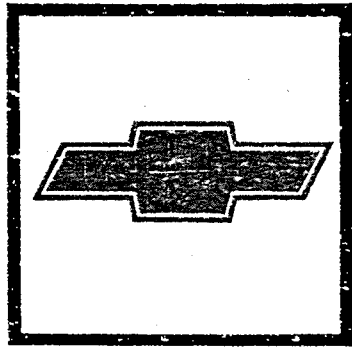


M. PEZZO-D  
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Results of  
  
Phase III-A  
Hydrogeological Investigation

for



General Motors Corporation  
CPC Group  
Grand Rapids, Michigan

March 1987

20676



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## 1.0 INTRODUCTION

Previous hydrogeological investigations by EDI at the General Motors Corporation, CPC Group, Metal Fabrication Plant in Wyoming, Michigan have identified a location in the plant at Column T-27 where equipment leaked through the floor of the facility. The equipment, a parts cleaner, is no longer located at that point. The leakage was Trichloroethylene (TCE). The soils below the floor have residuals of TCE and the groundwater has a plume of dissolved TCE which extends to the north of the source. The previous work had identified that TCE is present in the soils below the floor and that the plume extended to the north property line of the plant. In phase III, the highest priority was given to determining the size and character of the source area soils which were contaminated with TCE. Another purpose was to set wells in place to remove TCE from the soils by soil vapor extraction and to provide additional information on the groundwater in the source area. The previous studies completed on the site were the March, 1986 report titled "Results of Hydrogeological Investigation at the Column A-15 Excavation" and the June, 1986 report titled "Results of Phase II Hydrogeological Investigation".

## 2.0 PURPOSE AND SCOPE

This phase of work addressed the size and character of the TCE source area in the soils and groundwater. The investigation is shaped to provide necessary information for source remediation. The scope of work accomplished is as follows:

- 2.1 Soil vapor samples were taken from beneath the floor of the plant in three areas and along the south side of 36th Street. The largest area within the plant from which soil vapor samples were recovered, centers around column T-27, the known source area (see Figure 1). A portable gas chromatograph was installed in the plant during this sampling period. Soil vapor samples were also taken from the area around column O-44 and the area around column RS-9. These two areas were suspected to have had degreaser equipment use in the past. These samples were transported to EDI's laboratory and analyzed within 24 hours.
- 2.2 A four inch screen twenty feet in length, Well 87-3 (Figure 2), was placed in the soils in the center of the source area to recover soil vapor as a remedial measure.
- 2.3 Four soil borings 87-1, 87-2, 87-4, and 87-5 were placed around the column T-27 source area as shown in Figure 2. The soils above the water table were sampled for TCE contamination. Temporary wells were set in the groundwater at vertical ten foot intervals to sample for TCE. A well was placed in the boring with a ten foot screen extending upward from just above the water table to serve for soil vapor recovery and monitoring. A second screen in the same well was positioned

at the depth which the temporary wells indicated contained the most contaminated groundwater.

### **3.0 METHODS**

#### **3.1 Soil Vapor Study**

For the soil vapor study CPC precut 3-inch cores through the concrete floor of the facility. Soil vapors were collected by driving a hollow metal rod into the soils beneath the facility to a depth of three feet. In a few locations, additional samples were taken at a depth of 6 feet as a calibration of the method. The soil vapors were extracted by a battery-operated air pump pulling 1000 cubic centimeter of soil vapor per minute. The soil vapors are pulled through the hollow rod and Teflon tubing for purging at least five minutes. The samples are either extracted from the tubing ahead of the pump with a syringe, or a Tedlar bag is attached to the discharge of the air pump. The metal rod is brushed to remove soils and heated with a propane torch to decontaminate it between samples. During a majority of the sampling the gas chromatograph was located on-site. Duplicate samples were taken in some locations to assess the sampling variability.

#### **3.2 Drilling and Well Installation**

#### **3.3 Soil Borings**

At each of the locations where wells were installed, the soil boring was advanced using hollow stem augers. For the 2-inch wells installed, the augers were 4 1/4- inch ID. For the two 4-inch wells installed, the augers were 6 inch ID.

#### **3.4 Soil Sampling**

Soil samples were collected at 5-foot intervals with a split spoon sampler down to the water table. The samples thus collected were examined for lithology to complete the log of the boring, and a portion of each spoon sample was taken for chemical analysis for trichloroethylene. When clay was encountered beneath the aquifer, a split spoon sample was taken for both lithology and chemical analysis. The soil borings and well logs are included in Appendix A.

#### **3.5 Temporary Wells**

In all of the borings, when groundwater was encountered, a temporary well was set. After development and sampling the augers were advanced 10 feet and a second temporary well was set. This pattern was continued through the thickness of the aquifer until clay or non-permeable materials were encountered. The resulting chemical analyses were used to characterize the vertical variation within the aquifer. The temporary wells

were constructed of 2-inch galvanized casing and 3-foot stainless steel screen. All of the well materials were thoroughly steam cleaned prior to installation in the augers. Each time a temporary well was set, the well was developed by a Brainard hand pump or bailing. After development, the water samples were collected for chemical analysis with a stainless steel bailer.

### **3.6 Permanent Wells**

The permanent wells were set through the augers to a depth indicated by the results from the temporary wells. Three of the permanent wells, 87-1, 87-2, and 87-4, are constructed of 2 inch galvanized casing and 3-foot stainless steel screen. The formation was allowed to collapse around the screen. Each of these wells has an upper section with 10 feet of stainless steel screen in the soils above the water table. The screen is set from 8.5 to 19.5 with a 1 foot connector in the middle. The boring was backfilled with natural soils to the surface. The wells were completed with a flush-mount cap cemented into the floor of the plant level with the cement and below the wood block. Well 87-5 is constructed of 4-inch galvanized casing with a 4 inch stainless steel screen 10 feet in length set near the bottom of the aquifer at 39.5 to 50.5 feet. The boring was backfilled with natural soils to the surface. The well was completed with a standard cap below grade inside a 12-inch steel ring and cover set level with the concrete floor. Well 87-3 was constructed of 4-inch stainless steel screen set from 1.0 to 20.7 feet. The boring was backfilled with natural soils. The well was completed with 0.5 feet of 4-inch galvanized casing and a standard cap below grade inside a 12-inch steel ring and cover set level with the concrete floor.

### **3.7 Groundwater Sampling**

Water samples were collected from the new wells and selected existing wells. Wells 86-2, 87-1, 87-2, and 87-3 were sampled on January 23, 1987. Well 87-5 was sampled on January 30, 1987. The wells were purged of at least three casing volumes with a ditch pump or a bailer prior to sampling. In the case of well 87-5, the yield of the well indicated that development of the well was not complete. The well was alternately purged and filled with water from the plant water system approximately ten times. Just prior to sampling the well was pumped steadily at 1 gallon per minute for one hour.

### **3.8 Hydrology**

The static water level in the wells was determined to the nearest 0.01 foot using the wetted tape method. The flush mount style of cap used in many of the wells are not vented. This requires that the well be allowed to stabilize to atmospheric pressure before the water level is measured in the well. In this case, the permeability of the formation is sufficient that stabilization occurs within 5 minutes. The water level was measured after stabilization occurred.

### 3.9 Chemical Analysis

The chemical analyses were performed according to the following methods:

Chemical	Instrumentation	Method
Trichloroethylene	GC	EPA 601
Volatile Priority Pollutant	GC/MS	EPA 624
Acid Priority Pollutant	GC/MS	EPA 625
Base Neutral Priority Pollutant	GC/MS	EPA 625

## 4.0 RESULTS AND DISCUSSION

### 4.1 General Site Geology

The Metal Fabrication Plant is underlain by glacial outwash consisting of sands and gravels. Beneath the sands and gravels is a silty clay which slopes to the west and north. Figure 2 plots the locations of soil borings from this study, previous groundwater sampling work, and previous work done for the placement of equipment within the facility. The traces of the geologic cross-sections which have been assembled are also indicated in Figure 2. Figures 3 through 6 are the cross-sections. None of the borings on-site penetrate to bedrock which occurs at approximately 100 feet in this area based on a limited number of water well records. The upper bedrock is part of the Michigan formation, approximately 100 feet thick, underlain by the Marshall sandstone. The Michigan formation consists of a sequence of shale, gypsum, and limestone. These rock types generally exhibit low permeability values and may serve as substantial protection for the underlying Marshall sandstone aquifer.

The older borings completed for equipment foundations penetrate the clay unit for a substantial depth (up to 50 feet). On the west side of the plant where the top of the clay is the deepest, boring 311 penetrated through two feet of clay and encountered further sands and gravel. The well logs from previous work are included in the Appendix for the Phase II Report. The most recent borings penetrate the clay only a few feet to substantiate its depth. The surface elevation of the clay has been plotted in Figure 7. The slope of the clay surface is to the west-northwest in general and at a gradient of approximately 1 foot in 15 feet. In the source area, the slope is less, approximately 1 foot in 30 feet. The highest elevations of the clay occur along the east side of the plant from column A-10 to Column A-20. Cross-sections A-A' and B-B', Figures 3 and 4, record the apparent slope of the clay surface in the direction of the cross-section. Cross-section B-B', Figure 4, trending north and south through the source area to the north property line, indicates a consistent slope of the clay to the north. Additional borings between well 87-5 and well 86-3 would most likely show that the surface of the clay is not as smooth as indicated.

The expected variability is a couple of feet. Cross-sections x-x and y-y. Figures 5 and 6, are expanded-scale representations of the source area in north-south and east-west directions, respectively.

The sands and gravels above the clay are in general free of silty material and clay stringers or partings. The relative positions of these materials do probably influence the flow pattern of groundwater to some extent due to differences in permeability. The amount of fine sand is substantially greater in the area of the source than in surrounding areas. To the north of the source area is medium sand overlain with progressively thicker fine sand. Above the water table, the soil materials are predominantly medium and fine sand. Gravels occur as occasional thin layers within the sand or in some locations just above the clay.

#### **4.2 Soil Vapor Study**

The soil vapor work done on site covered four areas. The largest area was surrounding the source area at column T-27. Twenty-nine soil vapor samples were collected from the area. Two areas, which were suspected as having had degreaser equipment, were also tested on a smaller scale. At column O-44 six locations were sampled. At column RS-9 nine samples were collected. The fourth area was along the south side of 36th Street. The concentrations of TCE found in the soil vapor samples are summarized in Table 1 and the analyses are included in Appendix B. The locations of the samples are plotted on Figure 1 and the TCE values are plotted on Figure 8. The area of column O-44 shows no discernible TCE in any of the samples. The area of column T-27 shows a large area of TCE in the soil vapors. The concentrations appear to be highest just to the east of Column T-27 and to fall off more rapidly to the north and west than to the east. The plume of TCE in the groundwater stretching to the north generates low concentration values in the soil vapor in the areas of column RS-9 and along 36th Street. In the area of RS-9 slightly higher values were found in two of the locations. These may indicate that a small amount of TCE was introduced into the soils in the area from equipment located there. The amount in the soils is probably not significant.

#### **4.3 Hydrology**

The groundwater levels have been measured twice during the completion of this study and the results summarized in Table 2. Water levels were taken on January 21, and 23, 1987 during sampling of the wells. A second round of measurements were taken on February 24, 1987. The surface of the groundwater has been contoured in Figure 9 based on the February 24, 1987 measurements. As can be seen in the figure, the groundwater flow direction is north-northwest in the vicinity of 36th Street. The shape of the groundwater surface is very similar to that found during the previous study except that the February 1987 levels are approximately 0.3 feet lower than those measured in May 1986.

TABLE 1

GM CPC  
SOIL VAPOR TCE SUMMARY  
(Mg TCE/M<sup>3</sup> Soil Vapor)

LOCATION	DEPTH (FEET)	PPM	MG/M <sup>3</sup>	LOCATION	DEPTH (FEET)	PPM	MG/M <sup>3</sup>	LOCATION	DEPTH (FEET)	PPM	MG/M <sup>3</sup>		
1	3	140	740	17	3	160	850	34	6	0.2	1.1		
	3D	160	850		18	3	550		2900	6D	0.16	0.85	
	6	160	860			35	6			6	0.89	4.7	
2	3	7.4	39	19	3		180	960	36	3.3	*	*	
	6	6.0	32		3D	170	900	6D		0.23	1.2		
3	6	1.9	10	20	MA	7.6	40	37	2.7	*	*		
4	3	6.2	33	21	3	25	130	38	3	*	*		
5	3	310	1650	22	2	40	210	39	3.5	*	*		
6	3	610	3240	23	2	17	90	40	3	*	*		
7	3	73	390	24	3	2.6	14	41	2	*	*		
	3R	77	410		25	3	710		3800	42	3.2	0.3	1.6
	3RD	60	320									3	0.11
8	3	4.9	26	26	3	5.0	27	43	3	0.11	0.59		
					3D	4.5	24		44	1.5	0.42	2.2	
9	3	180	960	27	3	2.8	15	45	4.0	0.40	2.1		
10	3	330	1750	28	3	98	520	46	3.6	3.0	16		
11	3	630	3350	29	3	1.0	5.3	47	3.5	0.44	2.3		
12	3	360	1900	30	6	0.52	2.8	48	3.0	0.15	0.80		
13	3	480	2550	31	6	0.23	1.2	49	4.0	1.4	7.4		
14	3	83	440	32	6	0.15	0.80	50	3.0	0.2	1.1		
					6D	2.3	12						
15	3	620	3300	33	6	0.33	0.41						
					6D	1.8	2.2						
16	3	360	1900										

D = Duplicate Sample  
\* = Non-Detectable

MA = Method Alteration, Open Column 0-6 ft.  
R = Duplicate Analysis

TABLE 2-

GM CPC SURVEY SUMMARY  
WATER TABLE ELEVATIONS

WELL NO.	SURFACE	T.O.C. <sup>a</sup>	WATER TABLE	WATER TABLE	SCREEN BOTTOM	SCREEN LENGTH	T.D. BORING
	ELEVATION	ELEVATION	ELEVATION	ELEVATION	ELEVATION		
			01/21/87	02/24/87			
85-1		675.61		659.81	655.4	5	20
85-2		672.22		658.35	653.9	5	20
85-3		681.11		660.2 b	651.1	10	30
85-4		681.06		660.1 b	650.6	10	30
85-5B		681.07		660.0 b	649.4	10	30
85-6		680.09		660.38	655.9	5	25.5
85-7		678.43	658.69	658.45	653.1	5	25
-----							
86-1		680.62		659.44	651.9	10	30
86-2	681.6	681.12	659.64	659.42	648.9	5	60.5
86-3		676.51	658.25	657.99	630.3	5	72
-----							
87-1	681.6	681.15	659.43	659.22	651.9	10/5	55
87-2	681.6	681.16	660.27	660.09	642.9	11/5	49.5
87-3		680.5		NA	658.8	20	22
87-4	681.6	681.11	659.50		652.4	10/5	65.5
87-5	681.5	680.77			630.5	11/11	64.0
-----							
87-8		677.62	658.45	658.12	655.4	3	66.5
87-9		673.87	658.10	657.92	620.6	3	85.0

All Elevations N.G.V.D.

a - TOC =  $\pm 0.04$  feet

b - Date Other Than 02/24/87

BORING NO.	DEPTH	SURFACE ELEVATION	BORING NO.	DEPTH	SURFACE ELEVATION
201	50	681.6	212	60	681.6
202	50	681.6	213	100	681.6
203	50	681.6	304	30	676.2
204	50	681.6	305	31	676.1
205	50	681.6	306	30.5	676.0
206	50.5	681.6	307	40.5	676.0
207	50.5	681.6	308	40	676.8
208A	115	681.6	309	70	674.1
209	60	681.6	310	40.5	677.1
210	60	681.6	311	90	677.4
211	60	681.6	312	40	677.1

The January 1987 levels are 0.2 feet above the February 1987 levels. Beneath the building the flow direction is converging. Two factors may contribute to this pattern. The building foundations on the eastern side have drains which remove some water from the top of the aquifer. The building also prevents recharge to the aquifer beneath it. The convergence of the water beneath the building has the effect of lessening the dispersion of the TCE plume as it moves north.

