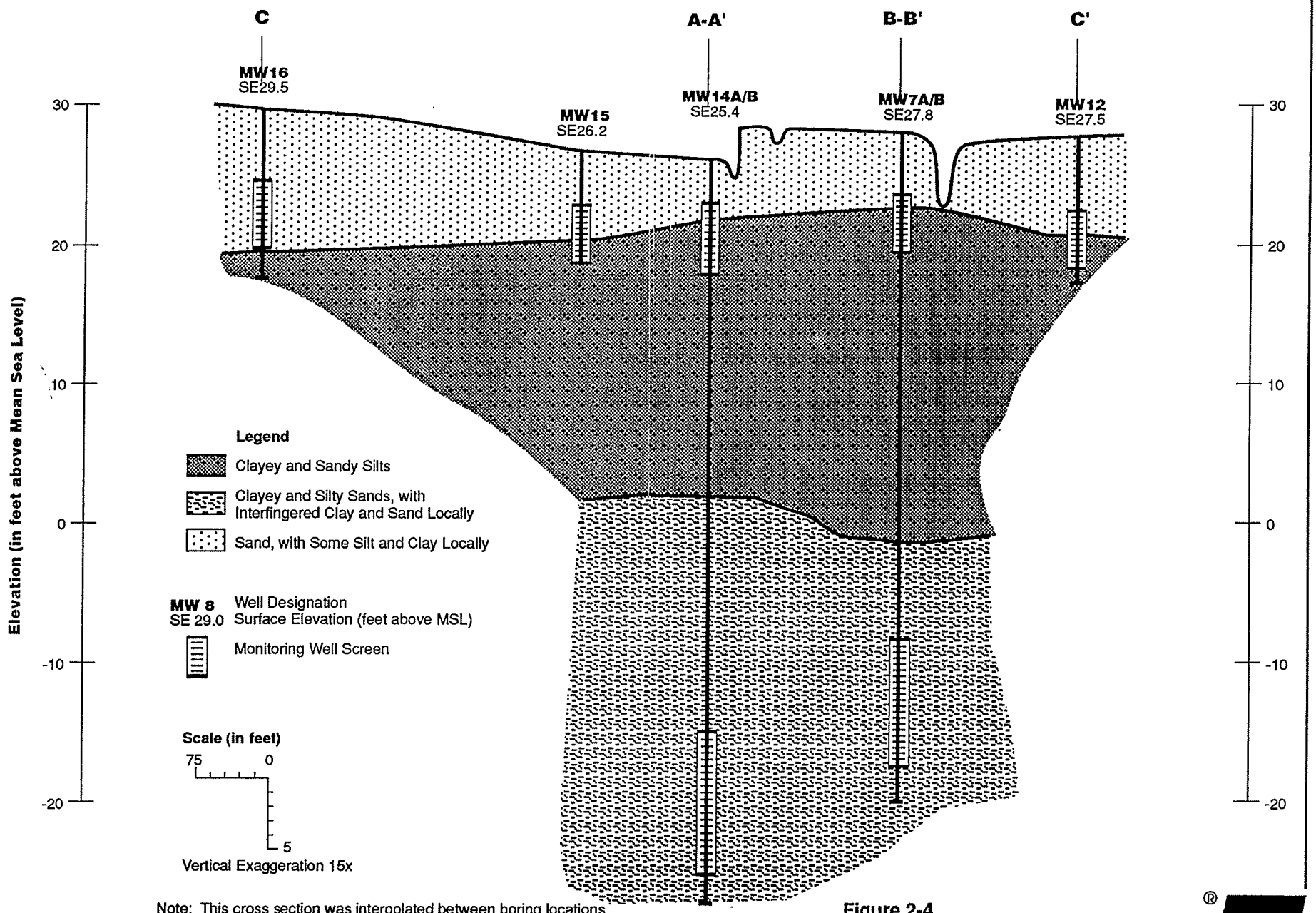
CH2M HILL



Note: This cross section was interpolated between boring locations.
Actual conditions between boring may differ from those shown here.

