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CURRENT CONDITIONS REPORT

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105 GM DRIVE
BEDFORD, INDIANA

EPA ID# IND006036099

Volume III – Appendix F and G

Prepared For:
GM/ENCORE

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APPENDIX F.1

CDM PRELIMINARY ENVIRONMENTAL ANALYSIS OF PLEASANT RUN CREEK

DRAFT

A Preliminary Environmental Analysis of Pleasant Run Creek

Prepared for

Barnes, Hickam, Pantzer & Boyd

July 1, 1977

TABLE OF CONTENTS

		Page
1.0	Introduction	1
2.0	Materials and Methods	2
	2.1 General	2
	2.2 Chemistry	2
	2.3 Fisheries	2
	2.4 Benthos RELATING TO BOTTOMS	2
3.0	Results and Discussion	4
	3.1 General	4
	3.2 Chemistry	4
	3.3 Fisheries	7
	3.4 Benthos	7
	3.5 Conclusion	11
4.0	Proposed Additional Studies	13
	4.1 General	13
	4.2 Bacteria	13
	4.3 (1) Phytoplankton Populations	13
	4.4 (2) Zooplankton Populations	14
	4.5 (3) Benthic Macroinvertebrate Populations	14
	4.6 Fisheries Populations	15
	4.7 (4) Periphyton	15
	4.8 Chemistry	15
	4.9 Physical	17
	4.10 Statistical Analysis	17
	4.11 Mass Transport and Extent of PCB Composition for Bottom Sediments in Pleasant Run Creek - Special Studies	17
	4.12 Technical Summary	18
	4.13 Cost Summary	19

TABLE OF CONTENTS
(continued)

		Page
5.0	Solid Waste Engineering	21
	5.1 General	21
	5.2 Potential Clean-up Measures	21
	5.3 Disposal of Contaminated Sediments	27
	5.4 Conclusion	32
6.0	Bibliography	35
	Appendix	36

LIST OF TABLES

		Page
Table 1 -	Chemistry data for the June 16, 1977 survey of Pleasant Run Creek.	5
Table 2 -	Species list and relative abundance of benthic macroinvertebrates collected on 16 May, 1977 from Pleasant Run Creek.	8
Table 3 -	Water Quality Parameters	16

LIST OF FIGURES

Page

Figure 1 - Sampling locations on Pleasant Run Creek, June 16, 1977. 6

1.0 INTRODUCTION

CDM Environmental Sciences Division (ESD) conducted the study of Pleasant Run Creek at the request of Barnes, Hickam, Pantzer and Boyd of Indianapolis, Indiana. The study was strictly a quick, qualitative study of the polychlorinated biphenyl (PCB) concentrations in sediment and river water and benthic and fisheries communities.

CDM Environmental Engineering Division (EED) conducted an on-site study of Pleasant Run Creek followed by an analysis of alternatives for treating the environment for the alleged PCB pollution. An analysis of costs involved in environmental treatment is also included. This report has been divided into five sections: Introduction, Materials and Methods, Results and Discussion, Additional Studies, and Solid Waste Engineering.

DRAFT

2.0 MATERIALS AND METHODS

2.1 General

The one day sampling effort was conducted on June 16, 1977 in the presence of two client affiliated personnel.

2.2 Chemistry

Two replicate sediment samples and a water sample were taken at each station for polychlorinated biphenyls (PCB) analysis. These samples were returned to CDM's Milwaukee laboratories for analysis. Analyses were performed according to approved USEPA procedures (Federal Register, 1973and USEPA, 1969).

2.3 Fisheries

A fisheries sample was obtained at Station B using a bag seine. The sample was photographed and released unharmed. At other stations, client affiliated and CDM personnel simply visually inspected the stream water for the presence of fish.

2.4 Benthos

Benthic sediment samples were taken at each station with an Ekman grab sampler. These were immediately preserved with formalin and returned to the laboratory for analysis. A visual description of the substrate was recorded at the time of each benthos sampling.

In the laboratory, the preservative was removed by placing the samples on a U.S. Standard no. 60 mesh sieve and gently washing with tap water. Each sample was sorted under a binocular dissecting microscope at 10x magnification. All organisms, except oligochaetes,

were removed from the sample and placed in vials containing 70 percent ethanol and five percent glycerin. Oligochaetes were placed in Amman's lactophenol to clear for several days. After the clearing, the oligochaetes were counted and randomly subsampled as follows:

Total in Sample	Subsample
1-50	all organisms
more than 50	50 organisms

The oligochaetes in the subsample were mounted in a commercial mounting medium on glass slides for identification. A subsample of chironomid larvae was selected randomly for slide preparation as follows:

Total in Sample	Subsample
1-50	10 organisms
more than 50	20%, up to a maximum of 25 organisms

The chironomids in the subsample were mounted in a commercial mounting medium on glass slides for identification.

Chironomid and oligochaete slides were identified using a Zeiss Compound Microscope with magnification ranging from 125x to 1250x (oil immersion). All other organisms were identified with a binocular dissecting microscope.

3.0 RESULTS AND DISCUSSION

3.1 General

Please note that in all cases only qualitative discussions can be given, due to the fact the correct sampling equipment, such as Ballchek corers should be used, and a more complete study should be made for quantitative judgments. However, the qualitative data which were obtained allow a reasonable assessment of the Pleasant Run Creek aquatic environment. The sampling locations are given in Figure 1.

3.2 Chemistry

The results for the polychlorinated biphenyls (PCB) analyses are given in Table 1 along with the percent dry weights for the sediments. Please note that the sediment values are the mean averages for two analyses.

As is evident from the data, the quality of substrate and water is better at Stations C and F, control and recovery control stations, respectively. As would also be expected, PCB concentrations are generally the highest in the discharge stream running into Pleasant Run Creek (Stations A and B). There is an interesting anomoly between concentrations of PCB at Station D just below the confluence of Pleasant Run Creek and the discharge stream and Station E by Peerless Road bridge. We found PCB concentrations to be an order of magnitude lower in the sediment at D as compared to E. In addition, the substrate was extremely mucky at E, while relatively much firmer

Table 1 Chemistry data for the June 16, 1977 survey of Pleasant Run Creek.

Station	PCB[a]-Water (mg/l)	PCB[a]-Sediment (mg/kg)[b]	Dry Weight (%)
A	0.055	1840	67.2
B	0.021	1120	60.3
C	<0.001	<0.5	57.5
D	0.013	76	57.2
E	0.027	800	36.0
F	0.007	1.0	70.0

a All concentrations of PCB are reported as Aroclor 1242
b on a dry weight basis

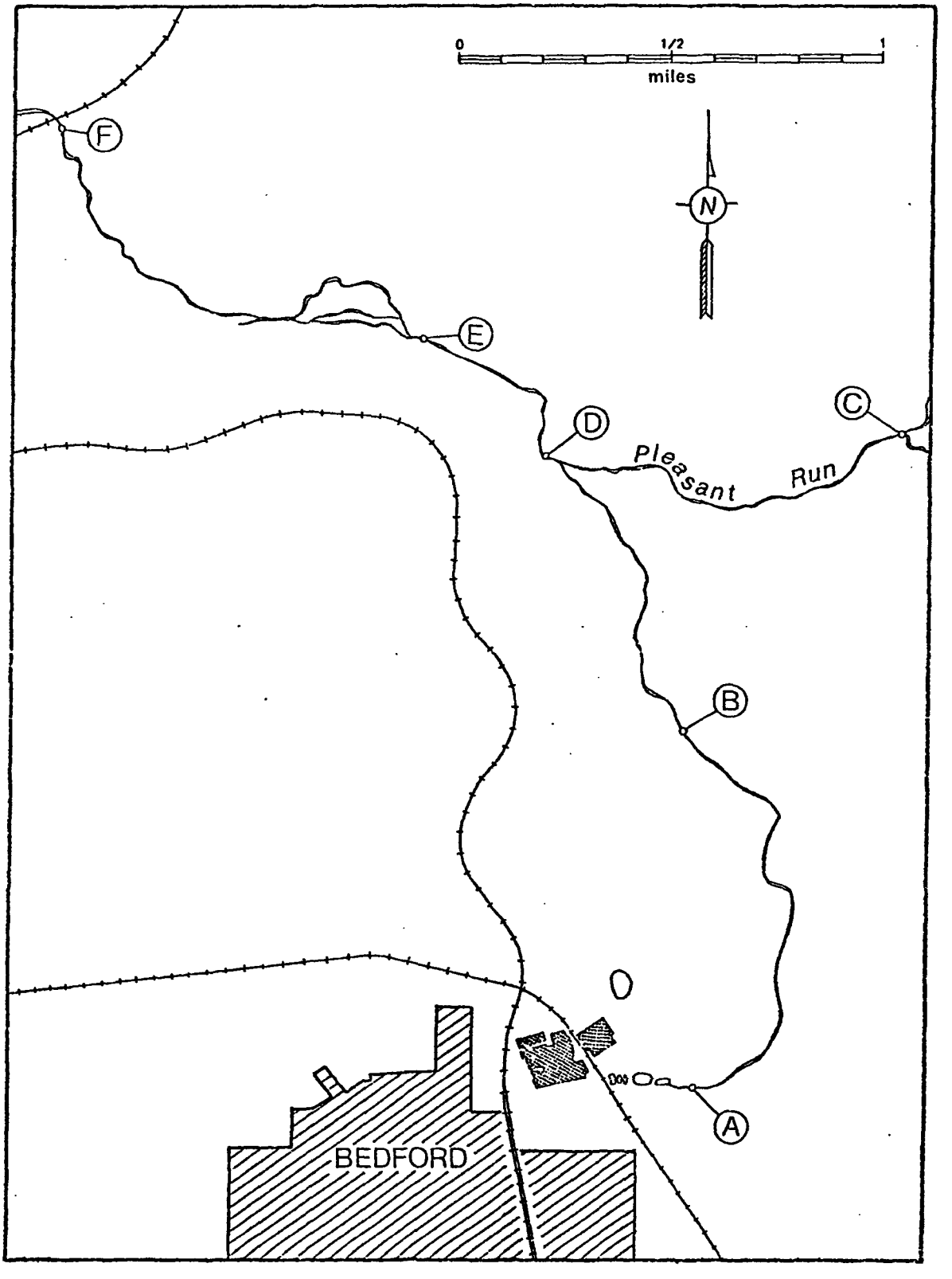


Figure 1 Sampling locations on Pleasant Run Creek, June 16, 1977.

at D. It appears that the bend in the river by Station E may have allowed the velocity of the river water to decrease and, thus, many entrained or suspended materials (such as PCB) would have been deposited in this area.

3.3 Fisheries

As mentioned in Section 2.3, fisheries seining operations were carried out only at Station B. It is important to note that, although the General Motors plant discharge provides 100% of the dry weather flow, we were still able to find fish in the stream. These fish, obviously, would not be there if there was no discharge. Although we did not seine at stations C and F, we did observe fish at these stations.

3.4 Benthos

The benthic samples were analyzed qualitatively to determine the "presence or absence of forms having varying degrees of tolerance to contaminants and to obtain information on 'richness of species'" (USEPA, 1973). The taxa present were represented by eight members of Subclass Oligochaeta, 12 members of the order Diptera and one member each of the Families Sphaeriidae and Lymnaeidae (Table 2). Stations, A,B, C,D,E, and F had 3,7,11,8,7 and 10 taxa respectively. Stations C (control) and F (recovery control) had relatively well balanced benthic structure with 5 taxa each of oligochaetes and dipterans. Stations A, and B (located in the discharge waters) and stations D, E (confluence) were dominated by species of oligochaetes with very few or no dipterans present. In a study by

Table 2 Species list and relative abundance of benthic macroinvertebrates collected on 16 May, 1977 from Pleasant Run Creek.

	Stations					
	A	B	C	D	E	F
Class Clitellata						
Subclass Oligochaeta						
Family Tubificidae						
Ilyodrilus templetoni			*			
Limnodrilus hoffmeisteri	*	**	*	**	***	**
L. cervix						*
L. udekemianus		****	*		***	*
Immature oligochaete without capilliform chaetae		***	*	****	****	***
Immature oligochaete with capilliform chaetae			**			*
Family Naididae						
Aulophorus furcatus	*	***			**	
Family Enchytraeidae						
Enchytraeidae spp.	*	**				
Class Insecta						
Order Diptera						
Diptera pupae		*				
Family Muscidae						
Muscidae spp.		*				
Family Culicidae						
Culicidae spp.					**	
Family Ceratopogonidae						
Ceratopogonidae spp.			*			

Table 2
(continued)

	Stations					
	A	B	C	D	E	F
(8)						
Family Chironomidae						
Chironomidae pupae			*			*
Subfamily Tanypodinae						
Procladius spp.					**	
Subfamily Chironominae						
Chironomus spp.			**	**		**
Stictochronomus spp.			***			
Paratendipes spp.			**			
Dicrotendipes spp.						*
Polypedilum (tripodura group) spp.						*
Subfamily Orthocladiinae						
Cricotopus bicinctus						*
(18)						
Class Pelecypoda						
Order Heterodonta						
Family Sphaeriidae						
Pisidium spp.			**			
(15)						
Class Gastropoda						
Order Pulmonata						
Family Lymnaeidae						
Physa spp.				**	**	

Codes:
- * least abundant
- ** abundant
- *** very abundant
- **** most abundant

Ganfin and Tarzwell (1973) it was found that many organisms occurring in large numbers in extremely polluted water can be found in limited numbers in cleaner waters. In this study a similar pattern was found with oligochaete species being very abundant especially at Stations B,D, and E and less abundant at Stations C and F (control and recovery control). The introduction of contaminants can restrict "intolerant" species. Stations A and B (discharge canal) had no members of the Family Chironomidae. Of the chironomid species found only Stations C and F had a variety of species with Stictochironomus and Criotopus bicenctus being associated with cleaner waters. The species comparisons indicate differences in benthic populations between stations. However, differences in habitat preferences of certain species, unrelated to the effects of introduced contaminants, can influence their presence or absence in a particular area.

The results of the qualitative study show Stations C and F to have similar well balanced benthic communities. Stations A and B are suspect of some form of contamination that is having an influence on the benthic populations. Stations D and E show some signs of recovery, although their community structure is not as balanced as Stations C and F. A more detailed assessment of the condition of the Pleasant Run Creek area would be possible with an extensive quantitative sampling effort.

3.5 Conclusion

It is apparent that due to the nature of the substrate in several locations, it is questionable weather a diversified benthic community can exist. However, given the nature of the area of study, the question must be asked that with or without the past discharge problems, could a more balanced community have existed. Obviously, in the stream between the plant and Pleasant Run Creek, no balanced aquatic community would exist without the discharge, since the discharge supplies 100% of dry weather flow.

Pleasant Run Creek itself may not support a totally balanced aquatic community with or without the plant discharge. This is due to possible heavy nutrient loading of the stream due to non-point source (agricultrual) discharges.

Finally, we did observe life throughout the course of the study - from oligochaetes just below the initial plant discharge to fish swimming in their discharge (Station B). Thus, on the basis of this one-time qualitative study, the following points can be made:

1. Aquatic life exists in Pleasant Run Creek and the plant discharge waters
2. A balanced aquatic community may not exist
3. Given the nature of the surrounding countryside, it may be unlikely that a balanced community could exist
4. Given the nature of the creek system, any drastic

engineering operations on a wholesale basis, such as dredging, could cause more harm by destroying the present aquatic community.

4.0 PROPOSED ADDITIONAL STUDIES

4.1 General

The study discussed below is designed to answer two questions: 1. What is the effect of polychlorinated biphenyls (PCB) on the indigenous biota of Pleasant Run Creek and the discharge stream? 2. To what extent are PCB's incorporated downstream in Pleasant Run Creek from the confluence of the discharge stream and Pleasant Run Creek? This environmental study will encompass all important levels of the aquatic food chain, their relationship and stability. Since each trophic level of the aquatic food chain is interdependent on other members of trophic levels, the overall stability of an aquatic ecosystem will be reflected in the composition of the members occupying each trophic level. Trophic levels to be quantitatively studied are listed in Sections 4.2 - 4.6.

Water quality must also be assessed. Therefore, a number of water chemistry parameters, flow and periphyton will also be analyzed. Finally, due to the specific aspects of this survey, we have also designed some studies which will be unique to this program.

4.2 Bacteria

Bacteria samples will be collected at Stations A-F and analyzed for fecal coliform, total coliform and fecal streptococci. Fecal coliform to fecal streptococci ratios will be determined to assess the possible source of nutrients.

4.3 Phytoplankton Populations

Phytoplankton are the primary producers in the aquatic

ecosystem. Therefore, they serve as a food source for larval fish, zooplankton, and benthic macroinvertebrates. Phytoplankton samples will be collected in duplicate at Stations A-F. These samples will be analyzed for species identification and enumeration to determine population stability and variations between stations.

4.4 Zooplankton Populations

Zooplankton are the primary consumers in the aquatic system. Feeding primarily upon the phytoplankton, they in turn serve as a food source for larval and filter feeding fish. Zooplankton samples will be collected at Stations A-F. These samples will be analyzed for species identification and enumeration to determine population stability and variation between stations.

4.5 Benthic Macroinvertebrate Populations

Because of their sessile nature, benthic macroinvertebrate populations are excellent indicators of environmental conditions and therefore variations in species composition and abundance will reflect changes in the natural habitat due to effluent addition. Four samples will be collected and analyzed at each station (Stations A-F). Since substrate composition is one of the most important factors controlling the benthic macroinvertebrate distribution, samples will be collected from similar substrates. Therefore the quantitative sampling will consist of two sampling methods. In the softer bottom sediments, an Ekman grab sampler will be used while in riffle areas where rocky substrate predominates, a Surber square foot sampler will be employed.

4.6 Fisheries Populations

Fish are the secondary consumers in the aquatic food chain. The composition of species in the population and their respective abundance are excellent indicators of their associated environmental conditions. Fish populations will be sampled by electroshocking techniques. The total length of the discharge stream will be fished from Station A to the confluence with Pleasant Run Creek. On Pleasant Run Creek, sampling stations will be located in the immediate vicinity of locations C, D, E, and F. These respective locations will be fished until it is determined that sufficient numbers and representative species have been captured to assess the indigenous population. Representative species will be sexed, age, growth and condition factors determined. These fish will be photographed and a reference collection maintained.

4.7 Periphyton

Periphyton is an assemblage of a wide variety of organisms that grow on submerged substrates and include, but is not limited to, bacteria, molds, algae and protozoa. Periphyton is an excellent indicator of water quality (USEPA, 1973). Periphyton samples will be collected at Station A-F by taking selected submerged rocks, sticks and portions of vegetation from their environment and returning the sample to the laboratory for identification.

4.8 Chemistry

Due to the nature of the area which is drained by Pleasant Run Creek, CDM is proposing to analyze for the parameters listed in Table 3. The parameters include

Table 3 Water Quality Parameters

Parameter	Preservation[a]	Detection Limit (mg/l)	Reference
Organic nitrogen	$HgCl_2$	0.01	APHA[b], p.244
Ammonia nitrogen	$HgCl_2$	0.01	EPA[c], p.134
Nitrate nitrogen	$HgCl_2$	0.01	EPA, p.170
Nitrite nitrogen	$HgCl_2$	0.002	EPA, p.195
Total phosphorus	$HgCl_2$	0.005	EPA, p.235
Orthophosphorus	$HgCl_2$	0.005	EPA, p.235
BOD_5	-	1.0	APHA, p.489
Chloride	-	0.5	APHA, p.97
Total suspended solids	-	1.0	EPA, p.278
Total dissolved solids	-	1.0	EPA, p.275
Turbidity	-	1 JTU	APHA, p.350
Potassium	HNO_3	0.01	APHA, p.211
Dissolved oxygen	in situ	-	APHA, p.484
pH	in situ	-	EPA, p.230
Temperature	in situ	-	APHA, p.348
Oil and grease	H_2SO_4, glass	1.0	APHA, p.254
PCB	glass	0.001	Fed. Reg.[d], 1973
Organochlorine pesticides	glass	0.001	Fed. Reg., 1973

a United States Environmental Protection Agency, 1974. Methods for Chemical Analysis of Water and Wastes, Washington, D.C. 298 p.

b American Public Health Association et al, 1971. Standard Methods for the Examination of Water and Wastewater, Washington, D.C. 874 p.

c United States Environmental Protection Agency, 1971. Methods for Chemical Analysis of Water and Wastes, Washington, D.C. 312 p.

d Federal Register, 1973. 38 FR 125, June 29, 1973.

nutrients to be analyzed in order to determine effects of non-point source drainage. Two replicate samples will be taken at all stations. Preservation methods, detection limits, and reference citations are listed in Table 3. These samples will be returned to Milwaukee for analysis.

4.9 Physical

Flow measurements will be made at all stations. A Marsh-McBirney Model 301 Electromagnetic Current Meter will be used for all field measurements.

4.10 Statistical Analysis

All biological and chemical data will be treated statistically. Analysis of variance and Student Newman Keuls Multiple Range test will be conducted to determine statistically significant differences between sampling locations. Statistical results will assist in the emperical interpretation for variations among stations and determinations of cause and effect relationships in Pleasant Run Creek.

4.11 Mass Transport and Extent of PCB Composition for Bottom Sediments in Pleasant Run Creek - Special Studies

Based on data from the preliminary investigation conducted on June 16, 1977, it appears that the major contribution of PCB's entering Pleasant Run Creek are settling out between Stations D and F.

To determine the volume, rate and location of PCB's along this reach, several parameters should be measured. Sediment core samples should be taken at selected locations between Stations D and F and the concentration of PCB's

determined. These replicate core samples should be taken at not less than every 100 feet. Additional parameters for this site specific location should include replicate turbidity and PCB water quality samples at each site. Half of the PCB samples would be filtered in Bedford before shipment to Milwaukee. In this manner, the suspended and dissolved fractions of PCB can be determined. River velocity measurements should also be made at each sampling location.

The approximate rate of settling can be determined by velocity measurements in conjunction with turbidity and suspended and dissolved PCB concentrations. The mass transport and settling rate study should be conducted during low and high flow conditions.

4.12 Technical Summary

CDM has designed this study to determine the nature of the aquatic community in Pleasant Run Creek and its tributaries and further, to assess the impact of PCB's on this community and the PCB's present sediment location. This study, in conjunction with engineering recommendations will make it possible to discuss the alternatives which can be pursued by the client in maintaining and enhancing the local environment while being consistent with socio-economic and cost-benefit factors.

Although CDM has presented the proposed additional study as a one-time study, we strongly believe that, if such a study is undertaken, more than one field effort should be performed. Our logic is two-fold. More than one seasonal study would allow us to examine seasonal

aquatic community variations. Secondly, studies during high flow and low flow conditions would allow us to compare the nature of the system during hydrological extremes.

4.13 Cost Summary

A. Field Preparation	
Scientist III - 10 hrs @ $22/hr	$ 220.00
B. Field Effort	
1 Scientist VI - 20 hrs @ $40/hr	800.00
1 Scientist V - 20 hrs @ $35/hr	700.00
2 Scientist III - 40 hrs @ $22/hr	880.00
2 Trucks, 1000 miles @ $.25/mile	250.00
1 Boat, all other rental equipment	N/C
Per Diem - 4 men, 2 days @ $40/day	320.00
Field Subtotal	$2,950.00
C. Laboratory	
1. Benthos - 4 samples/site - 24 samples @ $110/sample	$2,640.00
2. Phytoplankton - 2 samples/site - 12 samples @ $80/sample	960.00
3. Zooplankton - 2 samples/site - 12 samples @ $44/sample	528.00
4. Fisheries - 1 Scientist III, 16 hrs @ $22/hr	352.00
5. Periphyton - 1 sample/site - 6 samples @ $80/sample	480.00
6. Bacteriology - 2 samples/site - 12 samples @ $50/sample	600.00
7. Flow Data Reduction - 1 Scientist III, 5 hrs @ $22/hr	110.00
8. Chemistry - 2 samples/site - 12 samples @ $200/sample	2,400.00

9. Statistical Analysis - 1 Scientist IV - 40 hrs @ $26/hr	$1,040.00
Computer Charges	150.00
10. Special Studies - Maximum of Seven Sites	
14 Sediment Samples @ $75/sample	1,050.00
14 Dissolved/Total PCB Water Samples @ $60/sample	840.00
14 Turbidity @ $2/sample	28.00
Laboratory Subtotal	$11,178.00
D. Report and Management	
Secretary - 20 hrs @ $14/hr	280.00
Analysis of Special Studies and other Reporting Requirements:	
1 Scientist V - 40 hrs @ $35/hr	1,400.00
1 Scientist VI - 24 hrs @ $40/hr	960.00
Copying Charges	100.00
Management Subtotal	$ 2,740.00
E. Total Cost/Per Effort	$17,088.00
F. Total Cost - High Flow and Low Flow Conditions Only	$34,176.00
G. Total Cost - Quarterly Seasonal Efforts	$68,352.00

5.0 SOLID WASTE ENGINEERING

5.1 General

The purpose of this section of the report is to identify possible clean-up measures likely to be recommended in a detailed environmental study of Pleasant Run Creek and the Central Foundry discharge creek into Pleasant Run Creek. The assumption that such clean-up measures will be recommended is based upon the identification of PCB contaminated sediments, existing and proposed legislation controlling such wastes, and an assumption that some adverse environmental impact is resulting from the sediments. At this time, it is too early to say such a recommendation will be made. A detailed environmental analysis is required to determine the extent of any existing or potential future environmental impact. Additionally, a determination must be made whether or not any such impacts identified are significant enough to justify undertaking corrective actions which will have relatively high costs and which may have adverse environmental impacts associated with their implementation.

5.2 Potential Clean-Up Measures

If a determination is made that PCB's in the sediments of Pleasant Run Creek and the plant discharge creek are causing or may in the future cause significant environmental impact,

there are two basic approaches that may be undertaken. The first approach involves "fixing" the sediments and associated PCB's in place effectively removing them or separating them from the environment. The second approach requires the physical removal of the sediments from the environment.

The first step in evaluating these measures is estimating the quantity of sediments involved. Based upon estimates of the length of the creeks, average widths and sediment depths, we estimate that there are 50,000 to 60,000 cubic yards of sediment in Pleasant Run Creek from its confluence with the plant discharge creek to Salt Creek, and 3,000 to 5,000 cubic yards of sediment in the plant discharge creek. The actual quantity of sediment requiring treatment is, of course, unknown. Treatment requirements, if any, should be based upon the results of a detailed environmental analysis including the determination of:

a. The location and concentration of the PCB's within the sediment profile.

b. The concentration of PCB at which a significant environmental impact occurs

c. The degree to which the PCB's may become re-suspended in the creeks and transported to a new location

Analysis of these data would indicate the locations and extent of required excavation or treatment. For the purposes

of this preliminary study we have assumed about 60,000 cubic yards of sediment will require treatment. This is probably a relatively conservative (high) assumtion, but a detailed study could result in even greater quantities. Rough estimates of the cost for treating various other quantities of sediments can be made from the general cost estimates given for the base quantity of 60,000 cubic yards.

The two basic approaches to treating the sediments are discussed below:

1. "Fixing the Sediments in-place - This approach involves the application of a binder to the sediments to retain them in-place. This approach is commonly used for embankment stabilization and the creation of impermeable soil layers. The simplest approach is to place a fabric netting over the sediments to physically hold them in place. This would assist the sediments in resisting resuspension and transport downstream. It would not significantly reduce the impact of existing PCB contamination. It also would not be applicable for use in the plant discharge creek where the sediment is distributed over a number of small areas.

The most appropriate method in this case, particularly for Pleasant Run Creek, would be the use of a cement or asphalt admixture physically mixed into the sediments in place to form a hard stable surface. The thickness of this layer is usually up to six inches but with special construction it can be mixed through the entire sediment layer. This would

result in a structural mass which would resist erosion by the stream and in which the PCB's would be bound. There are several problems associated with this method, however. First, the particular cement or binder would have to be selected to resist any chemical reactions which could occur from various constituents of the sediment. Secondly, the structure would be subject to weathering from freezing in the winter and other hydraulic forces. This could result in rapid deterioration of the structure. Finally, the sediments in Pleasant Run Creek appear to be uncosolidated and consist primarily of clays and silts. Such material is not readily adaptable to such treatment and large quantities of sands may have to be added to the mixture. Also, the application of binders to in-place sediment would pose phyisical difficulties due to the inaccessibility of some areas.

This procedure will also have several environmental impacts. By fixing the sediments, the hydraulic characteristics of Pleasant Run will be altered, probably with higher flood levels and lower low flow volumes. There also could be some impact upon the nearby groundwater table. During construction, the creek's ecosystem would be destroyed. The ecosystem would take a long time to reestablish itself and probably would not be representative of the current natural system. Also, during construction, some of the contaminated sediments would be resuspended and carried downstream potentially affecting uncontaminated areas. This could be reduced by restricting

construction to one section of the creek at a time, and restricting downstream silt movement by the use of bales of hay, for example. This work will also require the construction of access roads at various locations to reach the creek with heavy equipment and the removal of riparian vegetation where required.

The estimated cost for the work on all of Pleasant Run Creek is very difficult to determine but is probably in excess of several million dollars. This method is probably not feasible for this application except possibly in a few small isolated areas where special conditions may exist.

2. Sediment Removal - This approach involves the physical removal of sediments from the creeks. Although it can be done utilizing drag-lines, backhoes, or other heavy equipment, the most appropriate method in this application appears to be hydraulic dredging. The sediment would be pumped through a hose to a nearby truck for transport. The hydraulic dredging apparatus can be visualized as a large vacuum cleaner for removing the sediments. The sediments in Pleasant Run Creek and the plant discharge creek appear to be amenable to this type of operation. However, large quantities of water are required to produce the necessary fluidity in the sediments to allow them to be pumped. The availability of water in the creeks may dictate the time and rate of progress of the work.

As with the previous method discussed above, this work will produce its own environmental impacts. On Pleasant Run

Creek it may be possible to float the pump in the stream; however, on the plant discharge creek and at places on Pleasant Run Creek, it will be necessary to physically move the pump requiring the removal of riparian vegetation. Also, the trucks must be brought to within several hundred feet of the pump requiring the construction of a number of access roads to the creeks. This method will also destroy the existing ecosystem in the creeks which again may take a long time to reestablish. The existing hydraulic characteristics of the creek will be altered impacting upon local use of the creeks. Finally, with this method there will be resuspension of sediment occurring which may significantly impact downstream areas. Although measures can be taken to reduce these impacts, nonetheless, they will exist.

The estimated cost for hydraulically pumping the sediments from the two creeks is estimated to be about $1,000,000 to $1,500,000. This includes removing the sediments and trucking them to a disposal area within a ten mile radius. It also includes an allowance for measures to reduce the environmental impacts but these could change with more detailed study. As with the other alternative, this cost can be reduced if sediment removal is confined to specific reaches of the creek.

5.3 Disposal of Contaminated Sediments

Once the contaminated sediments have been removed from the streams, they must be disposed of in an economical and environmentally acceptable manner. The Federal Environmental Protection Agency (EPA) has recently proposed rules and regulations for the disposal of PCB wastes. A copy of these proposed regulations are appended. The proposed regulations are applicable to all wastes containing more than 500 parts PCB per million. Below this limit, the Federal government would not have any regulatory authority although the individual states could regulate wastes containing less than 500 parts PCB per million. The sediment samples taken on June 16, 1977 indicate concentrations exceeding this limit at stations A, B, and E. However, at this time, it is difficult to determine the quantity of material which exceeds this limit out of the total estimated sediment quantity. For the purposes of this work, we are assuming that all the sediment (i.e. 60,000 cubic yards) must be disposed of in accordance with the proposed EPA regulations. The proposed regulations describe this requirement as follows:

> "Some mixtures that may contain more than 500 parts per million PCB chemical substances will not be affected by these regulations until their use is altered. For example, this regulation would not require that bottom sediments in rivers and harbors be removed from the watercourses. If they are removed for any reason such as dredging or excavation, the disposal of these sediments would have to meet the disposal provisions of this regulation. Similar considerations apply to contaminated soils."

alternative and to document any additional requirements. Although it is difficult to estimate the cost of the dewatering step, it can probably be done for less than $100,000 excluding treatment of the supernatent. Treatment of this liquid is discussed later.

The transportation of these wastes would require the use of enclosed watertight vehicles. Other restrictions may be imposed by the regulatory agencies. Permits from the appropriate state(s) and Federal regulatory agencies will be required. The transportation cost, based upon some dewatering, is estimated to be about $400,000 to $700,000. The disposal fee is estimated to be about $100,000 to $200,000. Thus, total disposal costs for this alternative are estimated in the range of $600,000 to $1,000,000 based upon the previously stated assumptions.

2. Incineration - Incineration is the most acceptable manner of destroying PCB. The incinerator must meet State and Federal requirements for this type of facility. There are incinerator types on the market which can meet these requirements. The problems involved in this application concern the nature of the sediments themselves. For the most part, these sediments are inorganic and will not burn. Thus, most of the material put in the incinerator will exit as residue. The fine grain size of these materials may also cause mechanical problems in the unit by getting into moving parts, causing erosion on surfaces exposed to the materials passing through,

and increasing air pollution emissions. Finally, as this material will not burn, fuel, either gas or oil, will be required to maintain high operating temperatures. Dewatering of the sediments prior to incineration may also be required.

The anticipated very high costs and questions on the ability of the incinerator units to handle this waste lead to the conclusion that this method of disposal does not appear feasible at this time. Also, the method of procurement and operation for a one-time use has not been investigated and is uncertain.

3. Placement in a prepared and contained land disposal site - This alternative would require the preparation of a lagoon for disposal of the sediments. This lagoon would be lined with an impervious material to prevent the escape of contaminated fluids into the groundwater or nearby surface waters. The liner could be a plactic or rubber type liner, bentonite clay material, or a natural clay or soil available in the area A detailed analysis of the sediment would be required to determine the best liner to use to resist any chemical reactions with materials in the sediment. However, it is anticipated that a locally available impervious material should be suitable. After placement of the liner, an under-drain system should be installed to collect any liquids collecting at the bottom and to assist in dewatering the material. Following filling of the lagoon, the excess water must be drawn off and the top sealed. Continuous monitoring

of the lagoon and nearby surface and groundwaters would be required to assure the continued integrity of the lagoon.

Approximately three to four acres would be required for this facility, depending upon its depth. The land could not be used afterwards except for recreational or other passive uses.

One problem associated with this alternative is treatment of the supernatent or excess water drawn off the lagoon. The concentration of the PCB's in this water will depend on many factors, as discussed in the previous section on resuspension of the PCB's, and some pilot plant work will be necessary. It may be possible to treat this water with the plant effluent, particularly if sophisticated equipment to remove current PCB discharges are installed. Otherwise, such equipment may be required, at least temporarily, for the lagoon discharge.

The estimated cost for this alternative is about $250,000 to $400,000 excluding land costs and treatment of the lagoon discharge.

Summary

From the above discussion, it is apparent that if the sediments in the plant discharge creek and Pleasant Run must be removed, that the most feasible alternative for disposal of the sediments is in a prepared contained lagoon constructed in the area. In addition to incineration, which is discussed above, other processing methods which could be used are energy irradiation to destroy the PCB's and fluidized bed and pyrolysis

units. Processing of the sediments with any of these systems is extremely costly and may pose many technical questions.

The alternatives outlined above are based upon disposing the estimated 60,000 cubic yards of sediment in compliance with proposed EPA regulations. As discussed in the preceding section, it may not be necessary to remove this much material. Also, much of the sediment may be disposed in another less rigorous manner if allowed by the State of Indiana. Further work with this problem should be directed towards determining the specific amount of sediment. At this time, all the alternatives should be reviewed and detailed costs developed for the most feasible alternatives.

5.4 Conclusions

From the results of our preliminary investigation, the most practical and economical method of corrective action to reduce the environmental impact of PCB in the sediments of Pleasant Run Creek and the plant discharge creek is removal from creeks and disposal in a contained lagoon. The total estimated cost for this alternative is in the range of $1,000,000 to $2,000,000. This cost estimate is for removing all the sediment in both creeks. The cost could be substantially lower if sediment removal can be restricted to "critical areas" and if additional information obtained from the detailed study is favorable to more efficient transportation or landfill operations.

Before an informed decision can be made relative to selection of alternatives, additional studies and investigations must be performed. The proposed environmental analysis will answer many questions about the extent and significance of the impact of PCB's on Pleasant Run Creek. This information, together with a detailed engineering evaluation of the alternatives, will allow the selection of the best alternative within environmental, economic, and social constraints. This engineering evaluation should include the following:

1. A determination of the quantities of sediment present in the creeks together with an analysis to determine the quantity of PCB's in the sediment and the physical properties of the sediment (i.e. consolidation, particle size distribution, dewatering characteristics) over depth and location along the creek. The underlying soils of the stream bed also would be determined.

2. A hydraulic investigation of Pleasant Run Creek and to a lesser extent the plant discharge creek to characterize sediment transport in the creeks and the conditions under which it occurs. The hydraulic investigation would also be used to determine the impact of various alternatives on the existing hydrology of the creeks.

3. A detailed analysis of sediment removal alternatives including hydraulic dredging and the use of mechanical equipment such as backhoes, end loaders, etc. This analysis would include the associated environmental impact of each alternative and estimated costs.

4. Evaluation of sediment disposal alternatives including a determination of all applicable parameters and associated costs of each alternative. Regulatory requirements would also be addressed.

5.0 BIBLIOGRAPHY

1. Federal Register, 1973, Analysis of Pollutants - Proposed Test Procedures 38 FR 125, June 29, 1973.

2. Gaufin, A.R., Use of Aquatic Invertebrates in the Assessments of Water Quality. Biological Methods for the Assessment of Water Quality, ASTM STP 528, American Society for Testing and Materials, 1973 pp 96-116.

3. United States Environmental Protection Agency (FWQA), 1969. Chemistry Laboratory Manual - Bottom Sediments Chicago, Illinois, 101p.

4. U.S. Environmental Protection Agency, 1973. Macro-invertebrates, pages 1-38 In: Biological field and laboratory methods for measuring the quality of surface waters and effluents. Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio.

APPENDIX

TUESDAY, MAY 24, 1977

PART V

THE NATIONAL ARCHIVES OF THE UNITED STATES • 1934 •

ENVIRONMENTAL PROTECTION AGENCY

POLYCHLORINATED BIPHENYLS (PCBS)

TSCA → Toxic Substances Control Act

RCRA → Resources Conservation & Recovery Act

Digitized by

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 761]

[FRL 722-3; OTS-068005]

OLYCHLORINATED BIPHENYLS (PCBS)

Toxic Substances Control

GENCY: Environmental Protection ency.

CTION: Proposed Rule pursuant to the uthority of section 6(e)(1), The Toxic ubstances Control Act (Pub. L. 94-469; Stat. 2003; 15 U.S.C. 2601, et. seq., reinafter referred to as TSCA). Pro- ide an opportunity for Informal Hear- ng pursuant to the Authority of section (c)(2) and 6(e)(4), TSCA.

UMMARY: These proposed regulations escribe disposal and marking require- ents for polychlorinated biphenyls PCBs) and articles and equipment ich contain PCBs. Newly manufac- red PCBs, PCB articles, and PCB quipment, as well as PCBs, PCB articles, nd PCB equipment presently in use. e covered by these requirements. ection 6(e) of TSCA requires the romulgation of rules prescribing mark- ng and disposal of PCBs by July 1, 977. The intent of these regulations to protect the environment from rther contamination by PCBs result- g from improper handling and use nd from release of PCBs to the environ- ent following disposal.

EARING PROCEDURE AND DATES: order to promulgate this rule as close s possible to the deadline set by TSCA, he following compressed schedule for omments and informal hearing is nec- ssary. To the extent specific changes re not set forth below, the proposed pro- edures for rulemaking under section 6 f TSCA, (40 CFR Part 750) 42 FR 0640 (April 21, 1977), will govern.

Comments on these proposed regula- ions must be received by EPA prior to he close of business on June 22, 1977. The informal hearing on these proposed egulations will begin at 10:00 a.m. on une 24, 1977, in room 3906, EPA Head- uarters, 401 M Street, SW., Washington, D.C. 20460. Requests for participation in he informal hearing must be received y EPA prior to the close of business on une 14, 1977.

All requests for cross-examination must be received by the Hearing Clerk within two days after the completion of the legislative part of the informal hear- ng. Requests for cross-examination will be acted on by EPA as soon as possible and not later than the deadline in the proposed regulations of one week after receipt. The cross-examinations granted by EPA will begin as soon as possible thereafter. All reply comments must be received by EPA prior to the close of business on the fifth working day after the last day of cross-examination.

Rules on funding public participation in the hearings related to this rulemak- ing will be published in the FEDERAL REG- ISTER shortly. These rules will be based on section 6(a)(4) of TSCA.

INFORMATION CONTACT:

David E. Wagner, Office of Toxic Substances (WH-557), Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, 202-426-9000. Joni T. Repasch is the Record and Hearing Clerk for this rulemaking. The official record of rulemaking is located in Room 725 WSME, EPA Headquarters, 401 M Street, SW., Washington, D.C. 20460, 202-426-9000. able for viewing and copying from 9 a.m. to 4 p.m., Monday through Friday excluding holidays. Hearing transcripts and other hearing material shall be added to the record as soon as feasible after they become available.

SUPPLEMENTARY INFORMATION: A support document titled, "PCB Marking and Disposal Regulations—Support Document," is available. Mrs. Joni T. Repasch, Room 713 WSME, 401 M Street, S.W., Washington, D.C. 20460, Telephone 202-426-9000, can provide information on obtaining copies of the document. This document contains PCB background information, PCB effects information, economic analyses of regulatory action, regulatory support information, and the list of documents contained in the official record of rulemaking.

Comments on these proposed regulations must be received by EPA prior to the close of business on June 22, 1977, and should be sent to the Environmental Protection Agency, Office of Toxic Substances (WH-557), 401 M Street, SW., Washington, D.C. 20460, Attn: Joni T. Repasch.

LEGAL AUTHORITY

Section 6(e) of TSCA states, "Polychlorinated Biphenyls

"(1) Within six months after the effective date of this Act the Administrator shall promulgate rules to

(A) Prescribe methods for the disposal of polychlorinated biphenyls, and

(B) require polychlorinated biphenyls to be marked with clear and adequate warnings and instructions with respect to their processing, distribution in commerce, use, or disposal or with respect to any combination of such activities.

Requirements prescribed by rules under this paragraph shall be consistent with the requirements of paragraphs (2) and (3).

Paragraphs (2) and (3) apply to bans on manufacturing, processing, and distributing in commerce and will be addressed at a later date. The definitions of polychlorinated biphenyls contained herein are consistent with definitions that EPA intends to use for rulemaking under paragraphs (2) and (3).

The legal authority contained in the Resource Conservation and Recovery Act (RCRA), Pub. L. 94-580, has not been used in the regulation. However, RCRA requires that by April 21, 1978, EPA identify hazardous wastes; establish a permit system for treatment, storage, and disposal of hazardous waste; and establish a manifest system for the disposition of wastes, as well as monitoring and recordkeeping requirements for hazardous waste management facilities. Thus, PCB-containing solid wastes that meet the criteria for "hazardous waste" may also be subject to broader regulations being developed under RCRA. If conflicts arise between the RCRA and TSCA approaches, the TSCA regulation could be amended or an exception to RCRA requirements could be granted.

DISCUSSION OF THE RULE:

BACKGROUND

Polychlorinated biphenyls (PCBs) are mixtures of the chemical compounds formed by the chemical bond of two benzene molecules into a biphenyl molecule with varying numbers of chlorine atoms attached to the biphenyl molecule. PCBs are among the most stable organic compounds known and exhibit other properties that render them useful as dielectric and heat transfer fluids. PCBs are currently used primarily in capacitors and transformers. They are also used in investment casting waxes and in the cooling systems of mining machinery.

Of the roughly 1.25 billion pounds of PCBs introduced into commerce in the United States since 1929, only 55 million pounds have been destroyed by incineration or by degradation in the environment. 290 million pounds are under varying degrees of control in landfills and dumps, and 150 million pounds are free in the environment. 758 million pounds are currently in service.

Of the approximately 758 million pounds currently in service, 750 million pounds are in electrical transformers and capacitors as follows:

- Transformers—140,000 items totalling 300,000,000 pounds of PCBs
- Large high voltage capacitors—5,000,000 items totalling 200,000,000 pounds of PCBs
- Large low voltage capacitors—20,000,000 items totalling 200,000,000 pounds of PCBs
- Small capacitors for highway lighting—25,000,000 items totalling 50,000,000 pounds of PCBs
- Small capacitors in small appliances—50,000,000 items totalling 50,000,000 pounds of PCBs
- Small capacitors in fluorescent light ballasts—800,000,000 items totalling 80,000,000 pounds of PCBs.

The transformers have a 40-year average life, and the other items have a 15- to 20-year average life. The relatively long life of these items will result in an equally long time period during which disposal of PCBs will be required.

Although PCBs have long been known to be extremely toxic, only in recent years have they been acknowledged to be a general threat to the environment. They have been found in significant concentrations in waterways and sediments throughout the world. They are a widely spread contaminant of fish and wildlife resources. Recently, they have been identified in the milk of nursing mothers throughout the United States.

PUBLIC PARTICIPATION IN THE DEVELOPMENT OF THE REGULATIONS

On December 20, 1976, a public panel meeting was held and representatives of key public and private organizations

were invited to participate in a discussion on the primary issues involved in these regulations. A notice of this meeting was published in the FEDERAL REGISTER prior to the meeting. (See 41 FR 53692I, December 8, 1976). On January 24, 1977, a public meeting was held the development of these regulations any interested person could request time to speak on any matter related to the regulations. A FEDERAL REGISTER notice (FR 3701 January 19, 1977) was published prior to the public meeting which contains a discussion of key issues and requested public comment on those issues.

GENERAL DEFINITION

The definitions of "Administrator", "Agency", "chemical substance", "distribute in commerce", "manufacture", and "process" are identical to the definitions of these terms in TSCA. The definitions of "mixture" and "person" are taken from the definitions in the proposed regulation 40 CFR Part 700, Toxic Substances Control, General Provisions.

CHEMICAL STRUCTURES INCLUDED IN DEFINITION OF PCBS

"PCB chemical substances" are defined as chemical substances which are limited to the biphenyl molecule that has been chlorinated to varying degrees. This definition is the basic building block for defining other forms of PCBs. Any modification other than chlorination to the molecule is sufficient to remove the resultant molecule from classification as a PCB.

One option considered was to broaden the definition of PCB chemical substances by altering the definition to read "* * * any chemical substance which includes the biphenyl molecule which has been chlorinated to varying degrees * * *" Such a broadening would include substances that have been altered by chemical reactions such as bromination, ammoniation, or hydroxylation. This would include a number of chemicals widely used in industry such as dichlorobenzidine, chloroterphenyls, and chlorinated solvents. This option is not proposed at this time because additional investigation is needed to determine the complete scope of chemical substances that would be included. Additionally, a more complete understanding of health, environmental, and economic effects of an expanded definition is necessary.