Hydraulic conductivity was measured in four wells as part of the Phase II Study. The hydraulic conductivity ranged from 17.1 ft/day to 192.6 ft/day. The average hydraulic conductivity is 79.9 ft/day. The flow rate can be calculated for the groundwater at the site by using the gradient of the groundwater as measured in the wells and the average of the hydraulic conductivity tests. The flow rate or velocity can be calculated as:

$$V = K i/P$$

where:

- V is the velocity
- K is the hydraulic conductivity
- i is the hydraulic gradient
- P is the porosity

The average hydraulic conductivity is 79.9 ft/day. The hydraulic gradient is 7.2 ft/mile (  $1.37 \times 10^{-3}$  ). The porosity is estimated at 25 percent. The estimated velocity is .44 ft per day.

#### 4.4 Chemical Analyses

The bulk soil samples taken with split spoons during drilling were analyzed for TCE. The results have been summarized in Table 3. Well 87-2 to the south of the source is the most distant well installed. No TCE was found in any of the soil samples in this well. In wells 87-1, 87-4, and 87-5, concentrations of TCE found in the soils increase with depth, although 87-4 does not have the uniformity that the other well samples show. Well 87-3, placed at the source, shows the same pattern of increasing concentration with depth. The concentrations of TCE are substantially higher in well 87-3 than in 87-4 or 87-5.

The groundwater samples collected from the temporary wells installed during drilling were analyzed for TCE. The results of those analyses are presented in Table 4. The results in all cases except for well 87-5 show the concentration of TCE is highest near the top of the groundwater. In well 87-5, the concentration was highest at the top of the aquifer (1900 ug/l), then dropped two orders of magnitude in concentration to 15 ug/l; at a deeper level however the concentration again rose to 490 ug/l just above the silty sand and clay at the bottom of the aquifer. These results have been plotted on the cross-sections in Figures 10 through 13 along with the soil vapor analysis where appropriate and the TCE results that were part of the analysis of the permanent wells. In the source

TABLE 3

SUMMARY OF SOIL SAMPLES ANALYSES  
CONCENTRATION TCE

Results Reported As ug/kg  
Detection Limit 4.0

<u>DATE</u>	<u>WELL NO.</u>	<u>DEPTH (FEET)</u>	<u>CONCENTRATION</u>	<u>DATE</u>	<u>WELL NO.</u>	<u>DEPTH (FEET)</u>	<u>CONCENTRATION</u>
01/12/87	87-1	4.0 - 5.5	<4.0	01/20/87	87-4	4.5 - 6.0	<4.0
		9.0 - 10.5	<4.0			8.5 - 10.0	<4.0
		14.0 - 15.5	25			13.5 - 15.0	5.5
		19.0 - 20.5	40			18.5 - 20.0	<4.0
		24.0 - 25.5	81			23.5 - 25.0	12
						64.0 - 65.5	<4.0
01/14/87	87-2	4.0 - 5.5	<4.0	01/23/87	87-5	3.5 - 5.0	<4.0
		9.0 - 10.5	<4.0			8.5 - 10.0	<4.0
		14.0 - 15.5	<4.0			13.5 - 15.0	20
		19.0 - 20.5	<4.0			18.5 - 20.0	19
		24.0 - 25.5	<4.0			23.5 - 25.0	17
		47.0 - 49.5	<4.0			62.0 - 64.0	<4.0
01/16/87	87-3	4.0 - 5.5	16	04/30/86	86-2 (Previously Drilled)	3.5 - 5.0	<5.0
		9.0 - 10.5	65			9.0 - 10.5	<5.0
		14.0 - 15.5	110			14.5 - 16.0	42
		18.0 - 19.5	140			19.0 - 20.5	5.0
						24.0 - 25.5	260
						50.0 - 51.5	<5.0

TABLE 4

SUMMARY OF TEMPORARY WELL GROUNDWATER ANALYSES  
CONCENTRATION TCE

Results Reported As ug/L

<u>DATE</u>	<u>WELL NO.</u>	<u>DEPTH (FEET)</u>	<u>CONCENTRATION</u>	<u>DATE</u>	<u>WELL NO.</u>	<u>DEPTH (FEET)</u>	<u>CONCENTRATION</u>
01/12/87	87-1	25.0 - 28.0	280	01/23/87	87-5	22.0 - 24.0	1900
		34.5 - 37.5	120			31.0 - 34.0	15
		43.5 - 46.5	140			41.0 - 44.0	57
		Final	1300			51.0 - 54.0	490
		(24.0 - 29.0)					
01/14/87	87-2	25.0 - 28.5	6.6	04/30/86	86-2 (Previously Drilled)	30.0 - 33.0	47,000
		35.0 - 38.5	54			40.0 - 43.0	220
		43.0 - 46.0	9.5			45.0 - 48.0	9.8
		Final	45				
		(33.0 - 38.0)					
01/20/87	87-4	22.3 - 24.3	220				
		32.0 - 35.0	8.3				
		42.0 - 45.0	1.3				
		51.5 - 54.5	4.9				

area at column T-27, the TCE concentrations can be seen to drop off most rapidly to the south and west. The northeastward trend of the TCE in the groundwater from the source area may be due in part to the convergence of the groundwater beneath the building.

The new permanent wells and well 86-2 were sampled and analyzed for the volatile, acid, and base neutral fractions of the priority pollutants. In addition, the samples were analyzed for hardness, pH, iron, and grease and oil. The positive results are summarized in Table 5.

In the volatile fraction, (trans)1,2-Dichloroethylene (1,2 DCE) appears in two of the wells in low concentrations. This compound is a common contaminant in TCE and also a biodegradation product of TCE. The plant has no history of use of 1,2 DCE so the probable source in the groundwater is the TCE.

In the base neutral fraction, Phenanthrene, Fluoranthene, and Pyrene appear in wells in the source area. These compounds are present at or just above the detection limit. These compounds are common contaminants of diesel fuels and oils. The other base neutral compounds present are Phthalates which are common plasticizers and also formed in the combustion process. The Phthalates present are Bis-2-Hexyl, Butyl-benzyl, and Di-N-Butyl.

No acid fraction compounds were present in the samples.

The pH averaged 7.75 with a range of 7.63 to 7.89. The hardness ranged from 350 mg/l to 460 mg/l. None of the samples showed a significant amount of oil or grease. The concentration of iron ranged from 1.4 mg/l to 230 mg/l.

#### **4.5 Completion of Wells for Soil Vapor Recovery**

The wells placed in the area of the source are multi-purpose. In addition to the characterization of the aquifer, and sampling of groundwater contamination, the wells were constructed in a manner suitable for use in soil vapor recovery. Wells 87-1, 87-2, 87-4, and 87-5 each have a second section ten feet in length screened above the groundwater. The total thickness of soils between the floor and the top of the groundwater is 21 to 23 feet. The bottom of the screened section was placed two to three feet above the groundwater so that approximately the lower half of the unsaturated soils are screened.

Well 87-3 is constructed of sections of 10 slot, 4-inch stainless steel screen connected to screen the entire thickness of the soils above the groundwater. The connections between screens are approximately one foot in length. The screen extends from one foot below the floor to 21.7 feet. Well 87-3 was placed in the center of the source area as determined by the information provided by plant personnel and the soil vapor study. The location selected is centered in the square formed by columns S-27, T-27, S-28, and T-

TABLE 5

ANALYTICAL SUMMARY OF  
GROUNDWATER FROM THE PERMANENT WELLS

GM CPC

WELL ID	GREASE & OIL (mg/L)	TOTAL IRON (mg/L)	HARDNESS (mg/L)	pH+	TCE (ug/L)	OTHER VOLATILE ORGANICS (ug/L)	OTHER PARAMETERS (Base Neutral Fraction) (ug/L)
86-2	<1.0	12	350	7.89	90,000		Bis-2-Ethyl Hexyl Phthalate - 36 Butyl Benzyl Phthalate - 13 Fluoranthene - 3 Phenanthrene - 4 Pyrene - 2
87-1	1.1	190	360	7.63	1,200	(trans)1,2-Dichloroethylene - 16	Phenanthrene - 3
87-2	1.7	15	460	7.81	65	(trans)1,2-Dichloroethylene - 12	Bis-2-Ethyl Hexyl Phthalate - 9 Butyl Benzyl Phthalate - 16 Di-N-Butyl Phthalate - 2 Fluoranthene - 3 Pyrene - 2
87-4	1.4	230	430	7.73	87		Bis-2-Ethyl Hexyl Phthalate - 29 Fluoranthene - 2 Pyrene - 2
87-5		1.4	350	7.70	70	Chloroform - 3	
Detection Limit	1.0	0.010	2.0	---			

+Standard Units

20676

G/EC27/891

28. The boring was backfilled with natural soils and completed 0.5 feet below the floor inside a 12-inch diameter metal collar with a flat plate cover. In this manner, piping for the soil vapor recovery program can be placed below grade.

Estimation of the quantity of TCE in the soils of the source area has to be based on a combination of the TCE in the soil vapor phase and the amount of TCE present in the soils as a residual liquid. Calculation of the quantity of TCE contained in the soil vapor is based on the assumption that the concentration is uniform vertically. The soil vapor sampling at 3-foot and 6-foot depths at the same location indicated that was the case in the upper quarter of the soils above the groundwater. However, TCE is a dense vapor which will sink through air. The soil vapor concentrations in the lower soils may approach the saturation value. A minimum quantity contained in the soil vapor can be calculated by assuming an average value of 1000 mg/m<sup>3</sup> over the area defined by the soil vapor study. This is an area approximately 400 feet (125 meters) on a side and 21 feet (6.5 meters) in thickness. The porosity of the sand material is estimated at 25 percent. The minimum quantity is equal to the concentration X porosity X volume of soils = 1000 mg/m<sup>3</sup> x .25 x 125 m x 125 m x 6.5 m = 25 Kg of TCE. Soil boring samples may not adequately represent the amount in the soils because the liquid TCE is probably not distributed uniformly in the source area soils. However, the concentrations in the groundwater at the source indicate liquids have sunk through the unsaturated soils to the water. According to MacKay, Roberts, and Cherry (Environmental Science and Technology, 1985), the residual for dense chlorinated liquids such as TCE would range from .35% to 5% by volume of soil. If we assume an area 10 feet square through which liquid settled, the residual can be estimated as:

$$\begin{aligned} \text{Volume of soils} \times \text{residual factor} \times 1.47 \text{ g/cm}^3 &= \text{Kg TCE} \\ \text{for } 3\text{m} \times 3\text{m} \times 6.5\text{m} \times .0035 \times 1.47 \text{ g/cm}^3 &= 300 \text{ Kg TCE} \\ \text{for } 3\text{m} \times 3\text{m} \times 6.5\text{m} \times .05 \times 1.47 \text{ g/cm}^3 &= 4300 \text{ Kg TCE} \end{aligned}$$

The estimated amount of residual liquid is much greater than that in the soil vapors. The rate of change in the concentration of TCE extracted from well 87-3 during vapor recovery may provide a more refined estimate of the quantity of liquid in the soils.

## 5.0 CONCLUSIONS

The soil vapor study and borings and wells placed in the source area have defined the size of the source area and provided information about the concentrations in the area. There is a significant quantity of material in the soils above the groundwater which should be recoverable by soil vapor extraction. The soil materials are estimated to be permeable enough to allow adequate soil vapor flow. The wells have been constructed for soil vapor recovery. The plan for the pilot study of soil vapor recovery is included here as Section 6.

Soil vapor samples were taken in the two additional suspected source areas. In neither case was sufficient TCE measured to indicate significant soil contamination.

The source area in the groundwater has been confirmed by the wells completed. The source area groundwater with concentrations above 1 part per million is slightly smaller than the soil vapor study area and shifted northward slightly by the groundwater flow.

## 6.0 WORK PLAN FOR SOIL VENTING

### 6.1 Goals

1. To develop criteria for a full scale soil venting design, the pilot study needs to provide the following information:
  - a. How many air intake wells are needed and their location in relation with the recovery well.
  - b. Most effective air purge rate and system pressure.
  - c. The concentration of trichloroethylene in the soils with time; at various flow rates; and how quickly it builds up and stabilizes after shutdown.
  - d. Starting levels of soil vapors at various depths and the concentration change with time.
  - e. The air flow rate at the intake wells at various air purge rates.
  - f. TCE concentration of ambient air samples in the plant.
  - g. The allowable levels of discharge to the air (following discussion with the regulatory agency).

### 6.2 Work Plan

1. Get MDNR approval and permit to install.
2. Construct galvanized steel tubing soil vapor monitoring wells at various distances and depths from the vapor recovery well. Figure 14 indicates proposed locations.
3. Extend the top of casing elevation of the air intake wells by four feet; install a rotameter to the intake and drill a velocity port.
4. Install a pipeline from the vapor recovery well to a vacuum pump fitted with a water seal.