Figure 2-3
GEOLOGIC UNIT CROSS SECTION B-B'
DuPont Kentec Facility

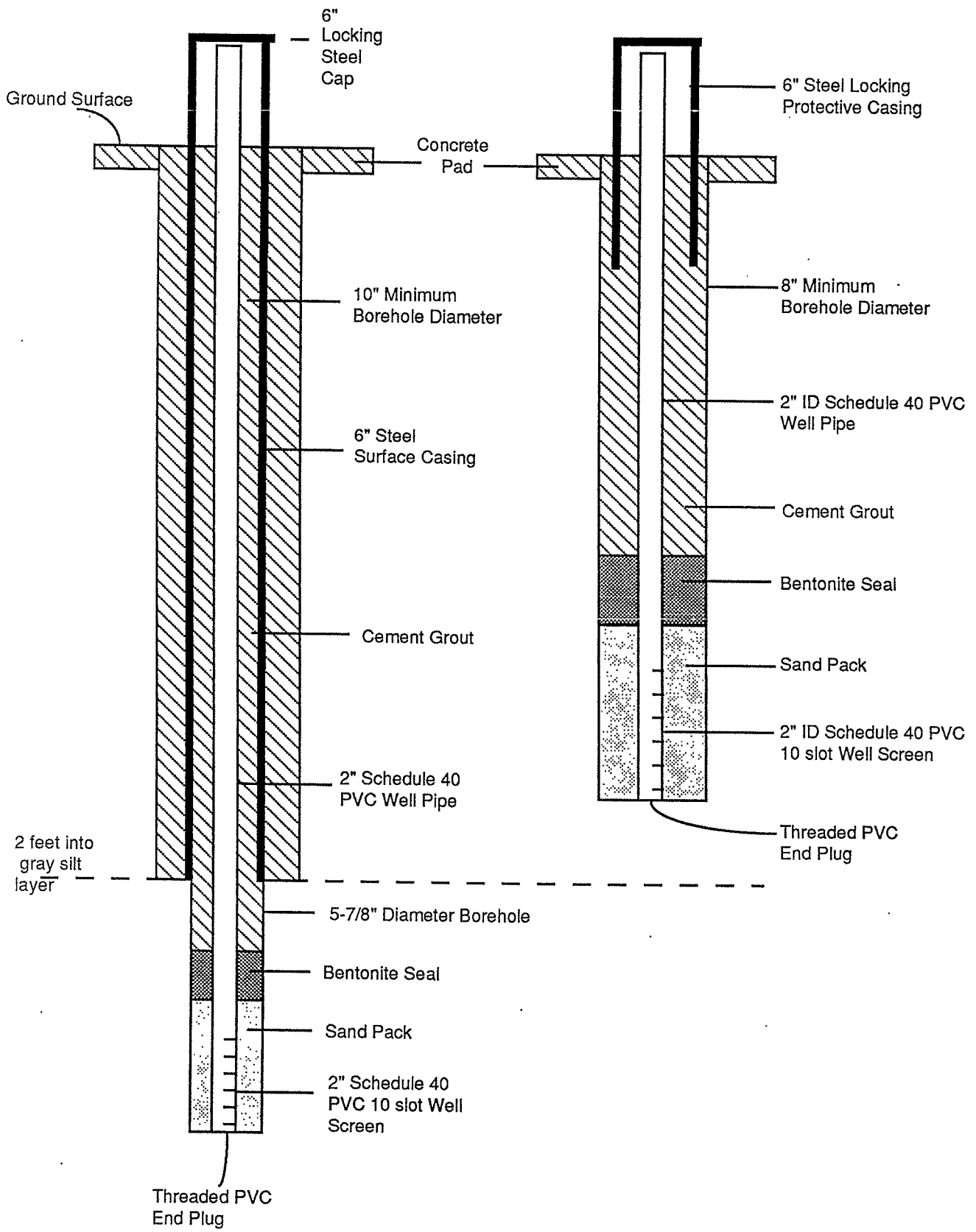
CH2M HILL



Note: This cross section was interpolated between boring locations.
Actual conditions between boring may differ from those shown here.

Figure 2-4
GEOLOGIC UNIT CROSS SECTION C-C'
DuPont Kentec Facility

CH2M HILL



Well Construction Diagram
Du Pont Kentec Plant

GROUNDWATER FLOW

Hydraulic Conductivities

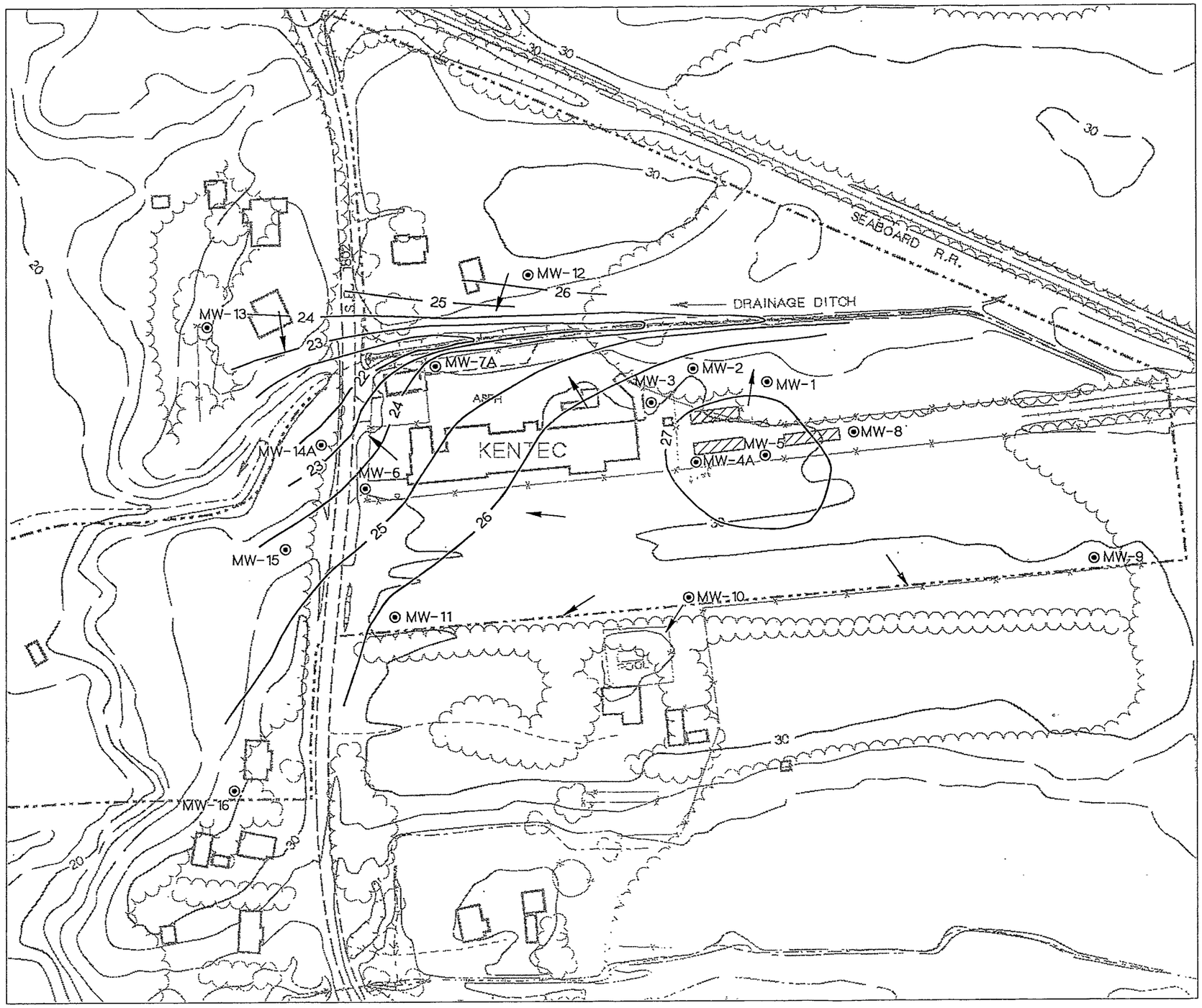
Horizontal: Surficial - 4 ft/day
Peedee aquifer - 20 ft/day