PCB MIXTURES, WASTE MATERIALS, AND SLUDGES

"PCB mixture" are defined to mean mixtures, except sludges from municipal sewage treatment facilities, that contain 0.05 percent or greater of PCB chemical substances (on a dry weight basis). The definition for PCB mixtures covers mixtures that will be found in commercial applications and as waste materials. Transformer coolants and liquid dielectrics such as Askarels may be a blend of several PCB chemical substances and may contain solvents such as trichlorobenzene. The resulting mixture is then the chemical to which these regulations apply. These commercial fluids always contain a concentration of PCB chemical substances well above the 0.05 percent level. Dielectric liquids in capacitors usually contain 99 percent PCB chemical substances, and the PCB coolant fluids in transformers range from 60 to 99 percent PCB chemical substances. Other commercial chemicals such as chlorinated solvents and polychlorinated terphenyls also contain PCB chemical substances as byproducts of the manufacture of these chemicals. Polychlorinated terphenyls are reported to contain from 0.5 to 5 percent PCB chemical substances,[1] and hexachlorobenzene may have a PCB chemical substance concentration of 0.4 percent or higher. As a consequence, the disposal of these chemicals would have to meet the conditions of this regulation. Another group of PCB mixtures are waste materials. This group includes chemical substances and mixtures that become contaminated with PCB chemical substances as a result of commercial uses of PCB chemical substances and PCB mixtures, incidental exposure to PCB chemical substances and PCB mixtures during commercial activities, and environmental exposure to PCB chemical substances and PCB mixtures as a result of accidents and spills. Examples of such waste material include contaminated solvents used in cleaning operations, contaminated dielectric liquids used as substitutes in PCB electrical articles previously containing PCB mixtures, contaminated machinery and equipment used in PCB activities, contaminated rags and clothing, and contaminated soils, gravel, or paving materials.

The level of 0.05 percent or 500 parts per million was selected because it draws a line between those commercial products which are generally called PCBs and used as such and other widely used commercial products which may contain PCBs produced as a side effect of the manufacturing process. Though these latter chemicals may eventually require regulation, their commercial uses and essentiality have not been adequately reviewed at this time. Accordingly they have been omitted from this regulation without prejudice to their possible regulation at some later date. Some parties believe that wastes with very low levels of PCBs may present risks and should be regulated as PCBs. However, present knowledge of the dimensions of the waste problem is fragmented. Many of the wastes of concern are not recognized primarily as PCB wastes, but rather as waste oils (contaminated with PCBs) or industrial sludges containing PCBs. Accordingly, at the present, wastes are being regulated on the same basis as commercial products. Comments on this approach are particularly invited.

Later this year, when additional regulations are proposed limiting the manufacturing, processing, and use of PCBs, it may be possible to distinguish more clearly when an item or material becomes a waste. Additionally, regulations being developed under the Resource Conservation and Recovery Act (RCRA), Pub L. 94-580, will also refine waste materials. A possible consequence of these later regulations may be to lower the concentration of PCBs in the definition of waste materials. In the interim care must continue to be exercised in disposal of waste materials with lowed levels of PCB concentrations to avoid violating any water or air standards. Current water discharge standards for PCBs are very stringent ranging from zero discharge for capacitor and transformer manufacturing to one part per billion for other discharges.

Some mixtures that may contain more than 500 parts per million PCB chemical substances will not be affected by these regulations until their use is altered. For example, this regulation would not require that bottom sediments in rivers and harbors be removed from the watercourses. If they are removed for any reason such as dredging or excavation, the disposal of these sediments would have to meet the disposal provisions of this regulation. Similar considerations apply to contaminated soils.

In general, municipal sewage sludges seldom have contamination levels over 500 parts per million and, therefore, will not be affected by this regulation. Environmental management of these sludges is possible under a variety of Federal and State regulatory programs, and the effective integration of these programs is considered to be the most desirable approach to control this problem.

With regard to spills, more stringent requirements may be stipulated during a spill by spill-control personnel using other legislative and regulatory authority such as the Federal Water Pollution Control Act (Pub. L. 92-500) and the Safe Drinking Water Act (Pub L. 93-523). Later regulations under TSCA or RCRA could also lower the concentrations limits that would be applicable to spills.

PERSONS AFFECTED BY THE REGULATION

The regulation applies to all persons who manufacture, process, distribute in commerce, use, or dispose of PCBs. Since persons include local, state, and Federal governments, the applicability is very broad.

Some of the most common commercial enterprises and activities that will be subject to the regulations are electric power utilities which operate PCB transformers and large capacitors, owners of buildings and industrial facilities that use PCB transformers and large capacitors, highway departments and industrial facilities that use special high intensity lighting systems, service shops that repair small appliances with PCB capacitors, service shops that repair and refill PCB transformers. Other categories of affected commercial enterprises include manufacturers that produce new electrical items containing PCBs and owners and

[1] USEP-OTS. "PCBs in the United States: Industrial Use and Environmental Distribution." Feb. 25, 1976, Versar, Inc.

orage facility and the name of the own-
or or operator of the facility.

(3) Total quantities of PCBs remain-
g in service at the end of the calendar
ar using the following breakdown:

(i) Total weight in kilograms of any
CB chemical substances and PCB mix-
res in PCB containers, including the
entification of container contents such
liquids and capacitors.

(ii) Total number of PCB transform-
rs and total weight in kilograms of any
B chemical substances and PCB mix-
res contained in the transformers;

(ii) Total number of PCB large high
oltage capacitors.

(b) *Disposal and storage facilities.* Be-
ming in 1979, each owner or operator
a facility used for the storage or dis-
osal of PCBs shall by March 1 of each
ar prepare and maintain a document
ich specifies the manner in which
Bs were handled at the facility dur-
g the previous calendar year. Such
cument shall be retained at each fa-
ity for at least five years after the fa-
ity is no longer used for the storage or
posal of PCBs, except that in the case
chemical waste landfills such docu-
ents shall be maintained at least
nty years after the chemical waste
dfill is no longer used for the dis-
al of PCBs. Such documents shall be
ailable at the facility for inspection by
thorized representatives of the Envi-
mental Protection Agency. If the
ility ceases to be used for PCB storage
disposal, the owner or operator of
ch facility shall promptly notify the
ency Regional Administrator of the
ion in which the facility is located
t the facility has ceased storage or
posal operations and shall specify
ere the documents required to be
intained by this paragraph shall be
ted. The following information shall
included in each document:

1) The date when any PCBs are re-
ved by the facility during the previous
ndar year for storage or disposal, and
identification of the person and fa-
ty from whom such PCBs were
ived.

2) The date when any PCBs are dis-
ed of at the disposal facility or trans-
red to another disposal or storage fa-
ty, including the identification of the
cific types of PCB chemical sub-
nces, PCB mixtures, or PCB articles
containers; PCB transformers; and
B equipment or PCB articles not in
containers which were stored or disposed
of.

(3) Total weight in kilograms of any
PCB containers and the total weight in
kilograms of any PCB chemical sub-
stances or PCB mixtures contained in
any PCB transformers, received during
the calendar year, transferred to other
storage or disposal facilities during the
calendar year, and remaining on the dis-
posal or storage facility site at the end
of the calendar year, respectively, in-
cluding, where applicable, the identifi-
cation of PCB container contents such
as liquids, capacitors, etc. When PCB
containers or PCB chemical substances
or PCB mixtures contained in a trans-
former are transferred to other storage
or disposal facilities, the identification
of the facility to which such PCBs were
transferred shall be included.

(4) Total number of any PCB articles
or PCB equipment, not in PCB contain-
ers, received during the calendar year,
transferred to other storage or disposal
facilities during the calendar year, and
remaining on the facility site at the end
of the calendar year, respectively, in-
cluding the identification of the specific
types of PCB articles and PCB equip-
ment received, transferred, or remaining
on the facility site. When PCB articles
and PCB equipment are transferred to
other storage or disposal facilities, the
identification of the facility to which
such PCB articles and PCB equipment
were transferred must be included.

NOTE: Any requirements for weights in kilograms of PCBs may be calculated values if the internal volume of containers and transformers is known and included in the reports, together with any assumptions on the density of the PCB chemical substances or PCB mixtures contained in the containers or transformers.

(c) *Incineration facilities.* For each
owner or operator of a PCB incinerator
facility, the following information is re-
quired in addition to the information
required in paragraph (b) of this sec-
tion:

(1) When PCBs are being incinerated,
the following continuous and short-in-
terval data shall be collected and main-
tained for a period of five years from the
date of collection:

(A) Rate and quantity of PCBs fed
to the combustion system, as provided in
Annex I—§ 761.40(a)(3).

(B) Temperature of the combustion
process, as provided in Annex I—§ 761.40
(a)(4).

(C) Stack emission products to in-
clude O_2, CO, and CO_2, as provided in
Annex I—§ 761.40(a)(7).

(2) When PCBs are being incinerated,
data and records resulting from the mon-
itoring of stack emissions as required in
Annex I—§ 761.40(d)(2), shall be col-
lected and maintained for five years.

(3) Total weight in kilograms of any
solid residues generated by the incinera-
tion of PCBs during the calendar year,
the total weight in kilograms of any
solid residues disposed of by such facility
in chemical waste landfills, and the total
weight in kilograms of any solid residues
remaining on the facility site shall be
retained for five years.

(4) When PCBs are being incinerated,
additional periodic data shall be collect-
ed and maintained as specified by the
Regional Administrator pursuant to An-
nex I—§ 761.40(d)(4).

(5) A document shall be prepared on
any suspension of the operation of any
incinerator by the owner or operator
thereof, as required in Annex I-§ 761.40
(a)(8). The document shall, at a mini-
mum, include the date and time of the
suspension and an explanation of the
circumstances causing the suspension of
operation.

(d) Retention of Special Records by
Storage and Disposal Facilities. In addi-
tion to the information required to be
maintained by pragraphs (b) and (c) of
this section, each owner or operator of
a PCB storage or disposal facility
shall collect and maintain for the time
period required in paragraph (c) of this
section the following data:

(1) All documents, correspondence,
and data provided to the owner or op-
erator by any State or local government
agency that pertain to the storage or
disposal of PCBs at such facility.

(2) All documents, correspondence,
and data provided by the owner or op-
erator of such facility to any State or
local government agency that pertain to
the storage or disposal of PCBs at such
facility.

(3) Any applications and related cor-
respondence sent by the owner or oper-
ator of such facility to any local, State,
or Federal authorities in regard to waste-
water discharge permits, solid waste
permits, building permits, or other per-
mits or authorizations, such as those re-
quired by Annex I-§ 761.40(d) and Annex
II-§.61.41(c).

[FR Doc.77-14663 Filed 5-23-77;8:45 am]

method. Water analysis shall be ided in subparagraph (5)(iii) of ıragraph. Acceptable leachate col- ı monitoring/collection systems : one of the following designs un- wa[illegible]r is obtained pursuant to a[illegible](4) of this section.

Sin[illegible]/Leachate Collection. This consists of a gravity flow drain- installed under the waste disposal liner. This design is recom- d for use when semi-solid or leach- olid wastes are placed in a lined avated into a relatively thick, un- ed, homogeneous layer of low bility soil.

Compound Leachate Collection. system consists of a gravity flow ld installed under the waste dis- acility liner and above a second- talled liner. This design is recom- d for use when semiliquid or leach- olid wastes are placed in a lined avated into relatively permeable

Suction Manometers. This system ts of a network of porous "stones" ted by hoses/tubing to a vacuum The porous "stones" or suction neters are installed along the sides nde[illegible]he bottom of the waste dis- fac[illegible] liner. This type of system best when installed in relatively ible unsaturated soil immediately nt to the disposal facility's bottom r sides.

Chemical Waste Landfill Opera- (i) PCBs shall be placed in the l in a manner that will prevent [illegible]e to containers or articles. Other s placed in the landfill that are not ical[illegible]mpatible with PCBs or PCB [illegible]all be segregated from the th[illegible]ghout the waste handling isposal process.

An operations plan shall be devel- nd submitted to the Regional Ad- rator for approval as required in aph (c) of this section. This plan include detailed explanations of rocedures to be used for record- g, excavation and backfilling, segregation burial coordinates, [illegible] equipment movement, use [illegible] leachate collection systems, ling and monitoring procedures, oring wells, and security measures tect against vandalism and unau- ed waste placements. EPA guide- entitled "Thermal Processing and Disposal of Solid Waste" (39 FR of August 14, 1974) are a useful nce in preparation of this plan.

Records shall be maintained for CB disposal operations and shall in- the three dimensional burial co- ates for PCBs. Additional records be developed and maintained as ded in Annex VI.

Supporting Facilities. (i) A six woven mesh fence, wall, or similar shall be provided around the site revent unauthorized persons and als from entering.

Roads shall be maintained to and e site which are adequate to operate nat[illegible]n the site without causing safety or nuisance problems or hazardous conditions.

(iii) The site shall be operated and maintained in a manner to prevent safety problems or hazardous conditions resulting from spilled liquids and windblown materials.

(c) *Approval of chemical waste landfills.* Prior to the disposal of any PCBs in a chemical waste landfill, the owner or operator of the landfill shall receive written approval of the Agency Regional Administrator of the Region in which the landfill is located. Such approval shall be obtained in the following manner:

(1) *Initial Report.* The owner or operator shall submit to the Regional Administrator an initial report which contains:

(i) The location of the landfill.

(ii) A detailed description of the landfill including general site plans and design drawings.

(iii) An engineering report describing the manner in which the landfill complies with the requirements for chemical waste landfills in paragraph (b) of this section.

(iv) Sampling and monitoring equipment and facilities available.

(v) Expected waste volumes of PCBs.

(vi) General description of waste materials other than PCBs that are expected to be disposed of in the landfill.

(vii) Landfill operations plan as required in paragraph (b) of this section.

(viii) Any local, State, or Federal permits or approvals.

(ix) Any schedules or plans for complying with the approval requirements of these regulations.

(2) *Other Information.* In addition to the information contained in the report described in subparagraph (1) of this section, the Regional Administrator may require the owner or operator to submit such other information as the Regional Administrator finds to be reasonably necessary to determine whether a chemical waste landfill should be approved.

(3) *Contents of approval.* (i) Except as provided in subparagraph (4) of this paragraph, the Regional Administrator may not approve a chemical waste landfill for the disposal of PCBs unless he finds that the landfill meets all of the requirements of subparagraph (6) of this paragraph.

(ii) In addition to the requirements of paragraph (b) of this section, the Regional Administrator may include in an approval such other requirements as the Regional Administrator finds are necessary to ensure that operation of the chemical waste landfill does not present an unreasonable risk of injury to health or the environment from PCBs. Such requirements may include a fixed period of time for which the approval is valid.

(4) *Waivers.* An owner or operator of a chemical waste landfill may submit evidence to the Regional Administrator that operation of the landfill will not present an unreasonable risk of injury to health or the environment from PCBs, when one or more of the requirements of paragraph (b) of this section are not met. On the basis of such evidence and any other available information, the Regional Administrator may in his discretion find that any such requirements are not necessary to protect against such risk and may waive such requirements in any approval for that landfill. Such finding and waiver will be stated in writing and included as part of the approval.

(5) *Persons Approved.* Any approval will designate the persons who own and who are authorized to operate the chemical waste landfill, and will apply only to such persons.

(6) *Final Approval.* Approval of a chemical waste landfill will be in writing and will be signed by the Regional Administrator. The approval will state all requirements applicable to that landfill.

ANNEX III

§ 761.42 Storage for disposal.

(a) Any PCB article or PCB container stored for disposal before July 1, 1981, shall be removed from storage and disposed of before July 1, 1982. Any PCB article or PCB container stored for disposal after July 1, 1981, shall be removed from storage and disposed of within one year from the date when it was first placed into storage.

(b) Except as provided in paragraph (c) of this section, after October 1, 1977, owners or operators of any facilities used for the storage of PCBs designated for disposal shall comply with the following requirements:

(1) Such facilities shall have:

(i) An adequate roof to prevent rainwater from reaching the stored PCBs.

(ii) An adequate floor which has continuous curbing with a minimum six inch high curb. Such floor and curbing must provide a containment volume equal to at least two times the internal volume of the largest PCB equipment or PCB container stored therein or twenty-five percent of the total internal volume of all PCB equipment or containers stored therein, whichever is greater.

(iii) No drain valves, floor drains, sewer lines, or other openings that would permit liquids to flow from the curbed area.

(iv) Continuous, smooth, and impervious construction for floors and curbing such as Portland cement concrete.

(c)(1) After October 1, 1977, if the only PCBs stored at a particular facility are small capacitors which have an aggregate storage volume of not greater than two 55-gallon drums, the only storage requirement is to store such capacitors in sound, non-leaking containers within a building.

(2) The storage area shall be marked as required in Subpart C—§761.20(a)(6).

(3) No items of movable equipment used for handling PCBs in the storage facilities shall be removed from the areas unless decontaminated.

(4) All PCB containers shall be checked for leaks at least once every 30 days. All leaking containers and their contents shall be transferred immediately to properly marked nonleaking containers. Any spilled or leaked mate-

the person who submitted the report described in subparagraph (1) of this paragraph shall submit to the Regional Administrator a detailed plan for conducting and monitoring the trial burn. At a minimum, the plan must include:

(a) Date trial burn is to be conducted.

(b) Quantity and type of PCBs to be incinerated.

(c) Parameters to be monitored and location of sampling points.

(d) Sampling frequency and methods and schedules for sample analyses.

(e) Name, address, and qualifications of persons who will review analytical results and other pertinent data and who will perform a technical evaluation of the effectiveness of the trial burn.

(iii) Following receipt of the plan described in subdivision (ii) of this subparagraph, the Regional Administrator will approve the plan, require additions or modifications to the plan, or disapprove the plan. If the plan is disapproved, the Regional Administrator will notify the person who submitted the plan of such disapproval, together with the reasons why it was disapproved. That person may thereafter submit a new plan in accordance with subdivision (ii) of this subparagraph. If the plan is approved (with any additions or modifications which the Regional Administrator may prescribe), the Regional Administrator will notify the person who submitted the plan of such approval. Thereafter the trial burn shall take place at a date and time to be agreed upon between the Regional Administrator and the person who submitted the plan.

(3) *Other information.* In addition to the information contained in the report and plan described in subparagraphs (1) and (2) of this paragraph, the Regional Administrator may require the owner or operator to submit such other information as the Regional Administrator finds to be reasonably necessary to determine whether an incinerator shall be approved.

NOTE.—The Regional Administrator will have available for review and inspection an Agency manual containing information or sampling methods and analytical procedures for the parameters required in § 761.40(a)(3), (4), (6), and (7) plus any other parameters he may determine to be appropriate. Owners or operators are encouraged to review this manual prior to submitting any report required in this Annex.

(4) *Contents of Approval.* (i) Except as provided in subparagraph (5) of this paragraph, the Regional Administrator may not approve an incinerator for the disposal of PCBs unless he finds that the incinerator meets all of the requirements of paragraphs (a) and/or (b) of this section, whichever is applicable.

(ii) In addition to the requirements of paragraphs (a) and/or (b) of this section, the Regional Administrator may include in an approval such other requirements as the Regional Administrator finds are necessary to ensure that operation of the incinerator does not present an unreasonable risk of injury to health or the environment from PCBs. Such requirements may include a fixed period of time for which the approval is valid.

(5) *Waivers.* An owner or operator of the incinerator may submit evidence to the Regional Administrator that operation of the incinerator will not present an unreasonable risk of injury to health or the environment from PCBs, when one or more of the requirements of paragraphs (a) and/or (b) of this section are not met. On the basis of such evidence and any other available information, the Regional Administrator may in his discretion find that any such requirements are not necessary to protect against such risk and may waive such requirements in any approval for that incinerator. Any such finding and waiver must be stated in writing and included as part of the approval.

(6) *Persons Approved.* An approval will designate the persons who own and who are authorized to operate the incinerator, and will apply only to such persons.

(7) *Final Approval.* Approval of an incinerator will be in writing and signed by the Regional Administrator. The approval will state all requirements applicable to that incinerator.

ANNEX II

§ 761.41 Chemical waste landfills.

(a) *General.* A chemical waste landfill used for the disposal of PCBs shall be approved by the Agency Regional Administrator pursuant to paragraph (c) of this section. Such landfill shall meet all of the requirements specified in paragraph (b) of this section, unless a waiver from these requirements is obtained pursuant to paragraph (c)(4) of this section. In addition, the landfill shall meet any other requirements which may be prescribed pursuant to paragraph (c)(3) of this section.

(b) *Technical requirements.* Requirements for chemical waste landfills used for the disposal of PCBs are as follows:

(1) *Soils.* The landfill site shall be located in thick, relatively impermeable formations such as large-area clay pans. Where this is not possible, the soil shall have a high clay and silt content with the following parameters:

(i) In-place soil thickness, 4', or compacted soil liner thickness, 3'.
(ii) Permeability (cm/sec), $\leq 1 \times 10^{-7}$.
(iii) Percent soil passing No. 200 Sieve, ≥30.
(iv) Liquid Limit, ≥30.
(v) Plasticity Index, ≥15.
(vi) Artificial Liner Thickness, ≥30 mil.

NOTE.—In the event that an artificial liner is used at a landfill site, special precautions shall be taken to insure that its integrity is maintained and that it is chemically compatible with PCBs. Soil underlining shall be provided as well as a soil cover.

(2) *Hydrology.* The bottom of the landfill shall be substantially above the historical high groundwater table. Floodplains, shorelands, and groundwater recharge areas shall be avoided. There shall be no hydraulic connection between the site and standing or flowing surface water. The site shall have monitoring wells and leachate collection and shall be at least fifty feet from the nearest groundwater.

(3) *Flood protection.* (i) If the landfill site is below the 100-year floodwater elevation, the operator shall provide surface water diversion dikes around the perimeter of the landfill site with a minimum height equal to two feet above the 100-year floodwater elevation.

(ii) If the landfill site is above the 100-year floodwater elevation, the operators shall provide diversion structures capable of diverting all of the surface water runoff from a 24-hour, 25-year storm.

(4) *Topography.* The landfill site shall be located in an area of low to moderate relief to minimize erosion and to help prevent landslides or slumping.

(5) *Monitoring Systems.*—(i) *Water Sampling.* (a) The ground and surface water from the disposal site area shall be sampled for use as baseline operations.

(b) Defined water sources shall be sampled at least monthly when the landfill is being used for disposal operations.

(c) Defined water sources shall be sampled indefinitely on a frequency of no less than once every six months after final closure of the disposal area.

(ii) *Groundwater Monitor Wells.* (a) If underlying earth materials are homogeneous, impermeable, and uniformly sloping in one direction, only three sampling points shall be necessary. These three points shall be equally spaced on a line through the center of the disposal area and extending from the area of highest water table elevation to the area of the lowest water table elevation on the property.

(b) All monitor wells shall be cased and the annular space between the monitor zone (zone of saturation) and the surface shall be completely backfilled or plugged with Portland cement to effectively prevent percolation of surface water into the well bore. The well opening at the surface shall have a removable cap to provide access and to prevent entrance of rainfall or stormwater runoff. The well shall be pumped to remove the volume of liquid initially contained in the well before obtaining a sample for analysis. The discharge shall be treated to meet applicable State or Federal discharge standards or recycled to the chemical waste landfill.

(iii) *Water analysis.* As a minimum, all samples shall be analyzed for the following parameters, and all data and records of the sampling and analysis shall be maintained as required in Annex VI. Sampling methods and analytical procedures for these parameters shall be as specified in 40 CFR Part 136 as amended in 41 FR 52779 of December 1, 1976.

(a) PCBs.
(b) pH.
(c) Specific Conductance.
(d) Chlorinated Organics.

(6) *Leachate Collection.* A leachate collection monitoring system shall be installed beneath the chemical waste landfill. Leachate collection systems shall be monitored monthly for quantity and quality of leachate produced. The leachate should be either treated to acceptable limits for discharge in accordance with a State or Federal permit or disposed of by another State or Federal ap-

Station J

Located on Salt Creek approximately 50 ft above confluence with Pleasant Run in Section 34, N 1/2, T6N, R1W. The bottom was similar to Station I.

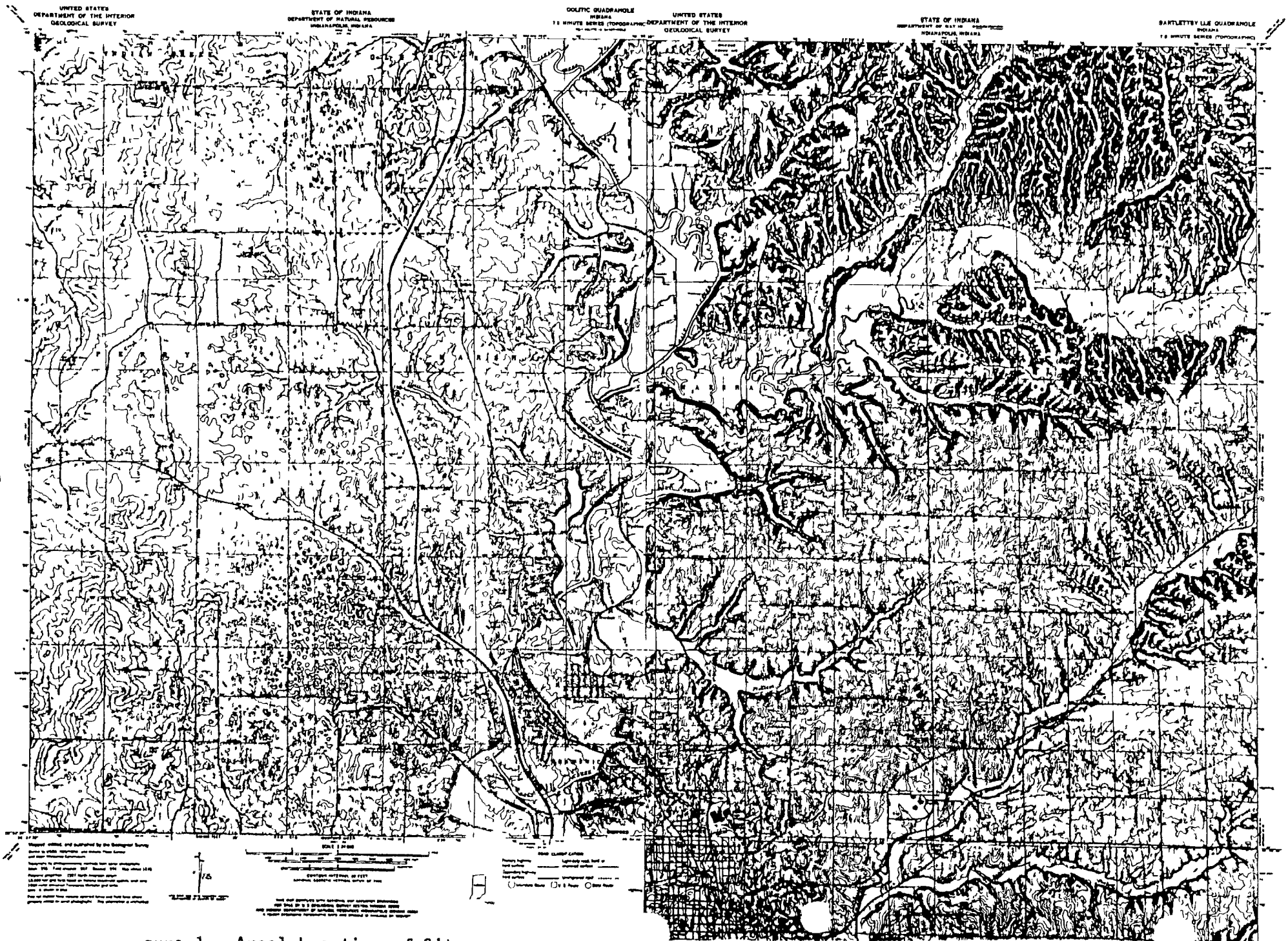
Station K

Located on Salt Creek within 50 ft and below confluence with Pleasant Run in Section 34, N 1/2 Marshall, T6N, R1W. Sediment samples were taken in soft sediment near the banks of Salt Creek. These locations had not been subjected to the severe scouring action as locations in the main current of the creek.

Station L

Located on Salt Creek approximately 2,500 ft below the confluence with Pleasant Run and above the crossing of the railroad spur from the quarry in Section 34, N 1/2 Marshall, T6N, R1W. Sediment samples were collected approximately 10 ft from each shore. The channel bottom at this location appeared to be hard clay and rock, similar to other Salt Creek stations with the exception of Station K which consisted of a softer, more penetrable material.

Specific site characteristics will be discussed in the text in relation to the physical/chemical/biological parameters studied.



.qure 1. Areal Location of Site

APPENDIX F.2

CAUSE NO. B-416

STATE OF INDIANA

INDIANAPOLIS 46206

STREAM POLLUTION CONTROL BOARD

1330 West Michigan Street

November 5, 1980

VIA CERTIFIED MAIL

Mr. David W. Graves, Jr., Attorney
General Motors Corporation
General Motors Building
3044 West Grand Boulevard
Detroit, MI 48202

Dear Mr. Graves:

Re: Adoption of Stipulation and Consent Order
Stream Pollution Control Board
of the State of Indiana
vs.
Central Foundary Division
General Motors Corporation
Bedford, Indiana
Cause No. B-416

This is to inform you that the Indiana Stream Pollution Control Board, at its regularly scheduled meeting of October 21, 1980, approved the Stipulation and Consent Order negotiated between yourself or your representatives and members of our staff. A copy of the Stipulation and Consent Order, executed by myself as Technical Secretary on behalf of the Board, is enclosed. You are no doubt familiar with the terms of the Consent Order necessary to insure future compliance.

Very truly yours,

Oral H. Hert

Oral H. Hert
Technical Secretary

Enclosure
cc: Hearing Officer
Mr. Floyd McCurdy, Plant Manager
Central Foundry Division
General Motors Corporation
U.S. EPA, Region V
Compliance Unit

STATE OF INDIANA)		BEFORE THE STREAM POLLUTION
)	SS.	CONTROL BOARD OF THE
COUNTY OF MARION)		STATE OF INDIANA

IN THE MATTER OF THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA,	)	
Petitioner,	)	
vs.	)	CAUSE NO. B-416
CENTRAL FOUNDRY DIVISION, GENERAL MOTORS CORPORATION BEDFORD, INDIANA	)	
Respondent	)	

STIPULATION AND CONSENT ORDER

A Notice of Hearing having been filed herein on April 26, 1977, and Petitioner and Respondent being desirous of settling and compromising this action and having consented, without hearing or adjudication of any issue of fact or law herein, to the entry of this Stipulation and Consent Order, and without this Stipulation and Consent Order constituting any evidence or admission by either party with respect to any issue of fact or law herein, the parties do hereby stipulate as follows:

Stipulation

1. The Stream Pollution Control Board of the State of Indiana is an agency of the State of Indiana, duly empowered to hold administrative hearings to determine whether there are possible violations of IC 13-1-3, IC 13-7, and Board Regulations, including but not limited to, 330 IAC 1-1 (formerly SPC 1R-3, and SPC 1R-4), 330 IAC 3 (formerly SPC 15), and 330 IAC 1-6 (formerly SPC 16), and to enter an order requiring the taking of such action as is indicated by the circumstances to cause the abatement of such condition.

2. The Stream Pollution Control Board of the State of Indiana has jurisdiction over both the subject matter and the parties to this action.

3. Pursuant to the provisions of IC 13-7 and IC 4-22-1, notice of hearing was issued and served upon Respondent through its authorized agent:

C.T. Corporation System
1011 Merchants Bank Building
Indianapolis, IN 46204

4. Respondent owns and operates a foundry in Lawrence County, Indiana, which is authorized to discharge effluent from two outfalls (Outfalls 001 and 002) into the waters of the State of Indiana under the terms, conditions, and limitations in NPDES Permit No. IN 0003573 (the "NPDES Permit").

5. On December 28, 1976, Petitioner issued Public Notice No. 51-1496M stating its intent to modify the NPDES Permit by including therein an effluent limitation limiting the polychlorinated biphenyl ("PCB") content of the discharge from Outfall 002 to an interim concentration of 80 ppb and to a final concentration of 1 ppb (parts per billion).*

6. Prior to 1972, the hydraulic fluid used in machinery at Respondent's foundry contained PCBs. Since 1972 all new hydraulic fluid purchased by Respondent has been only PCB-free fluid, but the prior use of PCBs contaminated such machinery and the drains and wastewater treatment system at the foundry. Wastewaters contaminated with varying concentrations of PCBs have been regularly discharged from Respondent's foundry into a ditch which flows into Pleasant Run Creek in Lawrence County. Respondent has, in consultation with the Division of Water Pollution Control of the Indiana State Board of Health, and with its consent, exerted a considerable effort, within the bounds of technological and economic feasibility, in good faith to remove such contamination of the foundry facilities and has succeeded

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* As used in this Stipulation and Consent Order parts per billion means micro-grams per liter (ug/l).

to the extent that levels of PCBs within the foundry's hydraulic systems are in compliance with the limitations in IC 13-7-16.5. Due to the highly stable and persistent nature of PCBs, it appears to be impossible to entirely eradicate PCBs from the foundry, and other than the carbon adsorption treatment system mentioned in paragraph 2 of the following Consent Order, there is no demonstrated technologically feasible or economically reasonable means of reducing the PCB content of treated wastewater from the foundry below 1 ppb.

7. On November 12, 1976, an undetermined quantity of wastewater contaminated with PCBs and with concentrations of oil, grease, and suspended solids in excess of the effluent limitations of Respondent's NPDES Permit was discharged from Outfall 002 of Respondent's foundry. In a second incident, on or about February 21, 1977, an indeterminate quantity of hydraulic flushing fluids contaminated with PCBs escaped from a storage tank at Respondent's foundry. Upon discovery of the spill, Respondent immediately contained the fluids within a paved area of its foundry with a sand dam and vacuumed them up. Subsequently, the previously frozen ground thawed and a small amount of the fluids remaining in cracks and crevices of the pavement flowed off Respondent's premises with melted ice and snow. After leaving Respondent's premises, the contaminated fluid flowed through a storm sewer into a drainageway on adjoining property. With respect to the latter incident, Respondent has cleaned up and removed the spilled material from the drainageway and the soil on the banks thereof to the satisfaction of Petitioner.

8. During the course of negotiations on this Consent Order, Respondent's personnel discovered that water, erupting in a spring-like manner from the ground on its property near the Milwaukee railroad tracks and adjacent to Respondent's wastewater treatment plant, contained detectable amounts of oils and PCBs along with very high amounts of chlorides. A preliminary investigation into this situation by both Petitioner and Respondent has failed to disclose the source of the water or its contamination. Absent evidence establishing a causal link between Respondent's manufacturing operations and the contaminated spring water, Respondent disclaims any responsibility to treat said water. Petitioner disagrees, believing that

Respondent may be responsible for the impact of said water on public health and welfare or the environment by virtue of its ownership of the property. However, it is recognized that investigations are continuing into this situation and that neither party wishes to delay expeditious finalization of the agreements on other significant actions provided for in this Consent Order pending a resolution of this issue. Therefore, this Order does not impose any obligation on Respondent to treat the above-mentioned water, provided that Petitioner, notwithstanding any other provisions of this Stipulation and Consent Order, does not waive any legal rights that it may have against Respondent with respect to the continuing issuance of the above-mentioned water from Respondent's property.

9. Upon entry of the following Consent Order and provided Respondent thereafter fully complies with the terms and conditions of said Consent Order, Petitioner agrees to forebear from the initiation of any further civil or criminal action, administrative or judicial, against Respondent arising out of (1) the allegations in the April 26, 1977, Notice of Hearing issued in the above-entitled action or (2) the presence of PCBs in the Respondent's water discharges from its Bedford, Indiana, plant with the exception of (i) any presently undetected or future emission of PCB-contamination leachate from the Lawrence County Landfill which enters or threatens to enter waters of the State as a result of Respondent's disposal there of PCB-contaminated sludges and other wastes from its foundry, (ii) the possible contamination of the sediments of Salt Creek downstream from its confluence with Pleasant Run Creek or of the East Fork of White River downstream from its confluence with Salt Creek as a result of the discharge of PCB-contaminated wastewaters from Respondent's foundry, (iii) the presence of PCBs in the spring-like water emerging on Respondent's property as described in paragraph 8 of this Stipulation, (iv) the potential contamination by PCBs of groundwater in the area of Respondent's foundry as a result of the Respondent's use of PCBs in the foundry operations, (v) the presence of PCBs in Respondent's sanitary wastewater discharges to the municipal sewer system of the City of Bedford, and (vi) as provided in paragraph 10 of this Stipulation. Petitioner further

agrees to hereby withdraw those portions of the allegations of its Notice of Hearing (dated April 26, 1977), which in substance, set out above-described issue (i) and reserves the right to institute new proceedings on said issue if and when deemed warranted.

10. Nothing in this Stipulation or Consent Order shall be construed to preclude the Petitioner from enforcing any federal or state laws and regulations controlling the discharge of PCBs which become effective after the entry of this Order.

CONSENT ORDER

NOW, THEREFORE, upon the consent of the parties hereto, it is hereby ORDERED, ADJUDGED AND DECREED as follows:

1. The provisions of this Order shall apply to the Respondent, its directors, officers, agents, servants, employees, successors, and assigns, and to all persons, firms, and corporations acting through or for them.

2. Outfall 002--Process Wastewater and Stormwater--Interim Treatment. Prior to the effective date of this Order, Respondent shall complete installation and begin operation of a carbon adsorption wastewater treatment system for process wastewater effluent from Outfall 002. Said carbon adsorption system shall limit the PCB content of its treated effluent to no more than 1 ppb. The total effluent from Outfall 002 will not be limited for PCBs, but the PCB content of said total effluent shall be monitored periodically.

3. Outfall 001--Noncontact Cooling Water and Storm Runoff--Interim Treatment. Not later than one year from the effective date of this Order, Respondent shall eliminate the normal dry weather discharge from Outfall 001. However, when necessary due to stormwater conditions, Respondent may discharge stormwater and noncontact cooling water overflow from Outfall 001 with a PCB concentration not to exceed 50 ppb.

4. Outfall 001--Noncontact Cooling Water and Outfall 002--Process Wastewater--Final Treatment. Not later than December 31, 1983, Respondent shall minimize to the maximum extent technically feasible and economically reasonable the discharge of process wastewater, including noncontact cooling water from Outfalls 001 and 002, by increasing the degree of water reuse in its water recycle system. Within twelve months of the entry of this Consent Order, Respondent shall demonstrate to Petitioner the maximum extent of discharge reduction achievable under the above criteria. Not later than December 31, 1983, the discharge from Outfall 002 shall contain no more than 1 ppb of PCBs, as well as comply with such other effluent limitations as are applicable.

5. Outfall 001--Storm Runoff--Final Treatment.

(a) Not later than December 31, 1983, Respondent shall complete construction and commence use of a new stormwater retention lagoon of sufficient capacity to contain storm runoff from improved plant areas expected to result from the 25-year, 24 hour storm event for the area. Said lagoon shall be fully lined with a material whose permeability is no more than 10^{-7} cm/sec.

(b) (1) Respondent shall, by December 31, 1983, either by (i) utilization of the carbon adsorption system constructed for the process wastewater discharge at Outfall 002 or (ii) construction of a separate carbon adsorption system for the stormwater lagoon, promptly commence such treatment and discharge of stormwater from the lagoon (and, in the event alternative (i) is implemented, discharge of treated process wastewater and stormwater) any time a storm event reduces reserve capacity of the lagoon below that sufficient to contain the 15-year, 24 hour storm event and continue such treatment and discharge until a 15-year, 24 hour storm event reserve capacity is attained, at which

point, natural evaporative losses may be relied upon for further reduction of the lagoon's contents. The PCB concentration of said discharge shall be limited to 1 ppb except when a severe storm event or combination of storm events result in an overflow of the storm water lagoon, despite Respondent's reasonable efforts to maintain the storage capacity required under this paragraph.

(2) Subparagraph (b)(1) shall not apply if within 12 months of the entry of this Consent Order, it is demonstrated by Respondent's engineering consultants:

(i) that such treatment of stormwater collected in the lagoon would not be necessary to reduce the PCB concentration of any discharge therefrom to no more than 1 ppb and would not be effective in reducing said PCB concentration significantly below 1 ppb, or

(ii) that it is technically infeasible or not operationally maintainable to treat said stormwater in order to reduce the PCB concentration of any discharge from said lagoon to no more than 1 ppb.

(c) Nothing in subparagraph (b) shall preclude Respondent from utilizing stormwater from the lagoon as "make-up" water for its closed-cycle system described in paragraph 4, above, so long as 15-year, 24 hour storm event reserve capacity, at minimum, is maintained.

(d) In order to prevent further contamination from foundry operations of any waters surfacing on Respondent's property or flowing onto it from a subsurface conduit, Respondent shall, not later than December 31, 1983, provide a conduit

to convey these waters from their point of origin or surfacing on Respondent's property to their natural point of exit from Respondent's property.

6. Schedules of Compliance. Within six months of the entry of this Consent Order, Respondent shall provide and agree to reasonable schedules of compliance for the activities described in paragraphs 2 through 5 of this Order setting forth increments of progress for the completion of each activity. The schedules shall include a date for submission of plans and specifications which must be reviewed by the Petitioner's staff and approved prior to construction of facilities.

7. The terms or substances of paragraphs 2 through 6 of this Order shall be incorporated into the NPDES Permit or any subsequent NPDES Permit or any other permit required by Regulation 330 IAC 3 pertaining to Respondent's foundry, except to the extent the terms or substance of said paragraphs may be revised or superseded as a result of action which may be taken by Petitioner pursuant to paragraphs 9 and 10 of the above Stipulation.

8. Stream Study. Within two months after the Petitioner and Respondent obtain the requisite permission or make alternative arrangements in accordance with paragraph 9, below, Respondent shall cause to be commenced by a qualified firm of environmental consultants a study to determine whether, and to what extent, there exists a condition of PCB contamination of the waters of the State of Indiana downstream of its foundry outfalls. The study plan has been submitted to Petitioner's staff and amended in accordance with the staff's recommendations agreed to by Respondent prior to issuance of this Order. The outline of such study plan is as follows:

(a) Geographic Boundaries. The study shall cover the stream length beginning at the unnamed ditch into which the foundry discharges wastewater, to the confluence of the ditch with Pleasant Run Creek, downstream to the confluence of Pleasant Run Creek and Salt Creek, and ending at points on Salt Creek, upstream and

downstream of the latter confluence, identified in the study plan.

(b) Examinations to be made. The study shall include quantitative assessment over the above stream lengths of the presence of PCBs at representative points in the water, the stream sediment and the high and low floodplains.

(c) Conclusions to be drawn. The study shall state conclusions as to the quantities of PCBs contained in each of the above-mentioned media in the area under examination and shall investigate and report on potential remedial actions that may be warranted.

Eighteen months after commencement of this study, Respondent shall have completed the study and have reviewed the alternatives suggested by the above study and any other study the Respondent has had performed and shall propose to Petitioner or its staff the remedial action, if any, which is technologically reasonable, economically reasonable, and ecologically sound to be implemented by Respondent. If remedial action is proposed by the Respondent and concurred with by the Petitioner, or if Petitioner recommends an alternative remedial action and Respondent concurs therewith, Respondent agrees to implement such remedial action in accordance with a reasonable schedule of compliance to be established by agreement of the parties.

9. Staff of the Petitioner will accompany Respondent in obtaining from the owners and occupants of property abutting or adjacent to the streams identified in paragraph 8, above, permission for Respondent's consultants to enter upon such land and perform the stream study referenced in said paragraph. In the event the owners or occupants of certain of such properties refuse to grant such permission, Respondent and Petitioner may consult and agree to alternative sites for the stream study or, if the properties in

question are recognized by both parties as essential to the integrity of the study, Petitioner may agree to exercise its right of entry and perform the study activities pertaining to such properties.

10. If, after entry of this Consent Order, the technology contemplated by this Consent Order will not achieve the various effluent prohibitions and limitations set forth in the Order, or if events beyond the reasonable control of Respondent should cause delay in meeting interim or final dates set forth in the Order, Respondent may petition the Board to modify the terms and conditions of this Consent Order, and the Board's action or inaction on such petition shall be reviewable pursuant to IC 4-22-1-1 et seq.

11. Full and timely compliance with the terms of this Agreed Order shall constitute a final adjudication of this action.

CENTRAL FOUNDRY DIVISION GENERAL MOTORS CORPORATION	STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA
By [signature]	By [signature]
Title Plant Manager-Bedford Plant	Title Tech. Secretary
Date 10-20-80	Date Oct 21, 1980

APPENDIX F.3

CDM ENVIRONMENTAL STUDY REPORT

Central Foundry Division
General Motors Corporation
Bedford Plant
P. O. Box 271
Bedford, Indiana 47421

May 18, 1983

Mr. Earl A. Bohner
Technical Secretary
State of Indiana
Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206

Subject: Stream Study Report

Dear Mr. Bohner:

The enclosed report "An Environmental Study of a System of Streams Near Bedford, Indiana", dated December 27, 1982 by Camp, Dresser, and McKee is being submitted for your information as requested in your letter to me dated January 14, 1983.

We are confident that this report will provide the necessary information that you requested.

If you have any questions, please contact me.

W. A. Butler

W. A. Butler
Superintendent
Plant Engineering

slc

cc: J. C. Stallsmith, Chief (letter only)
Operations Branch
Division of Water Pollution Control
ISBH

bcc: R. Herr (letter only)
P. Murphy " "
T. Karnosky " "
W. Cheek " "
J. Medved " "
P. Gerwert " "
J. Hollis " "
P. Zavala " "
J. Chu " "
G. Ohl " "
✓ R. Remmers " "

CDM
environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.
6132 West Fond du Lac Avenue
Milwaukee Wisconsin 53218
414-461-9500

414 - 781-4597

December 27, 1982

Mr. Ron Remmers
Project Engineer
General Motors Corporation
Central Foundry Division
Post Office Box 271
Bedford, Indiana 47421

Dear Mr. Remmers:

Please find enclosed the final report entitled "An Environmental Study of a System of Streams Near Bedford, Indiana".

CDM has enjoyed working on this interesting project and appreciated the cooperation extended to us by the General Motors staff.

Please give me a call should you have any questions regarding the report or any other matters of which CDM can be of service.

Sincerely,

CAMP DRESSER & McKEE INC.