4. Install a pipeline from the vapor recovery well to a vacuum pump fitted with a water seal.

The pipeline should include:

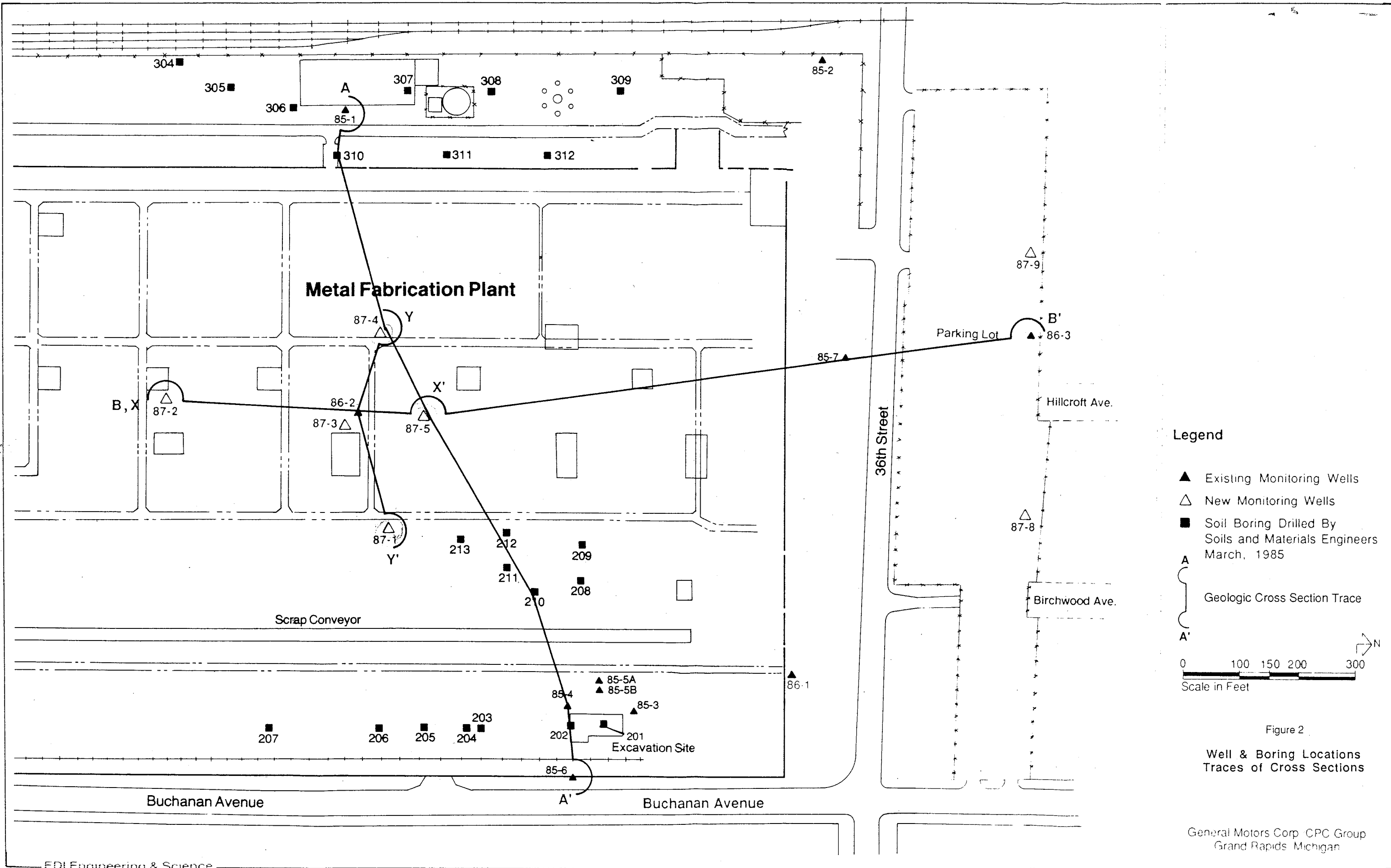
- sample port
  - pitot arrangement or air flow meter
  - appropriate valves
  - vacuum gauge
  - vent
5. Obtain an ambient air sample and analyze it for trichloroethylene and 1,1,1-trichloroethane.
  6. Obtain soil vapor samples from soil vapor monitoring wells and vapor recovery well before starting vacuum pump.
  7. Start vacuum pump and throttle to regulate the flow rate to 20 cfm. Measure the intake velocity and flow rate at each air intake well at periodic time intervals. At various time intervals, collect an air sample being drawn from the vapor recovery well. The system will then be shut down. Air samples will be collected from the vapor monitoring wells immediately after shutdown and at periodic time intervals thereafter. Repeat this procedure at two other air flow rates; i.e., 25 cfm, 30 cfm.
  8. Evaluate data to determine if additional air intake wells are required; the optimum air flow rate from vapor recovery well; cycle time for vapor recovery and shutdown; maximum trichloroethylene concentrations; and if the surface needs to be sealed between the air intake wells and the vapor recovery well.
  9. Arrange a meeting with the regulatory agency to discuss the allowable levels of TCE that can be discharged and required air emission controls
  10. Based upon the above steps, finalize the design and prepare a cost estimate for final implementation. Use pilot equipment to minimize any additional costs.

### 6.3 Pilot Soil Recovery Schedule

The pilot study will be conducted on the following schedule beginning with authorization to proceed:







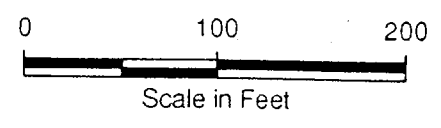
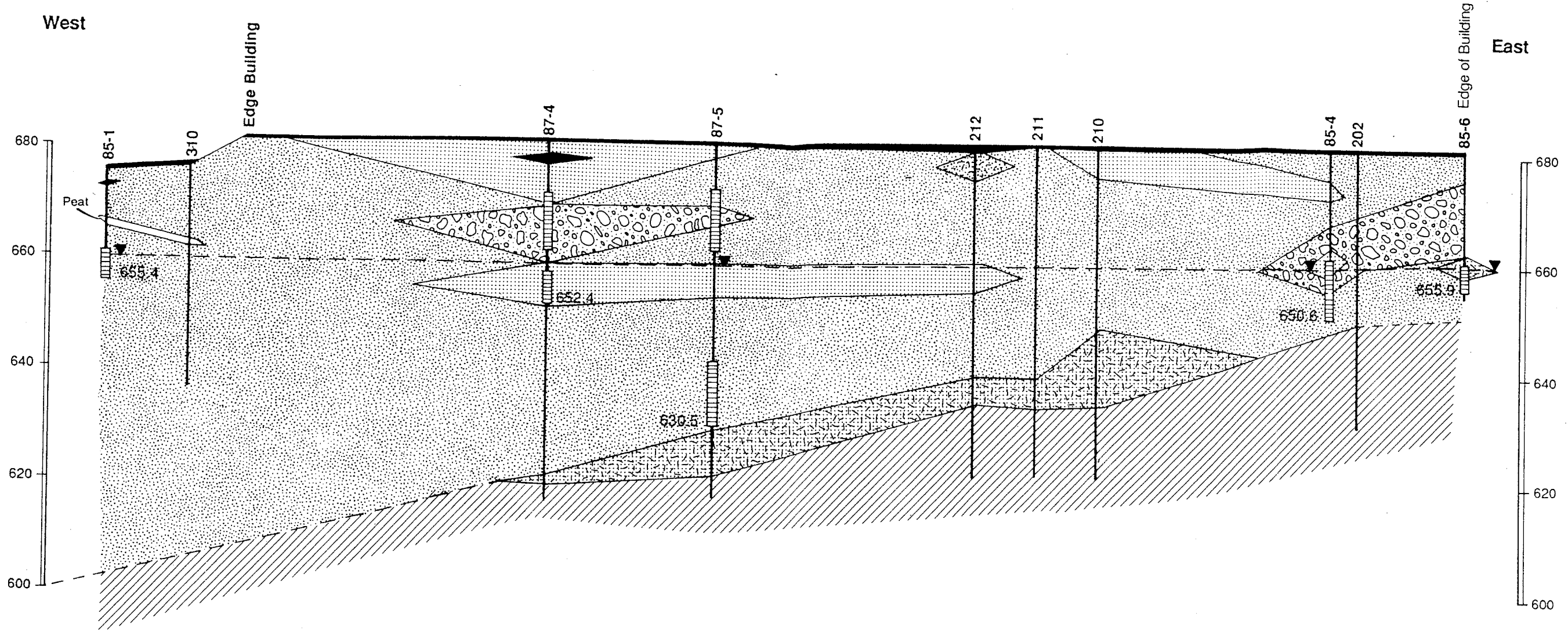
**Legend**

- ▲ Existing Monitoring Wells
- △ New Monitoring Wells
- Soil Boring Drilled By Soils and Materials Engineers March, 1985
- A  
A' } Geologic Cross Section Trace

0 100 150 200 300  
Scale in Feet

Figure 2  
Well & Boring Locations  
Traces of Cross Sections

General Motors Corp CPC Group  
Grand Rapids Michigan



**LEGEND**

- |  |               |  |             |
|--|---------------|--|-------------|
|  | Concrete      |  | Gravel      |
|  | Fine Sand     |  | Silt        |
|  | Sand          |  | Clay        |
|  | Sand & Gravel |  | Water Level |

Well Screen  
(630.5) Elevation

Horizontal Scale 1" = 100"  
Vertical Scale 1" = 20'

Elevations NGVD

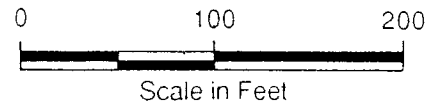
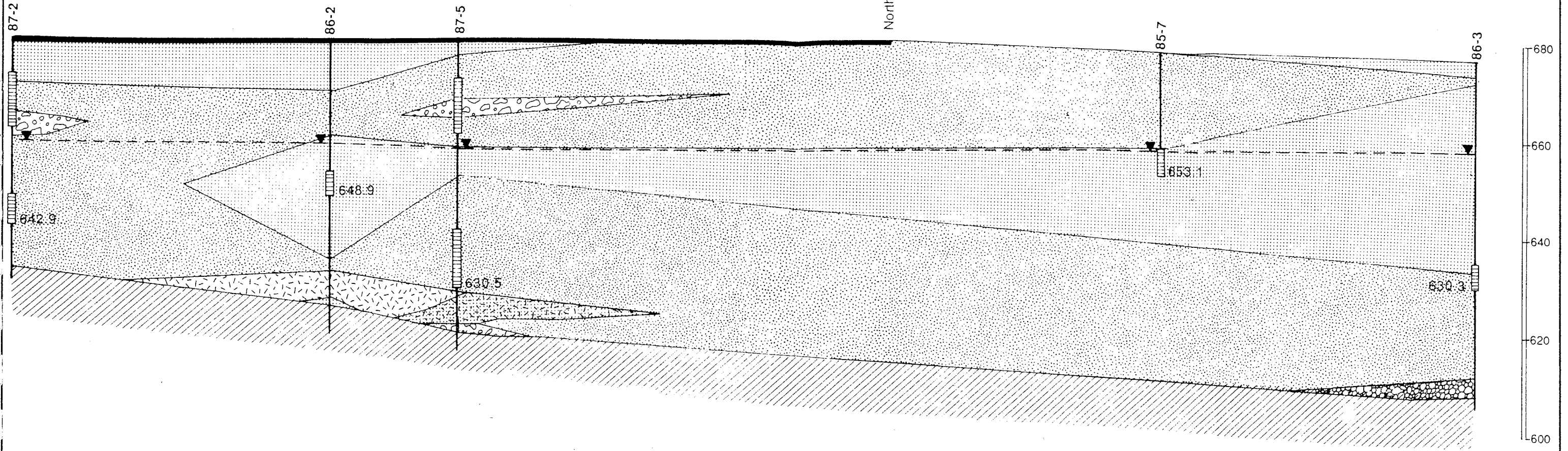
Figure 3

**Geological Cross-Section A-A'**









South


North

North Edge of Building



**LEGEND**

-  Concrete
-  Fine Sand
-  Sand
-  Sand & Gravel
-  Gravel
-  Silt
-  Clay
-  Water Level

 Well Screen  
(630.5) Elevation

Horizontal Scale 1" = 100"  
Vertical Scale 1" = 20"  
Elevations NGVD

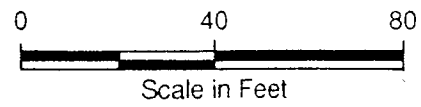
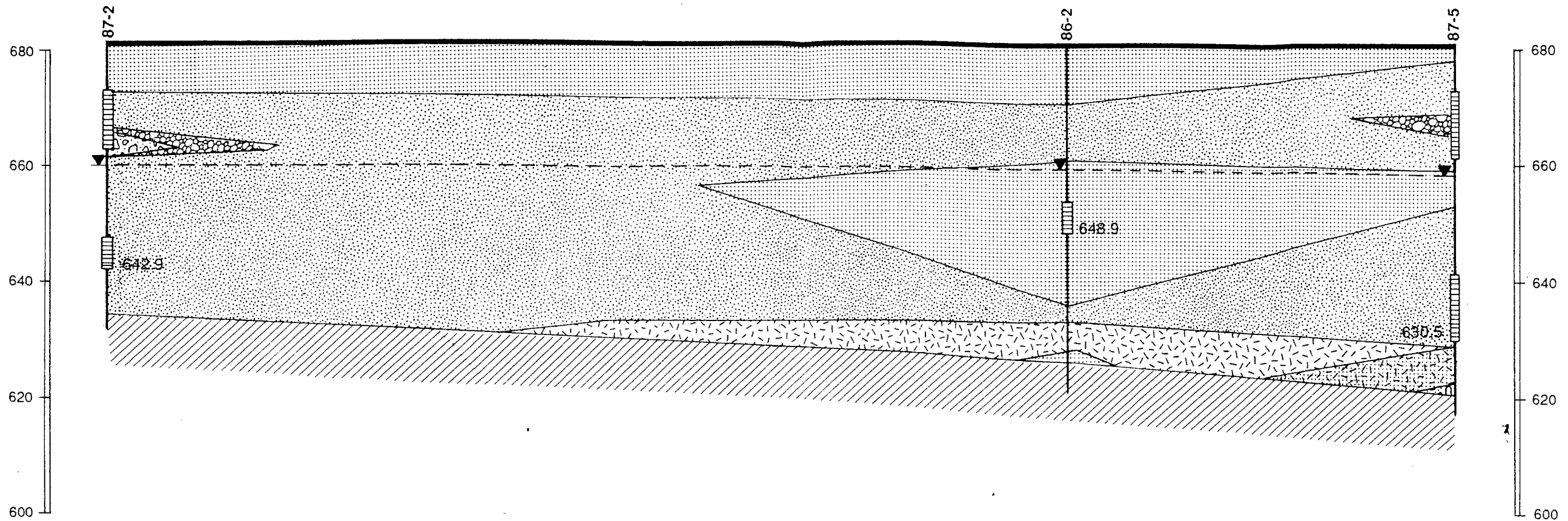
Figure 4

**Geological Cross-Section B-B'**









General Motors Corp./CPC Group  
Grand Rapids, Michigan


South

North



**LEGEND**

-  Concrete
-  Fine Sand
-  Sand
-  Sand & Gravel
-  Gravel
-  Silt
-  Clay
-  Water Level

 Well Screen  
(630.5) Elevation

Horizontal Scale 1" = 40'