Vertical: Peedee silt - 0.002 ft/day

Groundwater Flow

Horizontal: Surficial - 60 ft/year (6 to 530 ft/year)
Peedee aquifer - 100 ft/year (6 to 200 ft/year)

Vertical: Peedee silt - 0.03 to 0.3 ft/year



LEGEND

- ⊙ SHALLOW MONITORING WELL
- —26— EQUIPOTENTIAL LINE (IN FEET ABOVE MSL)
- ← APPROXIMATE DIRECTION OF GROUNDWATER FLOW

EQUIPOTENTIAL LINES ARE INTERPOLATED BETWEEN DATA POINTS.

0 75 150 225

SCALE: 1"=150'

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

Figure 3-1

POTENTIOMETRIC SURFACE
IN SHALLOW ZONE
FEBRUARY 1, 1990
Du Pont Kentec Facility

CH2M HILL

SHALLOW GROUNDWATER ANALYTICAL RESULTS

- Primary compounds detected: 1,4-dioxane; 1,1-DCE; 1,1-DCA
- Compounds migrating to the drainage ditch system and offsite to the south
- No compounds detected northwest of drainage ditch
- Possible multiple sources
- Concentrations of compounds do not appear to have decreased

ORGANIC CHEMICAL ANALYSIS
SHALLOW GROUNDWATER SAMPLES (μg/l)

Analysis	MW1			MW3			MW4A			MW5			MW6		
	5/87	6/88	1/90	5/87	6/88	1/90	5/87	6/88	1/90	5/87	6/88	1/90	5/87	6/88	1/90
Acetone	35	<10	<10	900	<50	<10	3,000	60	32	140	<10	<10	1,300	22	11
Carbon Disulfide	<5	<5	<5	<5	<25	<5	<5	<25	20	<5	<5	<5	<5	6	20
Chloroethane	<5	<10	120	11	<50	80	1.5	<50	150	<5	<10	<10	43	<10	95
1,4-Dichlorobenzene	/	<5	<5	/	<25	<5	/	<5	<5	/	<5	<5	/	<5	<5
1,1-Dichloroethane	<5	5	41	1.6	280	73	<5	900	800	<5	<5	<5	11	<5	16
1,1-Dichloroethylene	<5	<5	11	<5	<25	13	<5	<25	82	<5	<5	<5	1.7	<5	15
1,4-Dioxane	1,700	2,000	1,200	1,000	5,900	1,100	1,900	5,400	2,300	300	230	<50	16,000	33,000	22,000
Methyl Ethyl Ketone	<10	<10	<10	<10	58	<10	<10	140	11	<10	<10	<10	130	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	6J	<10	<10	<10	<10	<10	<10
Triethylene Glycol (mg/l)	<10	<5	0.81	<10	<5	0.25	<10	<5	<0.25	<10	<5	<0.25	<10	<5	<0.25
TOC (mg/l)	110	24.9	70.1	65	55.6	26.8	83	313	352	26	19	68.5	609	100	69.1

<! = Below method detection limit shown.
"/" = Sample not taken or analysis not performed
"J" = Estimated value. Measured value is less than quantitative detection limit.
"B" = Compound was detected in associated laboratory blank.

WDCR414/137.51

Analysis	MW7A		MW8		MW9	MW10	MW11	MW12	MW13	MW14A	MW15	MW16
	6/88	1/90	6/88	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90	1/90
Acetone	<10	7J	<10	<5	5J	9J	13	<5	<5	<5	7J	5J
Carbon Disulfide	<5	<5	<5	4J	<5	<5	<5	<5	<5	<5	<5	<5
Chloroethane	<10	100	<10	12	<10	43	190	<10	<10	<10	74	<10
1,4-Dichlorobenzene	7	4J	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	9	10	<5	3J	<5	290	230	<5	<5	<5	13	<5
1,1-Dichloroethylene	<5	12	<5	<5	<5	34	75	<5	<5	<5	27	14
1,4-Dioxane	11,000	5,700	<50	360	49J	43J	55J	<50	<50	1,600	41J	16J
Methyl Ethyl Ketone	<10	<10	<10	<10	<10	7J	9J	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Triethylene Glycol (mg/l)	<5	<0.25	<5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	0.772	<0.25	<0.25
TOC (mg/l)	31.9	75.0	10.7	15	41	72.2	94.9	6.2	29.0	51.6	21.7	2.3