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DFB:jf

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Prepared for
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An Environmental Study of a System of Streams Near Bedford, Indiana

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TABLE OF CONTENTS

		Page
I.	LIST OF TABLES	I-1
II.	LIST OF FIGURES	II-1
III.	INTRODUCTION	III-1
IV.	AREAL DESCRIPTION OF SITE AND STUDY LOCATIONS	IV-1
V.	WATER CHEMISTRY	V-1
	1. Methodology	V-1
	2. Results and Discussion	V-4
VI.	SEDIMENTS, SEDIMENT CHEMISTRY, AND WATERSHED STUDY	VI-1
	1. Methodology	VI-1
	2. Results and Discussion	VI-2
VII.	PERIPHYTON	VII-1
	1. Methodology	VII-1
	2. Results and Discussion	VII-2
VIII.	BENTHOS	VIII-1
	1. Methodology	VIII-1
	2. Results and Discussion	VIII-2
IX.	FISH POPULATION STUDIES AND TISSUE ANALYSIS FOR PCBs	IX-1
	1. Methodology	IX-1
	2. Results and Discussion	IX-2
X.	SUMMARY	X-1

TABLE OF CONTENTS

(Continued)

APPENDIX A - QUALITY ASSURANCE PROCEDURES

Open Channel Discharge Calculations
Field Operating Procedure - Current Meter
Equipment Specifications - Current Meter
Procedures for Sampling Suspended Sediment in Small Streams and Determination of Mass Transport
Procedures for Operating the US DH-48 Suspended Sediment Sampler
Equipment Specifications - Suspended Sediment Sampler
Procedure for Determining Percent Sand, Silt, and Clay in Suspended Sediment Samples
Procedure for Collecting Sediment Cores
Field Procedures for Obtaining Bottom Samples Using the Wildco-Ballcheck Core Sampler
Maintenance Procedure - Core Sampler
Laboratory Procedure for Particle-Sizing Sediment Cores
Equipment Specifications - Standard Sieve Set
Equipment Specifications - Core Sampler
Maintenance Procedure - Standard Sieve Set
Surface Water Sample Collection - Procedure
Equipment Operating Procedure - pH Meter
Calibration and Maintenance procedure - ph Meter
Chain-of-Custody Form
Personnel Training and Certification Procedure - Fisheries Department
Procedure for Reviewing and Checking Fisheries Data

TABLE OF CONTENTS

(Continued)

Procedure for Seine Usage
Procedure for Fish Age Determination Using Scale Samples
Fish Gear Summary
Fish Data Summary
Adult and Juvenile Fish Analysis Procedure
Maintenance of Fish Reference Collections
Phycology Department Data Flow Chart
Phycology Data Log
Periphyton and Phytoplankton Data Form
Training and Certification Procedures - Phycology Department
Benthic Algae (natural periphyton) Quantitative Field Collection Procedure
Preparation of M^3 Fixative
Natural Periphyton Quantitative Laboratory Procedure
Periphyton and Phytoplankton Laboratory Analysis Form
Procedure for Making Cleared Diatom Slides
Use of the Periphyton and Phytoplankton Data Form and Editing of Data
Additions and Changes to the Species Code List
Benthos Department Data Flow Chart
Benthos Field Trip Preparation Procedure
Benthos Data Form
Personnel Training and Certification - Benthos Department
Benthos Sample Inventory
Benthos Handling, Shipping and Storage

TABLE OF CONTENTS

(Continued)

Benthos Sample Washing Procedure
Benthos Sample Sorting Procedure
Benthos Slide Preparation
Benthos Identification Procedure
Benthos Sample Enumeration
Benthos Post-Trip Deposition Procedure
Equipment Operating Procedure - Surber Sampler
Equipment Operating Procedure - Ponar Sampler

APPENDIX B - PCB QA/QC DOCUMENTS AND QC RESULTS FOR WATER QUALITY PARAMETERS
PCB Chemistry Methodology and Quality Assurance Quality Control Documents for Water Analysis, Fish Tissue Analysis, and Sediment Analysis
Determination of PCBs in Sediment, Fish and Water Samples During the Spring Survey
Determination of PCBs in Sediment, Fish and Water Samples During the Fall Survey
Quality Control Data - Water Quality

APPENDIX C - PERIPHYTON COMPUTERIZED DATA
Computerized Periphyton Data Analysis for Spring and Fall Surveys

APPENDIX D - BENTHOS COMPUTERIZED DATA
Computerized Benthos Data Analysis for Spring and Fall Surveys

I. LIST OF TABLES

Table Number	Table Description	Page
1	Chemical parameters analyzed in water, sediment and fish.	V-2
2	Water quality of Pleasant Run and Salt Creek near Bedford, Indiana.	V-5
3	In situ physical/chemical parameters of Pleasant Run and Salt Creek near Bedford, Indiana.	V-6
4	PCB levels in water samples (ug/l).	V-7
5	Summary data of flow, PCB concentrations for suspended sediment, and sediment transport values.	VI-6
6	Percent sand, silt and clay in water samples collected during the spring and fall surveys for total sediment transport (S_t) determinations.	VI-7
7	Summary data of the distribution of sediment categories based on phi size and PCB concentrations at the various stations.	VI-8
8	PCB levels in sediments.	VI-9
9	PCB levels in watershed composite samples.	VI-10
10	PCB concentrations in fish captured on Pleasant Run and Salt Creeks, Lawrence County, Indiana.	IX-6
11	Fish collected during previous research on streams near the Bedford site.	IX-7
12	Threatened, endangered and special concern species of Indiana fish.	IX-10
13	Summary of fish species collected by minnow seine and electro-shocker in Pleasant Run and Salt Creeks, Lawrence County, Indiana during May 1981.	IX-11

I. LIST OF TABLES (Continued)

Table Number	Table Description	Page
14	Summary of fish species collected by minnow seine and electroshocker in Pleasant Run and Salt Creeks, Lawrence County, Indiana during September 1981.	IX-13
15	Age determination of selected fish species from Pleasant Run and Salt Creek, Lawrence County, Indiana, 1981.	IX-14

II. LIST OF FIGURES

Figure Number	Figure Description	Page
1	Areal location of site.	IV-4
2	Study locations at site.	IV-5
3	Total periphyton and the number of taxa collected at stations located on Pleasant Run and Salt Creeks.	VII-5
4	Percent composition of periphyton on Pleasant Run and Salt Creeks.	VII-6
5	Percent composition of total benthos, Oligochaeta and Chironomidae at Pleasant Run and Salt Creek stations.	VIII-7
6	Total benthos and numbers taxa at sampling stations located on Pleasant Run and Salt Creeks.	VIII-8
7	Numbers of species and numbers of individual fish collected at Pleasant Run and Salt Creeks.	IX-15

III. INTRODUCTION

The Environmental Planning and Sciences Division, Milwaukee Operations, of Camp Dresser & McKee Inc. (CDM) was contracted by General Motors Corporation to design and conduct an environmental study on segments of Pleasant Run Creek, and Salt Creek near Bedford, Indiana. The final study design and scope of work (Prepared March 1980) were developed from the original scope of work developed in June of 1978, following comments to revision by Dr. James Etzel of Purdue University, personnel with the Indiana State Board of Health, General Motors Corporation and Camp Dresser & McKee Inc. since initial study conception, all phases of work were performed under the management and guidance of Mr. Daniel F. Buss of CDM's Milwaukee office.

The environmental study was designed to ascertain:

- Whether or not a balanced, indigenous aquatic community exists in areas of PCB contamination;
- The concentration of PCBs in the flesh of various fish species;
- Sediment transport of PCBs;
- Concentrations of PCBs associated with river bottom sediments;
- Concentrations of PCBs in areas subject to flooding.

Also presented in this report, are recommendations for potential remedial actions that may be warranted. These recommendations are based upon the data gathered and reviewed during the course of this study.

The studies were conducted during May and September 1981. The May sampling was indicative of conditions during exceedingly high stream stage following heavy rains while the fall survey was conducted during low stream stage conditions. All aspects of work performed on this study were guided by strict quality assurance/quality control procedures. The following presents the findings of this study.

IV. AREAL DESCRIPTION OF SITE AND STUDY LOCATIONS

The study area lies within Sections 33, 34, 35 of Marshall township (T6N, R1W) and Shawswick township (T5N, R1W), between $86^{o}31'30"$ and $86^{o}27'30"$ west longitude and $38^{o}52'30"$ and $38^{o}55'30"$ north latitude in Lawrence County, Indiana (Figure 1).

The site lies within a horizontal bedrock bedding province dissected by streams, rivers and intermittent creeks forming a dendritic drainage network. The general drainage of the basin is to the south. Within the area, the more established rivers and streams have formed flood plains in which the streams have entered a meandering stage. This condition is characteristic of Pleasant Run Creek. The Bailey Branch of Pleasant Run Creek is cut into the bedrock at the headwaters with areas of sediment deposition being more pronounced near its confluence with the main stream. Salt Creek, in the area of study near the confluence with Pleasant Run is a conduit cut primarily in clay and bedrock. The bank is steeply sloping and the bed material consists of hard clay or rock with few areas of sediment deposition.

During the survey of Bailey's Branch of Pleasant Run Creek and the main branch of Pleasant Run Creek, it was found that coring of the bottom showed trapped sediment below a layer of coarser material which did not resuspend even at the high scouring conditions reached during flood stages typical of the spring of 1981. Core samples from reaches of Bailey Branch and Pleasant Run showed this layer to be a one to two inch zone of light colored sandy material overlaying the dark gray lower sediment layer. The fine grained underlayer of sediment was found by examination and calculation from data collected to be non-typical of materials of recent origin. It must therefore be concluded that this fine grained sediment is from time past and confirms the fact that it is a trapped rather than a dynamic one.

The study areas located on Salt Creek, Pleasant Run and its tributary are presented in Figure 2. This report will refer to the tributary from the Central Foundry to Pleasant Run as Bailey Branch. This is the name given to the tributary on the property maps. However this Bailey Branch should not be misconstrued with the tributary having the same name and entering Salt Creek in the Township of Marshall Section 26, T6N, R1W. The following presents a brief narrative of the study locations:

Station A

Located on Bailey Branch of Pleasant Run approximately 1,000 river feet downstream from the initiation of the Central Foundry discharge point in Section 11 Bedford, T5N, R1W. The stream is shallow, overlying areas of fractured limestone with numerous riffle areas. Deposition of sediment is primarily limited to small pools in stream bends.

Station B

Located on Bailey Branch approximately 1.2 river miles downstream from the initiation of the Central Foundry discharge point. It uncompassed an area in Section 2, S 1/2 Shawswick, T5N, R1W. At this location, the stream has widened and larger pool areas have formed in midstream. Riffle areas were less numerous. Sediment in the pool areas consisted of a fine grey-black material overlain by a lighter, usually coaser sand. The depth of sediment in the pools varied considerably.

Station C

Located on Pleasant Run approximately one river mile upstream of the confluence with Bailey Branch. Sampling was conducted immediately downstream from the intersection with East Road in Section 1, N 1/2 Shawswick, T5N, R1W. The stream consisted of riffle areas with pools at the bends of the stream. Sediment deposition in the pools was minor. The stream bottom primarily consisted of sand, gravel and larger cobble.

Station D

Located on Pleasant Run approximately 1,000 ft above the confluence with Bailey Branch. This segment of the stream passed through a flood plain area of Pleasant Run. The station is located in Section 2, N 1/2 Shawswick, T5N, R1W. The stream has widened significantly at this location. The bottom substrate consist of fine sand, silt and gravel.

Station E

Located immediately (with 100 ft) below the confluence of Pleasant Run with Bailey Branch in the zone of mixing. The station is located in Section 2, N 1/2 Shawswick, T5N, R1W. The bottom consisted of a very fine dark grey silt material mixed with detritus (leaves, twigs branches etc.).

Station F

Located on Pleasant Run approximately 0.5 river miles below the confluence with Bailey Branch in Section 2, N 1/2 Shawswick, T5N, R1W. The bottom substrate consisted of a fine dark grey silty material overlain by a thin layer of coaser material which was lighter in color. Considerable deposition had occurred in this area.

Station G

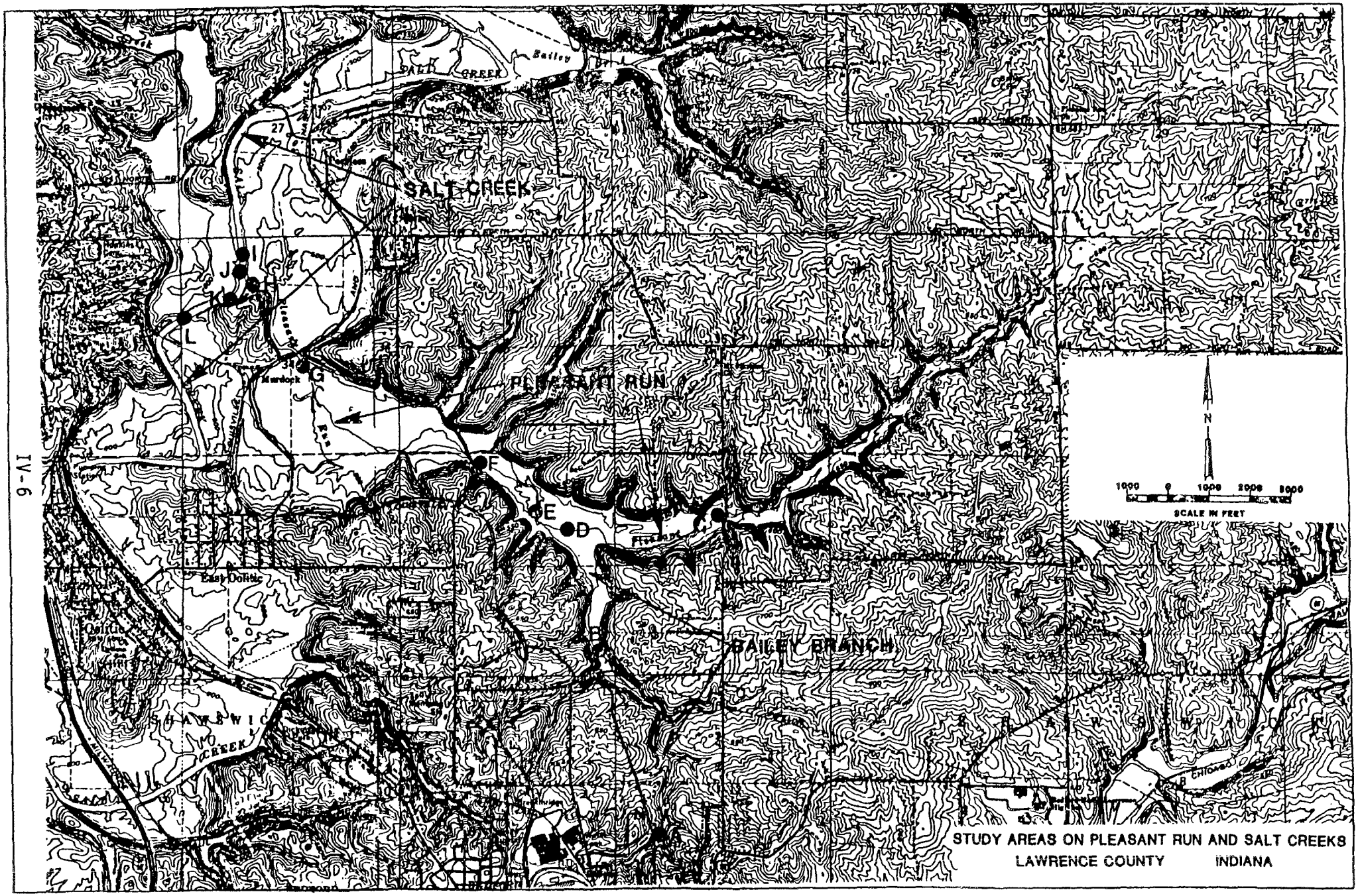
Located on Pleasant Run approximately two river miles below the confluence with Bailey Branch in Section 34, Marshall, T5N, R1W. Studies were conducted immediately upstream from the Louisville and Nashville railroad track. The streambed consisted primarily of sand and gravel and fractured limestone. Samples were collected in a riffle area. The sediment in the pool areas appeared to be a lighter grey as compared to the darker grey material near Station F.

Station H

Located on Pleasant Run immediately before its confluence with Salt Creek in Section 34, Marshall T6N, R1W. The bottom sediment consisted of fine soft brownish sand and clay. The banks were steep (estimated at 60^{o}) and barren. This location was a zone of deposition, probably due to the influence of backwater from Salt Creek and the very low current velocity.

Station I

Located on Salt Creek approximately 1,000 ft above the confluence with Pleasant Run in Section 34, N 1/2 Marshall, T6N, R1W. The bottom substrate consisted of hard clay. The banks were steep (approximately 60^{o}) and barren clay.



IV-6

Figure 2. Study Locations at Site

V. WATER CHEMISTRY

1. Methodology

Water samples analyzed for chemical parameters were collected during the biological and physical/chemical water quality survey periods. During each sampling effort the samples were collected at mid-depth with a nonmetallic water sampler or in very shallow locations, by direct grab. Sampling was always first initiated at stations downstream and collections made progressively upstream to prevent agitation of bottom sediments and thus eliminating the possibility of contamination. A more descript sampling protocol used for collecting water samples is presented in Appendix A. The water samples were placed in labelled bottles containing the appropriate preservative. These samples were then immediately transferred to an ice cooler for transport. In situ measurements for dissolved oxygen, temperature, and pH were taken with a Yellow Springs dissolved oxygen/temperature meter and a Ecolab Model 102B pH/temperature meter. These instruments were calibrated in the laboratory and preceding field measurements taken on site. The field collection data information was transferred to chain-of-custody forms, and submitted with the samples to the contract laboratory performing the chemical analysis.

Raltech Scientific Services of Madison, Wisconsin conducted the analysis for polychlorinated biphenyls (PCBs). This laboratory was the Wisconsin Alumni Research Foundation Inc. before purchased by Ralston Purina Co. Swanson Environmental Inc. performed the analysis for the nitrogen, phosphorus, and solids determinations. Methodology for the PCB determination and QA/QC documentation for the chemical analysis are submitted as Appendix B.

Water quality parameters; the limit of detection; the reference citation for the analytical method employed; and the method of preserving or treating the sample in the field is presented in Table 1.

One of the objectives of the study was to determine the concentrations of PCBs associated with suspended materials in the water. Filtration was conducted initially as the means for solids/

Table 1. Chemical parameters analyzed in water, sediment and fish tissue.

Parameter	Preservation	Detection Limit (mg/l)	Reference
WATER QUALITY			
Organic Nitrogen	1,2	0.01 as N	APHA[1], pg. 437
Ammonia Nitrogen	1,2	0.01 as N	EPA[2], pg. 165
Nitrate Nitrogen	1,2	0.01 as N	APHA, pg. 427
Total Phosphorus	1,2	0.005 as P	EPA, pg. 249
Total Solids	1	1	EPA, pg. 270
Total Suspended Solids	1	1	EPA, pg. 268
Total Dissolved Solids	1	1	EPA, pg. 266
Dissolved Oxygen	In situ		APHA, pg. 484
pH	In situ		APHA, pg. 460
Temperature	In situ		APHA, pg. 348
PCB	1	0.0001	EPA[3], 1973
SEDIMENTS			
PCB	1	0.1 (mg/kg)	EPA[4], 1969
Sieve Analysis			FOLK[5], 1974
FISH TISSUE			
PCB	1	0.1 (mg/kg)	EPA, 1969

REFERENCES

[1] American Public Health Association, et al., 1975. Standard Methods for the Examination of Water and Wastewater, 14th edition, Washington, D.C.

[2] United States Environmental Protection Agency, 1974. Manual of Methods for Chemical Analysis of Water and Wastes, Washington, D.C.

[3] United States Environmental Protection Agency, 1973. Methods for Polychlorinated Biphenyls in Industrial Effluents. Nat. Env. Res. Cent. Cinn., Ohio 45268.

[4] United States Environmental Protection Agency, 1969. Great Lakes Region Committee on Analytical Methods. Chem. Lab. Manual. Bottom Sediments.

[5] Folk, R.L. 1974. Petrology of Sedimentary Rocks. Hamphill Publ. Co., Austin, Texas. Pg. 16-17.

PRESERVATION TECHNIQUES

[1] Refrigeration at 4 c.
[2] H_2SO_4 to pH<2.

liquid phase separation on water samples collected in the spring. The water samples were filtered through a sintered glass funnel containing two Whatman #4 filter papers and through a 0.22u type GS millipore filter. However, the Milli-Q water spiked with PCBs showed that only five percent recovery of PCBs was attained through filtration. Also, the recoveries of PCBs from filtered tap water also indicated that the filtration procedure removes over 90 percent of the PCBs from the water. Assuming there is little or no suspended material in the water, it appears that the filters were removing the PCBs from the water itself; therefore the amount of PCBs associated with suspended material could not be determined by this method. The water samples were then centrifuged at 2500 rpm for five minutes and the supernatant taken for PCB measurement. One aliquot was analyzed uncentrifuged and another aliquot was centrifuged to remove suspended solids. Milli-Q water spiked with PCBs showed 60 percent PCB recovery after centrifugation. Therefore, this method was used to approximate the concentration of PCBs associated with suspended sediment.

A question that had arisen regarding the discussion of PCB analytical methodology was if the EPA, 1973 method was the same as the method employed by Raltech Scientific Services on the project. The extraction and clean-up procedures for determining PCB concentration in water by Raltech Scientific Services (EPA, 1979), "Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing") is the same as the method specified in the Scope of Work (EPA, 1973), "Methods for PCBs in Industrial Effluents"). The limit of detection shown in the EPA, (1973) Method, is approximately 1 mg/l for each Aroclor mixture when using microcoulometric or electrolytic conductivity detectors based on a 1 liter sample. However, if interference poses no problems, the sensitivity of the electron capture detector permits as little as 100 ml of the sample to be used (EPA, 1973, "Methods for PCBs in Industrial Effluents"). The limit of detection shown in the EPA, (1979) method is 0.1 ug/l when using electron capture detector based on a 1 liter water sample.

The following subsection of this report presents the analytical results of the spring high flow and fall low flow sampling programs and discusses the measured concentrations of these parameters in relation to water quality criterion concentrations established by the Environmental Protection Agency (EPA, 1976).

2. Results and Discussion

Water quality parameters measured at Stations A through L are presented in Tables 2, 3 and 4. In general, chemical constituents of the water did not vary significantly among stations and concentrations are typical of small warm water streams traversing a forest and agricultural environment.

The nitrogenous compounds enter the stream through runoff from agricultural land and the decomposition of organic matter. Organic nitrogen ranged from 1.52 to 0.19 mg/l in the spring and 1.32 to 0.33 mg/l during the fall survey. Ammonia nitrogen concentrations ranged from <0.01 to 0.49 mg/l in the spring and 0.01 to 0.58 mg/l in the fall. Ammonia concentrations for the stream system were generally higher in the fall. Levels of un-ionized ammonia in the range of 0.20 to 2 mg/l have been shown to be toxic to some species of freshwater aquatic life and a water quality criterion of 0.020 mg/l has been specified to provide safety for aquatic life (EPA, 1976).

Nitrate nitrogen concentrations were greater in samples collected during the spring, ranging from 3.56 to 1.04 mg/l and 0.335 to 0.935 mg/l in samples collected during the fall. Concentrations of nitrate-nitrogen were well below the 90 mg/l criterion of having an adverse effect on warm water fish (EPA, 1976). There were no discernible trends in nitrogen parameters being consistently higher or lower at stations on Salt Creek, Pleasant Run or Bailey Branch (discharge stream) and there was no pattern of nitrogen compounds increasing or decreasing through the system of streams.

Table 2. Water Quality of Pleasant Run and Salt Creek near Bedford, Indiana.

Station	Organic Nitrogen		Ammonia Nitrogen		Nitrate Nitrogen		Total Phosphorus		Total Solids		Total Suspended Solids		Total Dissolved Solids	
	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
A-1	1.52	1.13	0.35	0.01	1.12	0.398	1.28	0.862	765	683	13.7	1.4	751	682
A-2	1.03	0.85	0.49	0.35	1.04	0.337	1.26	0.815	756	718	11.3	1.4	745	717
B-1	0.88	1.23	<0.01	0.22	3.56	0.856	0.219	0.598	472	2269	12.4	5.5	460	2263
B-2	0.74	0.58	<0.01	0.77	3.45	0.935	0.225	0.592	470	2231	13.0	7.0	457	2224
C-1	0.39	0.91	<0.01	0.26	3.07	0.538	0.070	0.050	294	296	16.0	2.2	278	294
C-2	1.36	0.78	<0.01	0.32	3.07	0.463	0.073	0.024	312	263	25.6	1.6	286	261
D-1	0.28	0.88	<0.01	0.46	2.77	0.335	0.066	0.108	306	266	7.1	3.6	299	262
D-2	1.18	0.75	<0.01	0.30	2.68	0.374	0.037	0.065	280	282	6.4	7.9	274	274
E-1	0.75	0.61	<0.01	0.78	3.04	0.636	0.050	0.462	375	1001	9.4	16.0	366	985
E-2	0.19	0.76	<0.01	0.13	3.11	0.650	0.044	0.475	373	927	7.7	6.6	365	920
F-1	0.77	1.32	0.11	0.57	3.02	0.718	0.076	0.407	328	590	10.3	10.6	318	579
F-2	0.94	0.62	0.26	0.58	3.06	0.783	0.089	0.404	318	586	10.5	9.9	307	576
G-1	1.03	-	0.26	-	2.48	-	0.099	-	407	-	25.5	-	381	-
G-2	1.16	-	0.05	-	2.42	-	0.083	-	384	-	23.1	-	361	-
H-1	0.71	0.94	0.11	0.18	2.62	0.658	0.073	0.329	354	680	22.5	30.2	331	650
H-2	0.37	1.00	0.03	0.58	2.59	0.632	0.060	0.352	354	625	17.4	30.0	337	595
I-1	1.11	0.89	0.03	0.22	1.38	0.849	0.128	0.287	209	534	35.4	38.8	174	495
I-2	1.08	0.91	0.16	0.22	1.41	0.875	0.096	0.293	201	459	34.0	43.3	167	416
J-1	0.91	0.74	0.09	0.46	1.29	0.827	0.112	0.280	205	550	31.2	41.6	174	508
J-2	0.25	0.72	0.19	0.33	2.26	0.775	0.099	0.274	272	490	26.2	37.8	246	452
K-1	0.39	0.74	0.09	0.16	1.34	0.804	0.084	0.264	228	637	22.9	45.4	205	592
K-2	0.48	0.33	0.11	0.48	1.43	0.814	0.134	0.264	224	647	23.2	42.1	201	605
L-1	1.04	1.00	0.21	0.01	1.23	0.811	0.271	0.245	250	562	86.4	40.1	164	522
L-2	0.63	0.76	0.30	0.36	1.25	0.811	0.238	0.258	176	451	86.0	11.3	90	440

All data are expressed as mg/l.

Table 3

In Situ Physical/Chemical Parameters of Pleasant Run and Salt Creek near Bedford, Indiana

Station	Spring Sampling			Fall Sampling		
	Dissolved Oxygen (mg/l)	pH (as pH Unit)	Temperature (^{o}C)	Dissolved Oxygen (mg/l)*	pH (as pH Unit)	Temperature (^{o}C)
A	8.8	7.3	16.2	*	7.6	21.0
B	10.6	7.5	12.5	*	7.6	20.0
C	11.7	6.7	11.5	*	7.1	21.0
D	11.2	6.9	12.0	*	7.3	21.0
E	10.5	7.3	10.8	*	7.6	20.0
F	11.0	7.6	11.5	*	7.4	20.0
G	9.6	6.9	12.0	*	-	-
H	9.2	7.4	14.0	*	7.6	22.5
I	8.3	7.1	13.0	*	7.3	22.0
J	8.8	7.1	13.0	*	7.4	22.0
K	8.4	7.1	13.0	*	7.4	22.0
L	7.3	7.6	14.0	*	7.2	21.5

* equipment malfunction

Table 4

PCB Levels in Water Samples (µg/l)[1]

Station	Spring Sampling		Fall Sampling	
	Uncentrifuged	Centrifuged[2]	Uncentrifuged	Centrifuged[2]
A	-	-	8.96	3.50, 3.65
B	5.6	2.2	10.3, 11.2	3.21
C	<0.10	<0.10	<0.10	<0.10
D	<0.10	<0.10	0.45	0.18
E	3.7	2.0	7.95	4.83
F	3.0	1.8	7.02	4.13
G	2.8	1.1	-	-
H	3.2	1.6	4.04	2.31
I	0.17	0.10	0.28	0.14
J	0.16	0.10	0.23	0.10
K	0.32	0.12	0.30	0.16
L	0.39	(3)	0.46	0.27

(1) PCB concentration is calculated as Aroclor 1242 and detection limit was 0.1 µg/l based on a 1 liter sample.

(2) The water samples were centrifuged at 2500 rpm for 5 minutes and supernatant was taken for PCB measurement.

(3) Sample extract could not be recovered.

- (Station A, sample lost).
- (Station G, location not accessible).

Phosphorus as phosphate is one of the major nutrients required for plant nutrition and therefore stimulate plant growth. Phosphorus is contributed to the stream system primarily through surface runoff and the addition of organic detritus. Total phosphorus concentrations were highest at Station A during the spring (1.26, 1.28 mg/l) and fall (0.862, 0.815 mg/l) survey. With the exception of stations A, C and L-1, total phosphorus concentrations were higher in the fall.

During the spring and fall surveys, solids primarily existed in the dissolved state. Concentrations of dissolved solids were generally higher at Stations A, B and E, and lowest at C and D. In the spring, dissolved solids concentrations ranged from 751 mg/l at Station A to 90 mg/l at Station L and in the fall from 2263 mg/l at Station B to 261 mg/l at Station C. During spring, dissolved solids concentrations were similar from Station E through H, while in the fall, dissolved solids increased substantially at the aforementioned stations. During both spring and fall, dissolved solids concentrations on Salt Creek were lower than Pleasant Run and Bailey Branch with the exception of Stations C and D above the confluence of the two Branches of Pleasant Run. Although not definitely known, limiting concentrations for freshwater fish may range from 5,000 to 10,000 mg/l (EPA, 1976). Concentrations of total dissolved solids were well below this concentration range at all stations during the spring and fall surveys (Table 2).

Total suspended solids concentrations were generally higher in Salt Creek than Pleasant Run. In natural waters, suspended solids consist normally of erosion silt, organic detritus and plankton. Highest concentrations of total suspended solids were measured at Station L during the spring survey (86.0, 86.4 mg/l) while lowest concentrations were measured at Station A (1.4 mg/l) during the fall collection period.

During each field study *in situ* measurements for dissolved oxygen, pH and temperature were taken (Table 3). Dissolved oxygen concentrations during the spring survey ranged from 11.7 mg/l at

Station C to 7.3 mg/l at Station L. Dissolved oxygen concentrations exceeded 9.0 mg/l during the spring on the main branch of Pleasant Run. During the fall survey, a malfunction in the circuitry of the dissolved oxygen meter occurred. Therefore this data was questionable and not tabulated or discussed in the report. During spring dissolved oxygen concentrations were well above the minimum concentration of five mg/l for maintaining good fish populations (EPA, 1976).

Based on present evidence, a pH range of 6.5 to 9.0 appears to provide adequate protection for the life of freshwater fish and bottom dwelling invertebrates (EPA, 1976). pH values did not differ greatly among stations on Pleasant Run and Salt Creek during the spring or fall period. pH values range from 6.7 during the spring at Station C to 7.6 at Station L in the spring and stations A, B, E and H in the fall (Table 3).

Polychlorinated biphenyls (PCBs) are a class of compounds produced by the chlorination of biphenyls and are registered in the United States under the trade name Aroclor^{R}. The degree of chlorination determines their chemical properties, and generally their composition can be identified by the numerical nomenclature e.g. aroclor 1242, 1254 etc. The first two digits represent the molecular type and the last two digits the average percentage by weight of chlorine (National Technical Information Service, 1972).

PCB concentrations in water samples on Pleasant Run and Salt Creeks were in the low ug/l (ppb) range (Table 4). Concentrations of PCBs generally decreased from Stations A and B on Bailey Branch and Pleasant Run, downstream to Salt Creek. Lower concentrations occurred above the confluence with Pleasant Run and Salt Creek, increasing slightly below the confluence at Stations K and L. During the spring sampling, PCBs in whole water samples ranged from 5.6 ug/l at Station B to 0.16 ug/l at Station J and were <0.10 ug/l detection limit as Stations C and D. During the fall sampling period, concentrations ranged from 10.3 and 11.2 ug/l at Station B

to 0.23 ug/l at Station J and <0.10 ug/l at Station C. PCBs were detected at Station D during the fall sampling at a concentration of 0.45 ug/l. This station is near the confluence with Bailey Branch of Pleasant Run in a flood area. Due to the heavy rains during the fall period, PCBs probably were contributed from the overland runoff of contaminated sediment in this area. The results of all samples collected and analyzed on Pleasant Run and Salt Creek were calculated as Aroclor 1242 because the PCB pattern for most of the samples resembled Aroclor 1242. In a few cases, there appeared to be some pattern shifts; however all PCB data presented were calculated as Aroclor 1242.

The relatively higher concentrations of PCBs in the fall was probably due to the much lower stream flow and lower dilution coupled with some PCB addition through runoff from the exposed banks during this period of heavy fall rains (Table 4).

Studies were conducted during the spring high flow and fall low flow periods to determine PCB concentrations associated with suspended sediment. To accomplish this task, PCBs were analyzed at each station in whole water samples and then in the supernatant from an aliquot taken from the respective whole water sample following centrifugation. Concentrations of PCBs in the supernatant are also presented in Table 4. To arrive at the determination we assumed that the difference in PCB concentrations in whole water and the concentration in the supernatant would indirectly approximate the concentration associated with the sediment. The concentrations of PCBs directly measured in the supernatant (liquid fraction) is presented in Table 4 and the calculated concentration of PCBs at the various stream locations is presented in Table 5. The concentration of PCBs associated with sediment in water samples collected during the spring and fall surveys ranged from 40 to 70 percent with an average of 49 percent calculated for each seasonal study. During the spring period, the sand particle size group was generally more prevalent in samples collected for suspended sediments analysis than

in the fall, although the silt size group was the dominant suspended particle size in the water samples (Table 6). A higher percentage of sand would be expected because of the greater flow and higher stream velocities in the spring. Although total sediment transport was generally greater in the spring, PCB concentrations were correspondingly lower during the spring period. It should be reiterated at this point, that surface runoff, due to heavy rains, accompanied both the spring and fall surveys. The difference in PCB concentrations between the spring and fall surveys appears to be primarily due to dilution effects during the spring. In addition it is hypothesized that PCBs may be added to the stream system through runoff effect and scouring of the exposed banks which consisted of silt and clay. It appears that PCBs are not significantly mobilized by the resuspension of bottom sediments. The aforementioned assumption is based upon the premise that if the streams have the energy to transport the sand fraction, the bed of streams should be scoured sufficiently to resuspend the particle sizes smaller than the sand fraction (silt and clay) and thus increasing significantly the concentrations of PCB associated with the suspended sediment in the water column. Therefore one would suspect, even with dilution, a greater PCB concentration associated with suspended sediment during the spring high flow conditions if PCBs were being mobilized from the stream bed to any great extent.

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VI. SEDIMENTS

1. Methodology

Sediment core samples were collected at Locations B, C, D, E, F, G, H, I, J, K, L (Figure 2). These samples were collected using a gravity type or manual coring device. The procedure document for collecting sediment cores (No. 3902023) is presented in Appendix A. Core samples were collected in replicate at opposite sides in the river channel at locations with similar stream velocities. These locations were established on the tag line during velocity measurements for current cross sections to determine stream flow. A different core sampler insert chamber was used for each sample to prevent contamination between stations. In addition, before use, all inserts were washed in the laboratory using EPA approved methods.

The core sampler was inserted as vertically as possible into the stream bed penetrating to a depth of approximately twelve inches. Because of the hard, clay/rock bottom of Salt Creek, core sample penetration was limited to approximately four inches. Following collection of the core, the sediment was extruded into laboratory cleaned glass sample containers, labeled with the project number, site number, station number, collection date and investigators initials. The sample was thoroughly mixed and then subsampled for particle size determinations and PCB analysis. These samples were immediately placed in an ice chest and delivered to the laboratory for analysis.

As with the water chemistry samples, a chain-of-custody form presented in the QA/QC section (Appendix A) accompanied the samples to the laboratory where the PCB analysis were performed. A subsample of this core was analyzed at CDM for particle size distribution. The laboratory procedures for particle-sizing sediment cores (No. 3902029) is presented in Appendix A. Field data forms, notes and chain-of-custody forms have been bound and submitted to General Motors Corporation under separate cover because of their voluminous nature.

The area subjected to flooding was also sampled and these samples analyzed for PCB concentrations. This area was within the boundary delineated by high water marks. Core samples were collected at locations in the areas studied and composited to form one sample per area. The study was designed to determine the presence of PCBs and not delineate the area of contamination. Core samples were collected by a laboratory cleaned sampling container to an approximate depth of four inches. A sufficient number of samples were collected to form the composite sample at each station to detect the presence or absence of PCB in the study area. The locations of these areas are presented in Figure 2. Samples were placed in laboratory cleaned glass containers, transferred to an ice chest and shipped to the laboratory for analysis.

Suspended sediment analysis for particle size distribution and associated PCB concentrations were performed on samples collected at stations B, C, D, E, F. G, H, I, J, K, and L. Suspended sediment samples were collected along the tag line where core samples were collected. A DH-48 suspended sediment sampler recommended by the U.S. Geological Survey and their procedure for depth-integrating samples for suspended sediment was used on this study. The procedure used for sampling suspended sediment in small streams and the determination of mass transport (No. 3902027) is presented in Appendix A. A Marsh-McBirney Model 210 electromagnetic current meter was used to take velocity measurements. At all stations velocity was measured at the 0.6 depth. The "partial section" method of flow measurement in streams was applied to calculate flow in cfs at the stream locations. The "partial section" method (No. 3902012) is presented in Appendix A.

2. Results and Discussion

There is a considerable variation in bottom configuration and substrate type between the station locations on Pleasant Run and Salt Creek. These differences can be noted by visual observation

and the variations in distribution of gravel/sand, silt and clay fractions in core samples. Table 7 presents the distribution of sand/gravel, silt, and clay. The sand and gravel fraction in samples were higher at the upstream stations of Bailey Branch and the main branch of Pleasant Run to the confluence with Bailey Branch at Station E. From Station F through H, in the slower moving segments, silt size particles became the dominant substrate type. In core samples taken on Salt Creek, the silt size particles were also the dominant size category. PCB concentrations determined in sediment cores at the stations are also presented in Table 7. The concentrations of PCBs varied considerably among stations and did not appear to have a direct relation to particle size distribution in the core. It appears that there are several interacting factors influencing the high variability of PCB concentration and the distribution of sediments in the core samples:

a. the compaction and inherent nature of the sediment;
b. the location of the station;
c. subsampling from a composite sample of the core;
d. the affinity for PCB's to be associated with the different particulate material.

Samples at stations on the branches of Pleasant Run were collected in areas of nonconsolidated sediment. In viewing the core before placing in the container, various lens thicknesses of coarser material and dark gray material were observed. The thickness of these layers varied as well as their boundary delineation from one another. It should be remembered here that the analysis of PCB was conducted on a composite of these various sediments lens. Therefore, if the different lens have different relative PCB concentrations, and analysis was conducted on a composite, then PCB concentrations would not necessarily reflect the particle size distribution, i.e., percentage of sand (which is assumed to have a lower affinity for PCB than the finer silt and clay) but the concen-

tration of contamination in one of the lens. The variability in PCB concentration can be seen that exist in core samples at the same location in the stream bed accounting for the large differences between cores taken at the same location and during different flow conditions (Table 8).

For the most part, the bed of Salt Creek in the areas of study consisted of rock or consolidated clay. From the nature of this substrate it appears that the material is mainly inherent to the natural stream bed with a minor amount of deposition occurring near the confluence with Pleasant Run (Station H and K). The high degree of consolidation of the sediment, low sediment deposition, and the sediment being inherent to the natural stream bed is a possible explanation for the relatively low PCB concentrations.

PCB concentrations in core samples ranged from 482 mg/kg at Station E to <0.1 mg/kg at Station C. On Salt Creek, PCB concentrations in core samples were less than 10 mg/kg PCB with the exception of core sample K-2, L-1 and L-2 which had respective concentrations of 103.0 mg/kg, 20.3 mg/kg and 19.3 mg/kg PCB on a dry weight basis (Table 8).

PCB concentrations in watershed samples ranged from 152 mg/kg at Station F to <0.10 mg/kg at Station C on a dry weight basis (Table 9). Samples were not collected at Station G since access to the property could not be attained. Upstream from Station B the channel is cut through rock and forest land and it appears that the flow is well channelized with minor flooding. The area subject to flooding is most pronounced from Station B to Station G. In this area PCB concentrations in samples ranged from 80 to 152 mg/kg on a dry weight basis. With the exception of Station K, PCB concentrations in Salt Creek samples were less than five mg/kg on a dry weight basis.

Stream discharge measurements and total sediment transport in the streams during the high flow and low flow periods are presented in Table 5. As discussed in the previous water chemistry section of

this report, high flow conditions in spring were primarily due to heavy rains. During the fall survey, periods of rain also probably contributed a substantial amount of sediment to the streams through surface runoff. PCB concentrations associated with suspended sediment were generally higher at gaging stations during fall while total sediment transport was consistently higher at stations in the spring. It appears that lower PCB concentrations in the spring were primarily due to dilution effect during significantly higher stream flow conditions.

Table 5. Summary Data of Flow, PCB Concentration for Suspended Sediment, and Sediment Transport.

Station	Spring Sampling (High Flow Study) Date	Flow(ft^3/sec)	S_T(kg/s)(1)	PCB Conc. for the Suspended Sediment (µg/l)(2)	Fall Sampling (Low Flow Study) Date	Flow(ft^3sec)	S_T(kg/s)(1)	PCB Conc. for the Suspended Sediment (µg/l)(2)
B	5/20/81	6	2.16×10^{-3}	3.4	9/2/81	1.7	3.0×10^{-4}	7.10
C	5/20/81	12	7.1×10^{-3}	<0.10	9/2/81	0.73	3.9×10^{-5}	<0.10
D	5/21/81	11	2.1×10^{-3}	<0.10	9/2/81	2.54	4.1×10^{-4}	0.27
E	5/21/81	17	4.1×10^{-3}	1.7	9/2/81	4.40	1.4×10^{-3}	3.12
F	5/21/81	30	8.8×10^{-3}	1.2	9/2/81	4.55	1.3×10^{-3}	2.89
G	5/20/81	35	2.41×10^{-2}	1.7	9/1/81	-		-
H	5/20/81	42	2.38×10^{-2}	1.6	9/1/81	8	6.8×10^{-3}	1.73
I	5/20/81	889	8.73×10^{-1}	0.07	9/1/81	105.	1.22×10^{-1}	0.14
J	5/19/81	1321	1.3	0.06	9/1/81	133	1.49×10^{-1}	0.13
K	5/19/81	1673	1.36	0.20	9/1/81	186	2.3×10^{-1}	0.14
L	5/19/81	1810	4.42	(3)	9/1/81	152	1.1×10^{-1}	0.19

(1) S_T is total sediment transport at the measured rate. And $S_T = S_C \times Q$, where S_C is mean concentration of total suspended solids, Q is stream discharge. Total suspended solids data is presented in table 2 page V-5.

(2) PCB concentration for the suspended sediment is calculated as the difference between uncentrifuged concentration and centrifuged concentration of water samples.

(3) Sample extract could not be recovered.

Table 6. Percent sand, silt and clay in water samples collected during the spring and fall surveys for total sediment transport (S_t) determinations.

Station	Spring Sampling			Fall Sampling		
	% Sand	% Silt	% Clay	% Sand	% Silt	% Clay
B	41	59	-	20	80	-
C	100	-	-	100	-	-
D	13.04	86.96	-	-	100	-
E	-	100	-	-	100	-
F	36.26	46.20	17.54	-	50	50
G	3.52	96.48	-	-	-	-
H	2.93	97.06	-	50	25	25
I	6.79	90.81	2.40	33.3	66.6	-
J	68.19	31.81	-	-	100	-
K	46.55	32.75	20.69	-	100	-
L	15.42	76.47	8.11	-	100	-

Table 7. Summary Data of the Distribution of Sediment Categories based on Phi Size and PCB Concentrations at various stations.

	Spring Sampling (High Flow Study)					Fall Sampling (Low Flow Study)				
Station	Date	Sand and Gravel (%)	Silt (%)	Clay (%)	PCB Conc. (mg/kg)*	Date	Sand and Gravel (%)	Silt (%)	Clay (%)	PCB Conc. (mg/kg)*
B	5/20/81	91.29	8.84	0.0	202.0, 109.0	9/2/81	98.05	1.57	0.38	24.1, 111.0
C	5/20/81	89.00	10.40	0.59	<0.1, 0.12	9/2/81	92.63	6.66	0.70	<0.1, <0.1
D	5/21/81	86.48	12.68	0.80	0.22, <0.1	9/2/81	46.29	37.05	16.66	32.7, 18.9
E	5/21/81	87.02	9.30	3.67	482.0, 99.9	9/2/81	50.78	41.06	8.15	344.0, 229.0
F	5/21/81	27.82	51.22	20.85	43.3, 11.4	9/2/81	49.02	36.78	14.20	209.0, 285.0
G	5/20/81	30.70	65.38	3.92	102.0, 107.0	-	-	-	-	-
H	5/20/81	17.64	80.04	2.31	113.0, 60.3	9/1/81	36.12	46.98	16.90	18.2, 39.7
I	5/20/81	23.86	71.63	4.51	0.87, 0.17	9/1/81	29.98	68.60	1.42	1.46, 0.75
J	5/19/81	30.72	48.82	20.45	0.40, 0.80	9/1/81	30.02	63.57	6.40	0.71, 0.65
K	5/19/81	37.85	52.66	9.44	3.62, 103.0	9/1/81	47.46	52.23	0.30	2.56, 7.85
L	5/19/81	32.16	58.53	9.30	2.87, 19.3	9/1/81	30.77	68.14	1.08	20.3, 4.44

*PCB concentration is calculated on dry weight basis and taken from Table 8.

Table 8

PCB Levels in Sediments

Station	Fall Sampling					
		Aroclor 1242 (mg/kg)*			Aroclor 1242 (mg/kg)*	
	% Moisture	Wet Weight Basis	Dry Weight Basis	% Moisture	Wet Weight Basis	Dry Weight Basis
B-1	0.70	201.0	202.0	0.1	24.1	24.1
B-2	0.60	108.0	109.0	0.3	111.0	111.0
C-1	0.70	<0.1	<0.1	2.1	<0.1	<0.1
C-2	0.70	0.12, 0.16	0.12, 0.16	1.1	<0.1	<0.1
D-1	0.90	0.22, 0.22	0.22, 0.22	1.9	32.1	32.7
D-2	1.10	<0.1	<0.1	2.6	18.4	18.9
E-1	1.09	477.0	482.0	1.3	340.0	344.0
E-2	0.59	99.3	99.9	1.6	225.0	229.0
F-1	1.00	42.9	43.3	2.1	205.0	209.0
F-2	27.8	8.23	11.4	1.8	280.0	285.0
G-1	1.36	101.0	102.0	-	-	-
G-2	0.98	106.0	107.0	-	-	-
H-1	0.88	112.0	113.0	2.2	17.8	18.2
H-2	0.58	59.9	60.3	1.4	39.1	39.7
I-1	39.1	0.53	0.87	1.6	1.44	1.46
I-2	29.1	0.12	0.17	1.5	0.74	0.75
J-1	0.80	0.40	0.40	1.5	0.70	0.71
J-2	36.3	0.51	0.80	1.5	0.64	0.65
K-1	1.19	3.58	3.62	1.7	2.52	2.56
K-2	0.98	102.0	103.0	5.5	7.42	7.85
L-1	35.8	1.84	2.87	1.8	19.9	20.3
L-2	1.42	19.0	19.3	1.9, 2.0	4.36, 4.22	4.44, 4.31

*PCB concentration is calculated as Aroclor 1242 and detection limit was 0.10 mg/kg based on a 20 g sample.

Table 9

PCB Levels in Watershed Composite Samples

Station	% Moisture	Aroclor 1242 (mg/kg)* Wet Weight Basis	Aroclor 1242 (mg/kg)* Dry Weight Basis
A	0.8	38.4	38.7
B	0.4, 0.4	95.6, 92.4	96.0, 93.0
C	1.2	<0.10	<0.10
D	1.7	80.6	82.0
E	1.4	129.0	131.0
F	1.6	150.0	152.0
H	1.6	43.6	44.3
I	1.2	1.92	1.94
J	1.4	2.55	2.59
K	1.5	28.6	29.0
L	1.5	4.15	4.21

*PCB concentration is calculated as Aroclor 1242 and detection limit was 0.10 mg/kg based on a 20 g sample.