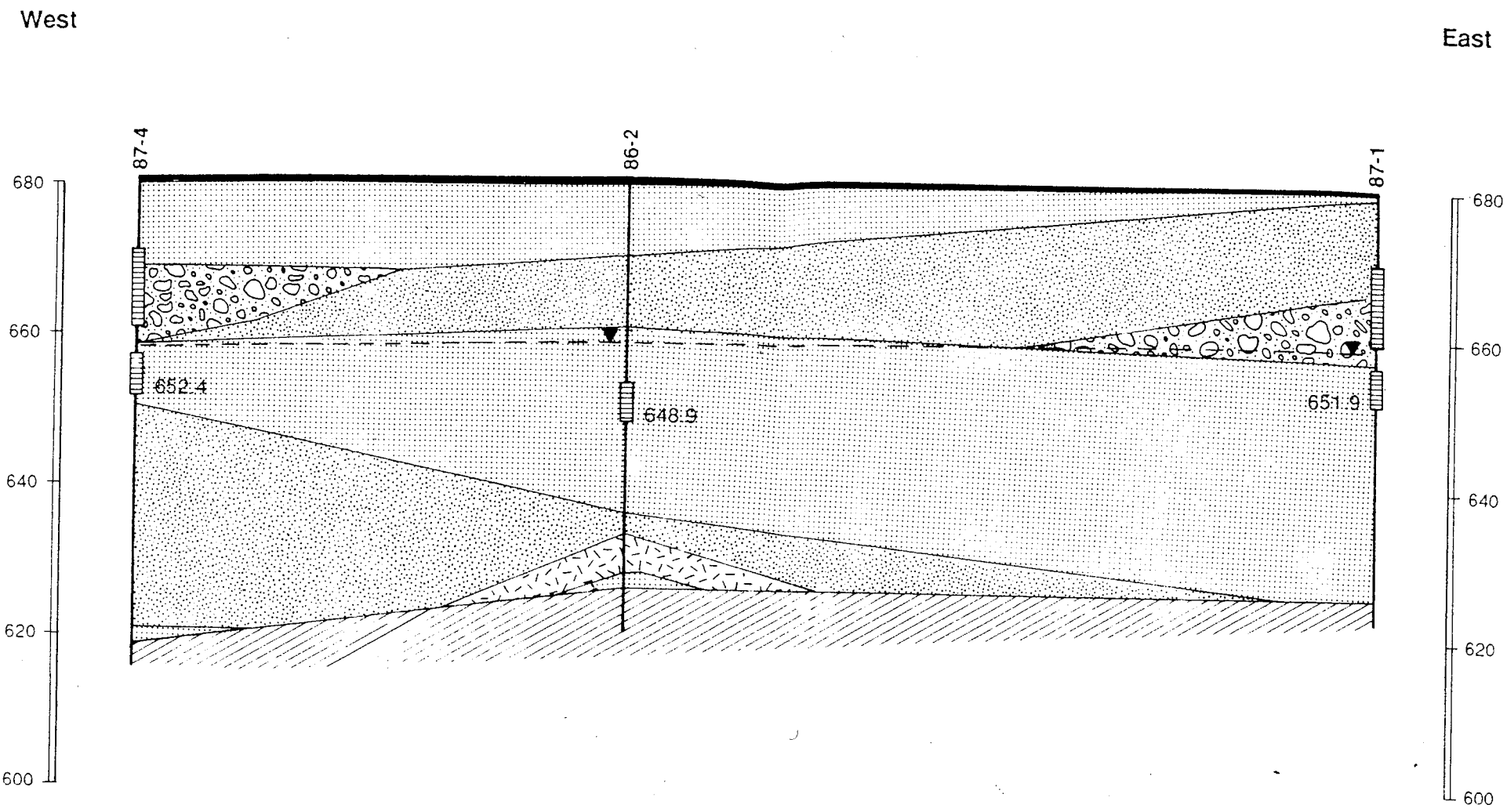
Vertical Scale 1" = 20'

Elevations NGVD









Figure 5


**Geological Cross-Section X-X'**

General Motors Corp./CPC Group  
Grand Rapids, Michigan



**LEGEND**

-  Concrete
-  Fine Sand
-  Sand
-  Sand & Gravel
-  Gravel
-  Silt
-  Clay
-  Water Level

 Well Screen  
(630.5) Elevation

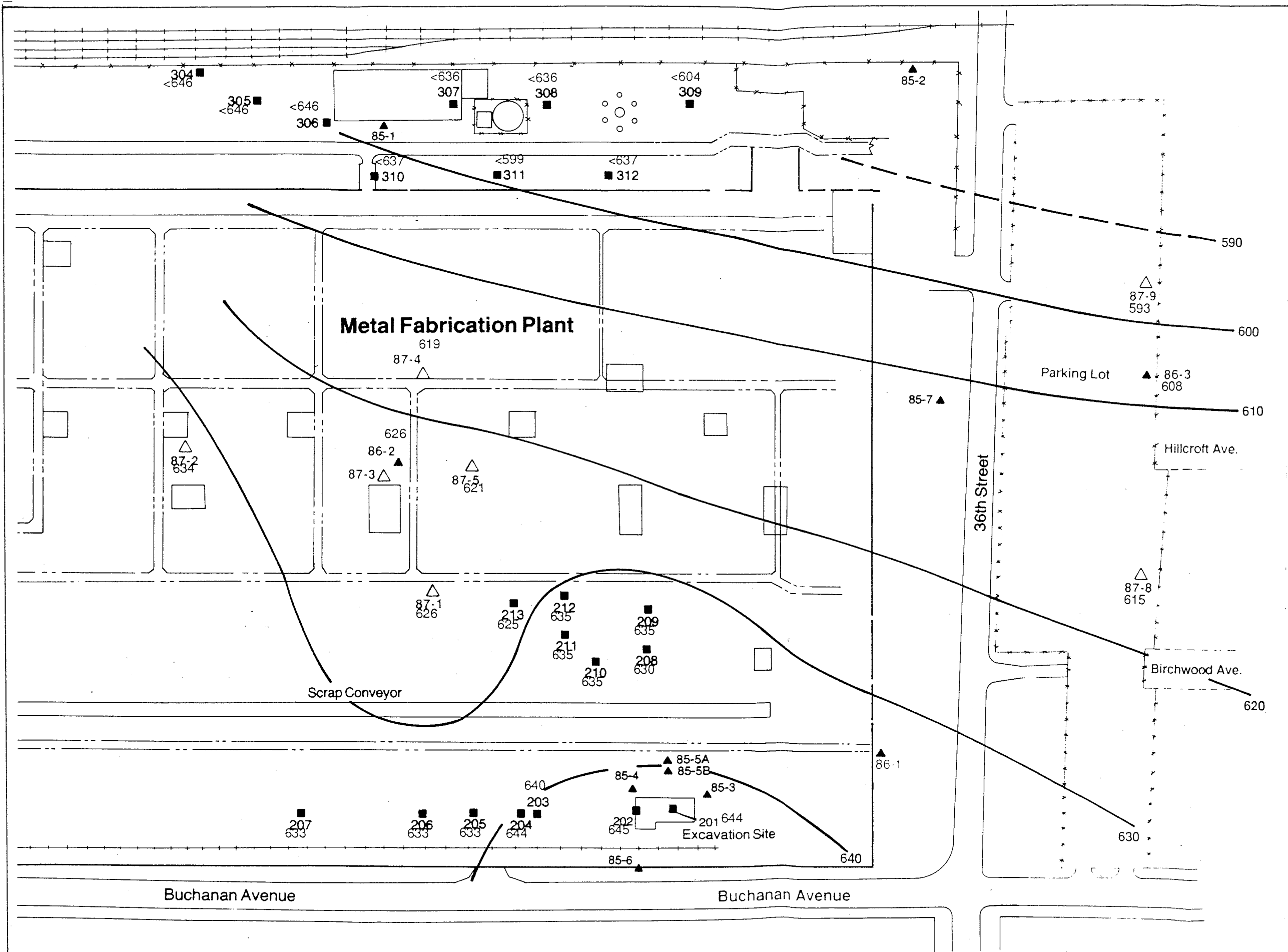
Horizontal Scale 1" = 40"  
Vertical Scale 1" = 20"

Elevations NGVD

Figure 6

**Geological Cross-Section Y-Y'**

General Motors Corp./CPC Group  
Grand Rapids, Michigan



**Legend**

- ▲ Existing Monitoring Wells
- △ New Monitoring Wells
- Soil Boring Drilled By Soils and Materials Engineers March, 1985

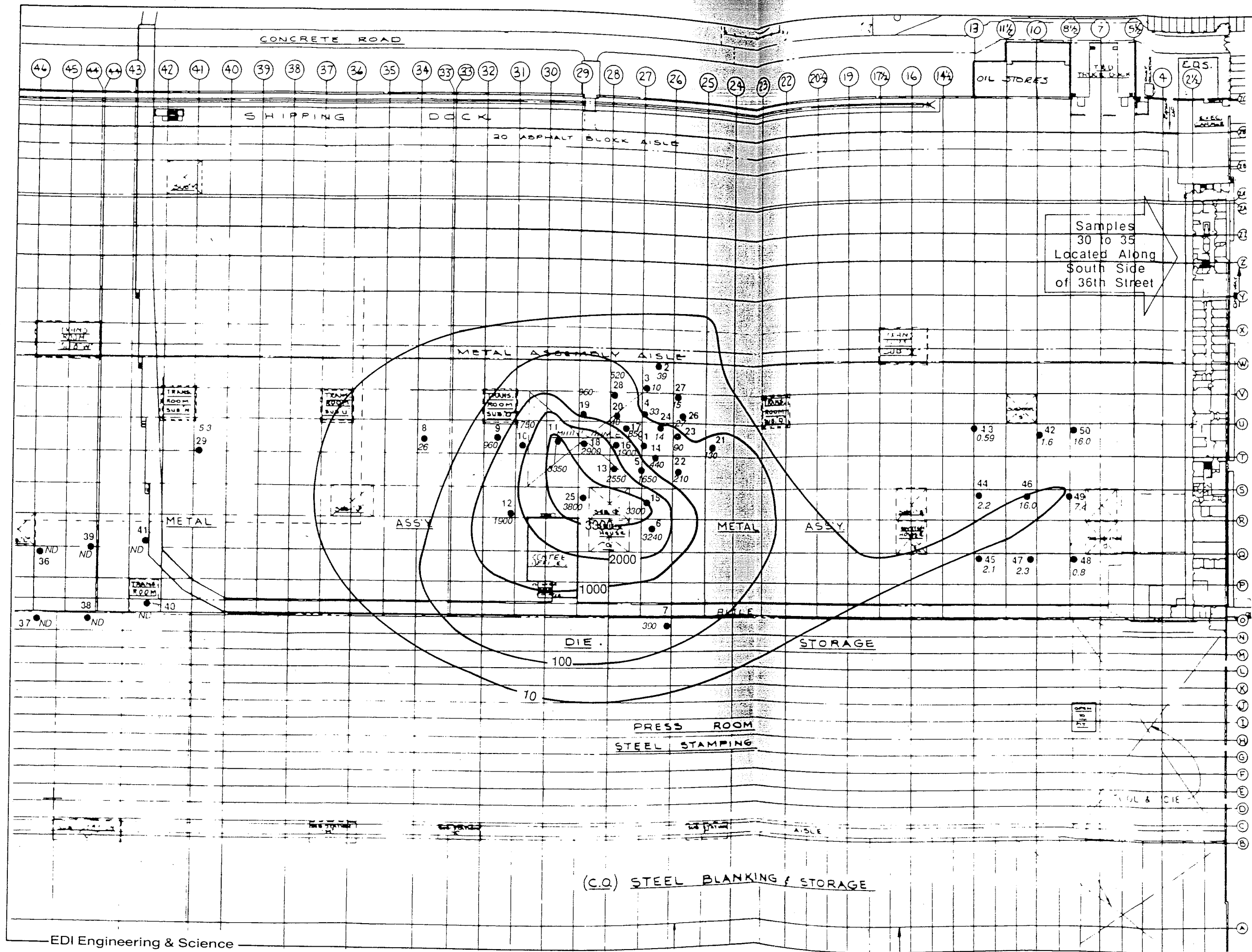
658 Clay Elevation

0 100 150 200 300  
Scale in Feet

N

Figure 7

Confining Clay Elevation  
General Motors Corp. GMG Group  
Grand Rapids, Michigan



- Legend**
- Sample Locations
  - Ⓐ Column Designation
  - TCE Concentration Levels
  - 14 TCE Concentration mg/m<sup>3</sup>

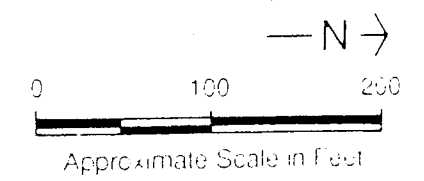
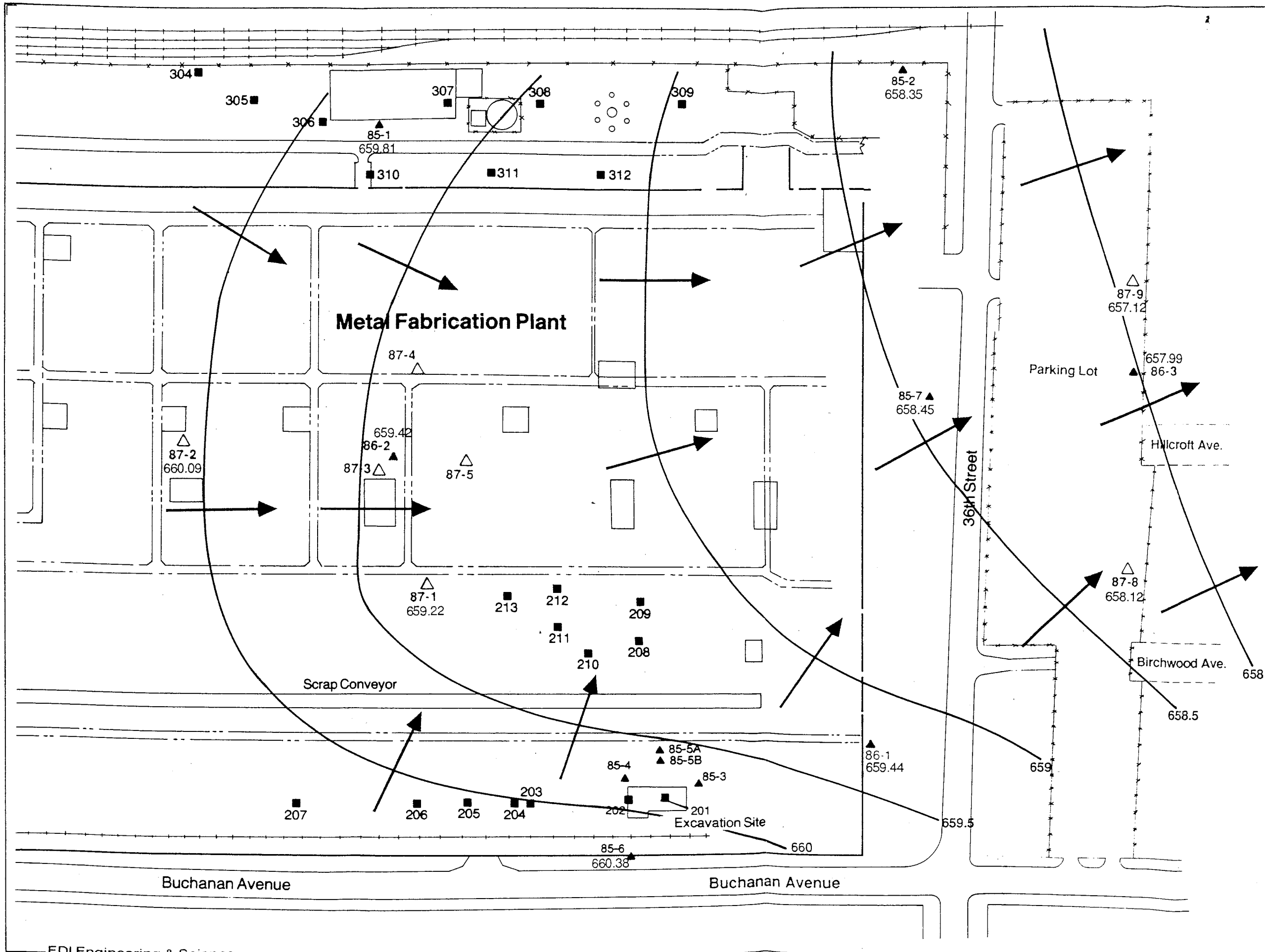