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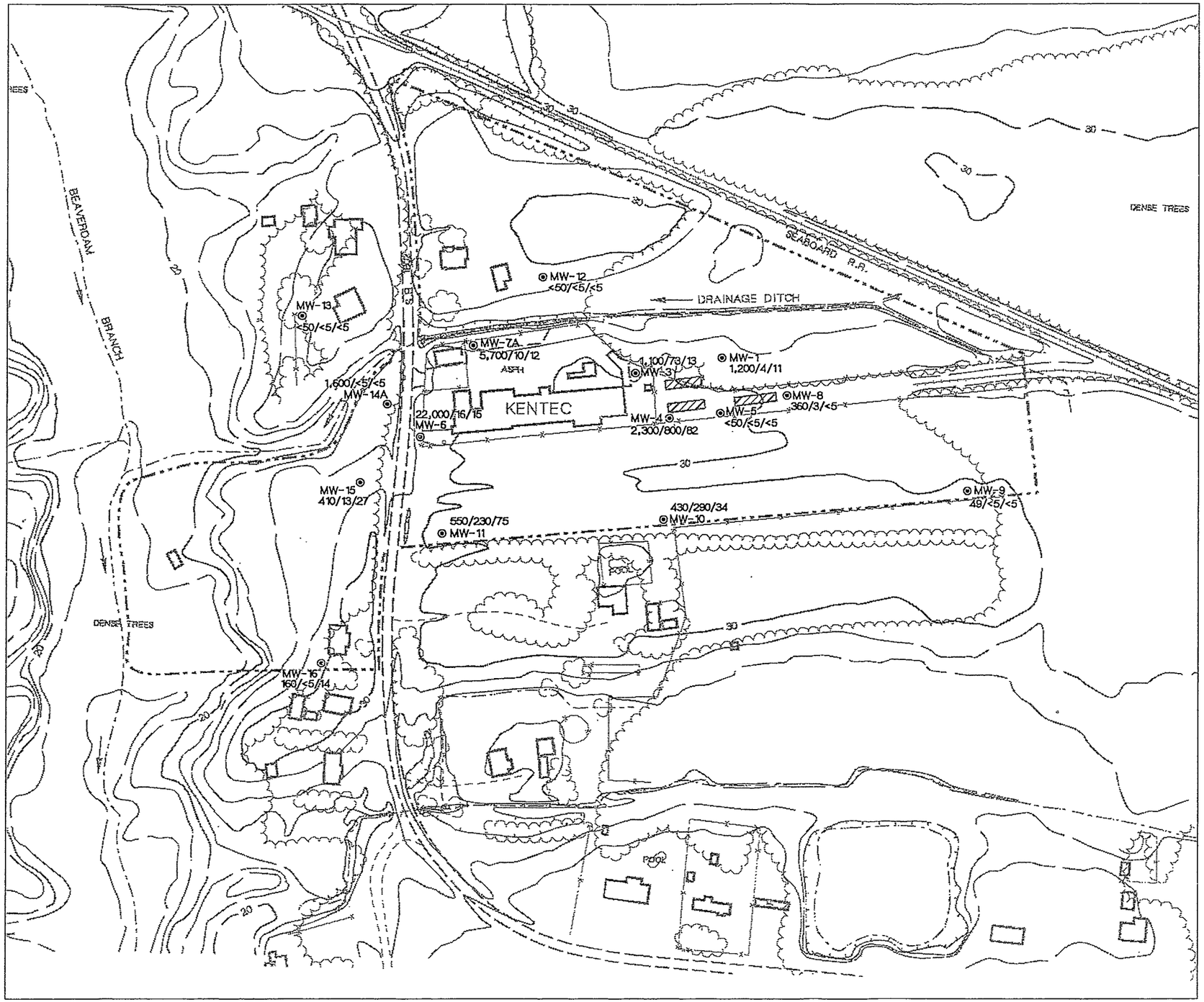

LEGEND

⊙ MONITORING WELL

1,100/73/13 1,4-DIOXANE/1,1-DICHLOROETHANE/ 1,1-DICHLOROETHYLENE

CONCENTRATIONS IN ug/l

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

0 100 200 300

SCALE: 1"=200'

Figure 4-3

CONCENTRATIONS OF 1,4-DIOXANE, 1,1-DICHLOROETHANE & 1,1-DICHLOROETHYLENE IN SHALLOW GROUNDWATER
JANUARY 1990
Du Pont Kentec Facility

CH2M HILL

PEEDEE AQUIFER GROUNDWATER ANALYTICAL RESULTS

- No compounds detected in Upper Peedee 50-foot monitoring wells
- No compounds detected in residential wells
- Low downward vertical groundwater flow rates suggest minimal migration of compounds through silt unit into Peedee Aquifer
- 1,4-Dioxane detected (approximately 100 ug/l) in onsite production well that is not in use

ORGANIC CHEMICAL ANALYSES
PEEDEE AQUIFER GROUNDWATER
(μg/l)

	Monitoring Wells							Residential Wells		Production Well	
	MW4B		MW7B		MW10B	MW14B		RW1	RW2	PW1	
Analysis	**1/90**	**7/90**	**1/90**	**7/90**	**8/90**	**1/90**	**7/90**	**1/90**	**1/90**	**8/90**	**10/90**
Acetone	5J	8BJ	6J	7BJ	6BJ	<10	7BJ	<10	6BJ	6J	3BJ
Carbon Disulfide	<5	<5	<5	<5	5	<5	<5	<5	<5	<5	3J
1,4-Dioxane	<50	<50	<50	<50	<50	<50	<50	<50	<50	110	59
Methylene Chloride	<10	10B	<10	5B	13B	<10	9B	<10	<10	6	4BJ
Triethylene Glycol	<250	<1,000	<250	<1,000	<1,000	1,900	<1,000	<250	<250	<1,000	<1,000
Total Organic Carbon	6,300	/	44,600	/	/	29,700	/	5,300	52,000	/	/
Xylenes	<5	<5	<5	<5	3J	<5	<5	<5	<5	<5	2BJ

<5 = Below method detection limit shown.
"/ " = Sample not taken or analysis not performed.
"J" = Estimated value. Measured value is less than quantitative detection limit.
"B" = Compound was detected in associated laboratory blank.