VII. PERIPHYTON

1. Methodology

Four replicate periphyton samples were collected from rock substrates (when possible) at Stations B, C, D, G, I, and K during spring and late summer (Figure 2). Samples were obtained by scoring rings into rocks with a No. 10 cork borer and scraping the periphyton enclosed by the ring (2.46 cm^2) into labeled sample containers. One ring (2.46 cm^2) was placed in each of four sampling bottles containing 10 mls of "M^3" fixative (Meyer 1971) and transported to the CDM laboratory. Periphyton were collected from rocks with maximum visible algal growth and from riffle areas with maximum estimated daily exposure to sunlight. The following information was recorded on one field data form (FO113 Rev E) per station for each sample collected: substrate, estimated percent daily exposure to sunlight, current velocity and depth. Also, the land use was recorded in the immediate area as cropland, pasture (with or without livestock access), forest, etc. so that the amount of disturbance to the periphyton community can be estimated.

Periphyton samples were analyzed for species composition and density using the inverted microscope method (Lund et al. 1958). The sample bottles were diluted or concentrated to workable volume depending on the concentrations of material in the samples. Each sample bottle was inverted several times and immediately subsampled with a volumetric pipette. The subsample was discharged from the pipette into a settling chamber, and distilled water was added to fill the chamber. The individual subsample volume was carefully selected to produce an optimum concentration of periphyton on the bottom coverslip. The chamber was then covered and left undisturbed for a sufficient time to allow the periphyton to settle on the bottom coverslip. After the appropriate settling time, the chamber was transferred to an inverted microscope and examined at high power magnification (1000X to 1250X). Periphyton in selected transects

were identified and counted for three hours or until the relative abundance of the species present was determined. Burnt mounts were used to evaluate the relative abundance and species composition of diatoms. Periphyton densities were calculated and expressed as reporting units per milliliter (units/ml) using the following criteria: each frustule, cell, filament or colony equals one unit.

Periphyton were identified to the lowest practical taxon (usually species) with the aid of the following taxomonic references: Collins and Kalinsky (1977), Desikarchary (1959), Geitler (1932), Huber-Pestalozzi (1938 and 1941), Huber-Pestalozzi and Hustedt (1942), Huber-Pestalozzi and Fott (1968), Hustedt (1930), Patrick and Reimer (1966 ad 1975), Prescott (1962), Skuja (1948, 1956 and 1963), Smith (1920 and 1950), Tiffany and Britton (1971), Walton (1915), Weber (1966), and Willen (1963). Burnt mount reference slides (Weber 1973) were used to aid in the identification of diatoms.

Voucher periphyton samples are retained for two years following project completion. All periphyton field and laboratory procedures followed CDM's existing Quality Assurance Program specifications. Computerized tables containing simple statistics such as numbers/cm^2, diversity and evenness indices are presented in Appendix C.

2. Results and Discussion

Periphyton include the assemblage of algal organisms that grow on free surfaces of submerged objects. They play an important role in flowing water because these organisms are the major primary producers in the aquatic environment. periphyton, in many instances, have been very useful toward indicating water quality. It is a well established fact that nutrition of algae is derived from the dissolved chemicals in the water and, therefore, their population dynamics should indicate the chemical environment of the surrounding water. However, there are physical factors such as light, current speed and temperature that influence the physiological state of algae.

Samples were collected from rock substrates in riffle areas where possible in Pleasant Run and Salt Creek. Differences in periphyton growth was primarily attributed to differences in habitat type. The number of different taxa and their abundance were greater in the rocky, shallower, faster stream head water locations at stations B, C, and D (Figure 3). Periphyton abundance and differences in species composition were generally lowest at Salt Creek. These periphyton population characteristics were attributed to the steep eroded banks, high turbidity and lack of suitable substrate. Diatoms were the major periphyton group in Pleasant Run while blue-green algae were the dominant group in Salt Creek. Green algae and Euglenoids comprised a minor part of the periphyton population (Figure 4).

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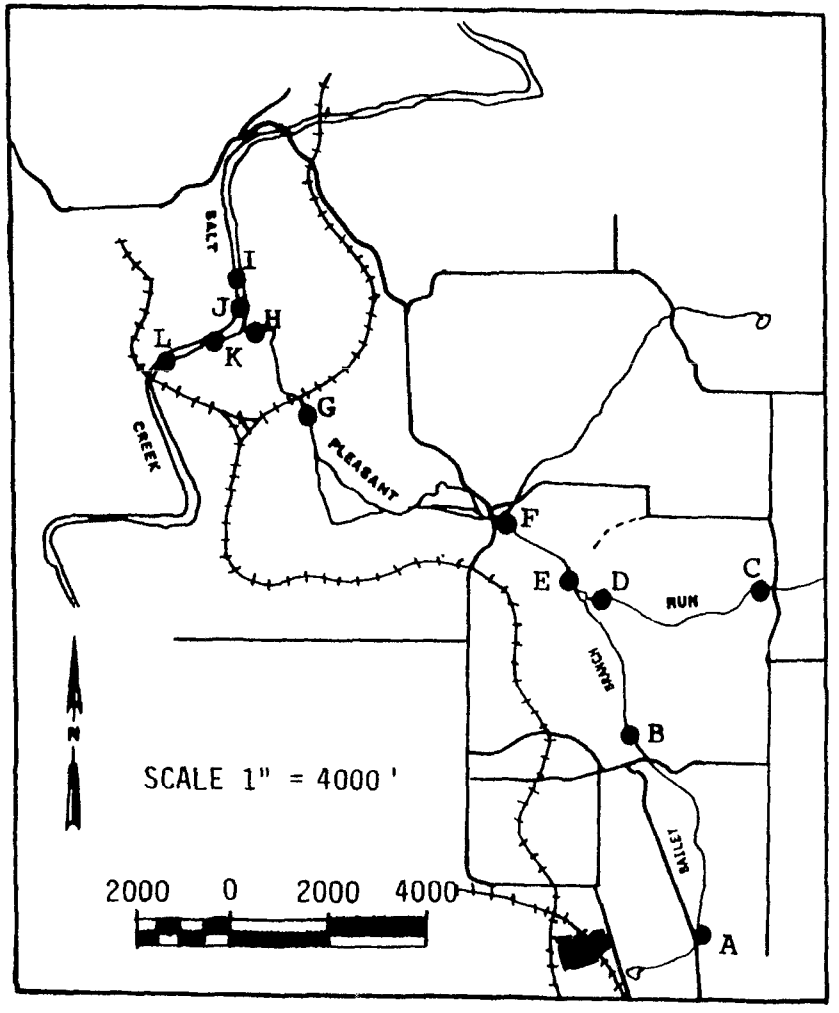
Figure 3. Total Periphyton and the number of Taxa collected at stations located on Pleasant Run and Salt Creeks.



STUDY AREAS ON PLEASANT RUN AND SALT CREEKS LAWRENCE COUNTY, INDIANA

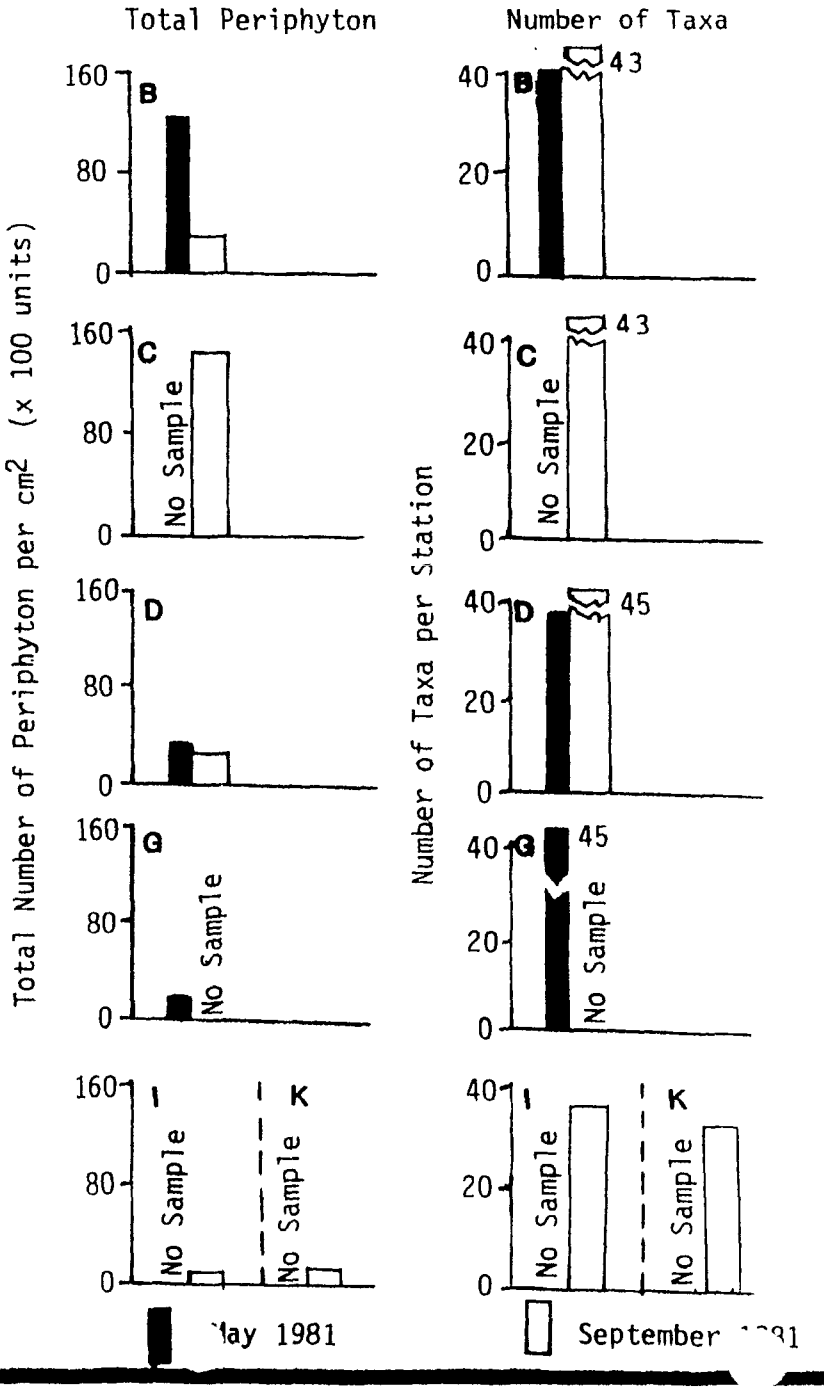
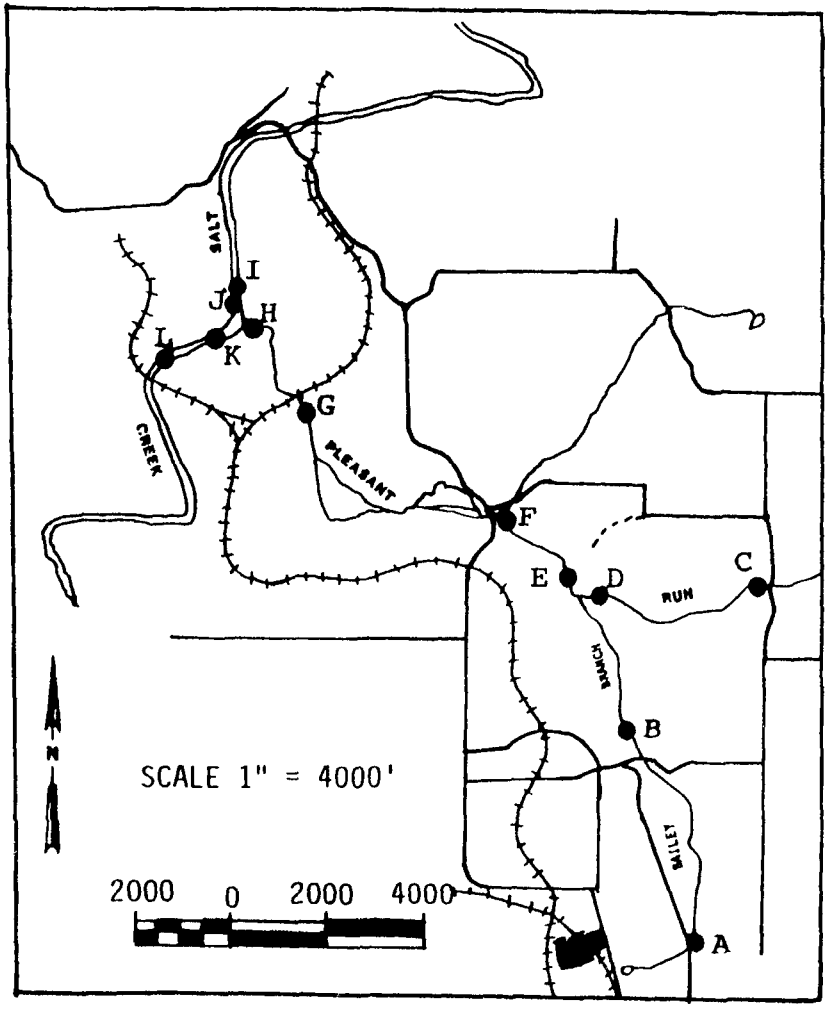


Figure 4. Percent composition of Periphyton on Pleasant Run and Salt Creeks.



STUDY AREAS ON PLEASANT RUN AND SALT CREEKS LAWRENCE COUNTY, INDIANA

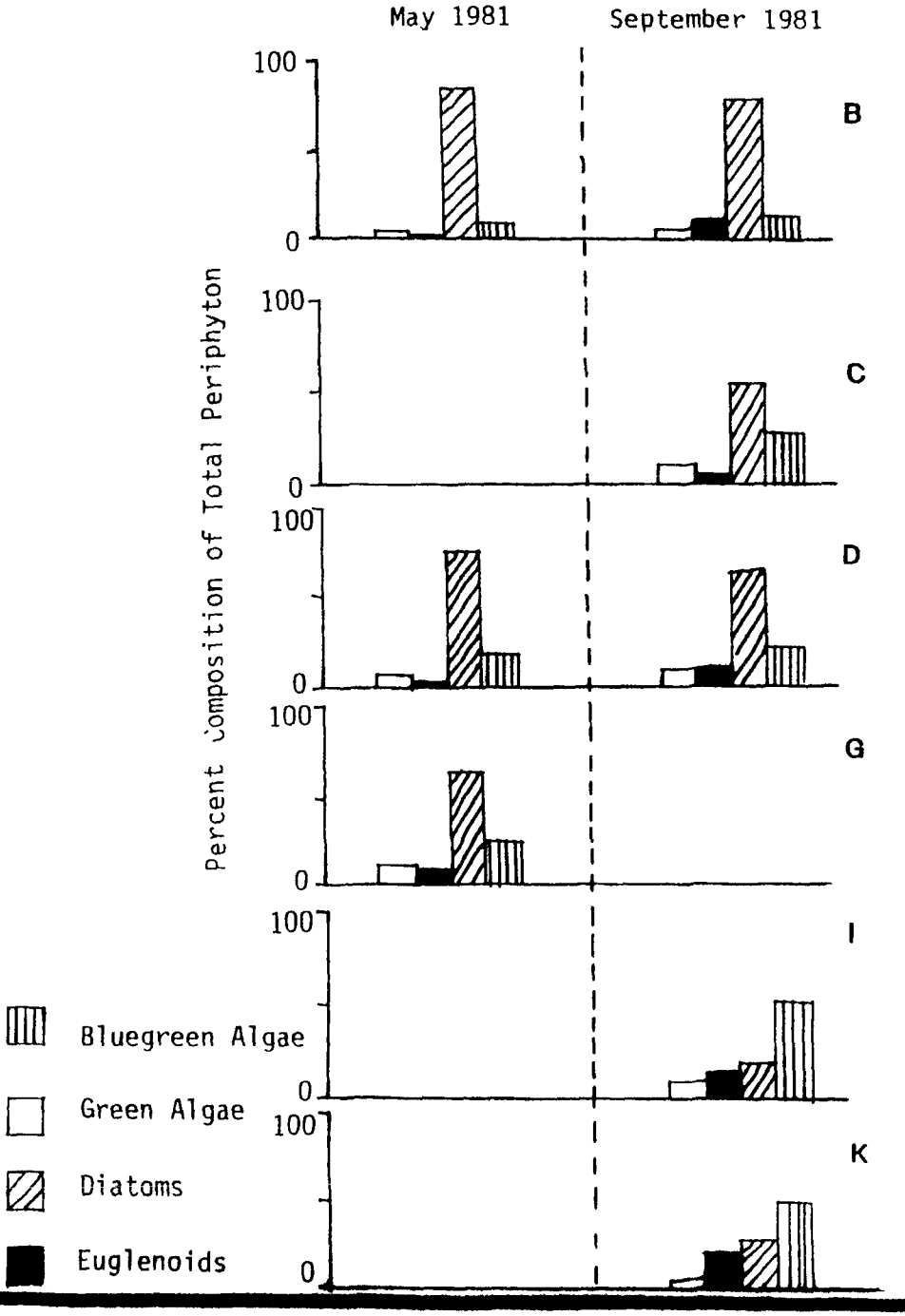
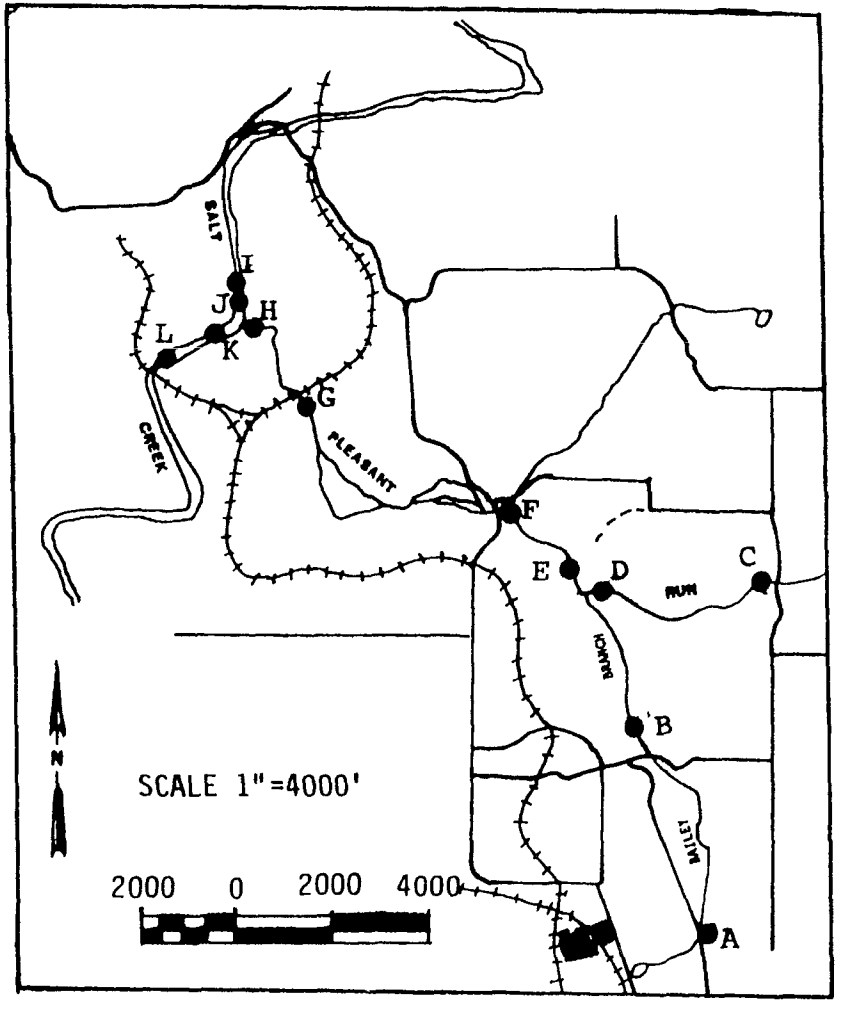
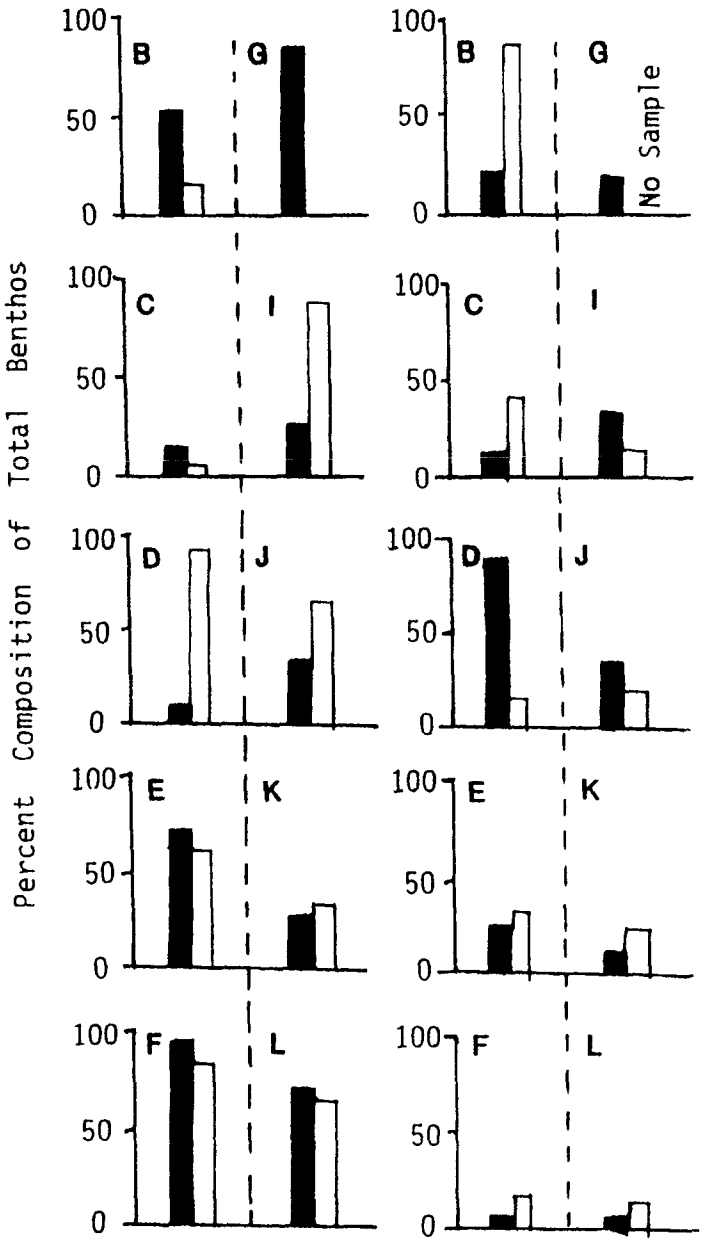


Figure 5. Percent composition of total Benthos, Oligochaeta and Chironomidae at Pleasant Run and Salt Creek locations.



May 1981

September 1981



STUDY AREAS ON PLEASANT RUN AND SALT CREEKS LAWRENCE COUNTY, INDIANA

VIII. BENTHOS

1. Methodology

Benthic macroinvertebrates were collected during the spring high water period and during the fall low water period. Four replicate samples were collected at Location B on Bailey Branch; Locations C, D, E, F and G on Pleasant Run; and Locations I, J, K and L on Salt Creek. Samples were collected using a petite Ponar (6 in x 6 in). Each sample was rinsed in the field on a U.S. Standard No. 30 mesh sieve (595u aperture), and the material retained on the sieve was rinsed into a labeled container, preserved with 10 percent formalin and transported to the laboratory for analysis.

In the laboratory, samples with excessive densities or an excessive volume of sediments were subsampled. The sample was rinsed onto a U.S. Standard No. 60 mesh sieve (250u aperture) and divided into quarters. If the density was still excessive, the quarter was further divided until a practical working density (approximately 200 organisms) was obtained. The unexamined portion was rinsed into a labeled jar and preserved with 10 percent formalin.

All benthic macroinvertebrates were sorted from the sediments using a dissecting microscope. All organisms, except worms and midges, were identified and enumerated when picked, then stored in 70 percent alcohol with five percent glycerin to prevent drying. Worms and midges were mounted and cleared in a nonresinous mounting medium on labeled microscope slides before being identified using a compound microscope. These slides were stored in labeled slide boxes. All benthic macroinvertebrates collected were stored by CDM and will be retained until further notification from General Motors Corp. All identification was to the lowest practical taxon using the following literature: Beck and Beck (1966 and 1969); Brinkhurst and Jamieson (1971); Brown (1976); Burch (1972); Edmondson (1959); Edmunds, Jensen and Berner (1976); Hamilton and Saether (undated);

Hilsenhoff (1975); Hiltunen (1967); Hiltunen and Klem (1980); Holsinger (1972); Klemm (1972); Merritt and Cummins (1978); Pennak (1978); Robak (1957); Saether (1969, 1971, 1976, 1977 and undated); Schuster and Etnier (1978); Sperber (1948); Usinger (1968); Wiggins (1977); and Williams (1972).

Benthic macroinvertebrate density was calculated using the equation:

$$D = N \times S \times C$$

where: D = density (number of organisms per square meter)
N = number of organisms counted
S = reciprocal of subsample fraction
C = collection device conversion factor (petite ponar = 43.06)

Shannon-Weaver (Zar 1974) species diversity index was applied to the data from each sample using the equation:

$$H' = \sum_{i=1}^{S} pi \log_2 pi$$

where: H' = species diversity index
S = number of species
pi = proportion of individuals found in taxon i

2. Results and Discussion

There is a scarcity of investigative studies involving the benthic macroinvertebrate community structures of the bodies of water in the immediate vicinity of the Bedford site. CDM (1980) has conducted an extensive Environmental Resource Inventory (ERI) near Francisco, Gibson County, Indiana and investigated the biology of Lost Creek in association with this inventory. Two water bodies, Lost Creek and the White River had physical characteristics that are

somewhat similar to Pleasant Run and Salt Creek. Therefore, a brief discussion of the general benthos for Lost Creek and the White River will be presented for comparative purposes to Pleasant Run and Salt Creek.

Lost Creek, the only water body in the general vicinity of the Francisco area, is a small creek ranging from one to two feet deep and one to five feet wide and reflected the physical characteristics of Pleasant Run at several locations. It has very few trees along the eight foot high clay banks. Although grass is present at the top of the banks, the sides are unprotected and highly susceptible to erosion. This is reflected in the substrate which is predominantly clay, mixed with sand, silt and gravel, the typical constituents comprising of the Pleasant Run and Salt Creek bottom substrates. The benthic macroinvertebrate fauna of Lost Creek was sparce, consisting of only five worm taxa, one sow bug, one true bug, and ten midge taxa. Other benthic macroinvertebrate studies in the immediate vicinity have been conducted in the White River located in the northern border of Gibson County. The White River has nearshore benthic habitats which were characterized by grassy shorelines; slow current; silt, clay and sandy substrates; and submerged vegetation (Whitaker et al. 1977). The silt and clay substrate resembles that of Salt Creek. Only qualitative sampling was conducted in the White River nearshore zone. The number of taxa qualitatively collected varied seasonally from 20 in winter to 47 in late spring. The most abundant groups in the qualitative samples were Oligochaeta, Collembola, Ephermeroptera, Trichoptera, Chironomidae and Sphaeriidae.

In the deeper, main channel of the White River, the benthic habitat was characterized by a fast current with clean, fine to coarse sand and no apparent detritus. Only quantitative samples were collected in the main channel. Chironomidae was the predominant group throughout most of the study period. On Pleasant Run and Salt Creek, Oligochaeta (worms) and Chironomidae (midge larvae) were the dominant benthos at all stations (Figures 5 and 6).

Total numbers of benthic macroinvertebrates, collected during May and September 1981 at the various locations were highest at Station D during the May and September sampling period, (>10,000 m2) and relatively low (<3,000 m^2) at Stations B, C, F, G, I, and J in May and at Stations B, C, J, and K in September. The total number of taxa at the various stations ranged from <10 m^2 at Station F in May to >30 m^2 at Station C in May (Figure 6). The number of taxa was relatively similar among Salt Creek stations. In addition, stations on Pleasant Run downstream from Station D were relatively similar in community structure. Computerized tables in Appendix D present the identification of the organisms, the number/sq meter, diversity and evenness statistics. At stations below the confluences of Pleasant Run and its tributary to the confluence with Salt Creek, Chironomidae and Oligochaeta were the dominant taxonomic groups. The stream bottom primarily consists of soft silt, sand and gravel throughout this segment, a suitable substrate for the worms and midge larvae that were consistently found. The substrate at Station C was primarily comprised of rock, cobble, sand and gravel. This substrate was an ideally suited habitat for the comparably larger populations of mayfly, beetle, fly and midge larvae, as well as species of Ispoda and Crustacea. Crustacea, primarly Lirceus fontinalis were relatively abundant at the Salt Creek Locations. Their abundance is largely influenced by the habitat of Salt Creek with its rock and hard clay bottom. Therefore, the benthos inhabiting Pleasant Run and Salt Creeks are primarily influenced by the physical characteristics of the Creeks and the associated type of substrate.

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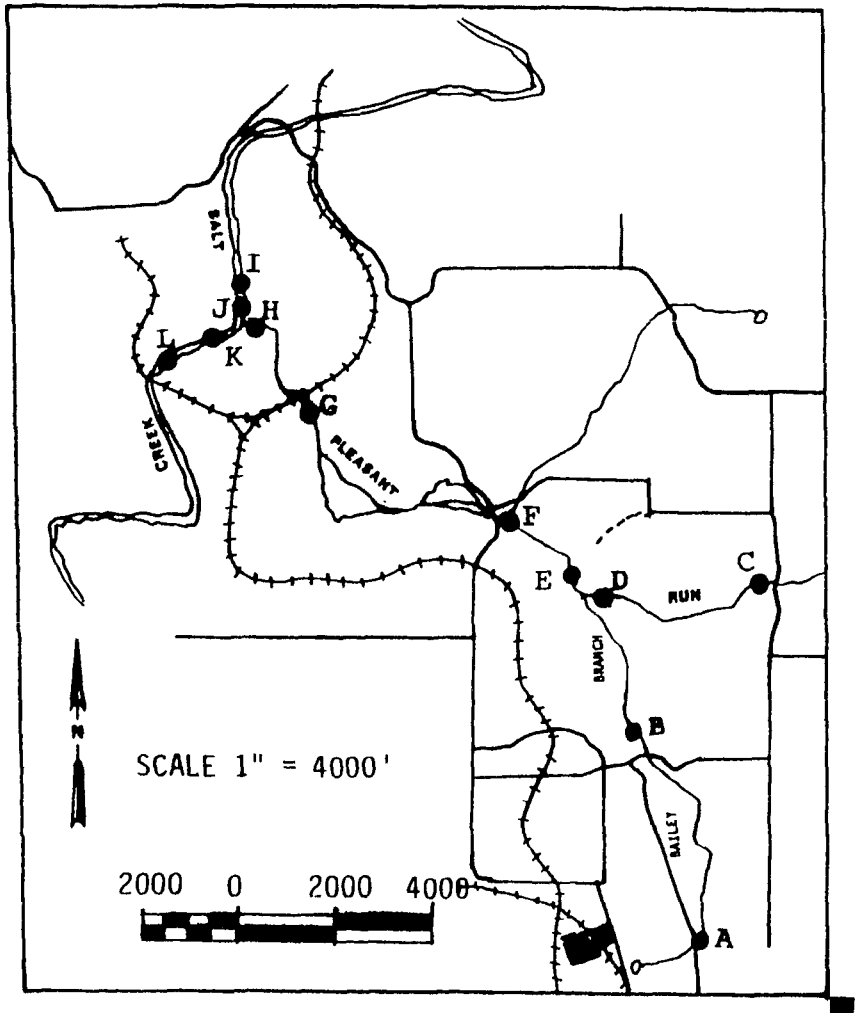
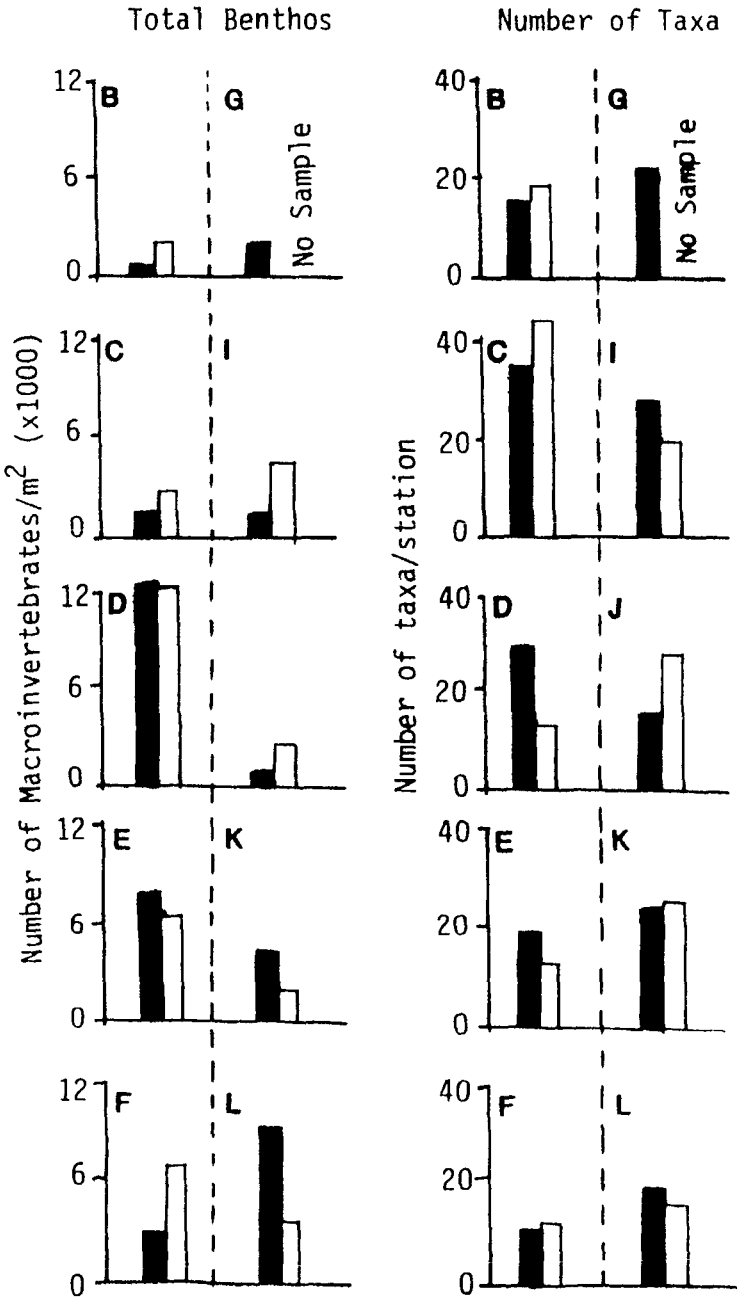
Figure 6. Total Benthos and number of Taxa at sampling stations located on Pleasant Run and Salt Creeks.



STUDY AREAS ON PLEASANT RUN AND SALT CREEKS LAWRENCE COUNTY, INDIANA



IX. FISH POPULATION STUDIES AND TISSUE ANALYSIS FOR PCBs

1. Methodology

Adult and juvenile fish were collected from Pleasant Run Creek and Salt Creek, Lawrence County from 19-21 May 1981 and 1-2 September 1982. Locations B, C, D, F, G, I, J, K, and L were sampled during each field effort (Figure 2). No seining was conducted at Location G in September due to low water levels in Pleasant Run Creek hampering boat access and blocked road access. Collection methods included backback electroshocking and minnow seine with habitat conditions dictating those methods employed at each sampling location. Both electroshocking and seining were conducted at Location B. Locations C, F, I, J, K and L were sampled only by electroshocker while Locations D and G were sampled only by minnow seine.

Minnow seining was conducted with a net measuring 25 ft x 6 ft constructed with 3/16 in Ace mesh. This seine was also used as a block net for electroshocking at Location C. Two to four seine hauls were made at each location during each sampling period. Electroshocking was conducted for 30 minutes at each location using a Coffelt Model BPI-C backpack electroshocker.

All fish collected were identified to species, enumerated, measured (total length in millimeters), and weighed (grams). Sex and spawning condition of representative specimens was determined by gross examination. Incidence of disease and physical abnormalities was also recorded. Scale samples for age determination were collected from the following specimens: 14 longear sunfish, 5 green sunfish, 2 largemouth bass, 1 white crappie, and 1 yellow bass.

As a general indicator of fish health within this stream system, condition factors were calculated for all species for which accurate weight data were available. Condition factors were calculated according to the following equation (Carlander 1969):

$$K_{tl} = \frac{W}{L^3} \times 10^5$$

where: W = weight in grams
L = total in millimeters

Fish Tissue Analysis for PCB

Representative fish captured during seining and electroshocking were tagged with the appropriate label, packed on ice, and delivered to Milwaukee and placed in a freezer until analysis commenced. Nineteen fish were analyzed for PCB concentration and percent lipid (Table 10). Preceding analysis, the fish gut was cleaned of sediment and detritus and the whole fish homogenized and analyzed. No game fish of a size to allow an adequate sample for PCB analysis following filleting were captured in Pleasant Run or Salt Creeks during either the spring or summer sampling periods. CDM attempted to obtain representative fish at all segments of the streams for PCB analysis. All PCB analysis were performed by Raltech Scientific Services of Madison, Wisconsin. The methodology for PCB analysis in fish tissue and the quality control results are presented in Appendix B.

2. Results and Discussion

A review of the literature yielded substantial data on the distribution of fishes in the watersheds near the study area. The majority of early records prior to 1900 were by Jordan (1878). The first extensive evaluation, encompassing over 412 locations in Indiana lakes and streams, was by Gerking (1945). The latest records have been compiled by the Indiana Department of Natural Resources district surveys and various universities. Whitaker and Gammon (in press) compiled the latest review of endangered and threatened fish species of Indiana. A review of the distribution of fish present in the waters near the study areas of Salt Creek and Pleasant Run encompassed the White River, Patoka River and its tributaries, the Wabash and Erie Canal, Muddy Fork and Lost Creek. A search was also made for literature involving species of special concern present in the lower White River that might be present in infringing areas or watersheds.

Gerking (1945) reported 170 species of fish from the waters of Indiana. Examination of the distribution of fish in recent literature reveals that at least 99 species may occur in the watersheds near the study area (Table 11). Threatened, endangered and special concern species of Indiana fish are presented in Table 12. The river darter and the blue sucker have been captured in the lower White River in recent years but were not present in collections of the survey on Salt Creek or Pleasant Run (Proffitt 1969, Proffitt and Benda 1971, Whitaker et al. 1973, CDM 1979, Nalco 1976, Hottell 1978).

A total of 664 fish representing 23 species was collected in the Pleasant Run and Salt Creek stream system during May and September 1981. Tables 13 and 14 present the total catch and percent composition of species at the sampling location and the mean length and size range of the species captured during May and September 1981. Species composition was considered typical of small warm-water midwestern streams having similar habitat and flow characteristics. The relative size of the fish captured was small, as expected in a lotic ecosystem of this type and size. The general condition (K_{tl}) of the fish was good but comparatively low condition for such species as green sunfish, largemouth bass and white crappie is probably due to their small size and lotic habitat (Carlander 1969 and 1977). Age determinations from a limited number of selected species indicate relatively good growth (Table 15). Incidence of disease and abornmalities was generally low. Blackspot (Neascus) was most common, affecting green suunfish (17.6%), creek chub (50%) and stoneroller (2.3%). Other diseases and abnormalities noted were spinal flexure (1 black bullhead), Lernaca (1 creek chub), fungus (1 white sucker) and open sores (1 bigmouth buffalo). None of the species collected during the spring and fall surveys were considered unique, with the exception of one yellow perch, undoubtedly introduced from upstream Lake Monroe. No threatened or endangered species were collected.

The most abundant groups of fish captured in Pleasant Run and Salt Creeks were minnows, sunfish and suckers. Few fish captured were large enough to be considered for human consumption. The number of fish species and total number of fish were highest at Stations C and D and lowest at Station B of Pleasant Run (Figure 7). The number of fish species and total number of fish captured on Salt Creek was comparatively low. Low catches in Salt Creek were primarily influenced by the nature of the stream habitat rather than water quality parameters. Within the study area, Salt Creek is deep, turbid, has steep banks and relatively swift current, all of which hampered sampling effectiveness. Location B bears close physical resemblance to Location C and general water quality parameters were similar. PCB concentrations in whole-water samples were highest at Location B, which may account for the paucity of fish; however, other factors not investigated could also be contributing.

Table 10 presents the fish species, station location where the fish were captured, concentration of PCB incorporated in the tissue and percent lipid. Fish analyzed were members of the minnow, sunfish and sucker families. These fish were selected for their potential as a source of food for human consumption as well as their size since many of the fish inhabiting these streams are very small (1-2 in) minnows and darters. PCB concentrations calculated as Aroclor 1242 ranged from 0.14 mg/kg (ppm) in a longear sunfish at Station C to 571.0 mg/kg in a white sucker collected at Station F. There was a very high variability in PCB concentration between fish species and the station where collected on Pleasant Run or Salt Creek. This variability is indicative of the fishes ability to migrate throughout the stream system thus feeding in different locations and substrates. At Location C, PCB concentrations were below 1 mg/kg (ppm) with the exception of striped shiner with a concentration of 1.42 mg/kg (ppm). PCB concentrations were higher in fish that predominately feed on bottom dwelling organisms. All

fish analyzed, with the exception of those fish captured at Station C, had PCB incorporated in tissue to concentrations that exceeded the five (5) ppm tolerance limit for PCB concentrations for fish and shellfish established by the Food and Drug Administration (FDA).

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Table 10. PCB concentrations in fish captured on Pleasant and Salt Creeks, Lawrence County, Indiana.

	Spring Sampling			Fall Sampling		
Station	Species	PCB Concentration (mg/kg)*	% Lipid	Species	PCB Concentration (mg/kg)	% Lipid
B	-	-	-	Creek chub	262.0	3.11
C	Striped shiner	1.42	2.46	White sucker	0.21	0.40
C	Creek chub	0.26	1.68	Longear sunfish	0.14	0.38
C	Green sunfish	0.44	0.98	Green sunfish	0.73	0.79
F	Creek chub	35.7	0.78	White sucker	571.0	3.79
F	Green sunfish	184.0	2.46	-	-	-
G	White sucker	9.28, 7.10	0.67, 0.61	-	-	-
I	Bigmouth buffalo	244.0	3.14	Longear sunfish	20.0	2.56
I	-	-	-	Golden redhorse	21.4	2.42
J	Longear sunfish	92.5	2.86	Longear sunfish	46.1	3.35
K	-	-	-	Golden redhorse	11.7	2.07
K	-	-	-	Longear sunfish	28.4, 31.9	1.75, 1.95
L	-	-	-	Longear sunfish	42.5	3.61

*PCB concentration is calculated as Aroclor 1242 and detection limit was 0.10 mg/kg based on a 25 g sample.

Table 11. Fish collected during previous research on streams near the Bedford site.

Family and Scientific Name	Common Name	White River[a]	Patoka River[b]	Keg Cre
Petromyzontidae (lampreys)				
Ichthyomyzon castaneus	Chestnut lamprey	x		
Ichthyomyzon unicuspis	Silver lamprey	x		
Acipenseridae (sturgeons)				
Scaphirhynchus platorynchus	Shovelnose sturgeon	x		
Polyodontidae (paddlefishes)				
Polyodon spathula	Paddlefish	x		
Lepisosteidae (gars)				
Lepisosteus osseus	Longnose gar	x	x	
Lepisosteus platostomus	Shortnose gar	x	x	x
Lepisosteus oculatus	Spotted gar		x	
Amiidae (bowfins)				
Amia calva	Bowfin	x	x	
Anguillidae (freshwater eels)				
Anguilla rostrata	American eel	x		
Clupeidae (herrings)				
Alosa chrysochloris	Skipjack herring	x		
Dorosoma cepedianum	Gizzard shad	x	x	x
Hiodontidae (mooneyes)				
Hiodon alosoides	Goldeye	x		
Hiodon tergisus	Mooneye	x		
Esocidae (pikes)				
Esox americanus	Grass pickerel	x	x	
Esox lucius	Northern pike		x	
Cyprinidae (minnows and carps)				
Campostoma anomalum	Stoneroller	x	x	
Carassius auratus	Goldfish	x		
Cyprinus carpio	Carp	x	x	x
Ericymba buccata	Silverjaw minnow	x	x	
Hybognathus nuchalis	Silvery minnow	x	x	x
Hybopsis aestivalis	Speckled chub	x		
Hybopsis storeriana	Silver chub	x		
Notemigonus crysoleucas	Golden shiner	x	x	x
Notropis atherinoides	Emerald shiner	x	x	x
Notropis blennius	River shiner	x		
Notropis cornutus	Common shiner	x		
Notropis chrysocephalus	Striped shiner	x	x	
Notropis emiliae	Pugnose minnow	x	x	
Notropis rubellus	Rosyface shiner	x		

Table 11.
(Continued)

Family and Scientific Name	Common Name	White River[a]	Patoka River[b]	Keg Creek
Cyprinidae (continued)				
Notropis spilopterus	Spotfin shiner	x	x	
Notropis texanus	Weed shiner			
Notropis stramineus	Sand shiner	x	x	
Notropis umbratilis	Redfin shiner	x		
Notropis volucellus	Mimic shiner	x		
Notropis whipplei	Steelcolor shiner	x		
Phenacobius mirabilis	Suckermouth minnow	x	x	
Pimephales notatus	Bluntnose minnow	x	x	x
Pimephales promelas	Fathead minnow	x		
Pimephales vigilax	Bullhead minnow	x		
Semotilus atromaculatus	Creek chub	x	x	
Catostomidae (suckers)				
Carpiodes spp.	Carpsucker species	x		
Carpiodes carpio	River Carpsucker	x	x	
Carpiodes cyprinus	Quillback	x	x	x
Carpiodes velifer	Highfin carpsucker	x	x	
Catostomus commersoni	White sucker	x	x	
Cycleptus elongatus[1]	Blue sucker	x		
Erimyzon oblongus	Creek chubsucker		x	
Hypentelium nigricans	Northern hog sucker	x		
Ictiobus bubalus	Smallmouth buffalo	x	x	
Ictiobus cyprinellus	Bigmouth buffalo	x	x	
Ictiobus niger	Black buffalo	x		
Minytrema melanops	Spotted sucker	x	x	
Moxostoma duquesnei	Black redhorse	x		
Moxostoma erythrurum	Golden redhorse	x	x	
Moxostoma anisurum	Silver redhorse	x		
Moxostoma carinatum	River redhorse	x		
Moxostoma macrolepidotum	Shorthead redhorse	x		
Moxostoma sp.	Redhorse species	x		
Ictaluridae (freshwater catfishes)				
Ictalurus furcatus	Blue catfish	x		
Ictalurus melas	Black bullhead	x	x	x
Ictalurus natalis	Yellow bullhead	x	x	x
Ictalurus nebulosus	Brown bullhead		x	
Ictalurus punctatus	Channel catfish	x	x	
Noturus eleutherus	Mountain madtom	x		
Noturus miurus	Brindled madtom	x		
Noturus gyrinus	Tadpole madtom		x	x
Pylodictus olivaris	Flathead catfish	x		
Aphredoderidae (pirate perches)				
Aphredoderus sayanus	Pirate perch	x	x	x

Table 11.
(Continued)

Family and Scientific Name	Common Name	White River[a]	Patoka River[b]	Keg
Cyprinodontidae (killifishes)				
Fundulus notatus	Blackstripe topminnow	x	x	
Poeciliidae (livebearers)				
Gambusia affinis	Mosquitofish	x		
Atherinidae (silversides)				
Labidesthes sicculus	Brook silverside	x		
Percichthyidae (temperate basses)				
Morone chrysops	White bass	x		
Morone saxatilis	Striped bass		x	
Centrarchidae (sunfishes)				
Centrarchus macropterus	Flier		x	x
Ambloplites rupestris	Rock bass	x		
Lepomis spp.	Sunfish species	x	x	
Lepomis cyanellus	Green sunfish	x	x	x
Lepomis gibbosus	Pumpkinseed	x		
Lepomis gulosus	Warmouth	x	x	x
Lepomis humilis	Orangespotted sunfish	x	x	x
Lepomis macrochirus	Bluegill	x	x	
Lepomis megalotis	Longear sunfish	x	x	x
Lepomis microlophus	Redear sunfish	x	x	
Lepomis punctatus	Spotted sunfish	x		
Micropterus dolomieui	Smallmouth bass	x		
Micropterus punctulatus	Spotted bass	x	x	
Micropterus salmoides	Largemouth bass	x	x	x
Pomoxis annularis	White crappie	x	x	
Pomoxis nigromaculatus	Black crappie	x	x	x
Percidae (perches)				
Ammocrypta clara	Western sand darter	x		
Ammocrypta pellucida[1]	Eastern sand darter	x		
Etheostoma asprigene	Mud darter	x		
Etheostoma gracile	Slough darter	x	x	
Etheostoma chlorosomun	Bluntnose darter		x	x
Etheostoma nigrum	Johnny darter	x	x	
Etheostoma spectabile	Orangethroat darter	x	x	
Percina caprodes	Logperch	x	x	
Percina phoxocephala	Slenderhead darter	x		
Percina sciera	Dusky darter	x		
Percina shumardi	River darter		x	x
Stizostedion canadense	Sauger	x	x	
Sciaenidae (drums)				
Aplodinotus grunniens	Freshwater drum	x	x	
Total number of taxa collected		92	59	

[a] Proffitt 1969, Proffitt and Benda 1971, Whitaker et al 1973, Nalco E.S. 1976, CDM 19
[b] Hottell 1978

[1] Indiana threatened Species

Table 12. Threatened, endangered and special concern species of Indiana fish (IDNR 1979a).