Figure 8  
 Soil Vapor  
 TCE Concentrations in mg/m<sup>3</sup>  
 General Motors Corp./CPC Group  
 Grand Rapids, Michigan



- Legend**
- ▲ Existing Monitoring Wells
  - △ New Monitoring Wells
  - Soil Boring Drilled By Soils and Materials Engineers March, 1985
  - ➔ Direction of Groundwater Flow

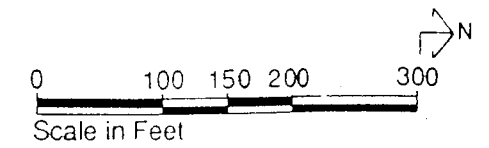
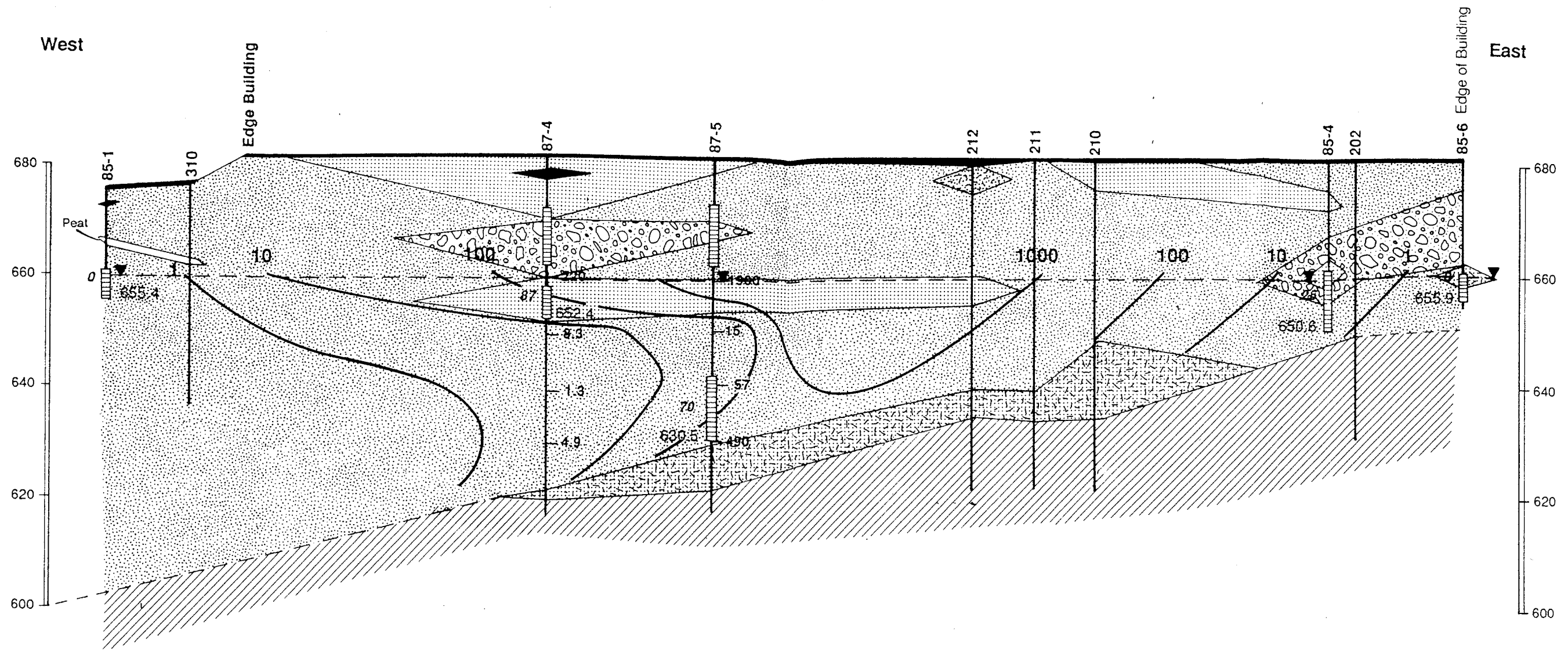


Figure 9

Water Table Elevation and  
Direction of Groundwater Flow  
(data Collected 2/24/87)  
General Motors Corp. CPC Group  
Grand Rapids, Michigan



**LEGEND**

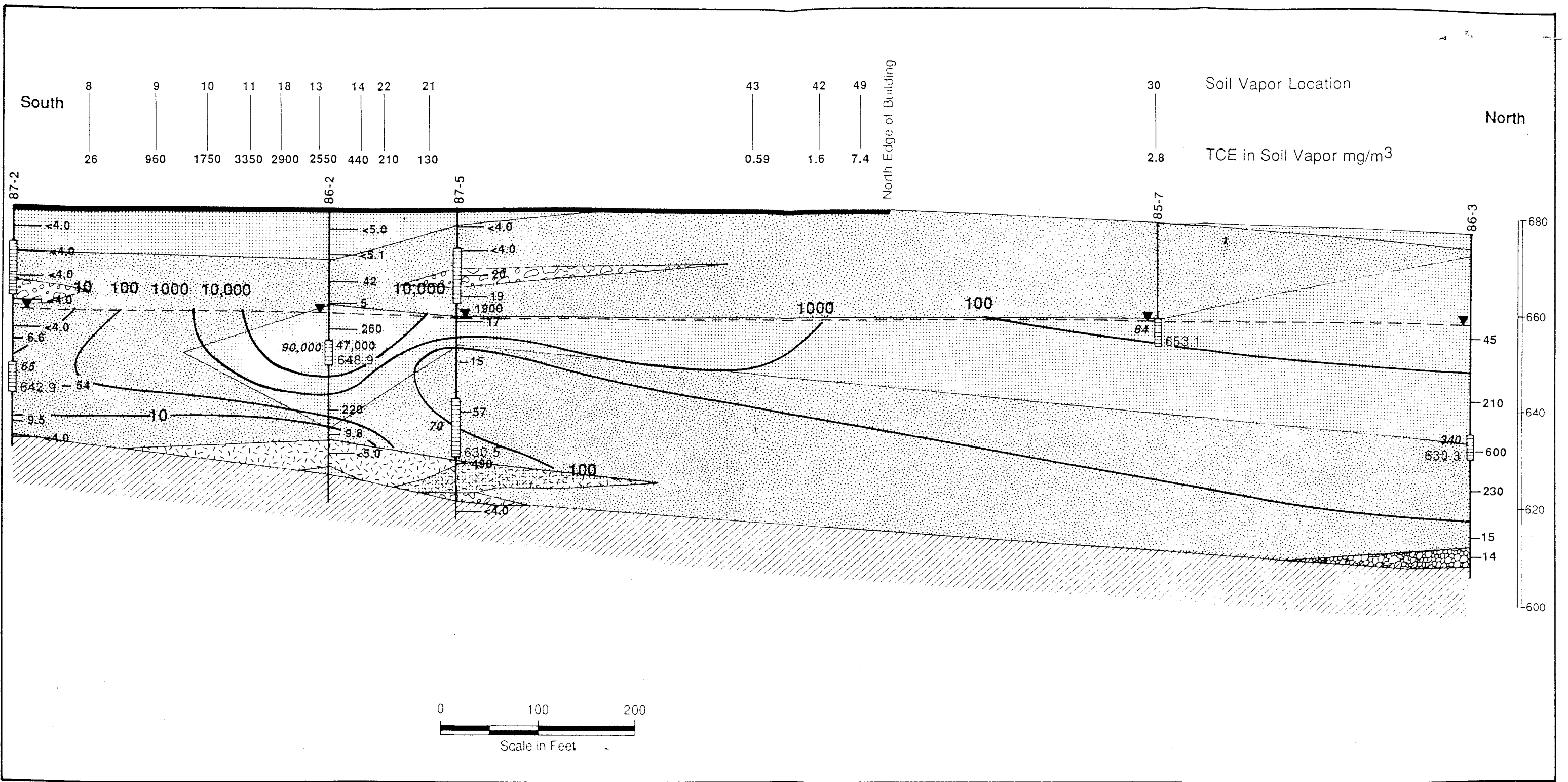
- Concrete
- Fine Sand
- Sand
- Sand & Gravel
- Gravel
- Silt
- Clay
- Water Level

- Well Screen
- TCE in Permanent Well Concentration ug/l
- TCE in Temp. Well Concentration ug/l
- TCE in Soil Concentration ug/kg

- Soil Vapor Location Number
- TCE in Soil Vapor Concentration mg/m<sup>3</sup>
- TCE Concentration in Groundwater ug/l
- Horizontal Scale 1" = 100'
- Vertical Scale 1" = 20'
- Elevations NGVD

Figure 10  
**Geological Cross-Section A-A'**  
**TCE Concentrations**  
**in Soil Vapor, Bulk Soil, Groundwater**

General Motors Corp./CPC Group  
 Grand Rapids, Michigan



**LEGEND**

- Concrete
- Fine Sand
- Sand
- Sand & Gravel
- Gravel
- Silt
- Clay
- Well Screen
- Water Level

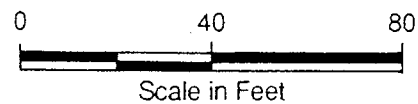
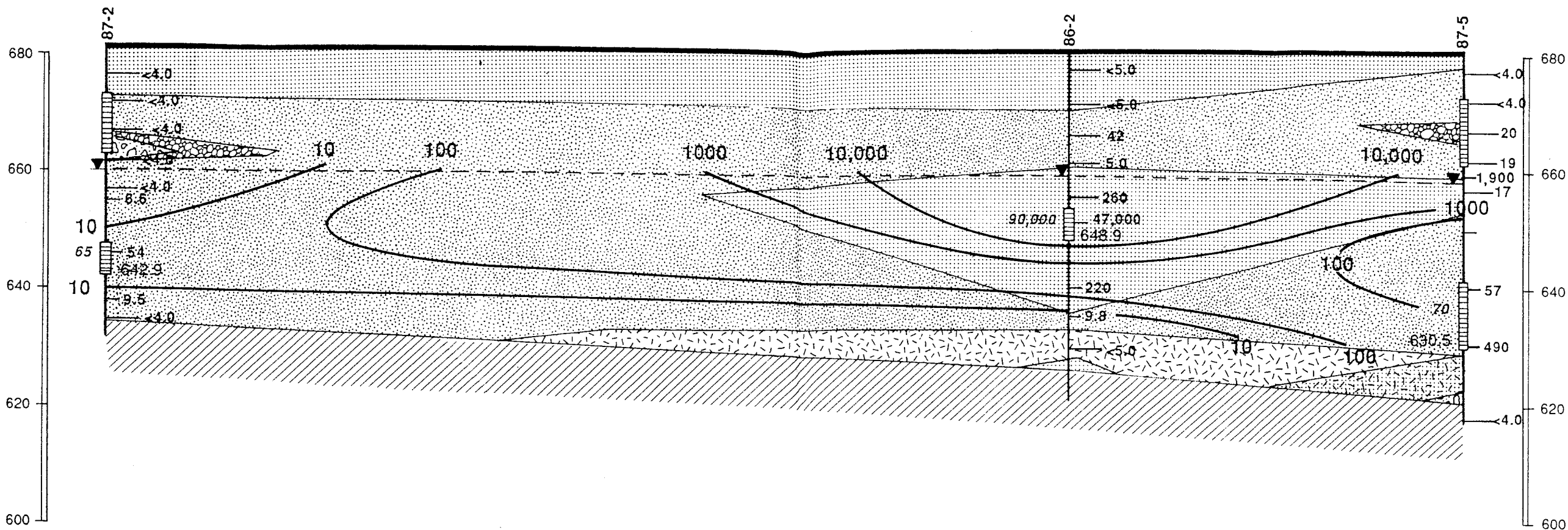
- TCE in Permanent Well Concentration ug/l
- TCE in Temp. Well Concentration ug/l
- TCE in Soil Concentration ug/kg

- Soil Vapor Location Number
- TCE in Soil Vapor Concentration mg/m<sup>3</sup>
- TCE Concentration in Groundwater ug/l
- Horizontal Scale 1" = 100'
- Vertical Scale 1" = 20'
- Elevations NGVD

Figure 11  
**Geological Cross-Section B-B'**  
**TCE Concentrations**  
 in Soil Vapor, Bulk Soil, Groundwater

General Motors Corp./CPC Group  
 Grand Rapids, Michigan

South 8 9 10 11 18 13 14 22 21 Soil Vapor Location  
26 960 1750 3350 2900 2550 440 210 130 TCE in Soil Vapor mg/m<sup>3</sup>  
North