WDCR500/020.51

SURFACE WATER AND SEDIMENT ANALYTICAL RESULTS

- Primary compounds detected in surface water: 1,4-dioxane & TEG
- Primary compounds detected in all drainage ditch surface water samples
- 1,4-Dioxane near or below detection limits in Beaver Dam Branch
- 1,4-Dioxane concentrations in sediment are less than concentrations in surface water

ORGANIC CHEMICAL ANALYSES
SURFACE WATER SAMPLES
(μg/ℓ)

	KSW9	KSW11		KSW16		KSW20	KSW22		KSW23		KSW24	KS25	KSW27	PS1
Analysis	**11/89**	**7/88**	**11/89**	**7/88**	**11/89**	**11/89**	**7/88**	**11/89**	**7/88**	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**
Acetone	<10	<10	11 B	<10	40 BJ	860 B	<10	<10	<10	<10	54 B	110 B	13 B	10
Carbon Disulfide	1J	12	27	<5	11 J	60 J	<5	14	<5	10	130	39	16	28
Chloroethane	14	<10	34	<10	<50	<100	<10	<10	<10	<10	<50	<50	<10	<10
1,1-Dichloroethane	<5	14	2J	<5	<50	<100	<5	<5	<5	<5	<25	<25	<5	<5
1,4-Dioxane	1,100	26,000	1,600	11,000	4,700	44,000	<50	<50	<50	58	6,700	6,500	490	<50
Methylene Chloride	9 B	<10	10 B	<10	37 B	90 BJ	16	5 B	<10	5 B	30 B	18 BJ	13 B	<10
Trichloroethylene	<5	<5	<5	<5	5 J	<100	<5	<5	<5	<5	<25	<25	/	<5
Triethylene Glycol (mg/l)	2.4	<5	2.6	<5	1.1	53	<5	4.1	<5	4.9	0.51	5.0	<0.25	<0.25
TOC (mg/l)	38.2	103	28.8	17.6	51.2	/	<1	6.9	16.7	7.7	/	88.8	36.9	10.1

<5 = Below method detection limit shown.
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"B" = Compound was detected in associated laboratory blank.

ORGANIC CHEMICAL ANALYSES
SURFACE WATER SAMPLES
BEAVERDAM BRANCH
(μg/l)

	Upstream				Downstream			
	SW22			SW28	SW23			SW29
Analysis	**7/88**	**11/89**	**8/90**	**8/90**	**7/88**	**11/89**	**8/90**	**8/90**
Acetone	<10	<10	15B	16B	<10	<10	15B	22B
Carbon Disulfide	<5	14	55	1J	<5	10	6	2J
1,1-Dichloroethylene	<5	<5	<5	2J	<5	<5	<5	<5
1,4-Dioxane	<50	<50	<50	<50	<50	58	<50	<50
Methylene Chloride	16	5B	6B	6B	<10	5B	20B	21B
1,1,1-Trichloroethane	<5	<5	<5	3J	<5	<5	<5	<5
Triethylene Glycol	<5,000	4,100	3,600	<1,000	<5,000	4,900	<1,000	<1,000
Total Organic Carbon	<1,000	6,900	/	/	16,700	7,700	/	/

<5 = Below method detection limit shown.
"/ " = Sample not taken or analysis not performed.
"J" = Estimated value. Measured value is less than quantitative detection limit.
"B" = Compound was detected in associated laboratory blank.