Scientific Name	Common Name	Status[1]
Acipenser fulvescens	Lake Sturgeon	E
Coregonus artedii	Cisco	T
Esox masquinongy ohiensis	Ohio Muskellunge	E
Esox masquinongy masquinongy	Northern Muskellunge	E
Clinostomus elongatus	Redside Dace	E
Notropis ardens	Rosefin Shiner	T
N. ariommus	Popeye Shiner	E
N. fumeus	Ribbon Shiner	S
N. shumardi	Silver Band Shiner	S
Cycleptus elongatus	Blue Sucker	T
Moxostoma valenciennesi	Greater Redhorse	E
Amblyopsis spelaea[2]	Northern Cavefish	E
Chlogaster agassizi[2]	Spring Cavefish	S
Typhlichthys subterrancus	Southern Cavefish	E
Ammocrypta pellucida	Eastern Sand Darter	T
Etheostoma camurum	Bluebreast Darter	E
E. histrio	Harlequin Darter	E
E. maculatum	Spotted Darter	E
E. squamiceps	Spottail Darter	E
E. tippecanoe	Tippecanoe Darter	E
E. variatum	Variegate Darter	E
Percina evides	Gilt Darter	E
P. uranidea	Stargazing Darter	S

[1]Indiana protected status code:

E = Endangered
T = Threatened
S = Special Concern

[2]Species with no records for Indiana, records in adjacent states suggest that in the future this species may be recorded for Indiana.

Table 13. Summary of fish species collected by minnow seine and electroshocker in Pleasant Run and Salt Creeks, Lawrence County, Indiana during May 1981.

Species		Total Catch and Percent Composition/Species/Sampling Location											
		B		C		D		F		G		I	
Scientific Name	Common Name	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Campostoma anomalum	Stoneroller	0	-	10	10.3	7	3.4	3	30.0	0	-	0	-
Notropis crysocephalus	Striped shiner	0	-	11	11.3	36	17.6	1	10.0	0	-	0	-
Notropis umbratilis	Redfin shiner	0	-	0	-	4	2.0	0	-	0	-	0	-
Pimephales notatus	Bluntnose minnow	0	-	31	32.0	141	69.1	2	20.0	5	55.6	0	-
Semotilus atromaculatus	Creek chub	0	-	6	6.2	13	6.4	2	20.0	0	-	0	-
Catostomus commersoni	White sucker	0	-	1	1.0	0	-	0	-	1	11.1	0	-
Ictiobus cyprinellus	Bigmouth buffalo	0	-	0	-	0	-	0	-	0	-	1	33.3
Ictalurus melas	Black bullhead	0	-	1	1.0	0	-	0	-	0	-	0	-
Lepomis cyanellus	Green sunfish	0	-	4	4.1	0	-	2	20.0	0	-	0	-
Lepomis macrochirus	Bluegill	0	-	0	-	0	-	0	-	0	-	2	66.7
Lepomis megalotis	Longear sunfish	1	100	4	4.1	0	-	0	-	0	-	0	-
Etheostoma flabellare	Fantail darter	0	-	15	15.5	0	-	0	-	0	-	0	-
Etheostoma nigrum	Johnny darter	0	-	0	-	0	-	0	-	3	33.3	0	-
Etheostoma spectabile	Orangethroat darter	0	-	14	14.4	3	1.3	0	-	0	-	0	-
	Total	1		97		204		10		9		3	

Table 13.
(continued)

Species		Total Catch and Percent Composition/Species/Sampling Location									
		J		K		L		Total		Total Length (mm)	
Scientific Name	Common Name	No.	%	No.	%	No.	%	No.	%	Mean	Range
Campostoma anomalum	Stoneroller	0	-	0	-	0	-	20	6.1	67.6	41-112
Notropis crysocephalus	Striped shiner	0	-	0	-	0	-	48	14.6	76.1	49-153
Notropis umbratilis	Redfin shiner	0	-	0	-	0	-	4	1.2	50.0	40 - 50
Pimephales notatus	Bluntnose minnow	0	-	2	50.0	0	-	181	55.0	41.0	21 - 84
Semotilus atromaculatus	Creek chub	0	-	0	-	0	-	21	6.4	68.1	41-139
Catostomus commersoni	White sucker	0	-	0	-	0	-	2	0.6	229.5	224-235
Ictiobus cyprinellus	Bigmouth buffalo	0	-	0	-	0	-	1	0.3	282.0	-
Ictalurus melas	Black bullhead	0	-	0	-	0	-	1	0.3	203.0	-
Lepomis cyanellus	Green sunfish	0	-	0	-	0	-	6	1.8	81.3	62-110
Lepomis macrochirus	Bluegill	0	-	2	50.0	0	-	4	1.2	56.3	32 - 84
Lepomis megalotis	Longear sunfish	1	100	0	-	0	-	6	1.8	85.2	40-170
Etheostoma flabellare	Fantail darter	0	-	0	-	0	-	15	4.6	52.1	39 - 63
Etheostoma nigrum	Johnny darter	0	-	0	-	0	-	3	0.9	47.0	46 - 48
Etheostoma spectabile	Orangethroat darter	0	-	0	-	0	-	17	5.2	48.5	43 - 62
	Total	1		4		0		329			

Table 14. Summary of fish species collected by minnow seine and electroshocker in Pleasant Run and Salt Creek, Lawrence County, Indiana during September 1981.

Scientific Name	Common Name	Total Catch and Percent Composition/Species/Sampling Location[a]																		Total		Total Length (mm)	
		B		C		D		F		I		J		K		L							
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			No.	%	Mean	Range
Dorosoma cepedianum	Gizzard shad	0	-	0	-	0	-	0	-	0	-	1	7.7	0	-	0	-			1	0.3	151.0	-
Esox americanus	Grass pickerel	0	-	0	-	0	-	0	-	1	5.9	0	-	0	-	0	-			1	0.3	228.0	-
Campostoma anomalum	Stoneroller	0	-	62	42.5	6	5.4	0	-	0	-	0	-	0	-	0	-			68	20.3	53.9	33 - 114
Notropis chrysocephalus	Striped shiner	0	-	1	0.7	8	7.1	4	20.0	0	-	0	-	0	-	0	-			13	3.9	38.0	31 - 53
Notropis spilopterus	Spotfin shiner	0	-	0	-	0	-	0	-	1	5.9	1	7.7	1	6.3	3	30.0			6	1.8	76.5	65 - 95
Notropis umbratilis	Redfin shiner	0	-	0	-	3	2.7	1	5.0	0	-	0	-	0	-	0	-			4	1.2	55.5	48 - 63
Pimephales notatus	*Bluntnose minnow*	0	-	37	25.3	62	55.4	5	25.0	3	17.6	0	-	0	-	0	-			107	31.9	51.6	23 - 75
Semotilus atromaculatus	Creek chub	1	100	16	11.0	16	14.3	8	40.0	0	-	0	-	0	-	0	-			41	12.2	56.7	29 - 162
Catostomus commersoni	White sucker	0	-	1	0.7	1	0.9	1	5.0	0	-	0	-	0	-	0	-			3	0.9	164.0	48 - 241
Moxostoma erythrurum	Golden redhorse	0	-	0	-	0	-	0	-	1	5.9	0	-	1	6.3	0	-			2	0.6	215.5	194 - 237
Labidesthes sicculus	Brook silverside	0	-	0	-	0	-	0	-	6	35.3	1	7.7	6	37.5	2	20.0			15	4.5	52.6	43 - 59
Morone mississippiensis	Yellow bass	0	-	0	-	0	-	0	-	0	-	0	-	1	6.3	0	-			1	0.3	175.0	-
Lepomis sp.	Sunfish (Unidentified)	0	-	0	-	3	2.7	0	-	0	-	0	-	0	-	0	-			3	0.9	24.3	24 - 25
Lepomis cyanellus	Green sunfish	0	-	11	7.5	0	-	0	-	0	-	0	-	0	-	0	-			11	3.3	94.3	61 - 168
Lepomis megalotis	Longear sunfish	0	-	13	8.9	0	-	1	5.0	4	23.5	7	53.8	7	43.8	4	40.0			36	10.7	93.9	28 - 155
Micropterus salmoides	Largemouth bass	0	-	0	-	0	-	0	-	1	5.7	2	15.4	0	-	0	-			3	0.9	135.0	65 - 186
Pomoxis annularis	White crappie	0	-	0	-	0	-	0	-	0	-	1	7.7	0	-	0	-			1	0.3	192.0	-
Etheostoma flabellare	Fantail darter	0	-	1	0.7	0	-	0	-	0	-	0	-	0	-	0	-			1	0.3	54.0	-
Etheostoma nigrum	Johnny darter	0	-	0	-	10	8.9	0	-	0	-	0	-	0	-	0	-			10	3.0	40.6	31 - 58
Etheostoma spectabile	Orangethroat darter	0	-	4	2.7	3	2.7	0	-	0	-	0	-	0	-	0	-			7	2.1	44.4	28 - 63
Perca flavescens	Yellow perch	0	-	0	-	0	-	0	-	0	-	0	-	0	-	1	10.0			1	0.3	117.0	-
	Total	1		146		112		20		17		13		16		10				335			

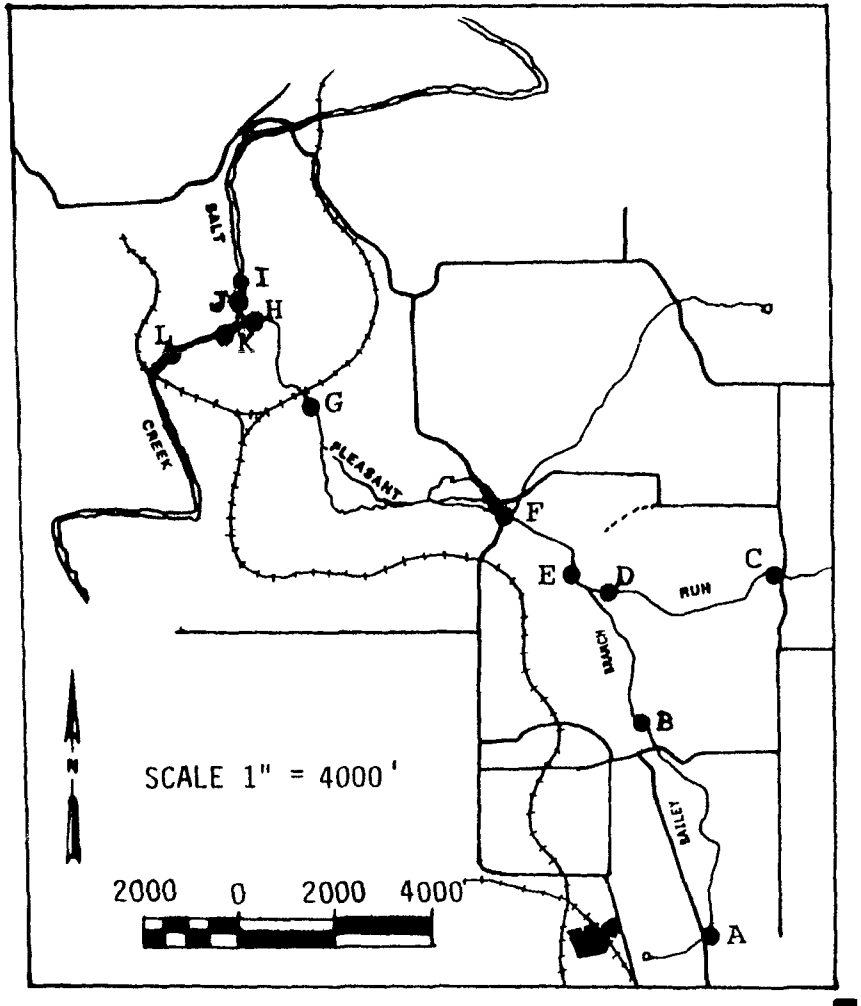
[a]No sample from Location G - access blocked.

Table 15. Age determination of selected fish species from Pleasant Run and Salt Creek, Lawrence County, Indiana, 1981.

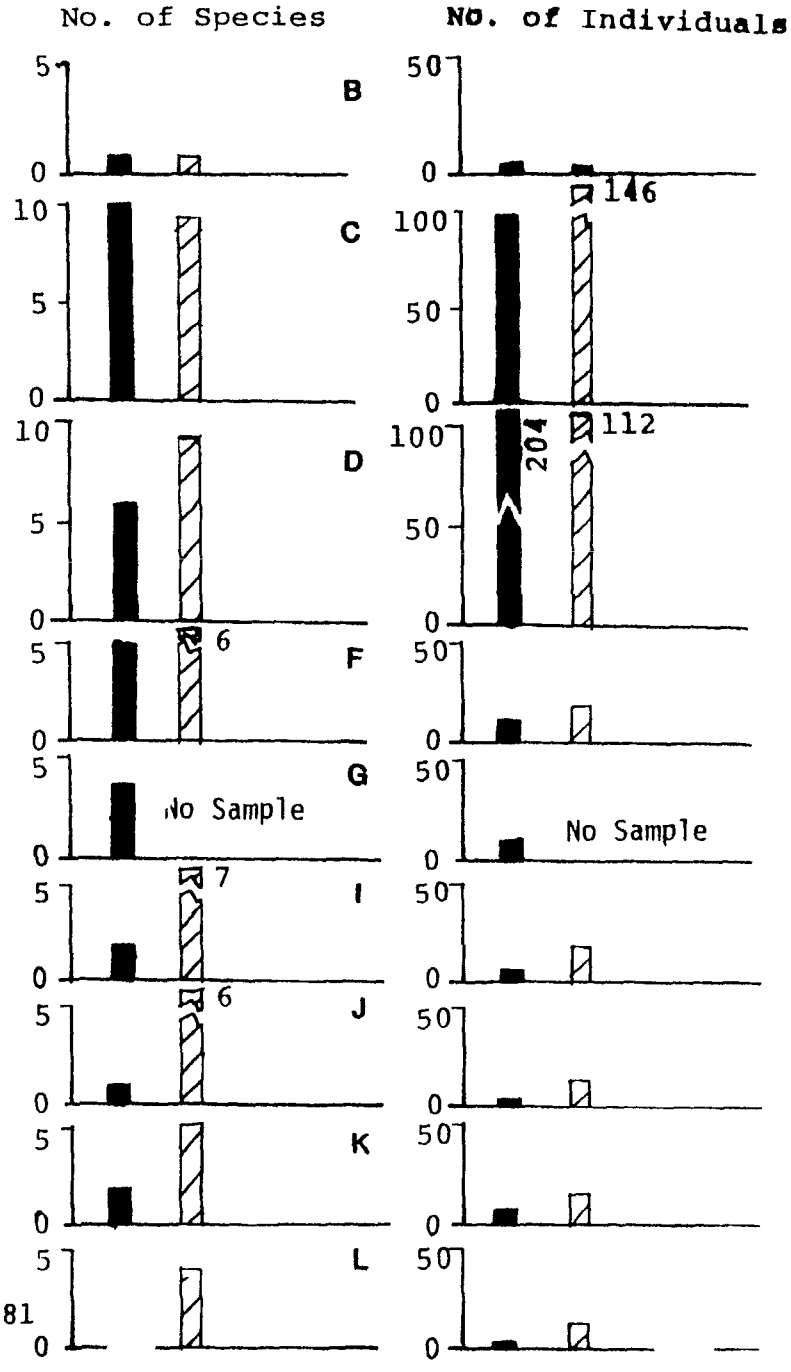
Species	No.	Mean Total Length[a]/Age Group			
		Age Group			
		I	II	III	IV
Longear sunfish	12	-	93	117	143
Green sunfish	7	-	96	115	168
Largemouth bass	2	170	-	-	-
White crappie	1	-	-	192	-
Yellow bass	1	-	175	-	-

[a]Total length (mm) at time of capture.

Figure 7. Numbers of species and numbers of individual fish collected at stations on Pleasant Run and Salt Creeks.



STUDY AREAS ON PLEASENT RUN AND SALT CREEKS LAWRENCE COUNTY, INDIANA



X. SUMMARY

Camp Dresser & McKee Inc. (CDM) was contracted by General Motors Corporation to design and conduct a study on Salt Creek, Pleasant Run and its tributary, Bailey Branch to ascertain:

- Whether or not a balanced, indigenous aquatic community exists in selected stream reaches;
- The concentration of PCBs in the flesh of fish;
- PCB content of mobile sediment;
- Concentrations of PCBs associated with bottom sediments;
- Concentrations of PCBs in areas subject to flooding.

This study was conducted during May and September 1981. The May sampling was conducted during high stream stage following heavy rains while the September sampling period was conducted during low stream conditions although limited heavy rains also accompanied this sampling period.

PCBs were not evenly distributed (patchy) throughout the bottom sediments of Salt Creek, Pleasant Run and its tributary, Bailey Branch (GM) discharge stream. The results of all samples were calculated as Aroclor^{R} 1242 since the PCB chromatographic pattern for most of the samples resembled Aroclor^{R} 1242. Because of the variable (patchy) nature of the PCB content of the sediments found in Bailey's Branch of Pleasant Run Creek and Pleasant Run Creek itself, no one number can be used to portray the overall data. In view of this it is necessary to refer to the PCB data on stream sediments to gain an appreciation of the situation.

Salt Creek PCB concentrations in sediments were generally less than 10 mg/kg with the exceptions being found in isolated pockets of sediment at Station K which is located immediately downstream from the confluence of Pleasant Run and in a pocket at Station L (located downstream from Station K).

During the spring high flow and fall low flow studies, PCB concentrations in the water ranged from less than detectable (quantifiable) at Station C to about 11 ppb at Station B on Bailey Branch of Pleasant Run. The average combined high and low flow PCB concentration in water samples

(excluding the Station C and D control stations) collected on Pleasant Run Creek was 5.5 ppb, which is below the solubility for Aroclor^{R} 1242. PCB concentrations associated with suspended sediment during the spring and fall surveys ranged from less than detectable at Station C to 7 ug/kg (ppb) at Station B in the fall. The average PCB concentration associated with suspended sediments for Pleasant Run Creek was 2.5 ug/kg (ppb). Based upon these relatively low concentrations of PCBs in the stream and those concentrations associated with the suspended sediment in comparison to the greater concentrations associated with the patch locations of bottom sediment below the coarser material layer, it appears that PCB mobilization from the previously deposited sediment areas in the stream has a small effect on water quality.

Soils containing PCB were found at various locations throughout the flood plain as delineated by high water marks. PCB concentrations greater than 50 mg/kg were found in composite samples taken at Locations B, D, E, and F. Concentrations of PCBs greater than 10 mg/kg and less than 50 mg/kg were measured at Locations A, H, and K. Locations I, J and L on Salt Creek had PCB concentrations in composite samples below 5 mg/kg.

The stream system supported a biotic community representative of small warm water midwestern streams with the exception of Bailey Branch and the segment of Pleasant Run from its confluence with Bailey Branch (Station E) to Station F. The benthic macroinvertebrate population consisted primarily of oligochaetes and chironomids on Pleasant Run Creek with the exception of Station C. The bottom substrate at Station C consisted primarily of gravel, and cobble with mayflies, beetle, fly and midge larvae being the most abundant benthic organisms. These organisms are commonly found associated with this type of substrate. Crustacea were relatively abundant at Salt Creek stations and are typically associated with rock and hard clay bottom materials characteristic to the bed of Salt Creek.

Periphyton were primarily collected from rock substrates in riffle areas. The number of different taxa and their relative abundance were greater in the rocky, shallower, higher velocity stream locations at Stations B, C, and D. Periphyton abundance and differences in species

composition were generally lowest at Salt Creek locations. Diatoms were the major periphyton group in Pleasant Run creek while blue-green algae were the dominant group in Salt Creek. Therefore, the spring and fall studies have shown that the assemblage and abundance of benthic macro-invertebrates and periphyton appear to be primarily influenced by the type of substrate at the particular stream location. All benthos and periphyton species appeared indigenous to their particular location in the stream system.

Fish were collected by minnow seine and electroshocking techniques. A concerted effort was made to obtain a representative sample of fish inhabiting all reaches of the stream system. A total of 664 fish representing 23 species were collected in the Pleasant Run and Salt Creek stream system during May and September. All fish captured were small ranging in length from 21 to 241 mm. Most fish captured in Pleasant Run and Salt Creek were forage species, primarily minnows and darters. Fish species composition and abundance in Pleasant Run and Salt Creeks were as expected in a lotic ecosystem of this type and size and were typical of small warm water midwestern streams having similar habitat and flow characteristics. None of the species collected during the spring and fall surveys were considered unique with the exception of one yellow perch, probably introduced from upstream Lake Monroe. No threatened or endangered species were collected.

Fish captured on Salt Creek, Bailey Branch and the main branch of Pleasant Run Creek had PCBs incorporated in their body tissue. Fish analyzed for PCBs that were captured at Station C (control station) had trace amounts of PCBs. These trace amounts of PCBs were probably incorporated into the fish when the fish migrated from contaminated segments of the stream system and while in this area fed on benthos and detritus associated with bottom sediment. Although fish were found to contain PCBs, essentially all fish captured were forage fish such as minnows, darters, suckers and very small sunfish and thus would not be considered a likely source of food.

Potential Remedial Actions

There are numerous alternatives that can be considered for a remedial action program involving PCB contamination problems in streams and their associated watersheds. The goal of the remedial action program should be minimize exposure of PCBs to humans, domestic animals and wildlife.

The major alternatives, some of which can be divided into subalternatives include:

- No action
- Complete PCB removal
- Selective PCB removal
- Restricting accesss to contaminated areas
- Rechannelization around pockets of contamination
- Sediment substrate stabilization and/or chemical fixation
- Combinations of the above.

APPENDIX A

Quality Assurance Procedural Documents

OPEN CHANNEL DISCHARGE CALCULATIONS

Current cross section measurements comprise the first phase in developing a discharge rating for a particular gaging station. When one or several rating curves have been developed for a site, the stage records from the stilling-well recorder may be converted to discharge.

CDM usually employs the "partial section" method of flow measurement in streams. With this method, a stream is divided up into sections small enough to assure that less than 10% of the total stream flow passes through each of these sections. This can only be estimated, since the flow obviously hasn't been measured yet. To assure that this criterion is met, a stream should be divided up into 15-25 sections. The 10 percent criterion is used only to reduce the error magnitude, since if an error occurs in one or two of the partial sections, its effect on total accuracy will be less if a large number of partial sections are used. Practical considerations, such as when stage is changing rapidly or the stream is very narrow as in the case of Pleasant Run Creek, may preclude the use of the ideal number of partial sections. The mean velocity of each partial section is then determined, and the flow through each partial section is calculated with the following formula (USGS 1969):

$$q_x = v_x \frac{b_{(x+1)} - b_{(x-1)}}{2} d_x$$

where: q_x = discharge through partial section x,
v_x = mean velocity at location x,
$b_{(x-1)}$ = distance from initial point to preceding location,
$b_{(x+1)}$ = distance from initial point to next location, and
d = depth of water at location x.

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APPROVED DWB DATE 3/24/82

This method is illustrated in Figure 1. For example, the discharge through partial section 4 would be calculated with the following formula:

$$q_4 = v_4 \frac{b_5 - b_3}{2} d_4$$

The endpoints, or whenever there is water on one side of an observation point, are treated somewhat differently. Here the depth and velocity may or may not be zero. The mean velocity at these points should be estimated when it is not possible to measure it with a current meter. For an endpoint near or coincident with the initial point, the calculation is as follows:

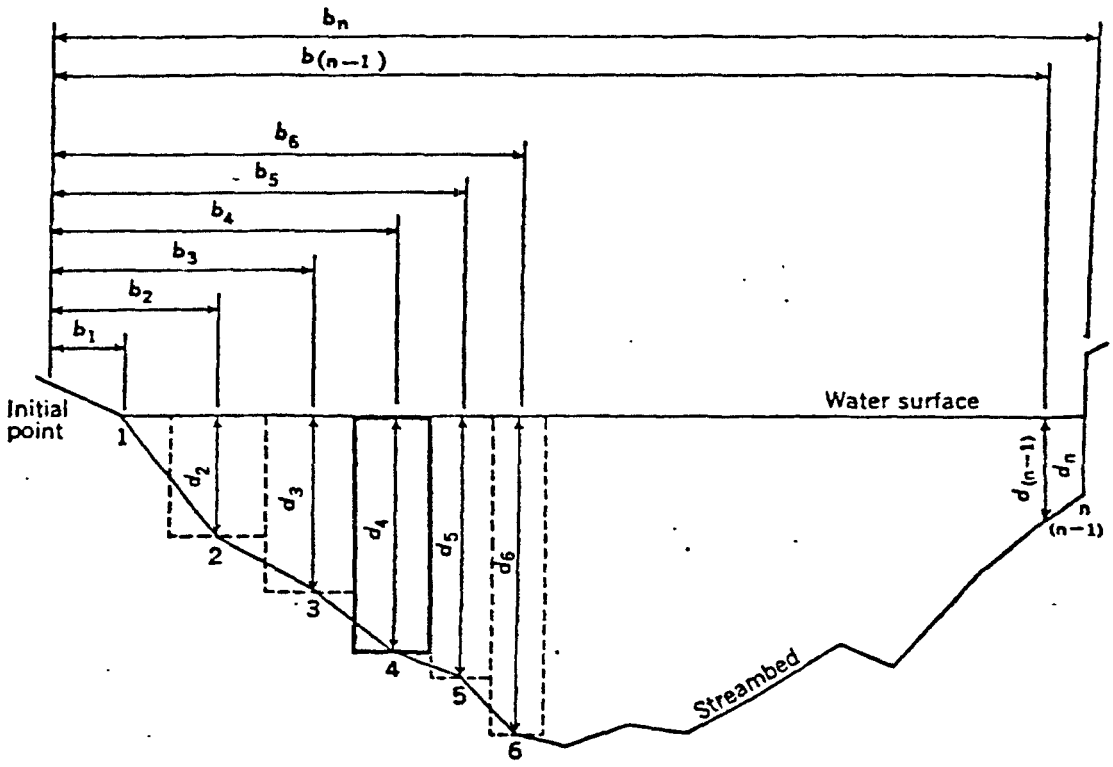
$$q_1 = v_1 \frac{b_2 - b_1}{2} d_1$$

For an endpoint nearest or coincident with the stream side opposite the initial point (the last station), it is:

$$q_n = v_n \frac{b_n - b_{(n-1)}}{2} d_n$$

The total discharge of the stream is calculated by summing the flows from all of the partial sections.

At least twenty of these cross section measurements are needed to construct an adequate relationship between stage and discharge. "The more the better" philosophy is applicable in this situation. Cross section measurements should be made at all different stream elevations or stages, and particular attention should be given to define the stage-discharge relationship at the higher stages, since this is the region where flooding may occur at various upstream areas, thereby altering an expected or estimated curve appearance. The flood stages are often the stages of most importance to engineers, planners, economists, and property owners, since property damage, structural damage, erosion, and water quality are more greatly affected at these flows. Discharge measurements are more difficult



EXPLANATION

1, 2, 3, ... n	Observation points
$b_1, b_2, b_3, \ldots\ldots b_n$	Distance, in feet, from the initial point to the observation point
$d_1, d_2, d_3, \ldots\ldots d_n$	Depth of water, in feet, at the observation point
Dashed lines	Boundary of partial sections; one heavily outlined discussed in text

Figure 1. Illustration of the partial-section method of measuring stream flows (USGS 1969).

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to make at the higher stages, since the stage may be changing rapidly. In such cases, it is important to make quick measurements, and to record the stage elevation at the beginning and end of the discharge measurements.

The location point of the cross section measuring point should be a permanent location, if possible, and should be located where the following criteria are met if possible:

1) Sediment scouring or sediment deposition are minimal over the length of the study period.
2) Sediment is fairly consolidated and easy to walk on if wading is required, or will allow solid detection of the streambed if measurements are from a bridge.
3) Channel dimensions will remain permanent over the study period. Avoid areas where bank erosion may occur at high stages.
4) Avoid areas where undercut banks are present, or where abrupt changes in stream bank geometry occur at high stages.
5) Choose a location where measurements can be made with relative ease during high stages, areas that will not present a hazard to personnel during measurements.
6) Avoid areas of turbulence. Attempt to find areas approaching uniform flow. Straight lengths of stream sections are desirable.
7) Avoid areas of heavy macrophyte growth.

In practice, cross section measurements are made with the aid of a "tag line" for measurements made by wading or by boat. The tag line should be strong enough for the particular application; a steel cable or large diameter rope if a boat is to be anchored to it, or a string if the stream is small and a boat is not needed. Known distances or intervals, that need not be equal, are marked off on the tag line denoting stations. If measurements are made from a bridge, the bridge railing can be conveniently marked off to denote the stations. Note from Figure 1 that with the exception of each endpoint, each station may be considered as the center point of each patial section when the partial section method is used.

Depth and velocity measurements are made at each station including both endpoints if possible. If the cross section is bounded by bridge abutments the velocity and depth must be measured or estimated at each endpoint since each will more than likely not be zero. If the cross section is bounded by streambanks, both depth and velocity may be zero. An endpoint may also be established at the edge of "dead water" if such a situation exists, since the dead water portion does not contribute to the stream flow and will only lead to error if an attempt is made to include it. If another type of situation exists where the velocity is below the "tolerance" level of the meter (to be discussed later) but the investigator feels it is necessary to include this volume of water, an estimate of the water velocity may be made. In this situation, the error caused by this estimation will probably be less than the error resulting from exclusion of this discharge.

The mean velocity at each station is what is desired. The velocity is usually measured at the 0.6 depth from the surface if the total depth is less than approximately 2.5 feet. If the total stream station depth is greater than 2.5 feet, the velocity is measured at the 0.2 and 0.8 depth from the surface, and then averaged (USGS 1969). Other variations of these methods are described in the literature (CHOW 1964, USGS 1969).

A Marsh McBirney Model 201 Current Meter was used for measuring velocity on this project because of anticipated low velocities. This is an electromagnetic type current meter where passage of fluid past two electrodes in the bulb-shaped probe causes a disturbance of the electromagnetic field around the electrodes. This disturbance generates a small voltage which is made proportional to actual fluid velocity by internal electronic circuitry. A direct velocity meter readout in feet per second is provided nearly instantaneously. Velocity range scales of 2.5, 5.0, and 10.0 fps are externally selectable, indicating that this meter cannot measure current velocities greater than 10 fps.

This type of meter also differs from the Price meters in that it is unidirectional in its measurement ability. It will measure only one velocity vector, the vector parallel to the probe longitidinal axis. This

is important to know, since the probe will not sense the velocity vector normal to the cross section, V_{NORM}, unless the probe longitudinal axis is also normal to the cross section. Since probe orientation cannot usually be seen beyond a particular depth, the staff to which it is attached must be capable of accurately determining this information.

This meter is an instantaneous readout meter, as mentioned earlier, and will not provide an average velocity reading. The meter reading will no doubt be varying to some degree and occasionally it will be quite erratic. It is the responsibility of the investigator to observe the meter fluctuation and to estimate an average velocity when the fluctuations are present. When meter readings are fluctuating, it could be an indication of eddying or turbulence, a condition that should have been avoided initially, if possible, when choosing the location for the cross section measurements.

This type of meter can be used where the Price meters cannot be used, such as in weedy streams or under any conditions that would affect the rotating mechanism of the Price type meters. Measurements can be made much quicker with the Marsh McBirney meter compared to the Price meters because of its nearly instantaneous readout capability.

All current meters discussed above require care and maintenance, since meter condition or deterioration will be reflected in the final results. Each of these meters have a periodic calibration schedule. The meters are periodically calibrated by the United States Geological Survey, and although they are fairly durable instruments, they should be treated as delicate instruments to avoid altering the calibration of each. A correction factor must be applied to each Marsh McBirney meter, where the correction is in the form of a linear regression equation attached to each meter. The observed meter reading is simply plugged into the equation to obtain the corrected value.

A step by step summary of a discharge or cross section measurement is as follows:

1. Assemble current meter and test for proper operation. Collect data form or notebook, pencil, stop watch, 50 ft tape, etc.

2. Partition stream into sections (with tag-line or bridge railing), visually observing the velocity and general flow of the stream. Remember, the partial section in question is not the same as the interval between two successive stations. Mark stations appropriately.
3. Record stream stage as indicated by one of the staff gages and record this value on the water level recorder chart at the point of pen contact.
4. Record on the data form or in the notebook the following items at a minimum:
   a.) Project
   b.) Site
   c.) Date
   d.) Time at start of measurements
   e.) Stage at start of measurements
   f.) Approximate wind direction and speed (if applicable)
   g.) General stream condition (e.g. turbid, clear, low level, floating debris, water temperature, type of streambed material, etc.)
   h.) Other factors having a bearing on discharge measurements
   i.) Location of initial point
   j.) Total width of stream to be measured
   k.) Type of current meter and conversion factor, if applicable

5. Determine the depth and mean velocity at the first station or "initial point" if the situation allows, and record.
6. Measure depth at the second station from initial point and record. Determine whether the velocity should be measured at the 0.6 depth from the surface (six-tenths depth method) or at the 0.2 and 0.8 depths (two-point method). Calculate respective depths from the surface, measure the velocity at each point, and record these values.
7. Continue on to each successive station as rapidly as possible, following the same procedure.

8. Determine the depth and mean velocity at the last station, or endpoint, and record.
9. Record on the data form the ending time of this series of measurements and the stage, since the stage may have been changing during the measurements.
10. Also enter the ending stage value on the recorder chart at the point of pen contact. This will illustrate the interval of time and stage variations during the cross section measurements. Also enter the date and indicate that a calibration has taken place over this interval.
11. Remove the tag line (if used), allow the current meter to dry, then pack it away in its respective carrying case.

There are a few other comments regarding stream calibrations that should be mentioned:

1) Measurements should be made with the investigator standing behind and well to the side of the meter.
2) Avoid disturbing or standing along the streambed beneath the cross section measuring points. This is part of the control area and should remain constant, if possible, from calibration to calibration of the stream. This is especially important if soft, mucky sediment is encountered somewhere along the cross section.
3) Try to use the same cross section throughout the study period and during all of the stream calibrations. However, the number and position of stations within the cross-section may be changed if necessary.
4) Always hold the wading rod nearly vertical, and be aware of how V_{NORM} is determined with each of the various types of meters, should it become necessary to switch meters during a calibration.

5) Try to make some of the stream calibrations throughout the study period to account for seasonal changes in streambank vegetation and streambed alterations. The variations in these and other factors may or may not have a significant impact on the rating curve, but if some of these factors do have an effect, it can be reflected in the rating curve.

FIELD OPERATING PROCEDURE

Equipment Identification: Marsh-McBirney, Model 201, water current meter.

1. Pre-survey
   a. Set selector switch to the "Cal" position. The meter should indicate in the "Cal" sector of the scale. If it does not, replace batteries with fresh ones. If it still does not indicate correctly, contact the manufacturer.
   b. Place the probe in a non-metalic bucket filled with water, and rotate the selector switch to the 2.5 ft/sec setting, moving the probe gently in the bucket, the meter should respond to the relative motion of the water and the probe. If it does not, then there is a malfunction and repairs are indicated. See: Instruction manual, model 201, Portable, water current meter, Marsh-McBirney, Inc. Rockville, MD.
2. Survey

   Depending on the type of study being conducted, attach the probe securely on either a wading rod, suspension cable with weight, or a fixed orientation mounting. Lower the sensor and mounting into the water and turn the instrument selector switch to the full scale range appropriate. The meter should be indicating water velocity past the sensor.

   If current direction is required then the instrument's current sensor must be attached to a rod that is marked in such a manner that the orientation of the sensor in the water is evident to the operator. To obtain current

magnitude and direction:

1. lower the sensor to the required depth,
2. rotate the rod until the current indicated is a maximum,
3. record this current speed,
4. using a hand held compass measure the bearing (azimuth) of the sensor,
5. record this bearing.

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APPROVED [signature] 23-I-76

EQUIPMENT SPECIFICATIONS

Equipment Identification: Marsh-McBirney, model 210, portable, water current meter.

Control Number: 1410036-1, 1410036-2

Calibration/Maintenance Schedule: Maintain before each use

Specifications:

1.0 General Description

General purpose, portable, single axis, electro-magnetic water current meter. It has two parts; the instrument case which contains circuits and batteries, and the sensor. They are connected by an electrical cable.

2.0 Physical Description

Instrument case - 7" by 4" by 10".

Sensor probe - 1" diameter.

The sensor probe is designed to fit Price type current meter hardware and is made of epoxy, stainless steel and PVC.

3.0 Electrical Description

Full scale ranges - 0-2.5, 0-5, and 0-10 ft/sec, switch selectable

Accuracy - ± 2.7% of reading, or ± 0.05 ft/sec. whichever is greater.

Reading time - 6 seconds standard

Power - 9 volts D.C.

Battery life - 100 hours minimum

A certificate of compliance stating that the equipment met the purchase specifications is on file in the Physical Department.

WRITTEN F.B. DATE 9-25-75 QA [illegible] DATE 11/5/75

APPROVED R.L.S. 6 Oct. 75

PROCEDURE FOR SAMPLING SUSPENDED SEDIMENT IN SMALL STREAMS AND DETERMINATION OF MASS TRANSPORT

I Equipment Needed

1. DH-48 Suspended Sediment Sampler with wading rod.
2. Glass sample jars for DH-48 Sampler
3. Graduated Tag-line.
4. Current meter and accessories - for measuring stream discharge.

II Objectives

1. Measure and calculate stream discharge at an optimum cross-section location with a current meter[1] if sediment transport calculations are required for the project.
2. Collect a sufficient number of water samples in a discharge-weighted manner to represent total suspended sediment load of the stream, compos ?, and analyze for total suspended sediment.
3. Correlate mean concentration of suspended sediment with stream discharge at the time of sampling.

III Methods

1. Set up tag-line across the stream at a site most suitable for measuring stream discharge[1]. This site will also be satisfactory for suspended sediment sampling (i.e. little turbulence, uniform flow, etc.)
2. Measure velocities congruent with methods described in the current measurement procedure[1].
3. With tag still in place, collect a water sample with the DH-48 sampler throughout the water column at equally spaced intervals across the stream, where the number of intervals should be between 10 and 20 (reference EWI method in National Handbook of Recommended Methods for Water-Data Acquisition[2]). This number of intervals should be adhered to only if sediment transport information is desired. Fewer intervals are require if only suspended sediment information is desired. Sampling action throughout each vertical column should follow the procedure for "depth-integrating suspended sediment samplers" described in the handbook[2]. Specifically:
   a. A uniform speed must be used throughout each vertical water column and this speed must be consistent from station to station. Upon reaching the bottom, the sampling action must immediately reverse and resume the constant speed. The traversing speed of the water column will depend upon the amount of sample required but should always assure isokinetic conditions[2].

   b. The sampler nozzle should be orientated perpendicular to the X-sectional area being sampled. Ideally the flow lines will also be perpendicular to the X-sectional area.

WRITTEN KB DATE 3/6/81 QA RT DATE 3-9-81

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c. Record the number of stations, interval between each station (a constant), and the approximate speed of the sampler movement within the water column.

4. Composite the discrete samples and analyze for total suspended solids by acceptable laboratory methods, yielding a concentration in milligrams per liter.

The following steps should also be followed if sediment transport calculations are required:

5. Calculate stream discharge in cubic feet per second[1].
6. Calculate total sediment discharge at this stream discharge:

$$S_C \frac{mg}{\ell} \times Q \frac{ft^3}{s} \times \frac{28.32\ell}{1\ ft^3} \times \frac{1\ kg}{1x10^6 mg} = S_T \frac{kg}{s}$$

where S_C = mean conc. of total suspended solids.
Q = stream discharge
S_T = total sediment transport at the measured flow rate.

7. A sediment discharge curve may be constructed with a sufficient number of these measurements carried out over a range of stream discharge.

IV Conclusions

1. This procedure does not account for bed-load material.
2. With reference to step 1, part III, turbulence may be a desirable characteristic in a stream, since it would tend to distribute the coarser particles (>63 u) throughout the water column and allow collection of this size fraction that would ordinarily be transported primarily by bedload transport mechanisms. It may be better under certain situations to separate the sediment sampling X-section location from the flow measurement location to facilitate both types of measurements.
3. Even though "width between stations" has been emphasized in this procedure, it should be realized that each station represents the mid-point of effective width (and the X-sectional area), not an endpoint.
4. The DH-48 sampler cannot sample within 9 cm(3.54 inches) of the stream bottom nor can it be used at depths >4.9 m (16.0 ft) with a 4.8 mm nozzle size nor 2.7m (8.8 ft) with a 6.4 mm nozzle size.

References:

[1]Procedure for determing the discharge of small streams, Procedure No. 3410046 (CDM Quality Assurance Program)

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[2]U.S Geological Survey, 1978. Sediment. Chapter 3 of the National Handbook of Recommended Methods for Water-Data Acquisition, an interagency government publication. 17-31

Additional Reference:

U.S. Geological Survey, 1970. Field Methods for Measurement of Fluvial Sediment. TWRI Book 3, Chap. C2, 60 pp.

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PROCEDURE FOR OPERATING THE US DH-48 SUSPENDED SEDIMENT SAMPLER

1. General

The US DH-48 sampler was designed for collecting a depth-integrated suspended-sediment sample in shallow streams. The sampler is usually operated while wading.

2. Accessories for Sampler

2.1. Pint glass bottles w/caps
2.2. 1/2 in. O.D. wading rod
2.3. 3/16 and 1/4 in. PVC nozzles

3. Procedure

3.1. Fit a clean glass bottle into the sampler and fasten the spring-loaded clamp over the base of the glass bottle.
3.2. Choose the sampling location in the stream and lower the sampler at a uniform rate with nozzle pointing directly upstream. Upon reaching the bottom, instantly reverse the direction and maintain a uniform speed while raising the sampler.
3.3. Carefully remove the sample bottle from the sampler, if full, and cap. Repeat Step 2 if desired, without risking complete filling of the bottle.
3.4. Mark the bottle with any of the following applicable information:
   a. Name of stream
   b. Location of cross-section
   c. Location of vertical
   d. Stream depth covered by the sample
   e. Stage of stream
   f. Date
   g. Time of day
   h. Initials of investigator
   i. Sampling time
   j. Water temperature
   k. Sample number
3.5. Repeat Step 1, using a clean bottle if required.

4. Comments

4.1. Although a uniform speed must be maintained while raising or lowering the sampler, the "lowering speed" need not be the same as the "raising speed" for general sampling.
4.2. The sampler must not be allowed to fill completely because the "free-flowing" sampling process will cease after this point.
4.3. The sample volume is regulated by the lowering and raising speeds. Slower speeds will increase the amount of sample collected in one vertical. Different nozzle sizes will also effect the sample volume (See attachment).

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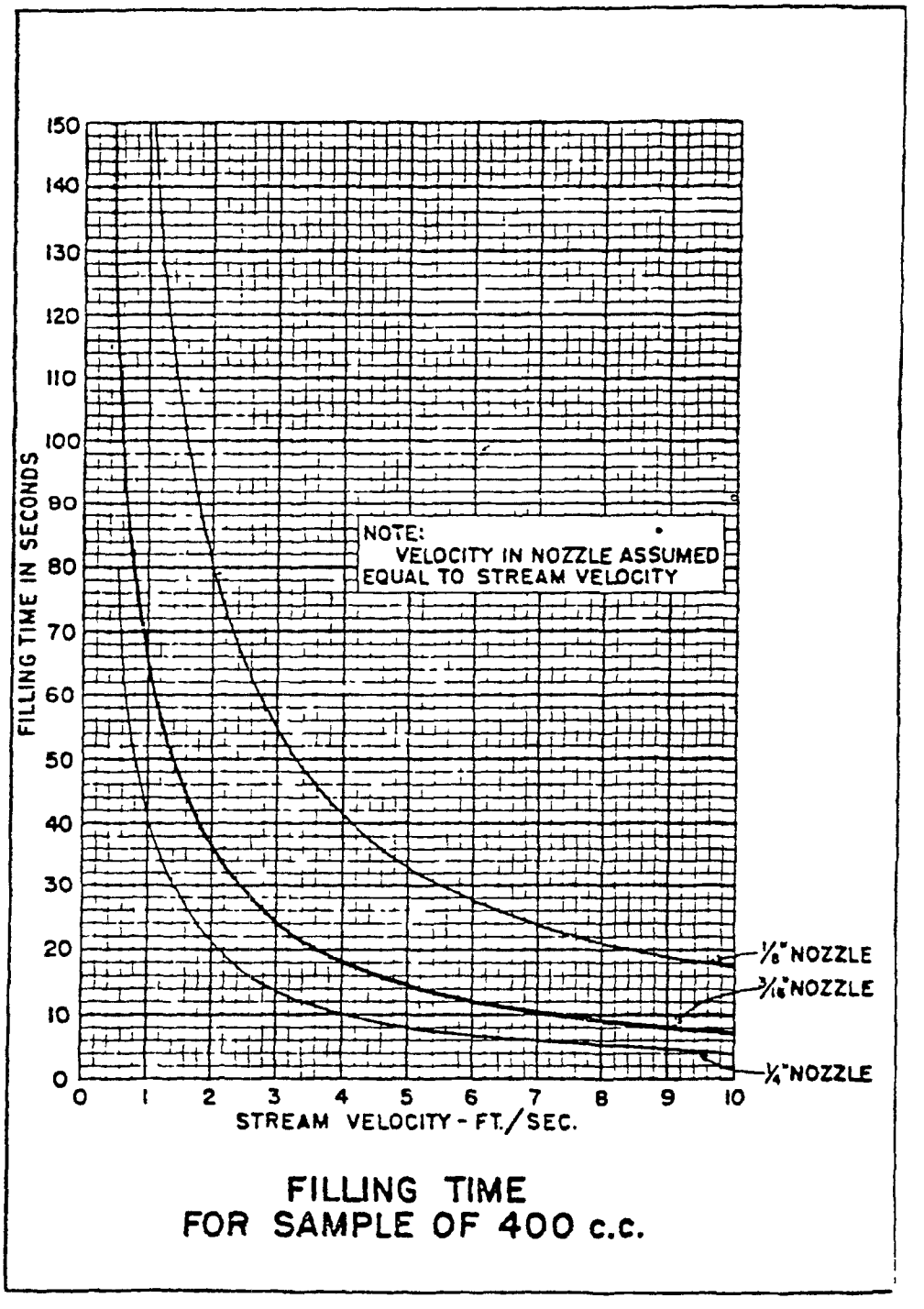

FILLING TIME
FOR SAMPLE OF 400 c.c.