**LEGEND**

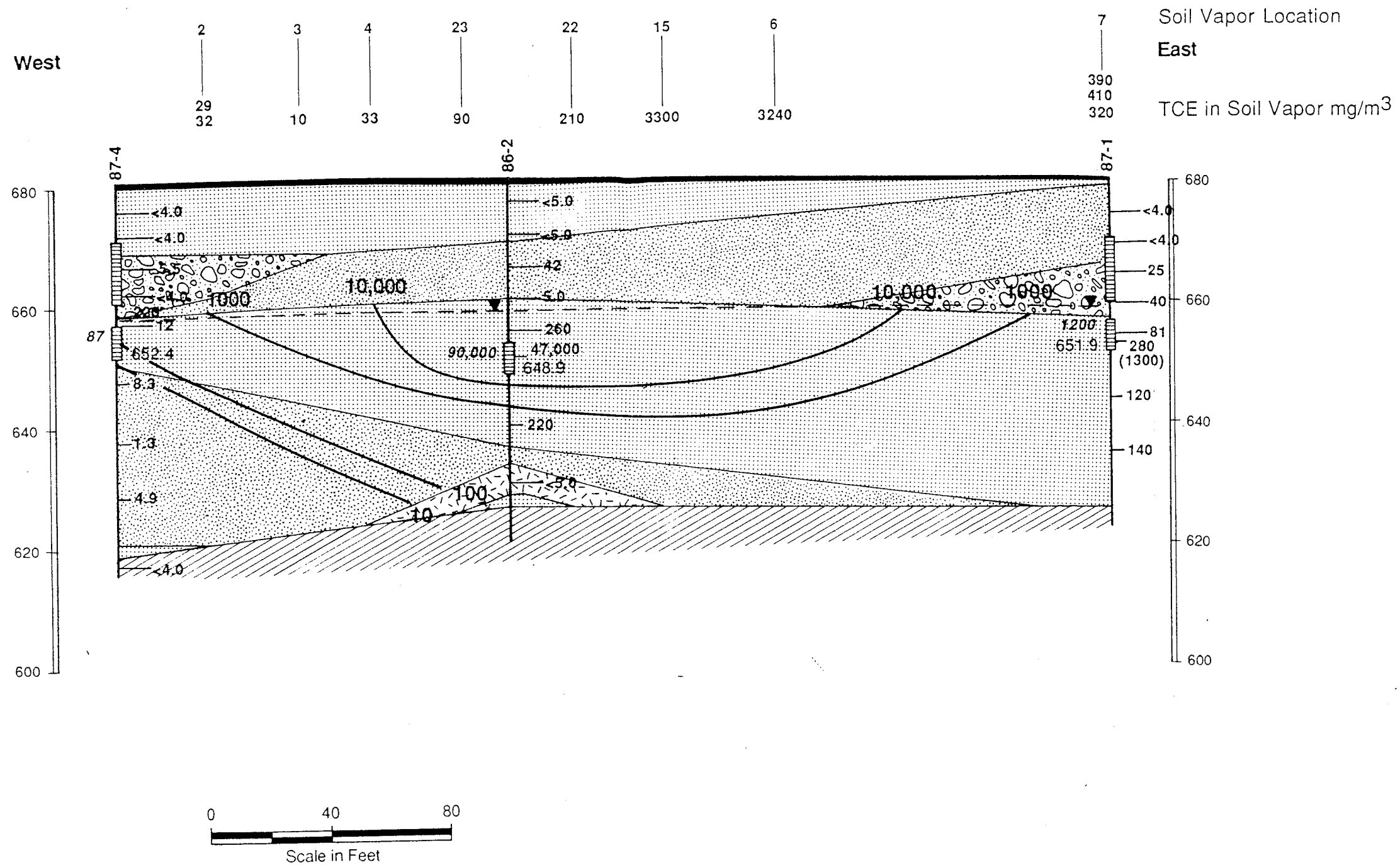
- Concrete
- Fine Sand
- Sand
- Sand & Gravel
- Gravel
- Silt
- Clay
- Well Screen
- Water Level

- TCE in Permanent Well Concentration ug/l
- TCE in Temp. Well Concentration ug/l
- TCE in Soil Concentration ug/kg

- Soil Vapor Location Number
- TCE in Soil Vapor Concentration mg/m<sup>3</sup>
- TCE Concentration in Groundwater ug/l
- Horizontal Scale 1" = 40'
- Vertical Scale 1" = 20'
- Elevations NGVD

Figure 12  
**Geological Cross-Section X-X'**  
**TCE Concentrations**  
**in Soil Vapor, Bulk Soil, Groundwater**

General Motors Corp./CPC Group  
Grand Rapids, Michigan



**LEGEND**

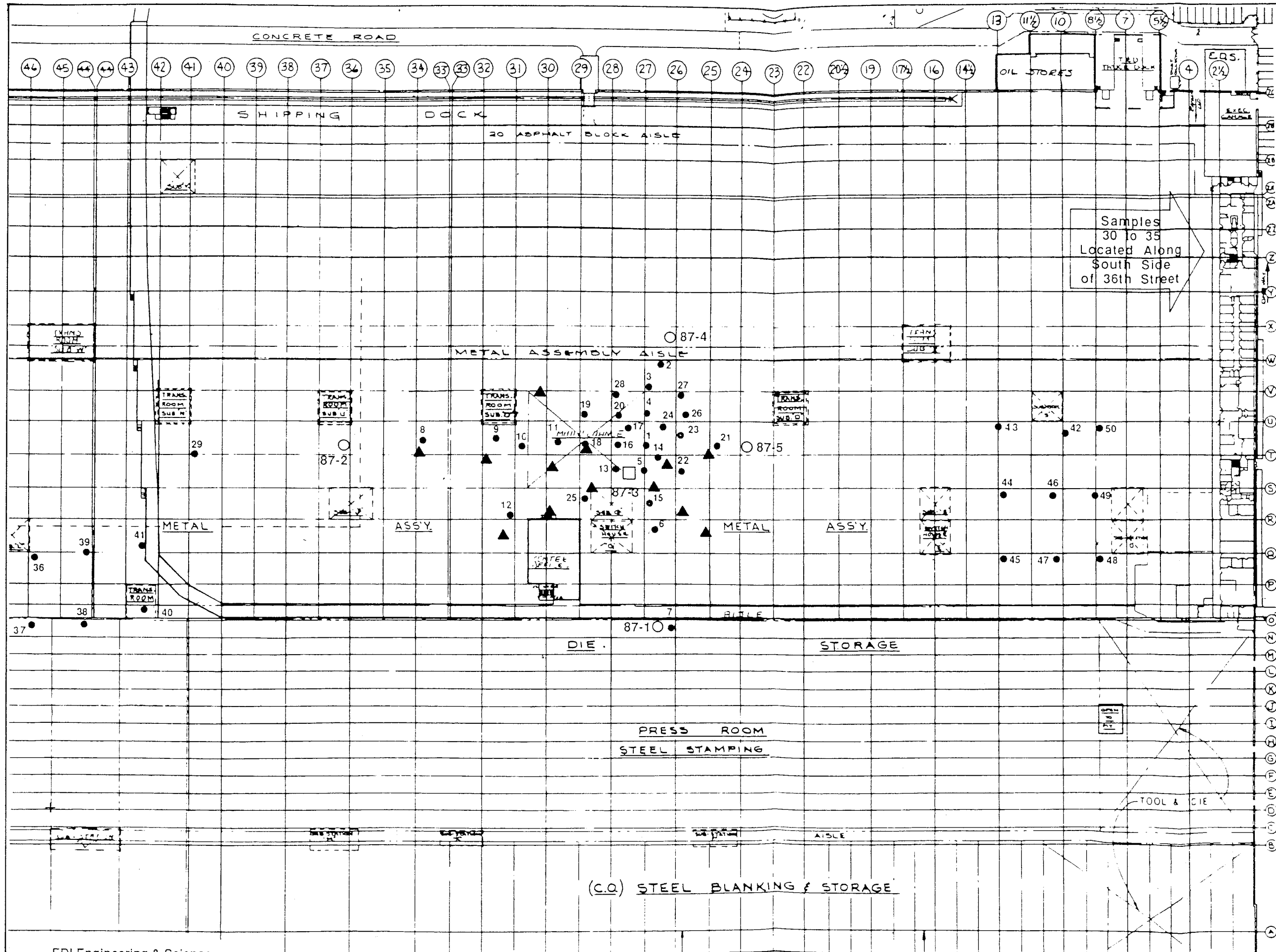
- |  |               |  |        |  |             |
|--|---------------|--|--------|--|-------------|
|  | Concrete      |  | Gravel |  | Well Screen |
|  | Fine Sand     |  | Silt   |  | Water Level |
|  | Sand          |  | Clay   |  |             |
|  | Sand & Gravel |  |        |  |             |

- |  |  |
|--|--|
|  | TCE in Permanent Well Concentration ug/l |
|  | TCE in Temp. Well Concentration ug/l     |
|  | TCE in Soil Concentration ug/kg          |

- |                           |   |
|---------------------------|---|
|                           | Soil Vapor Location Number                        |
|                           | TCE in Soil Vapor Concentration mg/m <sup>3</sup> |
|                           | TCE Concentration in Groundwater ug/l             |
| Horizontal Scale 1" = 40' |   |
| Vertical Scale 1" = 20'   |   |
| Elevations NGVD           |   |

Figure 13  
 Geological Cross-Section Y-Y'  
 TCE Concentrations  
 in Soil Vapor, Bulk Soil, Groundwater

General Motors Corp./CPC Group  
 Grand Rapids, Michigan



**Legend**

- Sample Locations
- Ⓐ Column Designation
- ▲ Soil Vapor Monitor Location
- Air Intake Well
- Soil Vapor Recovery Well

—N→

0      100      200

Approximate Scale in Feet

Figure 14  
Vapor Recovery Pilot Study  
Monitor Locations

















**APPENDIX B**

**CHEMICAL ANALYSES**

**Soil Vapor TCE**  
**Temporary Well TCE**  
**Soil TCE**  
**Permanent Well Analyses**

**Soil Vapor TCE**

**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/15/86 TIME:  
 DATE RECEIVED: 12/15/86 TIME:  
 DATE COMPLETED: 121586  
 SCHEDULED COMPLETION: 12/15/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 54

EDI SAMPLE NO:	#1-3'	#1-3'D	#1-6'	#2-3'	DETECTION LIMIT		UNITS
TRICHLOROETHYLENE	140	160	160	7.4	0.10		ppm
	740	850	850	39	0.50		mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/15/86 TIME:  
 DATE RECEIVED: 12/15/86 TIME:  
 DATE COMPLETED: 121586  
 SCHEDULED COMPLETION: 12/15/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 53

	#2-6'	#3-6'	#4-3'	#5-3'	DETECTION UNITS	
					LIMIT	
EDI SAMPLE NO:	5	6	7	8		
TRICHLOROETHYLENE	6.0	1.9	6.2	310	0.10	ppm
	32	10	33	1,650	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 00/00/00 TIME:  
 DATE RECEIVED: 12/16/86 TIME:  
 DATE COMPLETED: 121686  
 SCHEDULED COMPLETION: 12/16/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 52

					DETECTION	UNITS
	6-3'	#7-3'	#7R-3'	#7R-3'D	LIMIT	
EDI SAMPLE NO:	9	10	11	12		
TRICHLOROETHYLENE	610	73	77	60	0.10	ppm
	3,240	390	410	320	0.50	mg/m3
TIME SAMPLED:	12/15/86	12/15/86	12/16/86	12/16/86		

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/16/86 TIME:  
 DATE RECEIVED: 12/16/86 TIME:  
 DATE COMPLETED: 121686  
 SCHEDULED COMPLETION: 12/16/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 51

	#8-3'	#9-3'	#10-3'	#11-3'	DETECTION	UNITS
					LIMIT	
EDI SAMPLE NO:	13	14	15	16		
TRICHLOROETHYLENE	4.9	180	330	630	0.10	ppm
	26	960	1,750	3,350	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/16/86 TIME:  
 DATE RECEIVED: 12/16/86 TIME:  
 DATE COMPLETED: 12/16/86  
 SCHEDULED COMPLETION: 12/16/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 50

	#12-3'	#13-3'	#14-3'	#15-3'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	17	18	19	20		
TRICHLOROETHYLENE	360	480	83	620	0.10	ppm
	1,900	2,550	440	3,300	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
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**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/16/86 TIME:  
 DATE RECEIVED: 12/16/86 TIME:  
 DATE COMPLETED: 12/16/86  
 SCHEDULED COMPLETION: 12/16/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 49

	#16-3'	#17-3'	#18-3'	#19-3'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	21	22	23	24		
TRICHLOROETHYLENE	360	160	550	180	0.10	ppm
	1,900	850	2,900	960	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

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 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/16/86 TIME:  
 DATE RECEIVED: 12/16/86 TIME:  
 DATE COMPLETED: 121686  
 SCHEDULED COMPLETION: 12/16/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 48

	#19-3'D	#20	#20D	#21-3'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	25	26	27	28		
TRICHLOROETHYLENE	170	7.6	8.5	25	0.10	ppm
	900	40	45	130	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
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SAMPLED BY: LIETZKE & BOUWENS  
DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 00/00/00 TIME:  
DATE RECEIVED: 12/17/86 TIME:  
DATE COMPLETED: 12/17/86  
SCHEDULED COMPLETION: 12/17/86  
ANALYST: PCC  
QUALITY CONTROL REVIEW BY: PCC  
WORKSHEET NO: 47

	#22-2'	#23-2'	#24-3'	#25-3'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	29	30	31	32		
TRICHLOROETHYLENE	40	17	2.6	710	0.10	ppm
	210	90	14	3,800	0.50	mg/m3
TIME SAMPLED:	21/16/86	12/16/86	12/16/86	12/17/86		

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: LIETZKE & BOUWENS  
 DESCRIPTION: SOURCE SOIL VAPOR TESTING

DATE SAMPLED: 12/17/86 TIME:  
 DATE RECEIVED: 12/17/86 TIME:  
 DATE COMPLETED: 12/17/86  
 SCHEDULED COMPLETION: 12/17/86  
 ANALYST: PCC  
 QUALITY CONTROL REVIEW BY: PCC  
 WORKSHEET NO: 46

	#26-3'	#26-3'D	#27-3'	#28-3'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	33	34	35	36		
TRICHLOROETHYLENE	5.0	4.5	2.8	98	0.10	ppm
	27	24	15	520	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: DD  
 DESCRIPTION: SOIL VAPOR TESTING

DATE SAMPLED: 01/20/87 TIME:  
 DATE RECEIVED: 01/20/87 TIME:  
 DATE COMPLETED: 012187  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 38

	46	47	48	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70752	70753	70754		
TRICHLOROETHYLENE	3.0	0.44	0.15	0.10	ppm
	16	2.3	0.80	0.50	mg/m3



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: TL  
DESCRIPTION: PHASE II HYDROGEO

DATE SAMPLED: 01/30/87 TIME:  
DATE RECEIVED: 01/30/87 TIME: 2:00 PM  
DATE COMPLETED: 013087  
SCHEDULED COMPLETION: 01/30/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 39

		DETECTION LIMIT	UNITS
	49		
	4' DEEP		
EDI SAMPLE NO:	70969		
TRICHLOROETHYLENE	1.4	0.1	ppm
	7.4	0.50	mg/m3

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: DD  
 DESCRIPTION: SOIL VAPOR TESTING

DATE SAMPLED: 01/20/87 TIME: PM  
 DATE RECEIVED: 01/20/87 TIME:  
 DATE COMPLETED: 012187  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 37

	#50	AMBIENT	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70756	70757		
TRICHLOROETHYLENE	0.20	0.14	0.10	ppm
	1.1	0.74	0.50	mg/m3

"NIOSH MANUAL OF ANALYTICAL METHODS", THIRD EDITION, VOLUMES  
 1 AND 2, FEBRUARY, 1984.