WDCR500/018.51

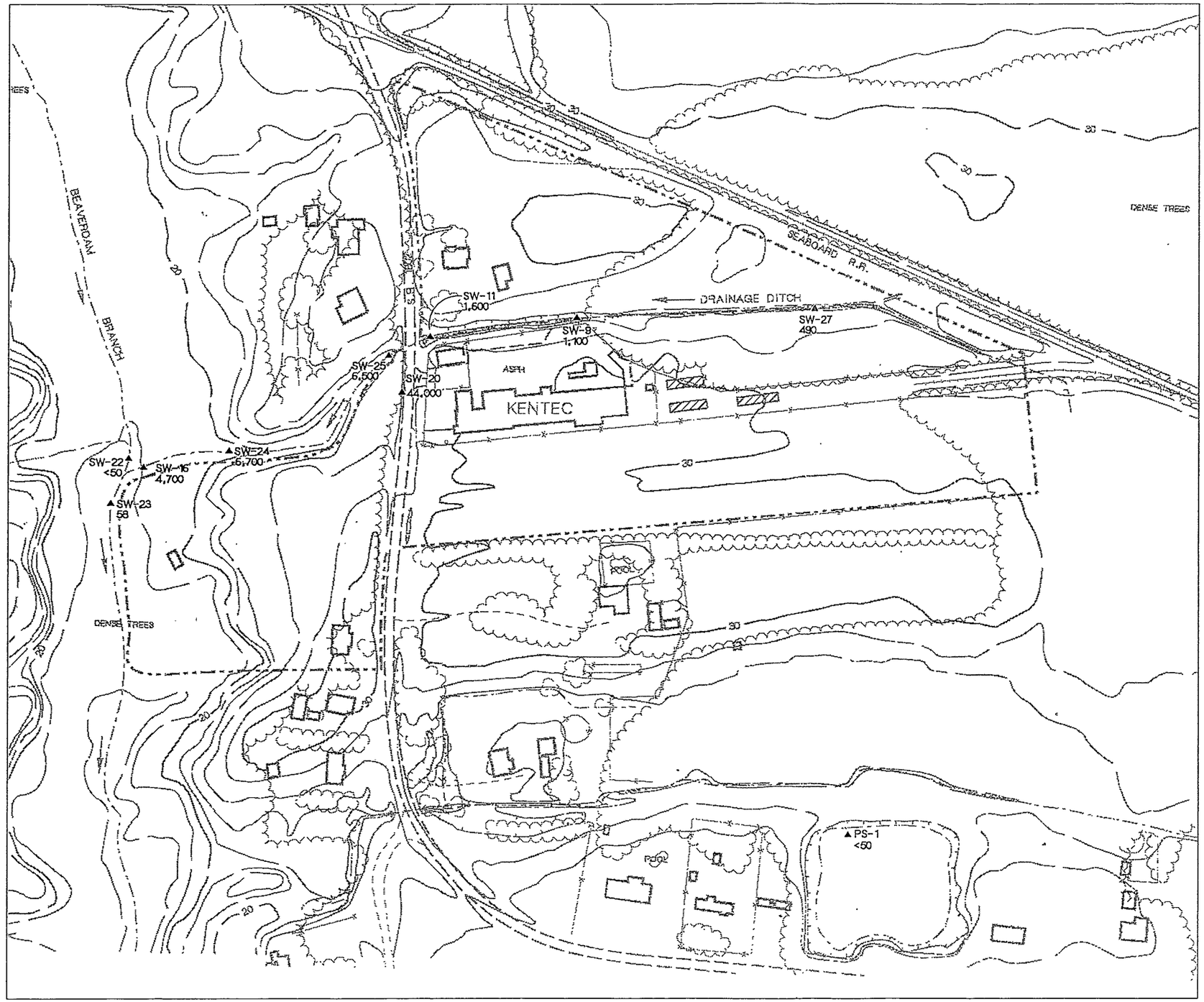
ORGANIC CHEMICAL ANALYSES
SEDIMENT SAMPLES
(µg/kg)

	KSED9	KSED11	KSED16	KSED20	KSED22	KSED23	KSED24	KSED25	KSED27
Analysis	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**	**11/89**
Acetone	<10	<10	<10	170 B	<10	64 B	20 B	45 B	<10
Carbon Disulfide	1 J	13	<5	32 J	<5	24	<6	22	2 J
1,4-Dioxane	1,000	210	1,800	18,000	280	1,500	1,000	2,400	<50
Methylene Chloride	98 B	95 B	13 B	89 B	140 B	30 B	57 B	67 B	150 B
Triethylene Glycol	<250	<250	<250	760	<250	<250	<250	390	<250

<5 = Below method detection limit shown.
"/" = Sample not taken or analysis not performed.
"J" = Estimated value. Measured value is less than quantitative detection limit.
"B" = Compound was detected in associated laboratory blank.

DRAFT

WDCR414/141.51



LEGEND

▲ SURFACE WATER SAMPLE

1,100 1,4-DIOXANE CONCENTRATION IN ug/l

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

0 100 200 300

SCALE: 1"=200'

Figure 4-4

CONCENTRATION OF 1,4-DIOXANE IN SURFACE WATER NOVEMBER 1989 Du Pont Kentec Facility