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EQUIPMENT SPECIFICATIONS

Equipment Identification: US DH-48 Suspended Sediment Sampler; manufactured by Product Manufacturing Company.[1]

Control Number: No. 1900025

Calibration Schedule: Not Applicable

Maintenance Schedule: Daily, upon use.

Equipment Specifications:

General description - The sampler consists of a streamlined aluminum casting which partially encloses a round pint bottle sample container. A pvc intake nozzle extends horizontally from the nose of the sampler body. A streamlined projection, pointing toward the rear on the side of the sampler head, accommodates the air exhaust port from which air may escape from the bottle as the sample is being collected. The sample container is held in place and sealed against a rubber gasket in the sampler head by a hand-operated spring-tensioned clamp at the rear of the sampler.

Weight - 4 1/2 lbs. with sample bottle
Length - 13 inches long
Sampler nozzles - PVC, 3/16"I.D. and 1/4"I.D.

[1] Product Manufacturing Co., Maplewood Industrial Park, 2515 Highway 61 North, St. Paul, MN 55109.

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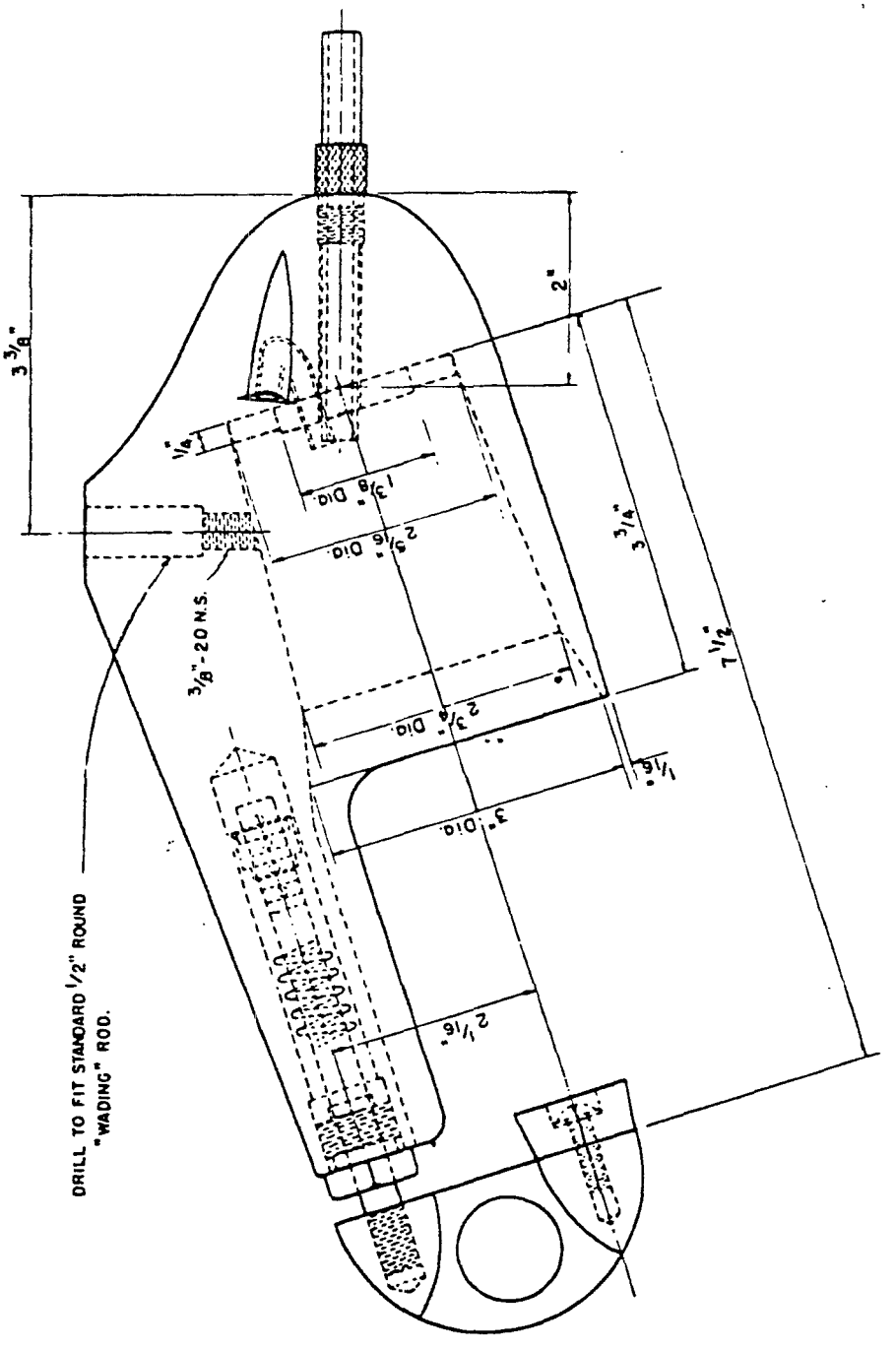

DEPTH-INTEGRATING SUSPENDED-SEDIMENT WADING-TYPE HAND SAMPLER, USDH-48

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PROCEDURE FOR DETERMINING PERCENT SAND, SILT, AND CLAY IN SUSPENDED SEDIMENT SAMPLES

1. General Principle

Each sample is filtered through a series of filters, and the non-filterable solids remaining on each filter are determined directly by the increase in weight over the tared weight of each crucible and filter. The three filter pore sizes chosen to represent the amount of sand, silt, and clay are 63 u, 4.0 u, amd 0.24 u respectively. Since this procedure is designed to represent insteam conditions, no correction for organic matter is made (except for large particles which are removed by hand) and no attempt is made to disaggregate the silt-clay particles if floculation exists.

2. Apparatus

a. Gooch crucibles, 30 ml capacity
b. Filtering apparatus
c. Drying oven
d. Dessicator with indicating dessicant
e. Analytical balance
f. Brass-cloth sieve material (63 u), 4.0 and 0.24 glass fiber filter disks.

3. Procedure

a. Cut concentric circles of filter material from a source of 63 u brass-cloth material, to fit the 30 ml Gooch Crucibles.

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b. Use distilled water with suction to fix filter material (63 u, 4 u, and 0.24 u) into Gooch crucibles.

c. Dry each crucible with filter at 105° C for one hour. Also dry dessicant for the dessicator.

d. Place dried dessicant (still warm) in dessicator, place crucibles in dessicator, seal with silicone grease, and let set for approximately one hour. Do not place more than 13 crucibles into each dessicator.

e. Weigh each crucible in an environmental chamber to the nearest 0.001 mg and record this weight. Note the order in which each crucible is weighed, since this order must be maintained when re-weighted with the filtered solids.

f. Using a graduated cylinder, measure out a well-mixed 250 ml subsample (or more if low suspended solids concentration is suspected) from the original suspended sediment water sample.

g. Under suction, filter the sample through each size filter in turn, beginning with the coarsest (63 u) filter and concluding with the finest (0.24 u) filter. Rinse the graduated cylinder and the sides of each crucible during the filtering process to assure that all particles have been filtered.

h. Transfer all crucibles to a drying oven at 105° C for at least one hour. Also re-dry the dessicant.

i. Place dessicant and crucibles in dessicator for one hour.

j. Weigh all crucibles again, for the final weight, in an environmental chamber and record. These weighings should be performed in the same

order as when initially weighed.

k. Two blank crucibles should be carried through the process to allow correction for slight variations in humidity.

4. Calculations

a. Calculate non-filterable residue as follows for each particle size range (each filtered amount):

$$\text{Total Suspended Solids, mg/l} = \frac{(A-B) \times 1000}{C}$$

where A = weight of filter and residue, mg.

B = weight of filter, mg.

C = ml of initial sample filtered

b. Express each sediment fraction as a percentage of the total suspended sediment in the sample.

Adapted in part from: Manual of Methods for Chemical Analysis of Water and Wastes. 1974. pp 268-269

WRITTEN KB DATE 3/6/81 QA KT DATE 3-9-81

APPROVED DB DATE 3/9/81

Procedure for Collecting Sediment Cores

1. Two cores must be collected at each location using a non-metallic gravity-type or manual coring device. Both core samples will undergo chemical analyses while only one will be subjected to particle sizing.

2. The corer is prepared for use following the manufacturer's instructions. If a gravity-type corer is used, the unit is lowered to a point above the river bottom and is allowed to free-fall for penetration into the sediment. If a manual coring device is used, the device is inserted into the sediment a distance sufficient to assure an adequate sample collection.

3. The coring device is retrieved, and if the device contains a plastic core liner, this liner is removed with the sample. The corer and sample should be kept in as near vertical orientation as possible during this operation to avoid disturbing the cored sediments.

4. Extrude the top several inches (project specific) of the core and place into a sample container labeled with the project number, site number, station number, collection data, and investigator's initials. If both chemical analyses and particle sizing must be performed on the cored sample, this sample must be thoroughly mixed and then subsampled. That portion of the sample for chemical analyses must be placed into a glass container if certain chemical parameters require this container material (review EPA methods for sample container material and holding times).

5. Ship all samples to the laboratory for analysis according to acceptable laboratory procedures.

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FIELD PROCEDURE FOR OBTAINING BOTTOM SAMPLES USING THE WILDCO-BALLCHEK CORE SAMPLER

a. Equipment:

1 Wildco-Ballchek core sampler
1 plastic liner, 2 in O.D. x 30 in long
1 eggshell core catcher
2 end caps for plastic liner
1 boat, motor, etc.
1 core sample removal tool

b. Procedure:

1. Locate sampling station and position survey boat over it.
2. Remove plastic nosepiece and insert plastic liner. Insert an eggshell core catcher and replace nosepiece.
3. Place the core sampler in the water, nose down and let it drop to the bottom. Retrieve the sampler and its core sample using the attached line.
4. When the sampler is in the boat, remove the core sample by unscrewing the nosepiece and sliding the plastic liner with its core sample out of the brass tube. Close the ends of the plastic liner with the end caps to protect the collected sample and ready the sampler for the next sample.
5. After the final sample is taken, clean the instrument of all contamination.

If the sampling station is deep and the bottom very soft, it may happen that the core sampler, when allowed to drop the total depth, will bury itself in the bottom. In such a case, lower the sampler part of the way by its attached line before letting it free-fall to the bottom. Generally, 12 to 15 feet of free-fall is sufficient to obtain a core sample.

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Core samples may be removed from the plastic liners in the field or in the laboratory by using the core sample removal tool to push the core sample from the plastic liner into a suitable container. Plastic liners should be washed before reuse.

The normal life of an eggshell core catcher is from six to 20 samplings and should be replaced when it is apparent that it is no longer operating properly.

MAINTENANCE PROCEDURE

Equipment Identification: Wildco-Ballchek Core Sampler, non-metalic version

Control Number: 1440005

Maintenance Schedule: Before and after each use

Maintenance Procedure:

1. Inspect inside of metal coring tube for contamination and clean if necessary.
2. Inspect retrieving line for frays. Replace if necessary
3. Inspect the plastic nose piece for contamination and clean if necessary.
4. Inspect the entire unit for damage that would prevent it from operating correctly. Repair as necessary.

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LABORATORY PROCEDURE FOR PARTICLE-SIZING SEDIMENT CORES

1. General Principle

The silt-clay fraction of a sediment sample is separated from the sand fraction. The silt-clay fraction is further separated into the clay fraction versus silt fraction, and the sand fraction is sieved through a series of nested sieves to characterize the sand-gravel size distribution.

2. Apparatus

a. Gooch crucibles, 30 ml capacity.

b. 4.0μ and 0.24μ glass fiber filter disks.

c. Filtering apparatus.

d. Drying oven.

e. Dessicator with indicating dessicant.

f. Analytical balance.

g. Sieve set for particle-sizing sand and gravel.

h. Ro-tap Shaker.

i. 1 liter beaker or larger, evaporating dishes, etc.

3. Procedure

a. Mix the core sample thoroughly and subsample an amount that will provide approximately 75 grams of sand-gravel (estimate amount) for sieving purposes, since using a sample of this size will minimize the percent error due to sand "lost on the sieves". Place the subsample in a tared evaporating dish.

WRITTEN KB DATE 3/6/81 QA KT DATE 3-9-81

APPROVED AVB DATE 3/9/81

b. Oven-dry the subsample at a low oven temperature (~50°C) for a 24-hour period. A high oven temperature would bake the sediment and not allow adequate disaggregation of the silt-clay particles.

c. Allow the sample and container to cool somewhat, then weigh to the nearest 0.01 mg and record. Subtract the tare weight of the evaporating dish from this value to get the total initial sample weight.

d. Place the subsample into a 1000 ml beaker, add approximately 500 ml of distilled water, and stir with an electromagnetic stirring bar until thoroughly disaggregated.

e. Wet-sieve this sediment solution through a 63μ sieve, washing the sediment on the screen with a fine jet of distilled water, and saving all filtrate that passes through the sieve. Ideally, the amount of filtrate passing the screen, including wash water, should not exceed 1000 ml by volume. The filtrate now contains all silt and clay while the portion remaining on the screen is sand and gravel.

f. Temporarily put aside the filtrate. Wash the sand-gravel portion from the screen with distilled water into a tared beaker or evaporating dish. Allow to set for several minutes and then decant the clear supernatant. Place the container in a drying oven at 105°C and evaporate all moisture.

g. Remove the sand-gravel fraction from the oven, allow to cool, and then weigh the container and sample to the nearest 0.01mg. Subtract the container tare weight to get the total sand fraction weight.

Subtract this weight from the total sample weight to obtain the total silt-clay fraction weight.

h. Sieve the sand-gravel fraction through a series of nested sieves with the aid of a Ro-tap shaker. Be sure to include a pan at the very bottom to collect any silt-clay particles that were not washed through the 63μ sieve during the wet-sieving process. The sieve sizes within the nest will depend upon what sand or gravel fractions are desired, but sieving will always be from the coarsest sieve to the finest sieve.

i. Weigh each sand and gravel fraction retained on the screens to the nearest 0.01mg and record the weight for each fraction. The sum of these values plus the "pan weight" (weight of material in pan) should sum to within 2% of the total sand-gravel fraction weight. Re-sieving is in order if this accuracy is not achieved. Note that some material is always retained or "lost" on the screens.

j. The individual sand and gravel fractions may be disposed of, put keep the "pan material" and add this to the filtrate containing the rest of the silt-clay fraction.

k. A dispersing agent may now be added to this filtrate if flocculation between silt-clay particles is evident. This step is optional since the filtrate will be filtered under vacuum and it is not clear whether this flocculating condition is eliminated by the filtering action or not. A dispersing agent may be prepared by adding 40.0g of sodium metaphosphate and 8.0g of sodium biocarbonate in distilled water

diluted to one liter[1]. Then 10 ml of this "calgon solution" is added per gram of silt-clay sediment sample remaining in the filtrate from the wet-sieving process (calculated earlier).

l. Stir the filtrate (silt-clay solution) with an electromechanical stirrer for five minutes and analyze according to the methods in the Procedure for Determing Percent Sand, Silt, and Clay in Suspended Sediment Samples. The only difference will be that filtration through the 63u sieve has already been accomplished. It is only necessary to determine the silt fraction by filtering the filtrate through the 4.0u filter, and the clay fraction by filtering this secondary filtrate through the 0.24u filter.

m. Calculate the percent silt and percent clay by dividing the weight of each fraction by the total sediment sample weight and multiply by 100.

[1] National Handbook of Recommended Methods for Water-Data Acquisition, 1978. An Interagency Government Report. Chapter 3, Sediment, p 3-95. (Obtainable through U.S. Geological Survey).

WRITTEN KB DATE 3/6/81 QA KT DATE 3-9-81

APPROVED KB DATE 3/9/81

EQUIPMENT SPECIFICATIONS

Equipment Identification: Standard Sieve Set

Control Number: 1440003

Calibration/Maintenance Schedule: Maintenance daily when in use

Specifications:

1.0 Description: The standard sieve set is a set of thirteen, 8" diameter, 2 7/8" wide, nesting, brass sieves used to size classify sediments. The set also includes one wet sieve of 63 μm size, 8" diameter and 8" deep, one catch pan and one cover.

2.0 General: The standard sieves are Tyler mesh series, standard size sieves in the following sizes:

5 (4.00 mm)	42 (355 μm)
7 (2.80 mm)	60 (250 μm)
9 (2.00 mm)	80 (180 μm)
12 (1.40 mm)	115 (125 μm)
16 (1.00 mm)	170 (90 μm)
24 (710 μm)	250 (63 μm)
32 (500 μm)	

Specification Verification:

3.0 Inspection

The equipment will be inspected daily when in use per the Standard Sieve Set Maintenance Procedure.

4.0 Specifications From: Tyler Combustion Engineering Company "Specification tables for industrial wire cloth woven wire screens No. 74" 1973 edition.

WRITTEN WK DATE 2-19-75 QA MH DATE 2/21/75

APPROVED WK 2-19-75

EQUIPMENT SPECIFICATIONS

Equipment Identification: Wildco - Ballchek Core Sampler, non-metalic version.

Control Number: 1440005

Maintenance Schedule: Before and after each use. (See 3440009)

Specifications:

1.0 Usage

This device is designed to obtain a 2 in diameter by 30 in. long sample of river, lake or ocean bottom material without metal contamination from the instrument itself.

2.0 Description

Weight: 25 lbs.

Core tube: Brass, 30" x 2" I.D.

Insert tube: Plastic, 30" x 2" O.D.

Diving weight: 10 lbs.

3.0 Reference

WILDCO catalog #74, page 16.

WRITTEN F.B. DATE 1/26/76 QA WN DATE 1-27-76

APPROVED RWC 26-I-76

MAINTENANCE PROCEDURE

Equipment Identification: Standard Sieve Set

Control Number: 1440003

Maintenance Schedule: Daily, when in use.

Maintenance Procedure:

A. Inspect each screen for integrity (no holes, etc.) or stretched, broken or displaced screen wire. Initial and date the soil data form following inspection. If the screen is found damaged, repair or replace before using. When damaged screens are found they will be logged in the maintenance record and the corrective action indicated.

B. Inspect screens for jammed grains between the screen wires, clean with soft brush and compressed air to remove as many grains as possible.

Inspection Records:

A. Nonconforming Equipment: If equipment does not meet the specified performance limits, a variance form is initiated. If the equipment cannot be adjusted to within specified limits, it is tagged "HOLD" to prevent inadvertent use.

WRITTEN FB DATE 1/26/76 QA MH DATE 2-5-76

APPROVED RWC 26-I-76

Surface Water Sample Collection - Procedure

1.0 General

Collection of surface water samples for analysis of chemical parameters is the most frequently performed field task. Samples are collected in the majority of cases by taking a "grab sample" of the surface water, or in some cases by an automatic mechanical sampling device.

Grab samples are collected with a "general" or unpreserved container constructed out of material that will not later interfere with parameters to be analyzed in the sample. This collected sample is transferred to appropriately labeled and preserved sample bottles. These bottles must be of the correct material and contain the correct preservative for the parameters to be analyzed.

Samples gathered with an automatic mechanical sampling device, such as the ISCO Model 1680 sequential sampler, retain the sample until collected by the operator. This ISCO model is semi-programmable, programmed to collect a sample at pre-determined intervals, and to place the sample in discrete bottles or together as one composite sample. All material that comes in contact with the collected water sample, including the sample bottles, must not interfere with later analysis of parameters. Preservation of the samples should be made as soon as possible after retrieval by the operator.

On occasion integrated water samples are desired. A Kemmerer or similar type sampler is used to collect a sample over several feet of depth. A subsample is retained and preserved with the appropriate preservative.

All samples must be clearly labeled and kept on ice after collection, usually in ice-filled coolers, until transferal to refrigeration units at the laboratory.

2.0 Specific

When sampling from a stream at several stations, sampling begins with the lower station and proceeds to the upper station. This sequence will avoid alteration of downstream water quality resulting from upstream activities during the sampling process. Samples should be collected upstream of the investigator at the stream mid-point, or from the area of greatest velocity unless specified otherwise by project sampling criteria. In all cases, emphasis should be placed on obtaining a representative sample.

Samples should be collected with a general bottle and poured into preserved bottles. Sample bottles should be filled nearly to the top without losing any of the preservative, and should be clearly labeled with a waterproof marking pen. After returning to the laboratory from a field sampling effort, samples should be properly logged-in and custody relinquished to laboratory personnel, or refrigerated if laboratory personnel cannot immediately attend to them.

3.0 Records

Each sample collected should be labeled with the appropriate project and sample number, sampler's initials, time and date of collection, type of sample, and type of preservative. The appropriate field data form or record book should describe any other pertinent information such as sample color and odor, location of the collection point (station), and

unusual conditions or circumstances that may affect the subsequent chemical analyses. Sample "chain of custody" procedures must be followed (refer to CDM laboratory procedures).

WRITTEN KB DATE 800319 QA KT DATE 3-20-80

APPROVED DHB DATE 3/19/80

EQUIPMENT OPERATION PROCEDURE

Equipment Identification: pH/Temperature Recorder
Ecologic Model 302 B

Equipment Maufacturer: Ecologic Instrument Corporation, Bohemia, N.Y.

Control Number: 302

Operating Procedure: (reference owners manual)[1]

1. Prior to using the Model 302 B portable recorder, the condition of the internal batteries must be checked. If charging is required, plug the AC line cord into a 115 volt AC 60 cycle outlet and allow 18 hours for a full charge. At the end of the charging period, the function switch should be switched to the BAT CHECK position and the AC line cord removed. The meter should fall within the battery check limits, indicating the battery has been charged.

2. Set the meter function switch to TEMP and submerge the probe assembly into the buffer solution (a buffer solution is prepared by dissolving one tablet in four ounces of distilled or or deionized water). Allow 60 seconds to elapse, then note the measured temperature.

3. Set the meter function switch to either pH measurement position. If "pHm" is selected, set the TEMP control to the measured temperature of the solution. If "pHa" is selected, pH is automatically temperature compensated.

4. Adjust the CAL control for a reading on the meter which corresponds to the buffer pH selected.

5. The pH/temperature recorder is now ready for operation, depending upon the choice of operating mode (i.e., METER mode or RECORDER mode).

   a. In the METER mode selection there are three selector switches from which to choose from; pHa, pHm, and TEMP.

      pHa - the meter indicates pH which is automatically temperature compensated;

      pHm - the meter reads manually temperature compensated pH. Temperature of the solution must be set on the TEMP dial.

      TEMP - the meter indicates the temperature in degrees centigrade being measured by the sensor assembly.

WRITTEN CTH DATE 5-1-80 QA RT DATE 5-6-80

APPROVED DRB DATE 5/6/80

b. In the RECORDER mode, the AC recorder will record automatic temperature compensated pH, or temperature, depending upon the position of the RECORDER function switch. While recording pH or temperature, instantaneous pH or temperature may be observed on the 3¼ inch meter movement.

6. Two flow cells are provided in the recorder package to be used in conjunction with the probe assembly; the submersible cell and the in-line flow cell.

[1]Ecologic Instrument Corporation, 1977. Instruction Manual-Model 302 B pH/Temperature Recorder. Ecol. Instr. Corp., Bohemia, New York.

CALIBRATION AND MAINTENANCE PROCEDURE

Equipment Identification: pH/Temperature Recorder
Ecologic Model 302 B

Equipment Manufacturer: Ecologic Instrument Corporation, Bohemia, N.Y.

Control Number: 302

Calibration Procedure:

1. Battery Check:
In the "battery check" position, the chart recorder is energized and the meter indicates relative strength of the internal battery. If the AC line cord is plugged in, the meter will read on or close to full scale, indicating the battery is charging. It is not recommended that the instrument be left in this position, as it will affect battery strength and charging time.

2. Meter Field Calibration:
Check before each use. Using a buffer in the expected region of pH measurement, adjust the calibration control for a reading on the meter which corresponds to the appropriate buffer being used. Three different buffer tablets are provided together with three four ounce wide-mouth bottles and stirrer stick. A buffer solution is prepared by thoroughly dissolving one buffer tablet in four ounces of distilled or deionized water.

3. DC Recorder Calibration: (reference instruction manual)[1]
All Calibration results (lab and field) should be noted and recorded.

Maintenance Procedure:

An adequate supply of support materials must be kept on hand (i.e. chart paper for the recorder and buffer tablets). Batteries should always be fully charged. The condition of the electrode should always be checked for any cracks or dirt, and must be kept clean when not in use. All wires, especially the power cord, should be checked for frayed ends or loose connections. The flow cells (submersible and in-line flow) must also be checked for proper fit and general condition.

[1]Ecologic Instrument Corporation, 1977. Instruction Manual - Model 302 B pH Temperature Recorder. Ecol. Instr. Corp, Bohemia, New York.

WRITTEN C.T.L. DATE 5-1-80 QA RT DATE 5-6-80

APPROVED ORB DATE 5/6/80

CHAIN OF CUSTODY
CAMP DRESSER & McKEE INC.

F0226

Date _____ Initial Sampler _____

Sample Number												
Project Number	Location Number	Anal. Type	Day	Month	Year	Sampling Location	Volume to be Collected	Time Collection Began	Initials	Time Collection Completed	Initials	Comments

Relinquished by		Received by		
Name	Company	Name	Company	Date-Time
Relinquished by		Received by		
Name	Company	Name	Company	Date-Time
Authorization for Disposal		Date-Time	Disposed by	Date-Time

PERSONNEL TRAINING AND CERTIFICATION PROCEDURE

The fisheries group quality assurance procedures are read by the new employee and discussed with certified fisheries personnel. Emphasis is placed on those procedures pertinent to the work assigned. The new employee observes as certified fisheries personnel perform group tasks and then the new employee performs the same tasks while being supervised. All work done by the new employee is rechecked for accuracy.

New employees are acquainted with field procedures such as field trip preparation, sample collection and processing plus data form completion. They are also trained in laboratory procedures such as picking ichthyoplankton, pressing scales, sample analysis and fish identification. Included in the training process is the operation and maintenance of fisheries equipment.

Upon completion of the training period, a certification exam is arranged and administered. The exam content is dependent upon the employee catagory (e.g., fisheries technician, fisheries biologist). Each job description lists the minimum requirements necessary to hold that title and the work responsibilities associated with it. The test results are attached to the Personnel Certification Form and are filed in the quality assurance manager's office.

All group personnel are periodically reevaluated for certification.

WRITTEN [signature] DATE 11 August 78 QA [signature] DATE 8-11-78

APPROVED [signature] DATE 8/11/78

PROCEDURE FOR REVIEWING AND CHECKING FISHERIES DATA

Field notes, concerning station locations, gear types, sampling intervals and other pertinent trip information, are initialed and dated by the investigator and filed by the fisheries group personnel.

All sample data are recorded on the appropriate fisheries data form. Upon completion of the field work, the forms are initialed and dated by the investigator and then checked for completeness, initialed and dated by a second person. If data are to be computerized, the field data portion of the forms are photocopied. The originals are filed by data analysis group personnel and the copies are filed by fisheries group personnel until the samples have been analyzed.

Upon completion of sampling processing, the laboratory analysis portion of the fisheries data forms are initialed and dated by both the analyst and a person who checks the data for correctness. Any discrepancies found in the data are either resolved by the fisheries group manager or samples are sent to a consultant for identification. A literature search for more information may be conducted. If data are to be computerized, the entire fisheries data forms are photocopied. The copies are filed by fisheries group personnel and the originals are filed by data analysis group personnel for keypunching.

WRITTEN [signature] DATE 1/3/80 QA [signature] DATE 1-10-80

APPROVED [signature] DATE 1/10/80

PROCEDURE FOR SEINE USAGE

1. Record all pertinent physical information on Field Notes - Seine Forms.
2. The seine is unfolded, and if necessary, stretched to full length.
3. Depending upon seining requirements, appropriate number and length of seine hauls are taken.
4. Time start is noted on the data form. The seine is stretched and lowered as the haul commences.
5. After the appropriate amount of time has elapsed, the seine is drawn close to shore and stretched while the end poles are turned to a horizontal position.
6. The catch is shaken into the bag portion of the seine. From there, the fish are placed in suitable containers labelled with project code, site, station, and sample number and collection date. Formalin is added to the samples to obtain a 10% formalin solution.
7. Fish are analyzed per the Adult and Juvenile Fish Analysis Procedure.
8. Data forms are initialed and dated.
9. Data forms are photocopied. The originals are filed by the Data Analysis Group and the copies are filed by the Fisheries Group.

WRITTEN [signature] DATE 1 June 77 QA [signature] DATE 6-1-77

APPROVED [signature] DATE 7/06/01

PROCEDURE FOR FISH AGE DETERMINATION USING SCALE SAMPLES

1. Fish Age and Growth Data Form is used in recording aging data.
   a. Fish scales to be analyzed are grouped into species by station.
   b. Between five and ten scales (depending on size) are removed from an envolope and are placed convex surface down on a cellulose acetate slide.
   c. The slide is covered with a tin cover slide and fed through an Ann Arbor roll press.
   d. The cellulose acetate slide is returned to the appropriate slide envelope.
   e. The glass slide is placed on a micro-projector and a scale impression is displayed on a white backdrop.
   f. A strip of paper is placed on the projected image. Marks are made on the paper for the center of the scale, the edge and for each annulus.
   g. The strip of paper is labeled (species, fish, ID number, location).
   h. The strip of paper with the marks is placed on a meter stick.
   i. The radius and distances spanned by each annulus are noted and recorded on the Fish Age and Growth Data Form for the appropriate fish.
   j. The process is repeated for all scale samples.
2. Initial and date the Fish Age and Growth Data Forms.
3. Photocopy the data forms and file originals in Data Analysis Department and copies in Fisheries Department.

WRITTEN [signature] DATE 3-12-76 QA [signature] DATE 76-3-15

APPROVED [signature] 12-III-76

F 0249

Fish Gear Summary

CARD 1

COLLECTOR _____ DATE _____ CHECKED BY _____ DATE _____

1 2 3 4 5	6 7	8 9	10 11	12 13	14 15	16	17 18 19	20 21 22
PROJECT No.	YR	MON	DAY	SITE	STATION	REP	STATION DEPTH/ft	SAMPLING LEVEL/ft

TIME FISHED		TEMPERATURE °C	D. O.	GEAR TYPE	NET MEASURE		CURRENT SPEED	CARD No.
Hours	Minutes				Width	Mesh	Ft / Sec	
27 28	29 30	31 32 33 34	35 36 37 38	39 40 41	42 43 44	45 46	47 48 49 50	79

GEAR TYPE CODES

MESH CODES (Stretch)

NOTES

EQUIPMENT USED

_____

_____ _____ _____

_____

FISH D..A

COLLECTOR | DATE | Card 2 (Duplicate Columns 1-22) | CHECKED BY | DATE

Project no. | Date | Site | Station | Rep | Samp. Level | Time Collected | Gear

SPECIES	Species Code 23,24,25,26	Fish No. 28,29,30,31	Length mm 33,34,35,36	Weight gm 38,39,40,41,42	Disease	Abnorm.	SEX	MAT	AGE 50,51	Mesh 53,54	TAG No. 56,57,58,59,60	RECAP	TOTAL NUMBER	TOTAL WEIGHT	NOTES	Card no	End Fig

ADULT AND JUVENILE FISH ANALYSIS PROCEDURE

1. The Adult and Juvenile Fish Analysis Data Form is used to record data on fish species analysis.
2. Field data for the sample being analyzed are transferred to the Adult and Juvenile Fish Analysis Data Form.
3. The catch is separated by species. If large numbers of any one species are collected, the sample may be subsampled. Subsampling methods will be determined on a case by case basis.
4. If subsampling of the catch is unnecessary, measure and weigh each individual fish. Determinations are routinely total length in millimeters and weight in grams. Different classifications are employed when specified (e.g. fork length, standard lengt lengths in inches or weights in ounces).
5. If required, the sex and gonadal condition of each fish are determined. Determinations are either internal (dissection) or external (pressure applied to the body cavity to release sexual products).
6. If required, stomach samples are removed from individuals of each species and retained for later analysis. The exact number of stomachs retained is determined on a case by case basis.
7. Stomach samples are placed in Whirl-Pac bags and buffered formalin is added to obtain a 5-10% solution. The Whirl-Pac bags are labeled with project code, site, station and sample number, species code, fish I.D. number and collection date.
8. If required, ovaries and/or roe are removed from individuals of each species and retained for later analysis.
9. Ovaries and/or roe samples are placed in Whirl-Pac bags and buffered formalin is added to obtain a 5-10% solution. The Whirl-Pac bags are labeled with project code, site, station and sample number, species code, fish I.D. number and collection date.
10. If required, each species are examined externally for incidence of disease, parasitism, or physical abnormalities.

WRITTEN [signature] DATE 1/3/80 QA [signature] DATE 1-17-80

APPROVED [signature] DATE 1/10/80

11. If required, scale and/or spine samples are retained for age and growth analysis. Spine samples and scale samples are stored in appropriately labeled envelopes.
12. Spine and scale envelopes are kept on file by the Fisheries Group.
13. Data forms are initialed and dated by both the analyst and checker.
14. Data forms are photocopied with originals filed by the Data Analysis Group and copies filed by the Fisheries Group.

WRITTEN [signature] DATE 1/3/80 QA [signature] DATE 1-17-80

APPROVED [signature] DATE 1/10/80

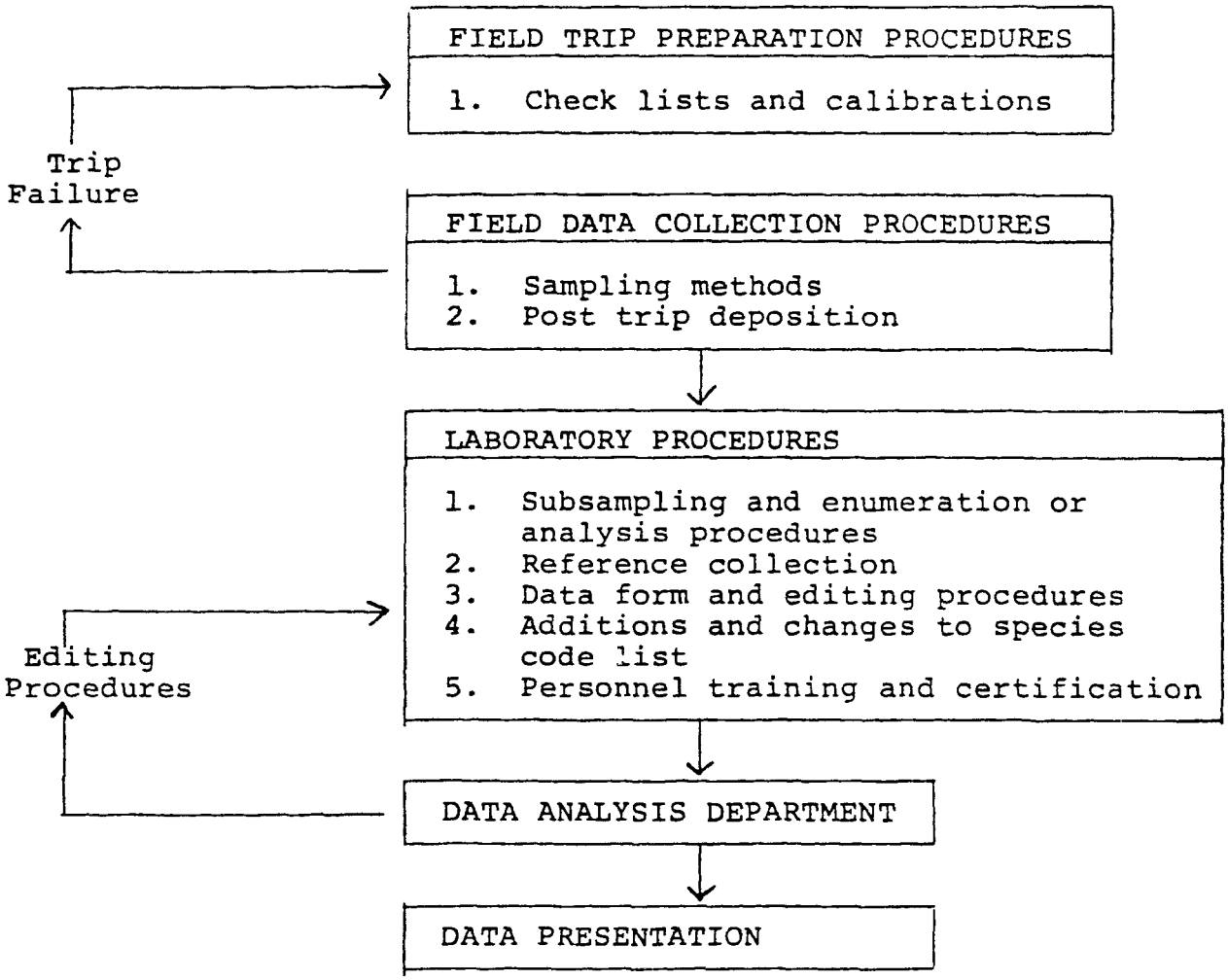
MAINTENANCE OF FISH REFERENCE Collections

Whenever possible, adult and juvenile fish are processed in the field and returned to the water alive. Occasional specimens and questionable specimens are returned to the laboratory for positive identification. Also, all small fishes (i.e. minnows, madtoms, killi fishes, and darters, etc.) are returned to the laboratory for analysis.

Representative specimens are used to establish project specific reference collections when these are required by the client. New species are added to the general Fisheries reference collection. When a specimen is removed from a project reference collection to the Fisheries reference collection, a note indicating the location of the transferred specimen is made.

Specimens are preserved in formalin. Inside each jar is placed a waterproof label containing the following information: species name, project number, place of capture, date of capture, and initials of the person responsible for the identification. Project reference collections are maintained for two years following completion of the project.

PHYCOLOGY DEPARTMENT DATA FLOW CHART



WRITTEN [signature] DATE April 21 1977 QA [signature] DATE 4-22-77
APPROVED [signature] DATE 4-22-77

PHYCOLOGY DATA LOG

1. The Phycology Data Log contains the following information:
   a) Sample Type
   b) Date Collected
   c) Sample Number
   d) Date Reference Slides Made and Agent
   e) Date Counted and Agent
   f) Date Editing Completed and Agent
   g) Date Subsample Made and Agent

2. Every sample that comes to the Phycology Group is entered in the Data Log as to sample type, date collected and sample number.

3. As each operation is performed on a sample, the date is entered in the appropriate column space in the Data Log along with the initials of the agent performing the operation. When an operation does not apply to a sample, a horizontal line is drawn in the appropriate column space.

WRITTEN [signature] DATE 800110 QA [signature] DATE 1-10-80

APPROVED [signature] DATE 1/10/80

PERIPHYTON AND PHYTOPLANKTON DATA FORM (Card 1)

River/Lake:	Location:	Client:

(1) Proj. no. _ _ _ _ _ _	(32) Temp. code _	(56) Volume settled (ml.) _ _ _ _ . _
(7) Date _ _ _ _ _ _	(33) Temp. surf. _ _ . _	(62) Volume code _
(13) Time _ _ _ _	(37) Temp. bott. _ _ . _	(63) Volume of composite _ _ _ _ . _
(17) Area _ _	(41) Depth code _	(69) Area units _
(19) Station _ _	(42) Depth contour _ _ . _	(70) Area Scraped _ _ _ _ . _
(21) Sample no. _ _ _	(46) Depth sample _ _ . _	
(24) Coll. device code _ _	(50) Secchi code _	
(26) Coll. invest. _ _ _	(51) Secchi depth _ _ . _	
(29) Analyzed sample _ _ _	(55) Microscope code _	

vol._____ Time_____

Investigators_____

Weather conditions_____

Light Meter_____ Code ____

Station	Reading	Units

Temperature Meter Control No._____

Comments:_____

Prepared by_____Date_____ Checked by_____Date_____

TRAINING AND CERTIFICATION PROCEDURES - PHYCOLOGY DEPARTMENT

The training of new personnel consists of the following:

The department quality assurance procedures are read and discussed with certified personnel; emphasis is placed on those procedures pertinent to the work assigned.

The new employee watches as a certified person performs department tasks and then performs these tasks while being supervised. All work done by the new employee is rechecked for accuracy.

Time is spent acquainting new counters with the algal species found in particular areas. All identifications are closely supervised by a certified phycologist. Identifications are aided by taxonomic keys, reference slides, drawings, and photographs.

The certification examination is arranged and administered by the Group Manager. The exam content is dependent upon the employee catagory (Scientist I-VI). The positions of Scientist I-VI are established under company policy. Each job description lists the minimum requirements necessary to hold that title, and the work responsibilities associated with it.

New employees are tested after an initial training period. All department personnel are reevaluated for certification periodically. Employees may also be certified to perform duties in other areas after cross-training has been successfully completed. The test results are attached to the Personnel Certification Form and filed in the Director's office.

WRITTEN KSC DATE 5/2/7 QA [illegible] DATE 6-1-77

APPROVED [illegible] DATE 770601

BENTHIC ALGAE (NATURAL PERIPHYTON)
QUANTITATIVE FIELD COLLECTION PROCEDURE

1. The equipment is readied, inventoried with the Periphyton Equipment Checklist and loaded into the truck.
2. At the site, the boat is launched, loaded with the equipment and motored to the sampling station. Suitable substrate (i.e. pilings, pier, rocks) is located.
3. With a calibrated cork borer, score two rings into the mass of periphyton on the surface of the substrate.
4. Clear the periphyton away from the areas around the rings with a scalpel and a small brush.
5. Scrape the rings of periphyton into a suitable container. Using distilled water from a wash bottle, the rings are cleaned of as much periphyton as possible. If required, the samples are preserved with the appropriate preservative.
6. Sample algae growing on particulate sediments with a calibrated flower bulb corer. The top inch of sediment within the corer is sampled. Place a plexiglass plate over the bottom of the corer, withdraw sample, and place in a metal tray. Wash sample from the tray into a bottle containing preservative.
7. Label the container with project code, station and sample number, collection date and investigator's initials.
8. The samples are returned to the laboratory for analysis.

WRITTEN WMM DATE 800117 QA KT DATE 1-18-80

APPROVED [illegible] DATE 17 JAN 80

CAMP DRESSER & McKEE INC.
Environmental Sciences Division

PREPARATION OF M^3 FIXATIVE

1. Prior to the sampling effort, Meyer's (M^3) fixative is added to each sample bottle so the phytoplankton and/or periphyton will be immediately preserved after collection.
2. The volume of preservative used is such that the final concentration in the sample will be approximately one percent.
3. The formula for Meyer's (M^3) fixative is as follows:

1g	I_2
0.5g	KI
5 ml	Glacial Acetic Acid
25 ml	Formalin
100 ml	H_2O

Notes: This fixative preserves cytological detail and precipitates blue-green algae. The flagella are retained, starch is stained and cell dimensions are not significantly altered. The specimens can be used for cytological study even after storage at room temperature for greater than five years.

Reference: Meyer, R.L. 1971. A study of phytoplankton dynamics in Lake Fayetteville as a means of assessing water quality. Arkansas Water Resources Research Center. University of Arkansas, Fayetteville. Publ. 10. 58 pp.

WRITTEN [signature] DATE 780323 QA [signature] DATE 3-23-78

APPROVED [signature] DATE 780323

NATURAL PERIPHYTON QUANTITATIVE LABORATORY PROCEDURE

1. The natural periphyton samples are inventoried and stored with the Phycology Group.
2. If necessary, the samples are mixed in a blender until the clumps are broken up. The samples are then returned to their collection containers.
3. A plate chamber is prepared by securely attaching a clean bottom plate to the rectangular plate with a metal retaining ring.
4. The plate chamber is labelled in pencil on the right-hand side with the project name, station, site, and sample number, date of collection, date and exact time sample is set up, and the initials of the person setting up the sample. The subsample volume is selected to give a cell density on the bottom of the settling chamber which is optimum for identification.
5. A few drops of distilled water are placed around the edge of the large circular opening in the rectangular plate. The cylindrical chamber is set over the opening and held firmly in place to produce a water seal.
6. The periphyton sample is resuspended as described by Weber (1966). The sample is mixed by inverting the sample bottle no fewer than seven times and then a graduated pipet is immediately filled and discharged back into the bottle. The bottle is mixed again and the pipet is refilled, this time to be discharged into the combined chamber, while being swirled to prevent cells from clinging to the sides of the cylindrical chamber.
7. A jet of distilled water is added to the combined chamber until a convex surface forms at the top. This ensures a uniform cell distribution on the bottom plate.

WRITTEN KSC DATE 5/31/77 QA [illegible] DATE 6-1-77

APPROVED [illegible] DATE 770601

8. A circular cover plate is slid across the top of the cylindrical chamber to form a water seal. The combined chamber system is left undisturbed for at least 24 hours to allow the maximum amount of algae to settle to the bottom plate.
9. After the required settling time, a few drops of water are placed around the base of the cylindrical chamber and a rectangular cover plate is used to slowly and steadily push the cylindrical chamber to a hole in the plate chamber where it discharges. As the cylindrical chamber is moved sideways, the cover plate closes the plate chamber without resuspending the algae.
10. The cylindrical chamber and circular cover plate are rinsed with distilled water, washed with a mild detergent, rinsed again and dried.
11. If the plate chamber is not counted immediately after being taken down, it is stored in a refrigerator to prevent both evaporation and contamination.
12. The plate chamber is taken from the refrigerator 5 to 10 minutes before it is used, in order for the condensation on the chamber plates to evaporate.
13. Natural periphyton are identified using either a Zeiss Standard UPL inverted microscope, a Nikon Model M inverted microscope or a Wild M40 inverted microscope.
14. For information concerning the recording of data, refer to the Use of the Periphyton and Phytoplankton Data Form and Editing of Data Procedure.
15. A grid of known area is moved across the slide in a random manner to determine which cells will be identified and counted. The following criteria are used:
    1. All unbroken algal cells with intact chloroplasts (whether individual cells or cells of a colony or filament) lying completely within the grid area are counted. In some cases, where it is impossible to obtain the exact number of cells in a colony or filament, an estimate is made.

2. Algal cells which touch the top and/or left side of the grid are counted. Algal cells which touch the bottom and/or right side of the grid are not counted.
3. Algal cells which touch both the bottom and the left side of the grid are counted, while those which touch both the top and right of the grid are not counted.
4. Algal cells which touch the left and right of the grid are counted, while those which touch the top and bottom of the grid are not counted.