**Temporary Well TCE**

**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: MVC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
DATE RECEIVED: 01/14/87 TIME: 1:15 PM  
DATE COMPLETED: 011487  
SCHEDULED COMPLETION: 01/27/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 16

	87-1 25-28'	87-1 34.5-37.5'	87-1 43.5-46.5'	87-1 FINAL 24-29'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70528	70531	70535	70551		
TRICHLOROETHYLENE	280	120	140	1,300	1.0	ug/l
DATE SAMPLED:	1/13/87	1/13/87	1/13/87	1/14/87		

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: MVC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
 DATE RECEIVED: 01/16/87 TIME: 10:50 AM  
 DATE COMPLETED: 011687  
 SCHEDULED COMPLETION: 01/27/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 17

	87-2 25-28.5'	87-2 35-38.5'	87-2 43-46'	87-2 FINAL 33-38'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70574	70575	70576	70650		
TRICHLOROETHYLENE	6.6	54	9.5	45	1.0	ug/l
DATE SAMPLED:	1/14/87	1/14/87	1/14/87	1/15/87		

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
 MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: ELC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
 DATE RECEIVED: 01/19/87 TIME: 5:00 PM  
 DATE COMPLETED: 011987  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 18

				DETECTION LIMIT	UNITS
	87-4 22.3-24.3'	87-4 32-35'	87-4 42-45'		
EDI SAMPLE NO:	70736	70737	70738		
TRICHLOROETHYLENE	220	8.3	1.3	1.0	ug/l

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
 MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/20/87 TIME: 9:30 AM  
DATE RECEIVED: 01/20/87 TIME: 11:45 AM  
DATE COMPLETED: 012087  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PCC  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 19

DETECTION UNITS  
LIMIT

87-4  
51.5-54.5'

EDI SAMPLE NO: 70742

TRICHLOROETHYLENE 4.9 1.0 ug/l

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: ELC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/22/87 TIME:  
 DATE RECEIVED: 01/22/87 TIME: 2:10 PM  
 DATE COMPLETED: 012287  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 20

				DETECTION LIMIT	UNITS
	87-5 22-24'	87-5 31-34'	87-5 41-44'		
EDI SAMPLE NO:	70782	70783	70784		
TRICHLOROETHYLENE	1,900	15	57	1.0	ug/l
TIME SAMPLED:	10:30 AM	11:15 AM	1:00 PM		

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
 MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/22/87 TIME: PM  
DATE RECEIVED: 01/22/87 TIME: 7:00 PM  
DATE COMPLETED: 012287  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 21

DETECTION UNITS  
LIMIT

87-5  
51-54'

EDI SAMPLE NO: 70799

TRICHLOROETHYLENE 490 1.0 ug/l

ANALYSIS BY "METHODS FOR ORGANIC CHEMICAL ANALYSIS OF  
MUNICIPAL AND INDUSTRIAL WASTEWATER", USEPA-600/4-82-057.



Soil TCE

**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: MVC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/13/87 TIME: AM  
 DATE RECEIVED: 01/13/87 TIME: 11:30 AM  
 DATE COMPLETED: 011387  
 SCHEDULED COMPLETION: 01/27/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 26

					DETECTION	UNITS
	87-1	87-1	87-1	87-1	LIMIT	
	4-5.5'	9-10.5'	14-15.5'	19-20.5'		
EDI SAMPLE NO:	70523	70524	70525	70526		
TRICHLOROETHYLENE	<4.0	<4.0	25	40	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: MVC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/13/87 TIME: AM  
DATE RECEIVED: 01/13/87 TIME: 11:30 AM  
DATE COMPLETED: 01/13/87  
SCHEDULED COMPLETION: 01/27/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 27

		DETECTION LIMIT	UNITS
	87-1 24-25.5'		
EDI SAMPLE NO:	70527		
TRICHLOROETHYLENE	81	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: MVC  
DESCRIPTION: PHASE II HYDROGEO

DATE SAMPLED: 01/14/87 TIME: PM  
DATE RECEIVED: 01/14/87 TIME: 6:20 PM  
DATE COMPLETED: 011487  
SCHEDULED COMPLETION: 01/28/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 24

	87-2 4-5.5'	87-2 9-10.5'	87-2 14-15.5'	87-2 19-20.5'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70568	70569	70570	70571		
TRICHLOROETHYLENE	<4.0	<4.0	<4.0	<4.0	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: MVC  
DESCRIPTION: PHASE II HYDROGEO

DATE SAMPLED: 01/14/87 TIME:  
DATE RECEIVED: 01/14/87 TIME: 6:20 PM  
DATE COMPLETED: 011487  
SCHEDULED COMPLETION: 01/28/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 25

			DETECTION	UNITS
			LIMIT	
	87-2	87-2		
	24-25.5'	47-49.5'		
EDI SAMPLE NO:	70572	70573		
TRICHLOROETHYLENE	<4.0	<4.0	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: MVC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/16/87 TIME: AM  
DATE RECEIVED: 01/16/87 TIME: 10:50 AM  
DATE COMPLETED: 011987  
SCHEDULED COMPLETION: 01/30/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 28

	87-3 4-5.5'	87-3 9-10.5'	87-3 14-15.5'	87-3 18-19.5'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70651	70652	70653	70654		
TRICHLOROETHYLENE	16	65	110	140	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: ELC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/19/87 TIME:  
 DATE RECEIVED: 01/19/87 TIME: 5:00 PM  
 DATE COMPLETED: 011987  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 30

	DETECTION LIMIT				UNITS
	87-4 4.5-6.0'	87-4 8.5-10'	87-4 13.5-15'	87-4 18.5-20'	
EDI SAMPLE NO:	70731	70732	70733	70734	
TRICHLOROETHYLENE	<4.0	<4.0	5.5	<4.0	4.0 ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/19/87 TIME:  
DATE RECEIVED: 01/19/87 TIME: 5:00 PM  
DATE COMPLETED: 011987  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 31

DETECTION UNITS  
LIMIT

87-4  
23.5-25'

EDI SAMPLE NO: 70735

TRICHLOROETHYLENE 12 4.0 ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/20/87 TIME:  
DATE RECEIVED: 01/20/87 TIME: 11:45 AM  
DATE COMPLETED: 012087  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PCC  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 29

DETECTION UNITS  
LIMIT

87-4  
64-65.5'

EDI SAMPLE NO: 70743

TRICHLOROETHYLENE <4.0 4.0 ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: 36th ST. PLANT  
 SAMPLED BY: ELC  
 DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/22/87 TIME:  
 DATE RECEIVED: 01/22/87 TIME: 2:10 PM  
 DATE COMPLETED: 012287  
 SCHEDULED COMPLETION: 02/05/87  
 ANALYST: PT  
 QUALITY CONTROL REVIEW BY: JE  
 WORKSHEET NO: 33

	87-5 3.5-5'	87-5 8.5-10'	87-5 13.5-15'	87-5 18.5-20'	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70785	70786	70787	70788		
TRICHLOROETHYLENE	<4.0	<4.0	20	19	4.0	ug/kg
TIME SAMPLED:	9:30 AM	9:40 AM	9:50 AM	10:00 AM		

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
 PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
 JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 01/22/87 TIME:  
DATE RECEIVED: 01/22/87 TIME: 2:10 PM  
DATE COMPLETED: 012287  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 34

DETECTION UNITS  
LIMIT

87-5  
23.5-25'

EDI SAMPLE NO: 70789

TRICHLOROETHYLENE 17

4.0 ug/kg

TIME SAMPLED: 10:05 AM

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: 36th ST. PLANT  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
DATE RECEIVED: 01/22/87 TIME: 7:00 PM  
DATE COMPLETED: 012287  
SCHEDULED COMPLETION: 02/05/87  
ANALYST: PT  
QUALITY CONTROL REVIEW BY: JE  
WORKSHEET NO: 35

		DETECTION LIMIT	UNITS
	87-5		
	62-64'		
EDI SAMPLE NO:	70800		
TRICHLOROETHYLENE	<4.0	4.0	ug/kg

ANALYSIS BY "TEST METHODS FOR EVALUATING A SOLID WASTE  
PHYSICAL/CHEMICAL METHODS", USEPA SW-846 SECOND EDITION,  
JULY, 1982.



**Permanent Well Analyses**

Grease & Oil

Iron

Hardness

pH

Volatile Priority Pollutants

Acid Priority Pollutants

Base Neutral Priority Pollutants

**ANALYTICAL SERVICES  
EDI LABORATORY REPORT**

CLIENT: CPC-GR METAL FAB PLANT  
 PROJECT NO.: 25615  
 LOCATION: GRAND RAPIDS, MI  
 SAMPLED BY: ELC  
 DESCRIPTION: PHASE III, HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
 DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
 DATE COMPLETED: 020487  
 SCHEDULED COMPLETION: 02/20/87  
 ANALYST: NJB, TL, BJM, BH  
 QUALITY CONTROL REVIEW BY: DEK  
 WORKSHEET NO: 14

	87-1	87-2	87-4	87-5	DETECTION LIMIT	UNITS
EDI SAMPLE NO:	70825	70826	70827	70828		
GREASE&OIL/FREON-EXT	1.1	1.7	1.4	<1.0	1.0	mg/l
IRON, TOTAL	190	15	230	1.4	0.01	mg/l
HARDNESS (as CaCO3)	360	460	430	350	2.0	mg/l
pH VALUE	7.63	7.81	7.73	7.70	---	std. units
DATE SAMPLED:	1/23/87	1/23/87	1/23/87	1/30/87		
TIME SAMPLED:	4:25 PM	5:20 PM	3:30 PM	3:45 PM		

**\*\*SAMPLES COLLECTED JAN. 23 WERE UNREFRIDGERATED OVER THE WEEKEND.**



ANALYTICAL SERVICES  
EDI LABORATORY REPORT

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
LOCATION: GRAND RAPIDS, MI  
SAMPLED BY: ELC  
DESCRIPTION: PHASE III, HYDROGEO

DATE SAMPLED: 00/00/00 TIME:  
DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
DATE COMPLETED: 020487  
SCHEDULED COMPLETION: 02/20/87  
ANALYST: JB, NJB, TL, BJM, BH  
QUALITY CONTROL REVIEW BY: DEK  
WORKSHEET NO: 9

DETECTION UNITS  
LIMIT

86-2

EDI SAMPLE NO: 70823

GREASE&OIL/FREON-EXT	<1.0	1.0	mg/l
IRON, TOTAL	12	0.01	mg/l
HARDNESS (as CaCO3)	350	2.0	mg/l
pH VALUE	7.89	----	std. units

DATE SAMPLED: 1/23/87

TIME SAMPLED: 3:15 PM

\*\*SAMPLES COLLECTED JAN. 23 WERE UNREFRIDGERATED OVER THE  
WEEKEND.



**ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS**

**TABLE 1  
VOLATILE FRACTION**

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 86-2

DATE SAMPLED: 01/23/87 TIME: 3:15 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 012787

SAMPLE NO. 70823

COMPOUND	RESULT	D.L.	COMPOUND	RESULT	D.L.
	(mg/l )			(mg/l )	
BENZENE	*	0.10	TRANS-1,2-DICHLOROETHYLENE	*	0.20
BROMODICHLOROMETHANE	*	0.20	1,2-DICHLOROPROPANE	*	0.30
BROMOFORM	*	1.5	CIS-1,3-DICHLOROPROPYLENE	*	0.40
BROMOMETHANE	*	1.0	TRANS-1,3-DICHLOROPROPYLENE	*	0.40
CARBON TETRACHLORIDE	*	0.40	ETHYL BENZENE	*	0.10
CHLOROBENZENE	*	0.10	METHYLENE CHLORIDE	*	0.20
CHLORODIBROMOMETHANE	*	0.30	1,1,2,2-TETRACHLOROETHANE	*	0.20
CHLOROETHANE	*	1.0	TETRACHLOROETHYLENE	*	0.20
2-CHLOROETHYL VINYL ETHER	*	1.0	TOLUENE	*	0.10
CHLOROFORM	*	0.10	1,1,1-TRICHLOROETHANE	*	0.20
CHLOROMETHANE	*	1.0	1,1,2-TRICHLOROETHANE	*	0.30
1,1-DICHLOROETHANE	*	0.20	TRICHLOROETHYLENE	90.	0.20
1,2-DICHLOROETHANE	*	0.20	TRICHLOROFLUOROMETHANE	*	0.30
1,1-DICHLOROETHYLENE	*	0.20	VINYL CHLORIDE	*	1.0

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 1  
VOLATILE FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 86-2

DATE SAMPLED: 01/23/87 TIME: 3:15 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 012787

SAMPLE NO. 70823

COMPOUND	RESULT (mg/l )	D.L.
XYLENE	<1.0	1.0



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 2  
BASE-NEUTRAL FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 86-2

DATE SAMPLED: 01/23/87 TIME: 3:15 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 013087

SAMPLE NO. 70823

COMPOUND	RESULT (mg/l )	D.L.	COMPOUND	RESULT (mg/l )	D.L.
ACENAPHTHENE	*	0.002	3,3'-DICHLOROBENZIDINE	*	0.020
ACENAPHTHYLENE	*	0.001	DIETHYL PHTHALATE	*	0.002
ANTHRACENE	*	0.001	DIMETHYL PHTHALATE	*	0.002
BENZIDINE	*	0.050	2,4-DINITROTOLUENE	*	0.010
BENZO (A) ANTHRACENE	*	0.005	2,6-DINITROTOLUENE	*	0.009
BENZO (K) FLUORANTHENE	*	0.005	DI-N-OCTYLPHTHALATE	*	0.002
BENZO (A) PYRENE	*	0.005	1,2-DIPHENYLHYDRAZINE	*	0.001
BENZO (G,H,I) PERYLENE	*	0.010	FLUORANTHENE	0.003	0.001
BIS-(2-CHLOROETHYL) ETHER	*	0.004	FLUORENE	*	0.002
BIS(2-CHLOROETHOXY) METHANE	*	0.004	HEXACHLOROBENZENE	*	0.005
BIS(2-CHLOROISOPROPYL)- ETHER	*	0.001	HEXACHLOROBUTADIENE	*	0.005
BIS-(2-ETHYL HEXYL)- PHTHALATE	0.036	0.002	HEXACHLOROETHANE	*	0.007
4-BROMOPHENYL PHENYL ETHER	*	0.007	HEXACHLOROCYCLOPENTADIENE	*	0.005
BUTYL BENZYL PHTHALATE	0.013	0.003	INDENO (1,2,3-CD) PYRENE	*	0.010
2-CHLORONAPHTHALENE	*	0.002	ISOPHORONE	*	0.002
4-CHLOROPHENYL PHENYL ETHER	*	0.003	NAPHTHALENE	*	0.001
CHRYSENE	*	0.005	NITROBENZENE	*	0.004
DIBENZO (A,H) ANTHRACENE	*	0.010	N-NITROSODI-N-PROPYLAMINE	*	0.004
DI-N-BUTYL PHTHALATE	*	0.001	N-NITROSODIPHENYLAMINE	*	0.003
1,2-DICHLOROBENZENE	*	0.003	PHENANTHRENE	0.004	0.001
1,3-DICHLOROBENZENE	*	0.003	PYRENE	0.002	0.001
1,4-DICHLOROBENZENE	*	0.003	1,2,4-TRICHLOROBENZENE	*	0.003