CH2M HILL

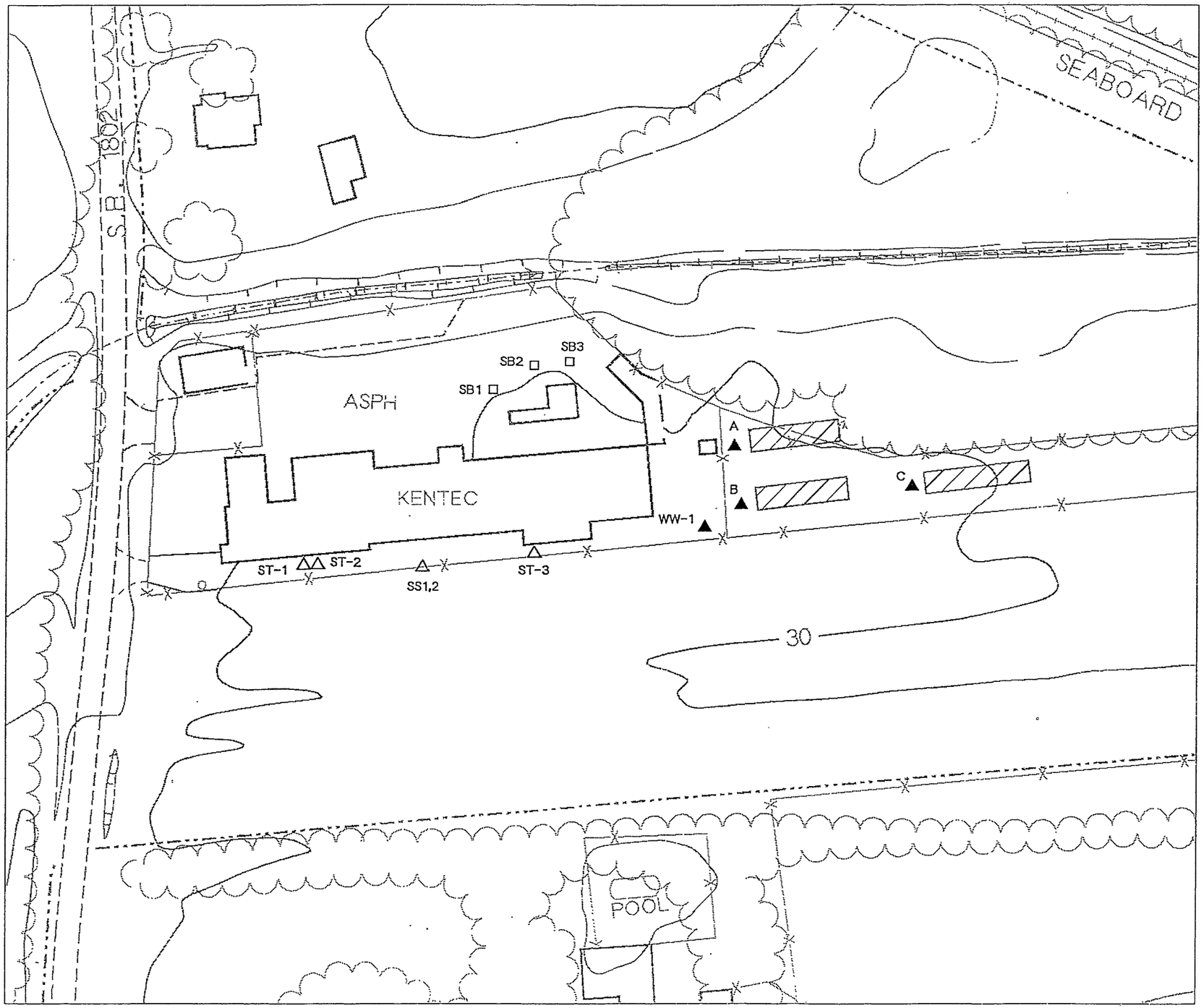
BIOMONITORING RESULTS

- 1,4-Dioxane observed in surface water samples does not appear to be adversely impacting the biological community
- No apparent difference in benthic populations between locations where 1,4-dioxane is elevated and where it is low
- Bioassay test results - no acutely toxic effect of organic concentrations in the surface water

SCOPE OF KENTEC AUDIT

- Identify potential sources of groundwater contamination from existing operations and, to the extent possible, past operations
- Identify sampling strategies and investigations methods that could be used to confirm and quantify potential contaminant sources
- Implement sampling and investigations
- Take action based on results

10-22-90;2398FC02.DGN



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LEGEND

▲ WATER SAMPLE

△ SOIL SAMPLE

NOTE: BASE MAP COMPILED FROM AERIAL PHOTOGRAPHY FLOWN ON 2/10/89.

0 40 80 120

SCALE: 1"=80'

Figure 1

FACILITY AUDIT SAMPLING
Du Pont Kentec Facility

CH2M HILL

ORGANIC CHEMICAL ANALYSES
FACILITY AUDIT SAMPLING

							Soil/Sludge Samples (µg/kg)									
	Water Samples (µg/l)						Sludge Tank		Drainline Soil		Soil Borings					
Analysis	Wet Well	Rinse Water	Drainbox A	Drainbox B	Drainbox C	ST-3	ST-1	ST-2	SS1	SS2	SB1S	SB1D	SB2S	SB2D	SB3S	SB3D
Acetone	150B	110B	7BJ	11B	8BJ	<10,000	230B	3,200J	17B	19B	64B	85B	54B	47B	51B	81B
1,1-Dichloroethane	32J	<5	<5	<5	<5	<5,000	78	11,000	<6	<6	<6	<6	<6	<6	<6	<6
1,1-Dichloroethylene	72	<5	<5	<5	<5	46,000	<6	5,400	<6	<6	<6	<6	<6	<6	<6	<6
1,4-Dioxane	27,000	2,500	<50	<50	<50	<50,000	2,400	<29,000	1,000	<52	120	560	240	910	<58	360
Methylene Chloride	18BJ	4BJ	7B	4BJ	7B	2,100BJ	43B	2,200BJ	72B	25B	53B	35B	24B	24B	15B	110B
Methyl Ethyl Ketone	160	<10	7B	<10	<10	<10,000	110	<5,800	<11	<11	7J	<12	7J	<12	<12	5J
1,1,1-Trichloroethane	630	<5	<5	<5	<5	120,000	3J	95,000	<6	<6	<6	<6	<6	<6	<6	<6
Toluene	<40	<5	1J	1J	4J	<5,000	2J	<2,900	34	2J	<6	<6	<6	<6	<6	<6
Ethylbenzene	<40	<5	<5	<5	<5	<5,000	2J	<2,900	<6	<6	<6	<6	<6	<6	<6	<6
Xylenes	<40	<5	<5	<5	<5	2,300BJ	6	<2,900	<6	<6	<6	<6	<6	<6	<6	<6
Triethylene Gylcol	4,000,000	520,000	<1,000	<1,000	<1,000	360,000	43,000	60,000	3,100	<1,000	7,700	6,800	2,600	1,700	<1,200	<1,200

<5 = Below method detection limit shown.
"/" = Sample not taken or analysis not performed.
"J" = Estimated value. Measured value is less than quantitative detection limit.
"B" = Compound was detected in associated laboratory blank.