16. Counting units are defined by the client in the project work scope.
17. The magnification at which the plate chamber is examined and the number of units counted are as per client request and are stated in the project work scope.
18. The number of grids counted are recorded on the Periphyton and Phytoplankton Data Form.
19. The Phycology Data Log is initialed and dated in the appropriate place after the samples are analyzed.
20. The cover plate, retaining ring and bottom plate are removed from the Plexiglas plate and washed with 95% ethyl alcohol. The writing on the Plexiglas plate is removed with an eraser, and the plate is rinsed with water.
21. The samples are sealed with parafilm and the jar lids are tightened. The samples are retained at CDM for two years following the final collection date.
22. The Phycology Data Log is initialed and dated after each data set is stored.
23. The Periphyton and Phytoplankton Data Forms are handled according to the Data Set Editing and Correction Procedure and the Data Set Filing Procedure.
24. If required, cleared diatom slides are prepared as specified in the Procedure for Making Cleared Diatom Slides. These are stored with the Phycology Group in labelled, plastic slide boxes.

S
Sample No.
Date

PERIPHYTON AND PHYTOPLANKTON LABORATORY ANALYSIS

Duplicate cols. 1-25, Left zero all other fields
Cards 2 through End

DO NOT KEYPUNCH

Species	Count	Species Code 27-28	29-30	31-32	33-34	35-36	Unit Count 40-45	Fields Counted 50-55	Mag. 59	Grid Length 60-65	Mean Biovolume 70-77	F

F . C

Sta. No. _____ Collection Date _____ LABOR ALYSIS Fraction subsampled _____

(left zero all fields) Method _____

Samp. No. _____ Page ____ of ____

Species Name (not keypunched)	Species Code 27 - 28	29 - 30	31 - 32	33 - 34	35 - 36	37	Number Counted 40 - 45	Number per Sample 50 - 55	Number per Subsample 60 - 65	Subsample Conversion Factor 70 - 75	Investigator 76 - 78	E Fl

Prepared By: _____

Midges: / ( ) Oli. frags

PROCEDURE FOR MAKING CLEARED DIATOM SLIDES

1. Centrifuge an adequate volume of suspended sample for 20 minutes at 2500 rpm (1000 x g) using head size number 320.
2. Decant the supernatant from the centrifuge tube with a suction tube.
3. When the water contains a high level of dissolved solids, these may crystalize when the sample dries, obscuring the diatoms on the finished slide. To avoid this, wash the sample by centrifuging with distilled water and decant the supernatant as directed previously. Washings may be repeated several times if necessary.
4. Thoroughly mix the algal concentrate in the centrifuge tube with a disposable pipet and deliver several drops to a coverslip. Dry the coverslips on a hot plate set on a low setting. When dry, examine the coverslips to determine if there is sufficient material for a diatom count. If not, repeat the process one to several times.
5. Transfer the coverslips to a muffled furnace. The cold muffled furnace is set at 550°C and left for one hour.
6. Place a 25 X 75-mm glass slide on a moderately warm hot-plate (setting number 3) and place a drop of Cargille's Carmount mounting medium at the center.
7. While the coverglass and slide are still hot, grasp the coverslip with a forceps, invert it so the side with the diatoms on it is face down, and place it on the drop of Carmount. It may be necessary to add additional Carmount at the margin of the coverslip.
8. Leave the glass slide and coverslip on the hot plate for 5-10 minutes to evaporate the solvent. When the bubbling ceases, remove the slide from the hot plate, place on a firm, flat surface, and cool until the Carmount hardens.

WRITTEN KSC DATE 5/31/77 QA [illegible] DATE 6-1-77

APPROVED [illegible] DATE 770601

9. Apply slight pressure to the coverglass with a blunt object (i.e., pencil eraser), if necessary, to drive off any additional air bubbles.
10. When the slide is cool, and the Carmount has hardened, use a razor to scrape the excess away from the cover-slip margin.
11. Include on each slide project name and code, sample number, sample type, and sample date.
12. The reference slides are filed in a slide box by the Phycology Group, and the Phycology Data Log is dated and initialed.

USE OF THE PERIPHYTON AND PHYTOPLANKTON DATA FORM AND EDITING OF DATA

1. Prior to counting each sample, the front page and some of the back page of a Periphyton and Phytoplankton Data Form are completed for that sample.

Steps in Process:

A. The correct sample type is circled (front page).
B. All other available data is filled in the proper spaces provided on the top of the front page of the data form. The bottom of the front page is initialed and dated.
C. The magnification code and grid length are filled in on the back page of the data form.

2. After the count is completed, the number of fields counted is recorded; any missing species codes are filled in, (Note: If a species is found for which a code does not exist (new species) follow the procedure outlined in Additions and Changes to the Species Code List). The count for each organism is tallied and recorded under unit count. When this is completed, the agent initials and dates the bottom of the back page of the data form.
3. After completion of the data form, it is turned over to a second person who checks both the front and back page to be sure all data have been filled in correctly and all counts have been tallied correctly. After the data form has been checked, it is initialed and dated and the Phycology Data Log is initialed and dated.

Steps in Checking Process:

A. Check all available data and be sure it is recorded correctly. Make proper changes after discussing them

with the person who prepared the data form or the Group Manager.

B. Check for addition errors in unit counts.

C. Check species code number and assign any that are missing or incorrect.

4. After the data forms have been checked, they are photocopied and the copies are filed by the Phycology Group. All pages for an individual sample are stapled together. The originals are placed in a properly marked folder which is placed in the "data to keypunch" basket in the Data Analysis Group. The Data Set Log is signed and dated.

5. The first computer output of data is checked against the Periphyton and Phytoplankton Data Forms. If a correction must be made, a Data Set Edit-Change Form is completed, approved and filed with the Data Analysis Group. This step is repeated until a perfect output of data is received. Each time data are edited, the Data Set Log is initialed and dated.

ADDITIONS AND CHANGES TO THE SPECIES CODE LIST

1. When a new species (one for which no code exists) is found, a code number is assigned to it. Note: Species codes must be assigned in the proper taxonomic area and the most recent species code list must be used when making these assignments.

   Newly assigned species code numbers are sent to the Data Analysis Group where they will be included in a updated species code listing.

Steps in Process:

A. When a species is found that does not have a species code, assign a code to it that places it in the correct taxonomic area. Write the code and species name on the most recent species code list.

B. Write the name of the species, line numbers between which the new species belongs, and the code assigned to that name on a Data Set Edit - Change Form.

C. After all new species for a particular data set have been written on a Data Set Edit - Change Form, the change form is given to the Group Manager for approval.

D. The Group Manager initials the Data Set Edit - Change Form and the form is taken to the Data Analysis Group and placed in the "edited data" basket.

E. The Data Set Log is initialed and dated.

F. When the new species have been added to the list, an updated copy of the list is given to the Phycology Group where it is checked.

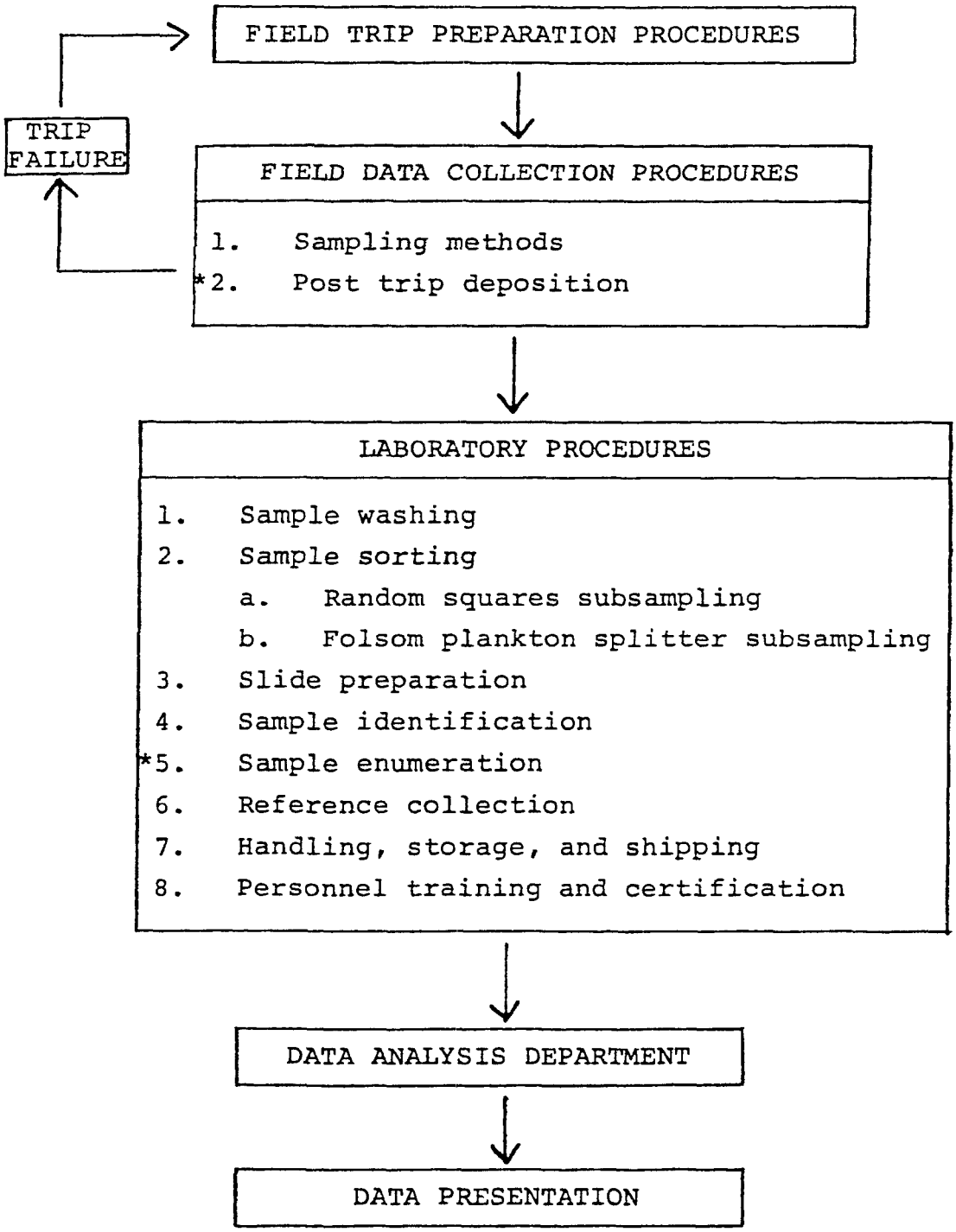
WRITTEN KSC DATE 5/31/7 QA LT DATE 6-1-77

APPROVED AKH DATE 770601

G. After the updated list is approved, the old list is filed in the archives and the most recent species list is used when adding any new species to the code list.

2. Rarely, a species will be misidentified and the name will be corrected by a consultant. When this occurs, the name on the species code list is changed to the correct name, but the code number remains the same. This change is handled in the same way as adding a species to the code list (see above).

BENTHOS DEPARTMENT DATA FLOW CHART



*Inspection points

WRITTEN PJS DATE 2 Feb. 76 QA [illegible] DATE 2-3-

APPROVED [illegible] 2-II-76

PAGE 1 of 1

BENTHOS FIELD TRIP PREPARATION PROCEDURE

1. Prepare the Benthos Data Forms and place them in the field notebook which accompanies the investigator into the field.
2. Examine and maintain sampling equipment. Update maintenance labels and initial and date the Benthos Equipment Log Book.
3. Make all necessary calibrations. Update calibration labels and initial and date the Benthos Equipment Log Book.
4. As the sampling equipment is assembled and loaded into the truck, check it off on the Benthos Equipment Checklist. Place the completed checklist in the field notebook with the data forms.

WRITTEN TPD DATE 8/21/79 QA [illegible] DATE 9-13-79

APPROVED [illegible] DATE 9/21/79

Limnetics, Inc.
332 West Fond du Lac Avenue
Milwaukee, Wisconsin 53218

Prepared by_____ Date_____

Checked by_____ Date_____

BENTHOS DATA FORM

River/Lake:	Location:	Client:

(1) Proj. no. __ __ __ __ __ __	(31) Temp. Code __	(57) Sub. type __
(7) Date __ __ __ __ __ __ (Yr. Mo. D)	(32) Temp. surf. __ __ . __	(59) Coll. dev. __
(13) Time __ __ __ __	(36) Temp. bott. __ __ . __	(61) Sieve code __
(17) Area __ __	(40) O_2 surf. __ __ . __	(63) Preservative
(19) Station __ __	(44) O_2 bott. __ __ . __	(64) Secchi code
(21) Sample no. __ __ __	(48) pH surf. __ __ . __	(65) Secchi depth __ __ .
(24) Investigator __ __ __	(52) pH bott. __ __ . __	(69) Current code
(27) Depth (meters) __ __ . __	(56) Data type __	(70) Current __ __ . __
		(75) Conv. factor __ __ __ __

Investigators_____ Total no. of samples collected at this station_____

Samples collected for H_2O chem._____ Sed. chem._____

Biomass_____ Sed. size_____

Weather conditions:_____

_____

_____

Comments:_____

_____

Container No.	Sample No.	Substrate
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

PERSONNEL TRAINING AND CERTIFICATION

1. Minimum Qualifications and Responsibilities
   a. Personnel employed as benthologists must comply with the minimum qualifications and responsibilities listed in the company policy manual.
2. Training
   a. All personnel involved in the analysis of benthic samples undergo a period of training during which they are assisted and supervised by certified personnel. The training period length is not formalized, but depends on the progress of the individual being trained.
   b. The trainee is instructed in the importance and use of quality assurance documents and forms, the use of taxonomic keys and recognition of important anatomical characters, and the identification of any taxonomic groups which he/she will be required to enumerate.
   c. The trainee makes a series of independent identifications from training samples. Permanent reference slides and vials are available for examination and can be used as aides in identification.
   d. Each identification made by the trainee is verified by the instructor. Training continues until the trainee can identify with ease the majority of organisms encountered. At no time, is a trainee allowed to work on project samples without the supervision of an instructor.
3. Certification
   a. Benthos personnel are required to take a certification exam upon completion of the training period.
   b. Upon satisfactory completion of a practical exam, benthos personnel are certified in writing to identify and enumerate particular groups of benthic organisms.
   c. Recertifications may be required periodically.

WRITTEN TFD DATE 8/21/79 QA [illegible] DATE 9-13-79

APPROVED [illegible] DATE 9/21/79

BENTHOS SAMPLE INVENTORY

1. All benthos samples received in the laboratory are inventoried to ensure that all samples collected in the field are accounted for in the laboratory and all samples are received in good condition.
2. Results of the inventory, initials of the person conducting the inventory and the date are recorded on the Inventory and Deposition Form.
3. Sample condition, at time of receipt, is recorded on the Inventory and Deposition Form. If samples were not received in good condition, an explanation is given in the space provided.
4. If a Variance Form is required, this is also indicated on the Inventory and Deposition Form.
5. When completed, the Inventory and Deposition Form is filed by the benthos group with the appropriate data forms.

WRITTEN TFD DATE 8/21/79 QA LT DATE 9-13-79

APPROVED [signature] DATE 9/21/79

BENTHOS HANDLING, SHIPPING AND STORAGE

1. Upon completion of laboratory analysis, all slides are prepared for long-term storage.
   a. Slides are arranged in numerical order (according to sample number) when possible, in slide boxes labeled with project number and collection date. The number of boxes in each series is indicated on the label.
   b. The appropriate space on the Inventory and Desposition Form is marked to indicate that all slides are in order.
2. Upon completion of laboratory analysis, all vials are prepared for long-term storage.
   a. Vials are arranged in boxes labeled with project number and collection date.
   b. The appropriate space on the Inventroy and Deposition Form is marked to indicate that all vials are in order.
   c. Once annually, vials are waxed to prevent alcohol evaporation. Vials are inverted and dunked into melted paraffin until a sufficient seal between the vial and cover is formed.
   d. The appropriate space on the Inventory and Deposition Form is checked to indicate that all vials are waxed.
3. All organisms placed in the reference collection are retained indefinitely.
4. Organisms not placed in the reference collection are retained for two years dating from project completion. Excluded are samples which are physically altered or destroyed due to the nature of analysis (e.g. biomass determinations).

WRITTEN THR DATE 810427 QA [illegible] DATE 4-27-81

APPROVED [illegible] DATE 4/27/81

5. Slides and vials are temporarily stored by the benthos group in the biology laboratory. Demands of space may eventually require that samples be transferred to the field equipment building. When such a transfer occurs, the appropriate space on the Inventory Deposition Form is marked to indicate where the samples have been deposited.

WRITTEN JHR DATE 810427 QA [illegible] DATE 4-27-81

APPROVED [illegible] DATE 4/27/81

BENTHOS SAMPLE WASHING PROCEDURE

1. A U.S. Standard No. 60 or No. 30 sieve (as per scope of work) is used to wash each sample. The sieve size selected is recorded at the top of the Sorting and Slide Preparation Form.
2. Prior to each use, the sieve is visually inspected to ensure that it is taut, free of holes and in otherwise good condition. Corrective maintenance, if required, is performed per the Tyler Sieve Maintenance Procedure.
3. When substrate samples are collected, each sample is emptied individually into the appropriate sieve and gently rinsed with tap water to remove the preservative.
4. When artificial substrates, such as the Hester-Dendy multiple plate artificial substrate samplers, are used, these are returned to the laboratory intact. The water in the container is poured through the appropriate sieve and each apparatus is disassembled over the sieve under slowly running tap water. All parts are gently brushed clean.
5. The sieve screen is rinsed and carefully brushed after each use as an extra precaution against cross contamination of samples.

WRITTEN TFD DATE 8/21/79 QA RT DATE 9-13-79

APPROVED [signature] DATE 9/21/79

BENTHOS SAMPLE SORTING PROCEDURE

1. After the sample is washed, the residue is carefully sorted to remove all benthic organisms.
2. If necessary, samples may be subsampled (as per scope of work). The method used and the fraction subsampled are recorded in the appropriate spaces on the Benthos Data Form.
3. Samples or subsamples are sorted using either a dazor or binocular dissecting microscope.
   a. dazor sorting procedure:

      The sample or subsample is distributed thinly in any suitable shallow pan or dish and examined through the magnifying lens.
   b. microscope sorting procedure:

      Small portions of the sample or subsample are placed in a square integrid petri dish for examination under a binocular dissecting microscope at 10X magnification,
4. All benthic organisms are removed with forceps and placed in vials. Some organisms require larger containers because of their size.
5. All organisms,except worms and midges, are placed in 70 percent ethyl alcohol and five percent glycerin solution. Glycerin is included to prevent drying of the organism in the event of accidental alcohol evalporation. Glycerin may be omitted when biomass determinations are to be made on the organisms. Worms and midges may need to be stored in other preservatives such as formalin, depending on the type of mounting medium to be used.
6. Each vial or container is labeled with project number, collection date and sample number to maintain sample identity.

WRITTEN JHR DATE 810427 QA RT DATE 4-27-81

APPROVED [signature] DATE 4/27/81

7. Vials belonging to each set of samples are stored together in boxes labeled with project number and collection date.
8. The major catagories of organisms found in the sample, excluding extra-large organisms, are indicated on the Sorting and Slide Preparation Form to provide a record of all organisms found.
9. When sample sorting is complete, the investigator initials and dates the Sorting and Slide Preparation Form.
10. The substrate remaining, after the sample has been sorted, is discarded. Where only a subsample was sorted, the remaining fraction of the sample may be retained or discarded (as per scope of work).

WRITTEN JHR DATE 810427 QA LT DATE 4-27-81
APPROVED [signature] DATE 4/27/81

BENTHOS SLIDE PREPARATION

Two groups of benthic organisms, the Chironomidae (midges) and the Oligochaeta (aquatic worms) must be mounted on slides before identifications can be made for most taxa.

Chironomidae Slide Preparation

1. Empty midges into a petri dish.
2. Whole organisms are counted, plus all intact anterior portions are counted as whole organisms. Posterior portions and other fragments are discarded.
3. Of the total number of chironomids in the sample, a subsample is randomly selected for slide preparation unless otherwise specified in project work scope.

total in sample	subsample
1-50	10 organisms
>50	20% to a maximum of 25 organisms

4. Chironomids are mounted in a suitable commercial mounting medium such as Turtox CMC, Euparol or Hydramount.
5. The larva is placed ventral side up in a drop of mountant on the slide. A cover glass is placed over the midge and is pressed gently to better expose the parts needed for identification. Two chironomid larvae may be mounted on the same slide under separate cover glasses. Large specimens may require that the head capsule and body be mounted under separate cover glasses on the same slide.
6. All slides are appropriately labeled with waterproof ink.
7. All organisms not mounted on slides are returned to the vial.

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APPROVED [signature] DATE 4/27/81

Oligochaeta Slide Preparation

1. The oligochaetes are cleared either by storing in Ammon's lactophenol for three to five days until enough muscle tissue is digested to expose the parts necessary for identification, or by mounting in a medium with clearing action.
2. Oligochaetes are then emptied from the vial into a dish and counted. For purposes of slide preparation, it is standard policy to count every oligochaete, or portion thereof, as one organism, if a subsample is to be removed.
3. A subsample of the total number of oligochaetes in the sample is randomly selected for the slide preparation if the project workscope specifies subsampling.

total in sample	subsample
1-50	all
>50	50 organisms

4. Several oligochaetes may be mounted on each slide using appropriate media and cover glasses as described previously.
5. When the appropriate number of oligochaetes have been mounted on slides, the remaining specimens, if any, are stored in the appropriate vial.
6. Each vial is labeled with sufficient information to maintain sample identity.
7. For both Chironomidae and Oligochaeta, the total number of organisms in the sample and the number of organisms subsampled for slide preparation are recorded on the Benthos Data Form using the following format:

   taxonomic group: no. of organisms on slides/no. of organisms in sample

   Example: If there were a total number of 75 oligochaetes in a sample and 50 were mounted, the notation would read, oligochaetes: 50/75.

WRITTEN JHR DATE 810427 QA [illegible] DATE 4-27-81

APPROVED [illegible] DATE 4/27/81

General Procedure

1. All chironomid and oligochaete slides are allowed to dry before being stored in slide boxes labeled with project number and collection date.
2. Occasionally, organisms other than chironomids and oligochaetes must be dissected and mounted on slides. A note must be included on the Benthos Data Form to indicate that the organism, or parts of it, has been removed from the vial and placed on a slide. The slides, if not added to the reference collection, are stored in the labeled slide boxes with the oligochaetes and chironomids.
3. The mounting medium, used in slide preparation, is recorded on the Sorting and Slide Preparation Form.
4. The person (s) responsible for slide preparation initials and dates the Sorting and Slide Preparation Form to indicate that the slides have been made.
5. When complete, the Sorting and Slide Preparation Form is filed with the appropriate Benthos Data Forms by the benthos group.

WRITTEN JHR DATE 810427 QA [illegible] DATE 4-27-81

APPROVED [illegible] DATE 4/27/81

BENTHOS IDENTIFICATION PROCEDURES

1. All Slide mounted specimens are examined with a compound microscope while unmounted macroinvertebrates are identified with a binocular dissecting microscope.
2. All organisms are identified by certified personnel trained in the taxonomy of specific genera.
3. Organisms are identified to the lowest practical taxonomic level with the aid of a reference library and a reference collection.
4. Specimens are sent to experts, recognized in the field of macroinvertebrates, for confirmation when a species has not been previously collected or available keys do not adequately identify the organism. A file containing correspondence with consultants is maintained by the benthos group.
5. Identification of Slide Mounted Organisms
   a. The names of the slide mounted organisms and the number counted are recorded in the appropriate spaces on the laboratory analysis portion of the Benthos Data Form.
   b. The investigator responsible for the identification(s) initials the appropriate space on the laboratory analysis portion of the Benthos Data Form.
6. Identification of Unmounted Organisms
   a. The names of unmounted organisms and the number counted in the sample are recorded in the appropriate spaces on the laboratory analysis portion of the Benthos Data Form.
   b. The investigator responsible for the identification(s) initials the appropriate space on the laboratory analysis portion of the Benthos Data Form.

WRITTEN JHR DATE 810414 QA [signature] DATE 4-15-81

APPROVED [signature] DATE 4/14/81

c. When no vial is present for a sample (apparently indicating the absence of any organisms), the Sorting and Slide Preparation Form is consulted to ensure that organisms are actually absent, rather than having been overlooked.

7. An identification Checklist Form is maintained to ensure that all groups of organisms in a sample have been identified and to provide a record of the personnel responsible for those identifications.

8. When each group of organisms has been completely identified, the investigator responsible for the identification(s) initials and dates the appropriate space on the Identification Checklist Form. If more than one investigator works on an identification, both sets of initials must appear on the Identification Checklist Form.

9. When organisms of a major taxonomic group are not present, the word "none" or a dash appears in the appropriate space on the Identification Checklist Form.

10. When complete, the Identification Checklist Form is filed with the appropriate Benthos Data Forms by the benthos group.

BENTHOS SAMPLE ENUMERATION

1. The names of all organisms identified in a sample are listed on the laboratory analysis portion of the Benthos Data Form.
2. Each organism is assigned a unique species code number which is recorded on the Benthos Data Form. Code number files are maintained by the benthos group and by the data analysis group.
3. In addition, the following information must be supplied on the laboratory analysis portion of the Benthos Data Form.
   a. number counted
   b. number per sample - total number of organisms in each major category from which a subsample was selected for identification
   c. number per subsample - number of organisms in the subsample which were selected for identification
   d. sample conversion factor - if sample was subsampled the reciprocal of sample fraction sorted (equals one (1) if sample is not subsampled)
4. The collection device calibration conversion factor, calculated from the actual measured dimensions of the device, is recorded on the field data portion of the Benthos Data From.
5. All numerical conversions from the number of organisms counted to the number of organisms per square meter are done by the computer using the information previously described.
6. Upon completion of the laboratory analysis portion of the Benthos Data Form, the number one (1) is placed in the "end flag" column at the end of the last horizontal row of information.

WRITTEN JHR DATE 810427 QA RT DATE 4-27-81

APPROVED FJ DATE 4/27/81

7. If the sample contains no organisms, all spaces on the laboratory analysis portion of the Benthos Data Form remain "blank", except an "end flag" is noted as previously described.
8. The person(s) responsible for completing the data form information intitals and dates the appropriate space to indicate that the work has been completed.
9. All Benthos Data Forms are reviewed by a second person who initials and dates the appropriate space to indicate that the data has been checked.
10. If data are to be computerized, the Benthos Data Forms are xeroxed. The originals are filed by the data analysis group and the copies are filed by the benthos group with related sample set data.

WRITTEN JHR DATE 810427 QA [illegible] DATE 4-27-81
APPROVED [illegible] DATE 4/27/81

BENTHOS POST-TRIP DEPOSITION PROCEDURE

1. Samples are returned to the laboratory under prescribed environmental conditions.
2. All equipment is checked to ensure that it has been returned in good working condition.
3. The Benthos Equipment Checklist is filed in the group file.
4. The Benthos Data Forms are reviewed for completeness and proper coding by the investigator who then initials and dates the "prepared by" space on the field data side of each form.
5. The completed Benthos Data Forms are reviewed for correctness by a second person who initials and dates the "checked-by" space on the field data side of each form.
6. If the data are to be computerized, the field data side of each form is xeroxed. The originals are retained by the benthos group for use during laboratory analysis of samples and the copies are filed by the data analysis group.

WRITTEN TFD DATE 8/21/79 QA RT DATE 9-13-79

APPROVED [signature] DATE 9/21/79

EQUIPMENT OPERATION PROCEDURE

Equipment Identification: Surber Square Foot Sampler

Control Number: FE-11

Operation Procedure:

1. The surber square foot sampler is designed to sample a specific area of the bottom in a lotic (flowing water) habitat and can only be used in a stream shallow enough for the operator to stand with the sampler and handle rocks on the bottom.
2. Unfold the device and place it on the bottom rocks so that the water flows over the foot-square quadrat into the catch net supported by the verticle frame.
3. Gently, but thoroughly, clean rocks within the square-foot frame in the water so that the debris and organisms removed can flow into the net. More rocks than those on the surface of the substrate should be cleaned.
4. Rocks that lie under the quadrat frame, half in and half out of the frame, are either all included or all disregarded or a percentage are taken and cleaned. Consistency on the part of the investigator is the important consideration.
5. Remove sampler from water and transfer collected debris to an appropriately labeled container. Preserve sample with ten percent buffered formalin.

WRITTEN TFD DATE 8/21/79 QA RT DATE 9-13-79

APPROVED [signature] DATE 9/21/79

EQUIPMENT OPERATION PROCEDURE

Equipment Identification: Ponar Grab and Petersen Grab

Control Number: FE-1, FE-2, FE-3, FE-4, FE-10

Operation Procedure:

1. Inspect the instrument to ascertain that all parts are in good working condition and that the grab is securely fastened to its line.
2. Keeping clear of the jaws, and other working edges of the grab, move the jaws to the open position. Bring the free end of the horizontal locking bar into position in the locking notch on the upper bar. The closing mechanism will release when the sampler is on the bottom.
3. Lower the sampler smoothly through the water to a depth of a few feet above the bottom. When sure that the grab will fall properly to the bottom, allow it to descend the rest of the way.
4. Once the sampler is on the bottom, allow a moment for it to sink into the sediment, then slack off on the cable. This releases the tension on the upper bar which permits the lower bar to drop out of the locking notch. As tension is resumed on the cable, the jaws enclose the sediment.
5. Gently pull the grab out of the substrate and retrieve it with a constant upward motion. Jerky retrieval might cause the sediment to wash over the top of the sampler.
6. When the grab arrives at the surface, immediately place it into a bucket or pan. The bucket or pan is held at the water surface to catch the grab.
7. If rock, pieces of wood, or any hard materials have prevented the jaws of the grab from closing, recollect the sample.

WRITTEN JHR DATE 810427 QA [signature] DATE 4-27-81

APPROVED [signature] DATE 4/27/81

8. If the sample is acceptable, empty the grab into the bucket or pan. Hands should be used to ensure that all of the sediment is removed from the grab.
9. Add some water to the bucket or pan and gently mix the sample into a slurry. Pour the slurry into the appropriate mesh screening box (as per work scope) and "pan" the surface of the water to wash the smaller sized sediment through.
10. Empty the residue into an appropriately labeled container and add ten percent buffered formalin. If glass containers are used, rocks should not be stored with the screened sample. They should be washed or gently brushed clean of attached material.
11. At the conclusion of sampling operation, replace the safety pin to prevent accidential closing of the grab jaws in handling or shipping.

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APPENDIX B

PCB Chemistry Methodology and Quality Assurance Quality Control Documents for Water Analysis, Fish Tissue Analysis and Sediment Analysis

Raltech
SCIENTIFIC SERVICES

P O Box 7545 • Madison, Wisconsin 53707 • 608/241-4471
A Division of Ralston Purina Company

Other Raltech Scientific Services Laboratories
St. Louis MO
Gray Summit MO

DRAFT REPORT

Determination of PCBs in Sediment, Fish, and Water Samples

for

Camp Dresser & McKee Inc.
Milwaukee, Wisconsin

by

Raltech Scientific Services
A Division of Ralston Purina Company
3301 Kinsman Boulevard
Madison, Wisconsin 53704

July 27, 1981
Revised August 21, 1981

Reports are submitted to clients on a confidential basis. No reference to the work, the results or to Raltech Scientific Services in any form of advertising, news release or other public announcement may be made without written authorization from Raltech Scientific Services.

INTRODUCTION

The purpose of this study was to determine the polychlorinated biphenyl (PCB) levels in fish, sediment, and water samples collected by Camp Dresser & McKee. The percentage of PCB associated with the suspended solids in the water also was to be determined.

Twenty-two sediment samples and 11 water samples were received from Camp Dresser & McKee on May 27, 1981. Eight fish samples were received on June 9, 1981. All samples were received in good condition.

SAMPLE PREPARATION

Sediment

The excess water was decanted from the sediment samples. All samples except F-2, I-1, I-2, J-2, and L-1 were placed in an aluminum foil-lined pan and allowed to air dry at room temperature for 2-3 days. The air-dried samples were passed through a #10 sieve. The unsieved material was discarded and the sieved samples were placed in 8-oz glass bottles. Sieves were cleaned between samples with water, acetone, and hexane. Samples F-2, I-1, I-2, J-2, and L-1 did not contain any large particles. Therefore, these samples were mixed mechanically using a spatula prior to subsampling for analysis.

Fish

Fish samples were ground as received in a Hobart food grinder. The ground homogenate was placed in a suitable sized, acetone-rinsed glass jar, and the jar was capped with aluminum foil.

Water

Approximately 1200 mL of water were filtered through a sintered glass funnel containing two Whatman #4 filter papers, and through a 0.22-μ Type GS Millipore filter. This represented the filtered water to be analyzed for PCBs. An aliquot of the unfiltered water also was analyzed for PCBs.

PROCEDURES

Sediment

After sample preparation, 20-g aliquots of the soil were weighed into 150-mL beakers. Wet samples were allowed to air dry in a hood for 2-3 days. After drying, the samples were transferred to a Soxhlet extractor with a glass wool plug. A plug of glass wool was placed on top of the soil and the extractor was fitted with a 250-mL Erlenmeyer flask. The beaker was rinsed with 200 mL of 50:50 hexane:acetone (v:v) and transferred carefully through the top of the extractor. Two to three boiling chips were added to the Erlenmeyer flask. The apparatus was fitted with a condenser and allowed to reflux for 8 hours, after which the Erlenmeyer flask was removed and the solvent concentrated on a steam bath to 1-2 mL. The extract was transferred to a 25-mL volumetric flask and made to volume with petroleum ether.

A Florisil column was prepared by placing approximately 6 in. of PR Grade Florisil (previously standardized) into a 19 mm id x 300 mm column with a 300-mL reservoir. The column was topped with approximately 1/4 in. of sodium sulfate, prewetted with 150 mL of petroleum ether, and the eluate discarded. Just as the petroleum ether reached the top of the sodium sulfate, a 5-mL aliquot of the sample extract was placed on the column, the receiver was changed, and the column eluted with 200 mL of petroleum ether. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume. Appropriate aliquots were injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculations).[1]

A separate 10-g sample was placed in a preweighed aluminum foil dish. The sample and dish were placed in a 110°C oven overnight. The aluminum dish was removed from the oven, desiccated, reweighed, and the percentage moisture was calculated.

Fish

After sample preparation, 25 g or the entire sample was weighed into a 150-mL beaker. The sample was mixed with approximately 150 g of anyhydrous sodium sulfate. The mixture was transferred to a 1-qt Waring blender cup containing 50 mL of petroleum ether. Approximately 50-60 g of sodium sulfate were added to the beaker and transferred to the Waring blender cup; this step was repeated. Petroleum ether (150 mL) was added to the beaker and transferred to the blender cup. The mixture in the blender cup was blended at medium speed for 2-4 minutes. After blending, the petroleum ether was decanted into a 500-mL Erlenmeyer flask through a 60-mL powder funnel lined with glass wool. The mixture in the blender was re-extracted with two 1-L portions of petroleum ether, and decanted after each addition of petroleum ether. After the third extraction, the solid material was transferred to the powder funnel and rinsed with 50 mL of petroleum ether. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume with petroleum ether. A 5-mL aliquot was transferred to a tared vial.

The solvent was removed and the vial placed in a 40°C oven for approximately 16 hours, after which the vial was removed from the oven, desiccated, reweighed, and the percentage lipid calculated. A separate 5-mL aliquot was transferred to a Florisil column as described for sediments. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume. Appropriate aliquots were injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculation).[2]

Water

One liter of water was transferred to a 2-L separatory funnel. The graduated cylinder in which the water was measured was rinsed with 150 mL of 15% dichloromethane in petroleum ether (v:v) and the rinse transferred to the 2-L separatory funnel. The separatory funnel was shaken for 2 minutes and the layers allowed to separate for 5-10 minutes. The lower layer was drained into the graduated cylinder. The top layer was transferred through a powder funnel (lined with glass wool and topped with 50-100 g of sodium sulfate) into a 500-mL round bottom flask. The above steps were repeated twice, each time transferring the top layer to the round bottom flask. After the final extraction the separatory funnel was rinsed with 50 mL of 15% dichloromethane in petroleum ether and the rinse transferred through the powder funnel into the round bottom flask. The combined extracts were concentrated to approximately 2 mL on a flash evaporator with a water bath at 40-50°C. The extract was transferred quantitatively with three 5-mL rinses of petroleum ether to a Florisil column and eluted as previously described. The resulting solution was concentrated on a steam bath to 2-3 mL, transferred to a 10-mL volumetric flask, and made to volume with petroleum ether. An appropriate aliquot was injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculations).[3]

RESULTS AND DISCUSSION

The results for all samples were calculated as Aroclor 1242 because the PCB pattern for most of the samples resembled Aroclor 1242. In a few cases there appeared to be some pattern shifts; however, all data presented in the attached tables were calculated as Aroclor 1242.

Sediment

The PCB results for the sediment samples are presented in Table 1. Three samples were analyzed in duplicate and the results fall within the expected range of the analysis (less than 20% relative standard error).

Three laboratory soils which had previously been shown to contain no detectable levels of PCB were spiked with various levels of PCB. The results are presented in Table 2. After discussion with Mr. Ronald Wenn of Camp Dresser & McKee) two samples were selected for reanalyses and recoveries.

Samples C-2, and D-1 were reanalyzed and also spiked with Aroclor 1242. Sample C-2 was spiked at 0.10 mg/kg and D-1 at 0.20 mg/kg. The results are presented in Table 2. The recoveries generally fall within the expected range (70-130%). A 160% recovery was obtained on sample C-2 when spiked with Aroclor 1242. However, because the spiking level was at the detection limit, this variation is not unusual.

A reagent blank analyzed with the samples contained less than 0.10 mg/kg PCB (the limit of detection) calculated as Aroclor 1242.

Fish

The PCB results for the fish are presented in Table 3. Sample G was analyzed in duplicate. Aroclor 1242 was added to laboratory control fish which was free of PCB's. The results are presented in Table 4. A reagent blank analyzed with the sample contained less than 0.10 ppm PCB (the limit of detection) calculated as Aroclor 1242.

Water

The PCB results for the unfiltered and filtered water are presented in Table 5. The recoveries of PCBs in unfiltered and filtered water are presented in Table 6.

The recovery data indicate that the filtration procedure removes over 90% of the PCB from water. One of the objectives of this experiment was to determine the amount of PCB associated with the suspended material in the water. It was anticipated that the filtration procedure would provide the required data. However, Milli-Q water spiked with PCB also showed a loss of over 90% through filtration. Assuming there is little or no suspended material in this water, it appeared that the filters were removing the PCB from the water itself; therefore, the amount of PCB associated with the suspended material could not be determined. After discussion with Mr. Ronald Wenn of Camp Dresser & McKee, it was decided to reanalyze the water from location F. One aliquot was analyzed uncentrifuged, and another aliquot was centrifuged to remove the suspended solids. The results are presented in Table 5, and indicate a 0.8-µg/L reduction in PCBs following centrifugation. At this point it was agreed with Mr. Wenn that several additional samples would be centrifuged and analyzed, and that recoveries would be run on a sample and on Milli-Q-filtered water. Appendix II details these analyses.

A blank analyzed with samples indicated levels of less than 0.10 µg/L PCB (the limit of detection) calculated as Aroclor 1242.

References.

1. U.S. Environmental Protection Agency, "Chemistry Laboratory Manual for Bottom Sediment and Elutriate Testing," Chicago, Illinois, March 1979, CRL Method No. 198 through 207.

2. U.S. Department of Health Education and Welfare, Food and Drug Administration, Pesticide Analytical Manual Vol. I, "Methods Which Detect Multiple Residues," Second Edition, 1966, Revisions 1969-1979. Section 211.13F.

3. U.S. Environmental Protection Agency, "Chemistry Laboratory Manual for Bottom Sediment and Elutriate Testing," Chicago, Illinois, March 1979, CRL Method No. 144 to 183, 651 to 732, 210 and 219.

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8/21/81
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Robert M. Lusskin, PhD
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Table 1

Polychlorinated Biphenyl Levels in Sediments

Raltech Number	Sample Identification				Moisture (%)	PCB Calculated as Aroclor 1242 (mg/kg)*	
	Location	Day	Month	Year		Wet Weight Basis	Dry Weight Basis
867508	B-1	20	5	81	0.70	201.0	202.0
867509	B-2	20	5	81	0.60	108.0	109.0
867509	Duplicate				0.58	128.0	129.0
867510	C-1	20	5	81	0.70	<0.10	<0.10
867511	C-2	20	5	81	0.70	0.12	0.12
867512	D-1	21	5	81	0.90	0.22	0.22
867513	D-2	21	5	81	1.10	<0.10	<0.10
867514	E-1	21	5	81	1.09	477.0	482.0
867515	E-2	21	5	81	0.59	99.3	99.9
867516	F-1	21	5	81	1.00	42.9	43.3
867517	F-2	21	5	81	27.8	8.23	11.4
867517	Duplicate				28.1	7.01	9.75
867518	G-1	20	5	81	1.36	101.0	102.0
867519	G-2	20	5	81	0.98	106.0	107.0
867520	H-1	20	5	81	0.88	112.0	113.0
867521	H-2	20	5	81	0.58	59.9	60.3
867522	I-1	20	5	81	39.1	0.53	0.87
867523	I-2	20	5	81	29.1	0.12	0.17
867524	J-1	19	5	81	0.80	0.40	0.40
867524	Duplicate				0.98	0.39	0.39
867525	J-2	19	5	81	36.3	0.51	0.80
867526	K-1	19	5	81	1.19	3.58	3.62
867527	K-2	19	5	81	0.98	102.0	103.0
867528	L-1	19	5	81	35.8	1.84	2.87
867529	L-2	19	5	81	1.42	19.0	19.3

* Reagent blank analyzed with samples contained less than 0.10 mg/kg PCB calculated as Aroclor 1242. Limit of detection was 0.10-mg/kg based on a 20-g sample.

Table 2

Recovery of Polychlorinated Biphenyl from PCB-Free Sediments

Aroclor Added	Level Added (mg/kg)	Level Found (mg/kg)	Percent Recovery
Aroclor 1254	1.00	0.89	89
Aroclor 1254	3.00	2.06	69
Aroclor 1242	2.00	1.78	89

Recovery of Polychlorinated Biphenyl (Aroclor 1242) from Field Samples

Sample Code	Level Added (mg/kg)	Level in Sample (mg/kg)	Level Found (mg/kg)	Percent Recovery
C-2	0	0.16	0.16	---
C-2	0.10	0.16	0.32	160
D-1	0	0.22	0.22	---
D-1	0.20	0.22	0.45	115

Table 3

Polychlorinated Biphenyl Levels in Fish

Raltech Number	Sample Identification					PCB Calculated as Aroclor 1242 (mg/kg)*	Percent Lipid
	Location	Day	Month	Year	Species		
872777	F	19	5	81	Creek Chub	35.7	0.78
872778	F	19	F	81	Green Sun Fish	184.0	2.46
872779	C	19	5	81	Striped Shiner	1.42	2.46
872780	C	19	5	81	Creek Chub	0.26	1.68
872781	C	19	5	81	Green Sun Fish	0.44	0.98
872782	G	21	5	81	White Sucker	9.28	0.67
872782	Duplicate					7.10	0.61
872783	J	21	5	81	Lougeur Sun Fish	92.5	2.86
872784	I	21	5	81	Big Mouth Buffalo	244.0	3.14

* Reagent blank analyzed with samples contained less than 0.10 mg/kg PCB calculated as Aroclor 1242. Limit of detection was 0.10 mg/kg based on a 25-g sample.

Table 4

Recovery of Polychlorinated Biphenyls from PCB-Free Fish

Aroclor Added	Level Added mg/kg	Level Found mg/kg	Percent Recovery
Aroclor 1242	0.80	0.75	94.0

Table 5

Polychlorinated Biphenyl Levels
in Unfiltered and Filtered Water (µg/L)

Raltech Number	Sample Identification				PCB Calculated as Aroclor 1242 (µg/L)*	
	Location	Day	Month	Year	Unfiltered	Filtered
867497	B	20	5	81	5.6	0.11
867498	C	20	5	81	<0.10	<0.10
867499	D	21	5	81	<0.10	<0.10
867500	E	21	5	81	3.7	0.11
867501	F	21	5	81	3.0	0.18
867502	G	20	5	81	2.8	<0.10
867503	H	20	5	81	3.2	<0.10
867504	I	20	5	81	0.17	<0.10
867505	J	19	5	81	0.16	<0.10
867506	K	19	5	81	0.32	<0.10
867507	L	19	5	81	0.39	a

Polychlorinated Biphenyl Level
in Centrifuged and Uncentrifuged Water

Raltech Number	Sample Identification				PCB Calculated on Aroclor 1242 (µg/L)	
	Location	Day	Month	Year	UnCentrifuged	Centrifuged
867501	F	21	5	81	2.6	1.8

* Reagent blank analyzed with the sample contained less than 0.10 µg/L PCB calculated as Aroclor 1242. Limit of detection was 0.10 µg/L based on a 1-L sample.

a Sample extract could not be recovered.

Table 6

Recovery of PCBs from Filtered and Unfiltered Tap Water

Level Added (µg/L)	Level Found (µg/L)		Percent Recovery	
	Unfiltered	Filtered	Unfiltered	Filtered
0.20	0.21	<0.10	105	0
5.0	4.6	0.21	92	4.2

Recovery of PCB from Filtered Milli-Q Water

Level Added (µg/L)	Level Found (µg/L)	Percent Recovery
3.33	0.16	5.0

APPENDIX I

Instrument Conditions and Calculations

All sample extracts were injected after cleanup onto a gas chromatograph equipped with a linearized electron capture detector, automatic liquid sampler, and interfaced to a Hewlett Packard 3356C data acquisition system.

The following instrument conditions were used:

Instrument: Hewlett Packard Model 5713A
Column: 6 ft x 4 mm id glass
Column packing: 3% OV-1 on 80/100 mesh Gas Chrom Q
Column temperature: 220°C
Injector temperature: 250°C
Detector temperature: 300°C
Carrier gas: 95% argon/5% methane.
Column flow: 33 mL/minute
Injection volume: nominal 4 µL.

The PCBs were calculated against standard Aroclor 1242 by comparing retention times and peak areas. The areas of the 15 major peaks observed in the Aroclor 1242 standard were compared to the areas of the same peaks in the samples. Sample PCB concentrations greater than the equivalent of 0.40 µg/mL were diluted and re-injected.

The calculations were as follows:

Soils and Fish

A = Sample weight (grams)
B = Initial volume (milliliters)
C = A/B
D = Concentration of standard (microgram/milliliter)
E = Area of peaks in standard (summation)
F = Area of peaks in sample (summation)
G = Dilution factor - $\frac{X1 \times X2 \quad Xn}{Z1 \times Z2 \quad Zn}$

Where:

X_1 = Volume of first dilution (milliliters)
$X_2 - X_n$ = Subsequent volume of each dilution (milliliters)
Z_1 = Aliquot taken for first dilution (milliliters)
$Z_2 - Z_n$ = Subsequent aliquot taken for each dilution (milliliters)

$\frac{D/E \times F \times G}{C}$ = microgram/gram = milligrams/kilogram = Amount of Aroclor present on an as is basis (ppm).

To correct from an as is basis to a dry weight basis, the milligram/kilogram or parts per million value is multiplied by 100 and divided by 100 minus the percent moisture value.

To correct from an as is basis to a lipid or fat basis, the milligram/kilogram or parts per million value is multiplied by 100 and divided by the percentage lipid.