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 3  
ACID FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 86-2

DATE SAMPLED: 01/23/87 TIME: 3:15 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 013087

SAMPLE NO. 70823

COMPOUND	RESULT	D.L.	COMPOUND	RESULT	D.L.
	( mg/l )			( mg/l )	
4-CHLORO-3-METHYLPHENOL	*	0.004	2-NITROPHENOL	*	0.005
2-CHLOROPHENOL	*	0.002	4-NITROPHENOL	*	0.015
2,4-DICHLOROPHENOL	*	0.003	PENTACHLOROPHENOL	*	0.020
2,4-DIMETHYLPHENOL	*	0.003	PHENOL	*	0.002
2,4-DINITROPHENOL	*	0.050	2,4,6-TRICHLOROPHENOL	*	0.005
2-METHYL-4,6-DINITROPHENOL	*	0.020			

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



**ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS**

**TABLE 1  
VOLATILE FRACTION**

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-1

DATE SAMPLED: 01/23/87 TIME: 4:25 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 012787

SAMPLE NO. 70825

COMPOUND	RESULT	D.L.	COMPOUND	RESULT	D.L.
	(mg/l )			(mg/l )	
BENZENE	*	0.005	TRANS-1,2-DICHLOROETHYLENE	0.016	0.010
BROMODICHLOROMETHANE	*	0.010	1,2-DICHLOROPROPANE	*	0.015
BROMOFORM	*	0.075	CIS-1,3-DICHLOROPROPYLENE	*	0.020
BROMOMETHANE	*	0.050	TRANS-1,3-DICHLOROPROPYLENE	*	0.020
CARBON TETRACHLORIDE	*	0.020	ETHYL BENZENE	*	0.005
CHLOROBENZENE	*	0.005	METHYLENE CHLORIDE	*	0.010
CHLORODIBROMOMETHANE	*	0.015	1,1,2,2-TETRACHLOROETHANE	*	0.010
CHLOROETHANE	*	0.050	TETRACHLOROETHYLENE	*	0.010
2-CHLOROETHYL VINYL ETHER	*	0.050	TOLUENE	*	0.005
CHLOROFORM	*	0.005	1,1,1-TRICHLOROETHANE	*	0.010
CHLOROMETHANE	*	0.050	1,1,2-TRICHLOROETHANE	*	0.015
1,1-DICHLOROETHANE	*	0.010	TRICHLOROETHYLENE	1.2	0.010
1,2-DICHLOROETHANE	*	0.010	TRICHLOROFLUOROMETHANE	*	0.015
1,1-DICHLOROETHYLENE	*	0.010	VINYL CHLORIDE	*	0.050

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 1  
VOLATILE FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-4

DATE SAMPLED: 01/23/87 TIME: 2:30 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 012787

SAMPLE NO. 70827

COMPOUND	RESULT (mg/l )	D.L.	COMPOUND	RESULT (mg/l )	D.L.
BENZENE	*	0.001	TRANS-1,2-DICHLOROETHYLENE	*	0.002
BROMODICHLOROMETHANE	*	0.002	1,2-DICHLOROPROPANE	*	0.003
BROMOFORM	*	0.015	CIS-1,3-DICHLOROPROPYLENE	*	0.004
BROMOMETHANE	*	0.010	TRANS-1,3-DICHLOROPROPYLENE	*	0.004
CARBON TETRACHLORIDE	*	0.004	ETHYL BENZENE	*	0.001
CHLOROBENZENE	*	0.001	METHYLENE CHLORIDE	*	0.002
CHLORODIBROMOMETHANE	*	0.003	1,1,2,2-TETRACHLOROETHANE	*	0.002
CHLOROETHANE	*	0.010	TETRACHLOROETHYLENE	*	0.002
2-CHLOROETHYL VINYL ETHER	*	0.010	TOLUENE	*	0.001
CHLOROFORM	*	0.001	1,1,1-TRICHLOROETHANE	*	0.002
CHLOROMETHANE	*	0.010	1,1,2-TRICHLOROETHANE	*	0.003
1,1-DICHLOROETHANE	*	0.002	TRICHLOROETHYLENE	0.087	0.002
1,2-DICHLOROETHANE	*	0.002	TRICHLOROFLUOROMETHANE	*	0.003
1,1-DICHLOROETHYLENE	*	0.002	VINYL CHLORIDE	*	0.010

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 1  
VOLATILE FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-4

DATE SAMPLED: 01/23/87 TIME: 2:30 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 012787

SAMPLE NO. 70827

COMPOUND	RESULT (mg/l )	D.L.
XYLENE	<0.010	0.010



**ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS**

**TABLE 2  
BASE-NEUTRAL FRACTION**

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-4

DATE SAMPLED: 01/23/87 TIME: 2:30 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 013087

SAMPLE NO. 70827

COMPOUND	RESULT (mg/l )	D.L.	COMPOUND	RESULT (mg/l )	D.L.
ACENAPHTHENE	*	0.002	3,3'-DICHLOROBENZIDINE	*	0.020
ACENAPHTHYLENE	*	0.001	DIETHYL PHTHALATE	*	0.002
ANTHRACENE	*	0.001	DIMETHYL PHTHALATE	*	0.002
BENZIDINE	*	0.050	2,4-DINITROTOLUENE	*	0.010
BENZO (A) ANTHRACENE	*	0.005	2,6-DINITROTOLUENE	*	0.009
BENZO (K) FLUORANTHENE	*	0.005	DI-N-OCTYLPHTHALATE	*	0.002
BENZO (A) PYRENE	*	0.005	1,2-DIPHENYLHYDRAZINE	*	0.001
BENZO (G,H,I) PERYLENE	*	0.010	FLUORANTHENE	0.002	0.001
BIS-(2-CHLOROETHYL) ETHER	*	0.004	FLUORENE	*	0.002
BIS(2-CHLOROETHOXY) METHANE	*	0.004	HEXACHLOROBENZENE	*	0.005
BIS(2-CHLOROISOPROPYL) - ETHER	*	0.001	HEXACHLOROBUTADIENE	*	0.005
BIS-(2-ETHYL HEXYL) - PHTHALATE	0.029	0.002	HEXACHLOROETHANE	*	0.007
4-BROMOPHENYL PHENYL ETHER	*	0.007	HEXACHLOROCYCLOPENTADIENE	*	0.005
BUTYL BENZYL PHTHALATE	*	0.003	INDENO (1,2,3-CD) PYRENE	*	0.010
2-CHLORONAPHTHALENE	*	0.002	ISOPHORONE	*	0.002
4-CHLOROPHENYL PHENYL ETHER	*	0.003	NAPHTHALENE	*	0.001
CHRYSENE	*	0.005	NITROBENZENE	*	0.004
DIBENZO (A,H) ANTHRACENE	*	0.010	N-NITROSODI-N-PROPYLAMINE	*	0.004
DI-N-BUTYL PHTHALATE	*	0.001	N-NITROSODIPHENYLAMINE	*	0.003
1,2-DICHLOROBENZENE	*	0.003	PHENANTHRENE	*	0.001
1,3-DICHLOROBENZENE	*	0.003	PYRENE	0.002	0.001
1,4-DICHLOROBENZENE	*	0.003	1,2,4-TRICHLOROBENZENE	*	0.003

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 3  
ACID FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-4

DATE SAMPLED: 01/23/87 TIME: 2:30 PM  
DATE RECEIVED: 01/26/87 TIME: 11:00 AM  
DATE COMPLETED: 013087

SAMPLE NO. 70827

COMPOUND	RESULT ( mg/l )	D.L.	COMPOUND	RESULT ( mg/l )	D.L.
4-CHLORO-3-METHYLPHENOL	*	0.004	2-NITROPHENOL	*	0.005
2-CHLOROPHENOL	*	0.002	4-NITROPHENOL	*	0.015
2,4-DICHLOROPHENOL	*	0.003	PENTACHLOROPHENOL	*	0.020
2,4-DIMETHYLPHENOL	*	0.003	PHENOL	*	0.002
2,4-DINITROPHENOL	*	0.050	2,4,6-TRICHLOROPHENOL	*	0.005
2-METHYL-4,6-DINITROPHENOL	*	0.020			

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 1  
VOLATILE FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-5

DATE SAMPLED: 01/30/87 TIME: 3:45 PM  
DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
DATE COMPLETED: 020287

SAMPLE NO. 70828

COMPOUND	RESULT	D.L.	COMPOUND	RESULT	D.L.
	(mg/l)			(mg/l)	
BENZENE	*	0.001	TRANS-1,2-DICHLOROETHYLENE	*	0.002
BROMODICHLOROMETHANE	*	0.002	1,2-DICHLOROPROPANE	*	0.003
BROMOFORM	*	0.015	CIS-1,3-DICHLOROPROPYLENE	*	0.004
BROMOMETHANE	*	0.010	TRANS-1,3-DICHLOROPROPYLENE	*	0.004
CARBON TETRACHLORIDE	*	0.004	ETHYL BENZENE	*	0.001
CHLOROBENZENE	*	0.001	METHYLENE CHLORIDE	*	0.002
CHLORODIBROMOMETHANE	*	0.003	1,1,2,2-TETRACHLOROETHANE	*	0.002
CHLOROETHANE	*	0.010	TETRACHLOROETHYLENE	*	0.002
2-CHLOROETHYL VINYL ETHER	*	0.010	TOLUENE	*	0.001
CHLOROFORM	0.003	0.001	1,1,1-TRICHLOROETHANE	*	0.002
CHLOROMETHANE	*	0.010	1,1,2-TRICHLOROETHANE	*	0.003
1,1-DICHLOROETHANE	*	0.002	TRICHLOROETHYLENE	0.070	0.002
1,2-DICHLOROETHANE	*	0.002	TRICHLOROFLUOROMETHANE	*	0.003
1,1-DICHLOROETHYLENE	*	0.002	VINYL CHLORIDE	*	0.010

\*COMPOUND NOT PRESENT AT DETECTION LIMIT

ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 1  
VOLATILE FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-5

DATE SAMPLED: 01/30/87 TIME: 3:45 PM  
DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
DATE COMPLETED: 020287

SAMPLE NO. 70828

COMPOUND	RESULT (mg/l )	D.L.
XYLENE	<0.010	0.010

ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 2  
BASE-NEUTRAL FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-5

DATE SAMPLED: 01/30/87 TIME: 3:45 PM  
DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
DATE COMPLETED: 020387

SAMPLE NO. 70828

COMPOUND	RESULT	D.L.	COMPOUND	RESULT	D.L.
	(mg/l )			(mg/l )	
ACENAPHTHENE	*	0.002	3,3'-DICHLOROBENZIDINE	*	0.020
ACENAPHTHYLENE	*	0.001	DIETHYL PHTHALATE	*	0.002
ANTHRACENE	*	0.001	DIMETHYL PHTHALATE	*	0.002
BENZIDINE	*	0.050	2,4-DINITROTOLUENE	*	0.010
BENZO (A) ANTHRACENE	*	0.005	2,6-DINITROTOLUENE	*	0.009
BENZO (K) FLUORANTHENE	*	0.005	DI-N-OCTYLPHTHALATE	*	0.002
BENZO (A) PYRENE	*	0.005	1,2-DIPHENYLHYDRAZINE	*	0.001
BENZO (G,H,I) PERYLENE	*	0.010	FLUORANTHENE	*	0.001
BIS-(2-CHLOROETHYL) ETHER	*	0.004	FLUORENE	*	0.002
BIS(2-CHLOROETHOXY) METHANE	*	0.004	HEXACHLOROBENZENE	*	0.005
BIS(2-CHLOROISOPROPYL)- ETHER	*	0.001	HEXACHLOROBUTADIENE	*	0.005
BIS-(2-ETHYL HEXYL)- PHTHALATE	*	0.002	HEXACHLOROETHANE	*	0.007
4-BROMOPHENYL PHENYL ETHER	*	0.007	HEXACHLOROCYCLOPENTADIENE	*	0.005
BUTYL BENZYL PHTHALATE	*	0.003	INDENO (1,2,3-CD) PYRENE	*	0.010
2-CHLORONAPHTHALENE	*	0.002	ISOPHORONE	*	0.002
4-CHLOROPHENYL PHENYL ETHER	*	0.003	NAPHTHALENE	*	0.001
CHRYSENE	*	0.005	NITROBENZENE	*	0.004
DIBENZO (A,H) ANTHRACENE	*	0.010	N-NITROSODI-N-PROPYLAMINE	*	0.004
DI-N-BUTYL PHTHALATE	*	0.001	N-NITROSODIPHENYLAMINE	*	0.003
1,2-DICHLOROBENZENE	*	0.003	PHENANTHRENE	*	0.001
1,3-DICHLOROBENZENE	*	0.003	PYRENE	*	0.001
1,4-DICHLOROBENZENE	*	0.003	1,2,4-TRICHLOROBENZENE	*	0.003

\*COMPOUND NOT PRESENT AT DETECTION LIMIT



ANALYTICAL SERVICES  
PRIORITY POLLUTANT ANALYSIS

TABLE 3  
ACID FRACTION

CLIENT: CPC-GR METAL FAB PLANT  
PROJECT NO.: 25615  
SAMPLE: 87-5

DATE SAMPLED: 01/30/87 TIME: 3:45 PM  
DATE RECEIVED: 01/30/87 TIME: 5:00 PM  
DATE COMPLETED: 020387

SAMPLE NO. 70828

COMPOUND	RESULT (mg/l )	D.L.	COMPOUND	RESULT (mg/l )	D.L.
4-CHLORO-3-METHYLPHENOL	*	0.004	2-NITROPHENOL	*	0.005
2-CHLOROPHENOL	*	0.002	4-NITROPHENOL	*	0.015
2,4-DICHLOROPHENOL	*	0.003	PENTACHLOROPHENOL	*	0.020
2,4-DIMETHYLPHENOL	*	0.003	PHENOL	*	0.002
2,4-DINITROPHENOL	*	0.050	2,4,6-TRICHLOROPHENOL	*	0.005
2-METHYL-4,6-DINITROPHENOL	*	0.020			

\*COMPOUND NOT PRESENT AT DETECTION LIMIT