ACTIONS AT KENTEC

- Drainline pipe cracks identified and repaired
- Fiberglass liner to the placed in wet well
- Concrete lined trench to be placed around drainline
- Tanks and contents to be removed
- Sealing expansion cracks in concrete
- Pressure testing line to rail car

KENTEC ONSITE REMEDY COMPONENTS

- Shallow groundwater removal
- Groundwater treatment
- Treated water discharge
- Soil removal

SHALLOW GROUNDWATER REMOVAL OPTIONS

- **Extraction Wells**
  Limited effectiveness due to small saturated thickness of shallow groundwater

- **Subsurface Drain**
  Potentially effective for shallow groundwater and because of silt layer

TARGET CONTAMINANTS

- 1,4 - Dioxane
- 1,1 - Dichloroethane
- 1,1 - Dichlorethene

GROUNDWATER TREATMENT OPTIONS

- Carbon adsorption
- Biological treatment
- Air striping
- Chemical oxidation
- Transport offsite

TREATED WATER DISCHARGE

- Release to Beaver Dam Branch
- Transport to Kinston WWTP
- Release to subsurface for flushing
- Use as production water

SOIL REMOVAL

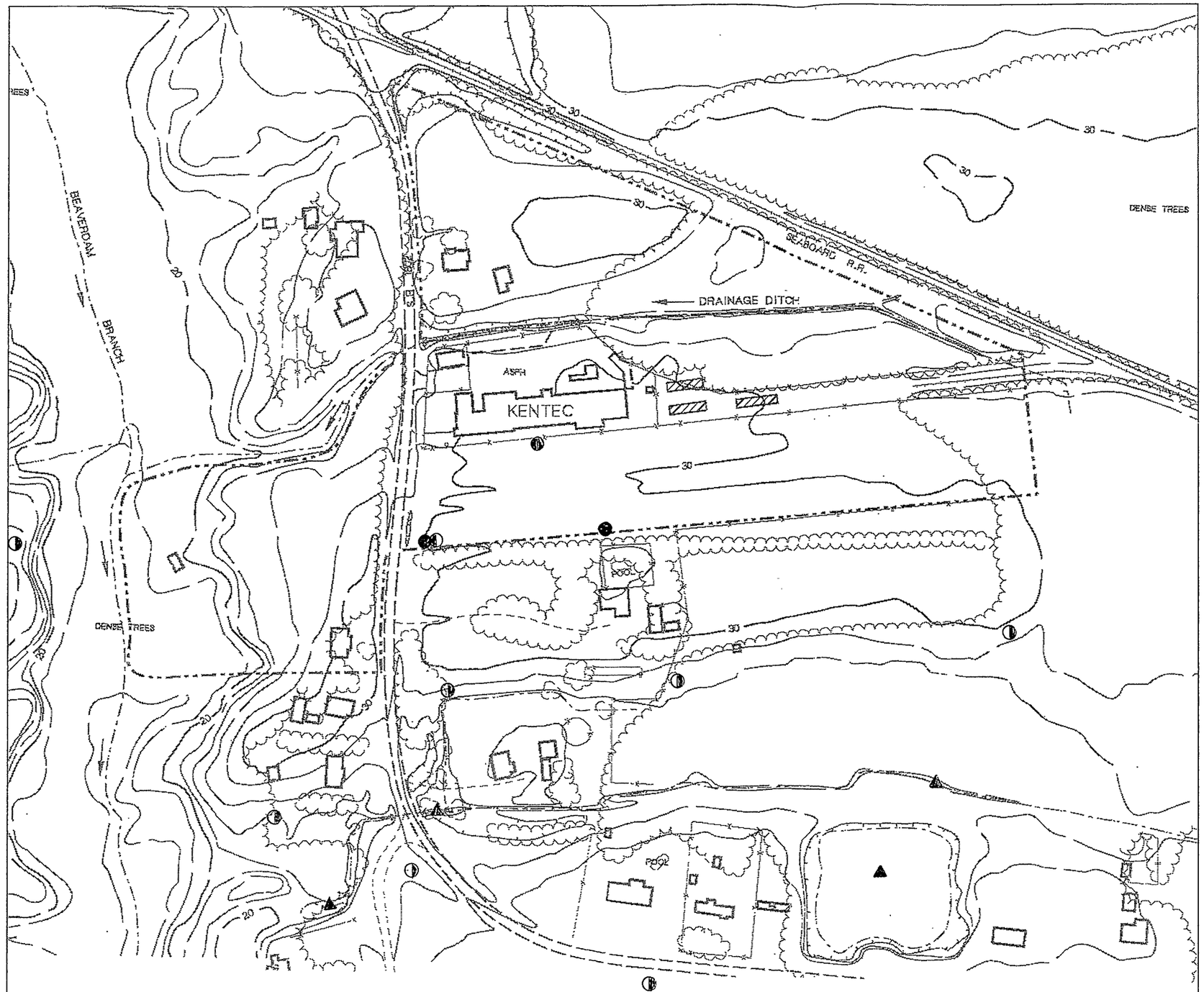
- Excavate soil above cleanup levels
- Transportation and offsite disposal
- Onsite treatment if volumes are large

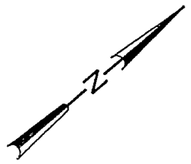
PROPOSED OFFSITE GROUNDWATER INVESTIGATIONS

- Install and sample seven shallow monitoring wells
- Sample residential wells
- Sample four surface water locations

PROPOSED ONSITE PEEDEE AQUIFER GROUNDWATER INVESTIGATION

- Install one monitoring well (50-feet deep) near MW11
- Install three monitoring wells (100-feet deep) in the vicinity of and downgradient of PW1
- Abandon PW1
- Sample all eight Peedee aquifer monitoring wells





100ft. Monitoring Well

50 ft. Monitoring Well

10 ft. Monitoring Well

Surface Water Sample

0 100 200 300

SCALE: 1"=200'

Du Pont Kentec Facility

CH2M HILL