Water

A = Sample volume (milliliters)
B = Initial volume (milliliters)
C = A/B
D = Concentration of standard (microgram per milliliter)
E = Area of peaks in standard (summation)
F = area of peaks in sample (summation)
G = Dilution factor - $\frac{X1 \times X2 \quad Xn}{Z1 \quad Z2 \quad Zn}$

Where:

X_1 = Volume of first dilution (milliliters)
$X_2 - X_n$ = Subsequent values of each dilution (milliliters)
Z_1 = Aliquot taken for first dilution (milliliters)
$Z_2 - Z_n$ = Subsequent aliquot taken for each dilution milliliters).

$\frac{D/E \times F \times G}{C} \times 1000$ = micrograms per liter of Aroclor present.

APPENDIX II

Background

After review of the data presented in the July 27 report to Camp Dresser, it was agreed with Mr. Ronald Wenn that samples coded B, E, G, H, I, and K contained enough sample to determine the PCB content using the centrifugation method. Also, to determine recoveries, sample L was split; one portion was analyzed uncentrifuged and the remaining portion was spiked with PCB and centrifuged. A sample of Milli-Q-filtered water was spiked with PCB and analyzed for PCB content both centrifuged and uncentrifuged.

Methodology

The sample containers were mixed by shaking vigorously for approximately 30 seconds. The samples were transferred to clean 8-oz jars and centrifuged at 2500 rpm for 5 minutes. The water was decanted carefully into a 1-L graduated cylinder. Additional water was centrifuged until at least 500 mL of centrifuged water were obtained. The water was extracted and the amount of PCB determined as described in the report.

Results

The PCB results are presented in Table I and recovery data are contained in Table II.

Table I

Polychlorinated Biphenyl Levels
in Centrifuged Water (µg/L)

Raltech Number	Sample Identification				PCB Calculated as Aroclor 1242 (µg/L)
	Location	Day	Month	Year	
867497	B	20	5	81	2.2
867500	E	21	5	81	2.0
867502	G	20	5	81	1.1
867503	H	20	5	81	1.6
867504	I	20	5	81	0.10
867506	K	19	5	81	0.12

Table II

Recovery of PCB Added to Test Water
and Milli-Q-Filtered Water

Sample Identification: Sample L; Day 19; Month 5; year 81

Level of PCB in uncentrifuged portion - 0.22 µg/L
Level of PCB added - 2.5 µg/L
Level of PCB after centrifugation - 1.4 µg/L
Percent recovery - 47.2%

Sample Identification: Milli-Q-Water

Level of PCB added - 5.0 µg/L
Level of PCB before centrifugation - 3.8 µg/L
Percent recovery - 76.0%
Level of PCB after centrifugation - 3.0 µg/L
Percent recovery - 60.0%

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DRAFT REPORT

Determination of PCBs in Sediment, Fish, and Water Samples

(Camp Dresser & McKee Project 1186)

for

Camp Dresser & McKee Inc.
Milwaukee, Wisconsin

by

Raltech Scientific Services
A Division of Ralston Purina Company
3301 Kinsman Boulevard
Madison, Wisconsin 53704

October 6, 1981

Reports are submitted to clients on a confidential basis. No reference to the work, the results or to Raltech Scientific Services in any form of advertising, news release or other public announcement may be made without written authorization from Raltech Scientific Services.

INTRODUCTION

The purpose of this study was to determine the polychlorinated biphenyl (PCB) levels in fish, sediment, and water samples collected by Camp Dresser & McKee. The amount of PCB associated with the suspended solids in the water was to be determined by analyzing the water as received and after centrifugation.

Thirty-one sediment samples, 11 water samples, and 11 fish samples were received from Camp Dresser & McKee on September 4, 1981. All samples were received in good condition.

SAMPLE PREPARATION

Sediment

The excess water was decanted from the sediment samples. All samples were placed in an aluminum foil-lined pan and allowed to air dry at room temperature for 4-6 days. The air-dried samples were passed through a #10 sieve. The unsieved material was discarded and the sieved samples were placed in 32-oz glass bottles. Sieves were cleaned between samples with water, acetone, and hexane.

Fish

Fish samples were ground as received in a Hobart food grinder. The ground homogenate was placed in a suitable sized, acetone-rinsed glass jar, and the jar was capped with aluminum foil.

Water

The sample containers were mixed by shaking vigorously for approximately 30 seconds. An aliquot equivalent to approximately 1 L was transferred to an 8-oz glass bottle and centrifuged at 2500 rpm for 5 minutes.

PROCEDURES

Sediment

After sample preparation, 20-g aliquots of the soil were weighed into 150-mL beakers. After drying, the samples were transferred to a Soxhlet extractor with a glass wool plug. A plug of glass wool was placed on top of the soil

and the extractor was fitted with a 250-mL Erlenmeyer flask. The beaker was rinsed with 200 mL of 50:50 hexane:acetone (v:v) and transferred carefully through the top of the extractor. Two to three boiling chips were added to the Erlenmeyer flask. The apparatus was fitted with a condenser and allowed to reflux for 8 hours, after which the Erlenmeyer flask was removed and the solvent concentrated on a steam bath to 1-2 mL. The extract was transferred to a 25-mL volumetric flask and made to volume with petroleum ether.

A Florisil column was prepared by placing approximately 6 in. of PR Grade Florisil (previously standardized) into a 19 mm id x 300 mm column with a 300-mL reservoir. The column was topped with approximately 1/4 in. of sodium sulfate, prewetted with 150 mL of petroleum ether, and the eluate discarded. Just as the petroleum ether reached the top of the sodium sulfate, a 5-mL aliquot of the sample extract was placed on the column, the receiver was changed, and the column eluted with 200 mL of petroleum ether. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume. Appropriate aliquots were injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculations).[1]

A separate 10-g sample was placed in a preweighed aluminum foil dish. The sample and dish were placed in a 110°C oven overnight. The aluminum dish was removed from the oven, desiccated, reweighed, and the percentage moisture was calculated.

Fish

After sample preparation, 25 g or the entire sample was weighed into a 150-mL beaker. The sample was mixed with approximately 150 g of anyhydrous sodium sulfate. The mixture was transferred to a 1-qt Waring blender cup containing 50 mL of petroleum ether. Approximately 50-60 g of sodium sulfate were added to the beaker and transferred to the Waring blender cup; this step was repeated. Petroleum ether (150 mL) was added to the beaker and transferred to the blender cup. The mixture in the blender cup was blended at medium speed for 2-4 minutes. After blending, the petroleum ether was decanted into a 500-mL Erlenmeyer flask through a 60-mL powder funnel lined with glass wool. The mixture in the blender was re-extracted with two 1-L portions of petroleum ether, and decanted after each addition of petroleum ether. After the third extraction, the solid material was transferred to the powder funnel and rinsed with 50 mL of petroleum ether. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume with petroleum ether. A 5-mL aliquot was transferred to a tared vial. The solvent was removed and the vial placed in a 40°C oven for approximately 16 hours, after which the vial was removed from the oven, desiccated, reweighed, and the percentage lipid calculated. A separate 5-mL aliquot was transferred to a Florisil column as described for sediments. The resulting solution was concentrated on a steam bath to 3-5 mL, transferred to a 25-mL volumetric flask, and made to volume. Appropriate aliquots were injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculation).[2]

Water

One liter of water was transferred to a 2-L separatory funnel. The graduated cylinder in which the water was measured was rinsed with 150 mL of 15% dichloromethane in petroleum ether (v:v) and the rinse transferred to the 2-L separatory funnel. The separatory funnel was shaken for 2 minutes and the layers allowed to separate for 5-10 minutes. The lower layer was drained into the graduated cylinder. The top layer was transferred through a powder funnel (lined with glass wool and topped with 50-100 g of sodium sulfate) into a 500-mL round bottom flask. The above steps were repeated twice, each time transferring the top layer to the round bottom flask. After the final extraction the separatory funnel was rinsed with 50 mL of 15% dichloromethane in petroleum ether and the rinse transferred through the powder funnel into the round bottom flask. The combined extracts were concentrated to approximately 2 mL on a flash evaporator with a water bath at 40-50°C. The extract was transferred quantitatively with three 5-mL rinses of petroleum ether to a Florisil column and eluted as previously described. The resulting solution was concentrated on a steam bath to 2-3 mL, transferred to a 10-mL volumetric flask, and made to volume with petroleum ether. An appropriate aliquot was injected onto a gas chromatograph equipped with an electron capture detector (see Appendix I for instrument conditions and calculations).[3]

RESULTS AND DISCUSSION

The results for all samples were calculated as Aroclor 1242 because the PCB pattern for most of the samples resembled Aroclor 1242. In a few cases there appeared to be some pattern shifts; however, all data presented in the attached tables were calculated as Aroclor 1242.

Sediment

The PCB results for the sediment samples are presented in Table 1. Two samples were analyzed in duplicate and the results fall within the expected range of the analysis (less than 20% relative standard error).

Two laboratory soils which had previously been shown to contain no detectable levels of PCB were spiked with various levels of PCB. The results are presented in Table 2.

Two control soil blanks analyzed with the samples contained less than 0.10 mg/kg PCB (the limit of detection) calculated as Aroclor 1242. The results are presented in Table 1.

Fish

The PCB results for the fish are presented in Table 3. Sample K was analyzed in duplicate. Aroclor 1242 was added to laboratory control fish which was

free of PCBs. The results are presented in Table 4. A control blank fish analyzed with the sample contained less than 0.10 ppm PCB (the limit of detection) calculated as Aroclor 1242.

Water

The PCB results for the uncentrifuged and centrifuged water are presented in Table 5. The recoveries of PCBs in uncentrifuged and centrifuged water are presented in Table 6.

A blank analyzed with samples indicated levels of less than 0.10 µg/L PCB (the limit of detection) calculated as Aroclor 1242.

References.

1. U.S. Environmental Protection Agency, "Chemistry Laboratory Manual for Bottom Sediment and Elutriate Testing," Chicago, Illinois, March 1979, CRL Method No. 198 through 207.

2. U.S. Department of Health Education and Welfare, Food and Drug Administration, Pesticide Analytical Manual Vol. I, "Methods Which Detect Multiple Residues," Second Edition, 1966, Revisions 1969-1979. Section 211.13F.

3. U.S. Environmental Protection Agency, "Chemistry Laboratory Manual for Bottom Sediment and Elutriate Testing," Chicago, Illinois, March 1979, CRL Method No. 144 to 183, 651 to 732, 210 and 219.

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Table 1

Polychlorinated Biphenyl Levels in Sediments (mg/kg)

Raltech Number	Sample Identification					Moisture (%)	PCB Calculated as Aroclor 1242 (mg/kg)	
	Location	Day	Month	Year	Comments		Wet Weight Basis	Dry Weight Basis
393798	B	2 & 3	9	81	Right Bank	0.1	24.1	24.1
393799	C	2 & 3	9	81	Right Bank	2.1	<0.10	<0.10
893800	D	2 & 3	9	81	Right Bank	1.9	32.1	32.7
393801	E	2 & 3	9	81	Right Bank	1.3	340.0	344.0
393802	F	2 & 3	9	81	Right Bank	2.1	205.0	209.0
893803	H	2 & 3	9	81	Right Bank	2.2	17.8	18.2
893804	I	2 & 3	9	81	Right Bank	1.6	1.44	1.[illegible]
393805	J	2 & 3	9	81	Right Bank	1.5	0.70	0.[illegible]
393806	K	2 & 3	9	81	Right Bank	1.7	2.52	2.56
893807	L	2 & 3	9	81	Right Bank	1.8	19.9	20.3
393808	B	2 & 3	9	81	Left Bank	0.3	111.0	111.0
393809	C	2 & 3	9	81	Left Bank	1.1	<0.10	<0.10
893810	D	2 & 3	9	81	Left Bank	2.6	18.4	18.9
893811	E	2 & 3	9	81	Left Bank	1.6	225.0	229.0
393812	F	2 & 3	9	81	Left Bank	1.8	280.0	285.0
393813	H	2 & 3	9	81	Left Bank	1.4	39.1	39.[illegible]
893814	I	2 & 3	9	81	Left Bank	1.5	0.74	0.[illegible]
393815	J	2 & 3	9	81	Left Bank	1.5	0.64	0.65
393816	K	2 & 3	9	81	Left Bank	5.5	7.42	7.85
893817	L	2 & 3	9	81	Left Bank	1.9	4.36	4.44
896509	L	2 & 3	9	81	Left Bank	2.0	4.22	4.31*
393818	B	2 & 3	9	81	Water Shed Composite	0.4	95.6	96.0
396510	B	2 & 3	9	81	Water Shed Composite	0.4	92.4	93.0*
893819	C	2 & 3	9	81	Water Shed Composite	1.2	<0.10	<0.10
393820	D	2 & 3	9	81	Water Shed Composite	1.7	80.6	82
393821	E	2 & 3	9	81	Water Shed Composite	1.4	129.0	131.0
893822	F	2 & 3	9	81	Water Shed Composite	1.6	150.0	152.0
893823	H	2 & 3	9	81	Water Shed Composite	1.6	43.6	44.3
393824	I	2 & 3	9	81	Water Shed Composite	1.2	1.92	1.94
393825	J	2 & 3	9	81	Water Shed Composite	1.4	2.55	2.59
893826	K	2 & 3	9	81	Water Shed Composite	1.5	28.6	29.0
393827	L	2 & 3	9	81	Water Shed Composite	1.5	4.15	4.21
393828	A	2 & 3	9	81	Water Shed Composite	0.8	38.4	38.7
896511		Control Soil Blank				0.5	<0.10	<0.10
896512		Control Soil Blank				0.5	<0.10	<0.10

* Duplicate.

Table 2

Recovery of Polychlorinated Biphenyl (Aroclor 1242)
from PCB-Free Sediments

Raltech Number	Level Added (mg/kg)	Level Found (mg/kg)	Percent Recovery
896513	0.49	0.51	104
896514	0.49	0.54	110

Table 3

Polychlorinated Biphenyl Levels in Fish
(mg/kg)

Raltech Number	Sample Identification					PCB Calculated as Aroclor 1242 (mg/kg)	Percent Lipid
	Location	Day	Month	Year	Species		
893829	C	1 & 2	9	81	Sunfish	0.73	0.79
893830	C	1 & 2	9	81	Sucker	0.21	0.40
893831	C	1 & 2	9	81	Longeared Sunfish	0.14	0.38
893832	K	1 & 2	9	81	Grenter Redhorse	11.7	2.07
893833	K	1 & 2	9	81	Longeared Sunfish	28.4	1.75
896515	K	1 & 2	9	81	Longeared Sunfish	31.9	1.95*
893834	I	1 & 2	9	81	Longeared Sunfish	20.0	2.56
893835	L	1 & 2	9	81	Longeared Sunfish	42.5	3.61
893836	J	1 & 2	9	81	Longeared Sunfish	46.1	3.35
893837	I	1 & 2	9	81	Grenter Redhorse	21.4	2.42
893838	C	1 & 2	9	81	Creek Chub	262.0	3.11
893839	F	1 & 2	9	81	W. Sucker	571.0	3.79
896516	Control Blank Fish					<0.10	0.94

* Duplicate.

Table 4

Recovery of Polychlorinated Biphenyl (Aroclor 1242)
from PCB-Free Fish

Raltech Number	Level Added (mg/kg)	Level Found (mg/kg)	Percent Recovery
896517	0.40	0.36	90

Table 5

Polychlorinated Biphenyl Levels
in Centrifuged and Uncentrifuged Water (µg/L)

Raltech Number	Sample Identification				PCB Calculated as Aroclor 1242 (µg/L)	
	Location	Day	Month	Year	Uncentrifuged	Centriguged
893840	A	2 & 3	9	81	9.0	
893841	A	2 & 3	9	81		3.5
895434	A	2 & 3	9	81		3.6*
893842	B	2 & 3	9	81	10.3	
895435	B	2 & 3	9	81	11.2*	
893843	B	2 & 3	9	81		3.2
893844	C	2 & 3	9	81	<0.10	
893845	C	2 & 3	9	81		<0.10
893846	D	2 & 3	9	81	0.45	
893847	D	2 & 3	9	81		0.18
893848	E	2 & 3	9	81	8.0	
893849	E	2 & 3	9	81		4.8
893850	F	2 & 3	9	81	7.0	
893851	F	2 & 3	9	81		4.1
893852	H	2 & 3	9	81	4.0	
893853	H	2 & 3	9	81		2.3
893854	I	2 & 3	9	81	0.28	
893855	I	2 & 3	9	81		0.14
893856	J	2 & 3	9	81	0.23	
893857	J	2 & 3	9	81		0.10
893858	K	2 & 3	9	81	0.30	
893859	K	2 & 3	9	81		0.16
894860	L	2 & 3	9	81	0.46	
893861	L	2 & 3	9	81		0.27
895438		Water Blank			<0.10	
895439		Water Blank				<0.10

* Duplicate.

Table 6

Recovery of PCBs from Uncentrifuged
and Centrifuged Milli-Q-Water

Raltech Number	Level Added (µg/L)	Level Found (µg/L)		Percent Recovery
		Uncentrifuged	Centrifuged	
895436	3.33	2.8	-	84.4
895437	-	-	2.0	61.3

APPENDIX I

Instrument Conditions and Calculations

All sample extracts were injected after cleanup onto a gas chromatograph equipped with a linearized electron capture detector, automatic liquid sampler, and interfaced to a Hewlett Packard 3356C data acquisition system.

The following instrument conditions were used:

Instrument: Hewlett Packard Model 5713A
Column: 6 ft x 4 mm id glass
Column packing: 3% OV-1 on 80/100 mesh Gas Chrom Q
Column temperature: 220°C
Injector temperature: 250°C
Detector temperature: 300°C
Carrier gas: 95% argon/5% methane.
Column flow: 33 mL/minute
Injection volume: nominal 4 µL.

The PCBs were calculated against standard Aroclor 1242 by comparing retention times and peak areas. The areas of the 15 major peaks observed in the Aroclor 1242 standard were compared to the areas of the same peaks in the samples. Sample PCB concentrations greater than the equivalent of 0.40 µg/mL were diluted and re-injected.

The calculations were as follows:

Soils and Fish

A = Sample weight (grams)
B = Initial volume (milliliters)
C = A/B
D = Concentration of standard (microgram/milliliter)
E = Area of peaks in standard (summation)
F = Area of peaks in sample (summation)
G = Dilution factor - $\frac{X1 \times X2 \quad Xn}{Z1 \times Z2 \quad Zn}$

Where:

X_1 = Volume of first dilution (milliliters)
$X_2 - X_n$ = Subsequent volume of each dilution (milliliters)
Z_1 = Aliquot taken for first dilution (milliliters)
$Z_2 - Z_n$ = Subsequent aliquot taken for each dilution (milliliters)

$\frac{D/E \times F \times G}{C}$ = microgram/gram = milligrams/kilogram = Amount of Aroclor present on an as is basis (ppm).

To correct from an as is basis to a dry weight basis, the milligram/kilogram or parts per million value is multiplied by 100 and divided by 100 minus the percent moisture value.

To correct from an as is basis to a lipid or fat basis, the milligram/kilogram or parts per million value is multiplied by 100 and divided by the percentage lipid.

Water

A = Sample volume (milliliters)
B = Initial volume (milliliters)
C = A/B
D = Concentration of standard (microgram per milliliter)
E = Area of peaks in standard (summation)
F = area of peaks in sample (summation)
G = Dilution factor - $\frac{X1 \times X2 \quad Xn}{Z1 \quad Z2 \quad Zn}$

Where:

X_1 = Volume of first dilution (milliliters)
X_2 - X_n = Subsequent values of each dilution (milliliters)
Z_1 = Aliquot taken for first dilution (milliliters)
Z_2 - Z_n = Subsequent aliquot taken for each dilution milliliters).

$\frac{D/E \times F \times G}{C} \times 1000$ = micrograms per liter of Aroclor present.

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Table 9

Quality Control Data - Water Quality

A. Duplicate Analysis from Spring Field Samples

Station	Level in Samples (mg/l)					
	Organic Nitrogen	Ammonia Nitrogen	Nitrate-Nitrite Nitrogen	Total Phosphorus	Total Solids	Total Suspended Solids
A-1	1.36 1.68	--	1.10 1.19	1.27 1.28	--	13.3 14.0
B-1	--	--	--	--	472 472	--
B-2	--	--	3.65 3.28	--	--	--
D-1	--	--	--	--	316 296	--
D-2	--	--	2.70 2.67	--	--	--
E-1	--	--	--	--	--	10.3 8.5
F-1	--	--	3.09 3.00	0.076 0.076	--	--
G-2	1.20 1.12	0.01 0.09	--	--	--	--
I-1	1.04 1.13	0.20 0.11	--	--	--	34.3 33.7
J-2	0.20 0.29	--	2.26 2.28	--	--	--
K-1	--	--	1.33 1.42	0.096 0.073	--	--
L-1	0.95 1.13	0.30 0.12	--	--	--	--

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B. Recovery of Reference Standards Analyses

Paremeter	Concentration Known (mg/l)	Concentration Found (mg/l)	Percent Recovery
Ammonia Nitrogen	2.00	1.95	97.5
	5.00	4.89	97.8
	10.00	9.96	99.6
Nitrate Nitrogen	0.050	0.049	98.0
	0.100	0.098	98.0
	0.200	0.194	97.0
	0.250	0.249	99.6
Total Phosphorus	0.250	0.251	100.4
	0.750	0.750	100.0
	1.25	1.25	100.0
	1.75	1.75	100.0

Table 10

Quality Control Data - Water Quality

A. Duplicate Analysis from Fall Field Samples

Station	Level in Samples (µg/l) Ammonia Nitrogen	Nitrate-Nitrite Nitrogen	Total Phosphorus	Total Solids	Total Suspended Solids
A-1	<0.01 0.02	-	-	-	-
C-1	-	-	-	-	3.0 1.4
C-2	-	-	-	257 269	-
D-1	-	-	-	-	4.5 2.7
D-2	-	-	0.067 0.063	-	-
E-1	-	-	-	1000 1002	-
E-2	-	-	0.485 0.465	-	-
F-1	-	0.739 0.711	-	-	-
H-2	0.63 0.54	-	-	-	-
J-2	-	0.824 0.748	-	-	-

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B. Percent Recovery of Spiked Fall Field Samples

Parameter	Station	Level Added (mg/l)	Level in Sample (mg/l)	Percent % Recovery
Ammonia Nitrogen	B-1	2.00	0.22	116
	D-1	5.00	0.46	111
Nitrate-Nitrite	B-2	0.050	-	112
Nitrogen	D-2	0.100	-	110
Total Phosphorus	A-1	1.00	0.862	97
	B-1	0.50	0.598	99

C. Percent Recover of Reference Standards

Parameter	Concentration Known (mg/l)	Concentration Found (mg/l)	Percent Recovery
Ammonia Nitrogen	2.00	2.06	103
	5.00	5.16	103
Nitrate-Nitrite	0.050	0.059	118
Nitrogen	0.200	0.208	104
Total Phosphorus	0.250	0.225	90
	1.00	1.04	104

APPENDIX C

Computerized Periphyton Data Analysis

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 19, 1981, — 1400 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
DIATOMACEAE			
PENNALES			
SYNEDRA	SPECIES	2.	1353.84
SYNEDRA	RUMPENS	1.	641.29
SYNEDRA	ULNA	1.	712.55
ACHNANTHES	SPECIES	41.	29428.22
ACHNANTHES	LANCEOLATA	6.	3990.27
COCCONEIS	PLACENTULA	1.	641.29
PHOICOSPHENIA	CURVATA	4.	2850.19
NAVICULA	CRYPTOCEPHALA	2.	1353.84
NAVICULA	VIRIDULA	3.	1995.13
NAVICULA	LUZONENSIS	3.	1995.13
GOMPHONEMA	SPECIES	5.	3348.97
GOMPHONEMA	OLIVACEUM	2.	1353.84
GOMPHONEMA	PARVULUM	2.	1353.84
CYMBELLA	SINUATA	1.	712.55
NITZSCHIA	ACICULARIS	3.	2137.64
NITZSCHIA	APICULATA	8.	5344.11
NITZSCHIA	PALEA	1.	641.29
NITZSCHIA	FRUSTULUM	38.	27433.09
SURIRELLA	ANGUSTATA	14.	10046.92
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	DISPERSUS	1.	712.55
OSCILLATORIALES			
OSCILLATORIA	SPECIES	1.	712.55
OSCILLATORIA	LIMNETICA	3.	2137.64
PHORMIDIUM	SPECIES	1.	712.55
UNIDENTIFIED ALGAE			
FLAGELLATED			
LESS THAN 5 U		1.	712.55
UNICELLULAR			
5 TO 10 MICRONS		7.	4987.83

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
DIATOMACEAE	137.	97334.03	90.70
CYANOPHYTA	6.	4275.29	3.98
UNKNOWN FLAGELLATE	1.	712.55	.66
UNKNOWN UNICELLULA	7.	4987.83	4.65
TOTALS	151.	107309.69	100.00

TAXA IN SAMPLE 25

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 19, 1981, 1400 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.4058	EVENNESS	.7334	REDUNDANCY	.2668
MAX. DIVERSITY	4.6439	MIN. DIVERSITY	.0041	INFORMATIONAL CONTENT	.36547+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 19, 1981, — 1400 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION			NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			1.	267.70
CHLOROCOCCALES				
CHARACIUM	SPECIES		1.	267.70
CHAETOPHORALES				
STIGEOCLONIUM	SPECIES		1.	267.70
CLADOPHORACEAE				
CLADOPHORA	SPECIES		4.	1070.79
EUGLENOPHYTA			1.	267.70
DIATOMACEAE				
PENNALES				
MERIDION	CIRCULARE		1.	267.70
SYNEDRA	ACUS		21.	5621.65
ACHNANTHES	SPECIES		35.	9262.33
ACHNANTHES	LANCEOLATA		5.	1472.34
RHOICOSPHENIA	CURVATA		7.	1873.88
NAVICULA	CRYPTOCEPHALA		5.	1231.41
NAVICULA	VIRIDULA		2.	481.86
NAVICULA	LUZONENSIS		1.	240.93
NAVICULA	MUTICA		3.	722.78
GOMPHONEMA	SPECIES		12.	3185.60
GOMPHONEMA	PARVULUM		15.	3908.38
NITZSCHIA	APICULATA		2.	481.86
NITZSCHIA	FONTICOLA		6.	1713.26
NITZSCHIA	PALEA		2.	481.86
NITZSCHIA	FRUSTULUM		30.	8057.70
SURIRELLA	ANGUSTATA		4.	963.71
CYANOPHYTA				
CHROOCOCCALES			1.	267.70
CHROOCOCCUS	SPECIES		8.	2141.58
OSCILLATORIALES				
OSCILLATORIA	LIMNETICA		1.	267.70
PHORMIDIUM	SPECIES		1.	267.70

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 19, 1981, 1400 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
UNIDENTIFIED ALGAE		
UNICELLULAR		
5 TO 10 MICRONS	7.	1873.88

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	7.	1873.88	3.99
EUGLENOPHYTA	1.	267.70	.57
DIATOMACEAE	149.	39967.24	85.17
CYANOPHYTA	11.	2944.67	6.27
UNKNOWN UNICELLULA	7.	1873.88	3.99
TOTALS	175.	46927.37	100.00

TAXA IN SAMPLE 26

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.7855	EVENNESS	.8054	REDUNDANCY	.1950
MAX. DIVERSITY	4.7004	MIN. DIVERSITY	.0090	INFORMATIONAL CONTENT	.17764+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 19, 1981, — 1400 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
CHAETOPHORALES			
STIGEOCLONIUM	SPECIES	2.	1490.87
DIATOMACEAE			
PENNALES			
SYNEDRA	ACUS	2.	1490.87
ACHNANTHES	SPECIES	125.	93552.05
ACHNANTHES	LANCEOLATA	4.	2981.74
NAVICULA	CRYPTOCEPHALA	1.	745.43
NAVICULA	VIRIDULA	2.	1490.87
NAVICULA	LUZONENSIS	6.	4472.61
NAVICULA	MUTICA	11.	8199.78
GOMPHONEMA	SPECIES	9.	6708.91
GOMPHONEMA	PARVULUM	3.	2236.30
NITZSCHIA	PALEA	4.	2981.74
NITZSCHIA	FRUSTULUM	58.	43458.84
SURIRELLA	ANGUSTATA	4.	2981.74
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	3.	2236.30
OSCILLATORIALES			
PHORMIDIUM	SPECIES	8.	5963.48
UNIDENTIFIED ALGAE			
UNICELLULAR			
LESS THAN 5 U		3.	2236.30
5 TO 10 MICRONS		2.	1490.87

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	1490.87	.81
DIATOMACEAE	230.	171300.87	92.74
CYANOPHYTA	11.	8199.78	4.44
UNKNOWN UNICELLULA	5.	3727.17	2.02
TOTALS	248.	184718.69	100.00

TAXA IN SAMPLE 17

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 19, 1981, 1400 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.4274	EVENNESS	.5939	REDUNDANCY	.4063
MAX. DIVERSITY	4.0875	MIN. DIVERSITY	.0016	INFORMATIONAL CONTENT	.44839+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 19, 1981, — 1400 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		7.	5515.00
TETRASPORALES			
GLOECCYSTIS	SPECIES	1.	787.86
ULOTRICHALES			
ULOTHRIX	SPECIES	1.	787.86
CHAETOPHORALES			
STIGEOCLONIUM	SPECIES	1.	787.86
CLADOPHORACEAE			
CLADOPHORA	SPECIES	4.	3151.43
EUGLENOPHYTA		1.	787.86
DIATOMACEAE			
PENNALES			
SYNEDRA	ACUS	1.	787.86
ACHNANTHES	SPECIES	36.	28362.88
ACHNANTHES	LANCEOLATA	4.	3151.43
RHOICOSPHENIA	CURVATA	16.	12605.72
NAVICULA	CRYPTOCEPHALA	5.	3939.29
NAVICULA	VIRIDULA	1.	787.86
NAVICULA	LUZONENSIS	3.	2363.57
GOMPHONEMA	SPECIES	21.	16545.01
GOMPHONEMA	PARVULUM	12.	9454.29
NITZSCHIA	SPECIES	3.	2363.57
NITZSCHIA	PALEA	1.	787.86
NITZSCHIA	FRUSTULUM	36.	28362.88
SURIRELLA	ANGUSTATA	10.	7878.58
SURIRELLA	OVATA	22.	17332.87
CYANOPHYTA			
CHROOCOCCALES		3.	2363.57
CHROOCOCCUS	SPECIES	5.	3939.29
OSCILLATORIALES			
OSCILLATORIA	SPECIES	1.	787.86
PHORMIDIUM	SPECIES	4.	3151.43

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 19, 1981, — 1400 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
UNIDENTIFIED ALGAE		
UNICELLULAR		
5 TO 10 MICRONS	1.	787.86

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	14.	11030.01	7.00
EUGLENOPHYTA	1.	787.86	.50
DIATOMACEAE	171.	134723.67	85.50
CYANOPHYTA	13.	10242.15	6.50
UNKNOWN UNICELLULA	1.	787.86	.50
TOTALS	200.	157571.54	100.00

TAXA IN SAMPLE 25

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.7241	EVENNESS	.8019	REDUNDANCY	.1982
MAX. DIVERSITY	4.6439	MIN. DIVERSITY	.0028	INFORMATIONAL CONTENT	.58681+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 20, 1981, — 1000 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
CHLOROCOCCALES			
SCENEDESMUS	ABUNDANS	1.	397.16
CRYPTOPHYTA		1.	397.16
DIATOMACEAE			
PENNALES			
SYNEDRA	SPECIES	1.	198.58
SYNEDRA	ACUS	1.	436.87
ACHNANTHES	SPECIES	110.	43687.36
COCCONEIS	PEDICULUS	1.	198.58
NAVICULA	CRYPTOCEPHALA	4.	1747.49
NAVICULA	TRIPUNCTATA	1.	198.58
GOMPHONEMA	SPECIES	2.	635.45
AMPHORA	PERPUSILLA	6.	2382.95
CYMBELLA	SPECIES	1.	436.87
CYMBELLA	MINUTA	2.	635.45
CYMBELLA	AFFINIS	17.	6711.97
DENTICULA	TENUIS	1.	436.87
NITZSCHIA	DISSIPATA	6.	2581.53
NITZSCHIA	PALEA	1.	198.58
SURIRELLA	ANGUSTATA	1.	198.58
SURIRELLA	OVATA	1.	397.16
CYANOPHYTA			
CHROOCOCCALES		2.	794.32
APHANOTHECE	SPECIES	1.	397.16
CHROOCOCCUS	SPECIES	2.	794.32
CHROOCOCCUS	DISPERSUS	1.	397.16
OSCILLATORIALES			
LYNGBYA	SPECIES	3.	1191.47
OSCILLATORIA	SPECIES	8.	3177.26
UNIDENTIFIED ALGAE			
UNICELLULAR			
LESS THAN 5 U		2.	794.32

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	1.	397.16	.57
CRYPTOPHYTA	1.	397.16	.57
DIATOMACEAE	154.	61082.87	87.99
CYANOPHYTA	17.	6751.68	9.73

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 20, 1981, 1000 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN UNICELLULA	2.	794.32	1.14
TOTALS	175.	69423.18	100.00

TAXA IN SAMPLE 25

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.3453	EVENNESS	.5050	REDUNDANCY	.4956
MAX. DIVERSITY	4.6439	MIN. DIVERSITY	.0061	INFORMATIONAL CONTENT	.16282+06

TABLE

GENEPAL MOTORS PERIPHYTON DATA — MAY 20, 1981, — 1000 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION			NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			1.	123.29
CHLOROCOCCALES			2.	246.58
DICTYOSPHAERIUM	PULCHELLUM		3.	369.87
DIATOMACEAE				
CENTRALES			1.	123.29
PENNALES				
ACHNANTHES	SPECIES		26.	3205.56
NAVICULA	CRYPTOCEPHALA		4.	480.83
GOMPHONEMA	SPECIES		8.	961.67
GOMPHONEMA	PARVULUM		8.	961.67
GOMPHONEMA	OLIVACEOIDES		1.	160.28
CYMBELLA	SPECIES		13.	1602.78
CYMBELLA	MINUTA		8.	961.67
CYMBELLA	AFFINIS		49.	6090.56
NITZSCHIA	DISSIPATA		6.	801.39
NITZSCHIA	PALEA		3.	320.56
CYANOPHYTA				
CHROOCOCCALES				
CHROOCOCCUS	SPECIES		1.	123.29
CHROOCOCCUS	DISPERSUS	MINOR	3.	369.87
UNIDENTIFIED ALGAE				
FLAGELLATED				
5 TO 10 MICRONS			2.	246.58
UNICELLULAR				
LESS THAN 5 U			1.	123.29

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	6.	739.74	4.28
DIATOMACEAE	127.	15670.25	90.72
CYANOPHYTA	4.	493.16	2.86
UNKNOWN FLAGELLATE	2.	246.58	1.43
UNKNOWN UNICELLULA	1.	123.29	.71
TOTALS	140.	17273.03	100.00

TAXA IN SAMPLE 18

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 20, 1981, — 1000 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.1303	EVENNESS	.7507	REDUNDANCY	.2502
MAX. DIVERSITY	4.1699	MIN. DIVERSITY	.0153	INFORMATIONAL CONTENT	.54069+05

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 20, 1981, — 1000 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
CHLOROCOCCALES		5.	678.62
CHARACIUM	SPECIES	2.	271.45
DIATOMACEAE			
PENNALES			
SYNEDRA	SPECIES	1.	122.15
ACHNANTHES	SPECIES	7.	950.06
NAVICULA	CRYPTOCEPHALA	2.	244.30
NAVICULA	TRIPUNCTATA	1.	122.15
GOMPHONEMA	SPECIES	1.	122.15
GOMPHONEMA	PARVULUM	2.	244.30
CYMBELLA	SPECIES	8.	1072.21
CYMBELLA	MINUTA	4.	597.18
CYMBELLA	AFFINIS	91.	12391.55
NITZSCHIA	DISSIPATA	3.	475.03
NITZSCHIA	PALEA	7.	950.06
SURIRELLA	OVATA	2.	244.30
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	1.	135.72
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		3.	407.17
UNICELLULAR			
5 TO 10 MICRONS		1.	135.72

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	7.	950.06	4.96
DIATOMACEAE	129.	17535.46	91.50
CYANOPHYTA	1.	135.72	.71
UNKNOWN FLAGELLATE	3.	407.17	2.12
UNKNOWN UNICELLULA	1.	135.72	.71
TOTALS	141.	19164.14	100.00

TAXA IN SAMPLE 17

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 20, 1981, 1000 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.2144	EVENNESS	.5418	REDUNDANCY	.4597
MAX. DIVERSITY	4.0875	MIN. DIVERSITY	.0131	INFORMATIONAL CONTENT	.42437+05

TABLE

GENEPAL MOTORS PERIPHYTON DATA MAY 20, 1981, 1000 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION			NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			2.	629.26
EUGLENOPHYTA			1.	314.63
DIATOMACEAE				
PENNALES				
ACHNANTHES	SPECIES		17.	5317.27
NAVICULA	CRYPTOCEPHALA		3.	943.89
NAVICULA	MINIMA		1.	346.09
GOMPHONEMA	SPECIES		2.	597.80
GOMPHONEMA	PARVULUM		1.	251.71
AMPHORA	PERPUSILLA		3.	818.04
CYMBELLA	SPECIES		2.	597.80
CYMBELLA	MINUTA		2.	597.80
CYMBELLA	AFFINIS		9.	2831.68
DENTICULA	TENUIS		0.	125.85
NITZSCHIA	SPECIES		0.	125.85
NITZSCHIA	DISSIPATA		1.	346.09
NITZSCHIA	PALEA		1.	251.71
SURIPELLA	ANGUSTATA		0.	125.85
CYANOPHYTA			3.	943.89
CHROOCOCCALES			34.	10697.47
CHROOCOCCUS	SPECIES		11.	3460.95
OSCILLATORIALES				
PHORMIDIUM	SPECIES		6.	1887.79
UNIDENTIFIED ALGAE				
UNICELLULAR				
LESS THAN 5 U			1.	314.63

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	629.26	2.00
EUGLENOPHYTA	1.	314.63	1.00
DIATOMACEAE	42.	13277.45	42.12
CYANOPHYTA	54.	16990.10	53.89
UNKNOWN UNICELLULA	1.	314.63	1.00
TOTALS	100.	31526.07	100.00

TAXA IN SAMPLE 21

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 20, 1981, 1000 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM .3 FEET TO .0 FEET

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.2278	EVENNESS	.7349	REDUNDANCY	.2657
MAX. DIVERSITY	4.3923	MIN. DIVERSITY	.0104	INFORMATIONAL CONTENT	.10176+06

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
CHLOROCOCCALES		2.	257.05
CLADOPHORACEAE			
CLADOPHORA	SPECIES	4.	514.09
EUGLENOPHYTA		3.	385.57
EUGLENALES			
PHACUS	SPECIES	1.	128.52
TRACHELOMONAS	SPECIES	3.	385.57
DIATOMACEAE			
PENNALES			
ACHNANTHES	SPECIES	2.	269.90
ACHNANTHES	LANCEOLATA	1.	192.78
RHOICOSPHENIA	CURVATA	4.	526.95
NAVICULA	SPECIES	1.	64.26
NAVICULA	CRYPTOCEPHALA	8.	1053.89
NAVICULA	TRIPUNCTATA	3.	334.16
NAVICULA	VIRIDULA	1.	64.26
GOMPHONEMA	SPECIES	6.	732.58
GOMPHONEMA	ANGUSTATUM	7.	861.11
GOMPHONEMA	OLIVACEUM	2.	269.90
GOMPHONEMA	PARVULUM	1.	128.52
CYMBELLA	SPECIES	1.	192.78
CYMBELLA	AFFINIS	4.	526.95
DENTICULA	TENUIS	1.	128.52
NITZSCHIA	DISSIPATA	3.	398.42
NITZSCHIA	FONTICOLA	1.	128.52
NITZSCHIA	LINEARIS	1.	64.26
NITZSCHIA	PALEA	1.	128.52
SURIRELLA	ANGUSTATA	1.	128.52
SURIRELLA	OVATA	1.	192.78
CYANOPHYTA			
CHROOCOCCALES		2.	257.05
CHROOCOCCUS	SPECIES	23.	2956.03

TABLE

GENERAL MOTORS PERIPHYTON DATA — MAY 21, 1981, — 930 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
UNIDENTIFIED ALGAE		
FLAGELLATED		
5 TO 10 MICRONS	1.	128.52

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	6.	771.14	6.76
EUGLENOPHYTA	7.	899.66	7.89
DIATOMACEAE	50.	6387.60	56.03
CYANOPHYTA	25.	3213.08	28.18
UNKNOWN FLAGELLATE	1.	128.52	1.13
TOTALS	89.	11400.01	100.00

TAXA IN SAMPLE 29

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 4.0570 EVENNESS .8439 REDUNDANCY .1572

MAX. DIVERSITY 4.8074 MIN. DIVERSITY .0353 INFORMATIONAL CONTENT .46250+05

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		2.	889.05
TETRASPORALES			
GLOEOCYSTIS	SPECIES	2.	889.05
CHLOROCOCCALES		1.	444.53
EUGLENOPHYTA		1.	444.53
EUGLENALES			
TRACHELOMONAS	SPECIES	2.	889.05
DIATOMACEAE			
PENNALES			
SYNEDRA	ULNA	1.	444.53
ACHNANTHES	SPECIES	4.	1778.10
RHOICOSPHENIA	CURVATA	2.	889.05
NAVICULA	SPECIES	3.	1333.58
NAVICULA	CRYPTOCEPHALA	8.	3556.20
NAVICULA	TRIPUNCTATA	4.	1778.10
GOMPHONEMA	SPECIES	2.	889.05
GOMPHONEMA	ANGUSTATUM	4.	1778.10
CYMBELLA	SPECIES	1.	444.53
CYMBELLA	MINUTA	1.	444.53
CYMBELLA	AFFINIS	1.	444.53
NITZSCHIA	APICULATA	1.	444.53
NITZSCHIA	DISSIPATA	4.	1778.10
NITZSCHIA	LINEARIS	2.	889.05
NITZSCHIA	PALEA	1.	444.53
SURIRELLA	OVATA	3.	1333.58
CYANOPHYTA			
CHROOCOCCALES		1.	444.53
OSCILLATORIALES			
LYNGBYA	SPECIES	1.	444.53
OSCILLATORIA	AGARDHII	1.	444.53
PHORMIDIUM	SPECIES	21.	9335.03

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
UNIDENTIFIED ALGAE		
UNICELLULAR		
5 TO 10 MICRONS	1.	444.53

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	5.	2222.63	6.67
EUGLENOPHYTA	3.	1333.58	4.00
DIATOMACEAE	42.	18670.06	56.00
CYANOPHYTA	24.	10668.61	32.00
UNKNOWN UNICELLULA	1.	444.53	1.33
TOTALS	75.	33339.39	100.00

TAXA IN SAMPLE 26

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 3.9655 EVENNESS .8436 REDUNDANCY .1568

MAX. DIVERSITY 4.7004 MIN. DIVERSITY .0123 INFORMATIONAL CONTENT .13221+06

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		2.	122.98
CHLOROCOCCALES			
ANKISTRODESMUS	SPECIES	1.	61.49
EUGLENOPHYTA			
EUGLENALES			
TRACHELOMONAS	SPECIES	1.	61.49
DIATOMACEAE			
PENNALES		1.	61.49
SYNEDRA	SPECIES	2.	122.98
NAVICULA	CRYPTOCEPHALA	12.	737.87
NAVICULA	TRIPUNCTATA	2.	122.98
NAVICULA	PELLICULOSA	1.	61.49
NAVICULA	VIRIDULA	4.	245.96
GOMPHONEMA	SPECIES	3.	184.47
CYMBELLA	SPECIES	5.	307.44
CYMBELLA	MINUTA	1.	61.49
CYMBELLA	AFFINIS	1.	61.49
NITZSCHIA	SPECIES	1.	61.49
NITZSCHIA	DISSIPATA	3.	184.47
NITZSCHIA	PALEA	11.	676.38
SURIRELLA	OVALIS	1.	61.49
SURIRELLA	OVATA	3.	184.47
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	11.	676.38
OSCILLATORIALES			
OSCILLATORIA	PSEUDOGEMINATA	1.	61.49
PHORMIDIUM	SPECIES	11.	676.38
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	61.49
UNICELLULAR			
5 TO 10 MICRONS		3.	184.47

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	3.	184.47	3.66
EUGLENOPHYTA	1.	61.49	1.22
DIATOMACEAE	51.	3135.93	62.20
CYANOPHYTA	23.	1414.24	28.05

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN FLAGELLATE	1.	61.49	1.22
UNKNOWN UNICELLULA	3.	184.47	3.66
TOTALS	82.	5042.09	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 3.8965 EVENNESS .8614 REDUNDANCY .1405

MAX. DIVERSITY 4.5236 MIN. DIVERSITY .0599 INFORMATIONAL CONTENT .19646+05

TABLE

GENERAL MOTORS PERIPHYTON DATA MAY 21, 1981, 930 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: F-PLEASANT R, STATION 1 , DEPTH RANGE FROM .5 FEET TO .0 FEET

PHYSICAL PARAMETERS: TEMPERATURE C F

UPPER 12.0 53.6

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		1.	814.34
CHLOROCOCCALES			
CHARACIUM	SPECIES	1.	814.34
EUGLENOPHYTA			
EUGLENALES			
TRACHELOMONAS	SPECIES	1.	814.34
DIATOMACEAE			
PENNALES			
NAVICULA	CRYPTOCEPHALA	1.	814.34
NAVICULA	TRIPUNCTATA	1.	814.34
NAVICULA	VIRIDULA	1.	814.34
NITZSCHIA	DISSIPATA	8.	6514.72
NITZSCHIA	PALEA	1.	814.34
SURIRELLA	OVATA	1.	814.34

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	1628.68	12.50
EUGLENOPHYTA	1.	814.34	6.25
DIATOMACEAE	13.	10586.42	81.25
TOTALS	16.	13029.45	100.00

TAXA IN SAMPLE 9

DIVERSITY CALCULATED IN LOG BASE 2
SHANNONS DIVERSITY 2.5000 EVENNESS .7887 REDUNDANCY .2120
MAX. DIVERSITY 3.1699 MIN. DIVERSITY .0093 INFORMATIONAL CONTENT .32574+05

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

		STATION B-DISCHARGE 1 ORGANISMS PER CM2				STATION D-PLEASANT R 1 ORGANISMS PER CM2			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
CHLOROPHYTA									
CHLOROPHYTA		1445.68	.00	5515.00	1.16	188.14	.00	629.26	.55
GLOEOCYSTIS	SPECIES	196.96	.00	787.86	.16	.00	.00	.00	.00
CHLOROCOCCALES		.00	.00	.00	.00	231.30	.00	678.62	.67
CHARACIUM	SPECIES	66.92	.00	267.70	.05	67.86	.00	271.45	.20
ANKISTRODESMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
DICTYOSPHAERIUM	PULCHELLUM	.00	.00	.00	.00	92.47	.00	369.87	.27
SCENEDESMUS	ABUNDANS	.00	.00	.00	.00	99.29	.00	397.16	.29
ULOTHRIX	SPECIES	196.96	.00	787.86	.16	.00	.00	.00	.00
STIGEOCLONIUM	SPECIES	636.61	.00	1490.87	.51	.00	.00	.00	.00
CLADOPHORA	SPECIES	1055.56	.00	3151.43	.85	.00	.00	.00	.00
TOTAL OF CHLOROPHYTA		3598.69	.00	11030.01	2.90	679.06	.00	950.06	1.98
EUGLENOPHYTA									
EUGLENOPHYTA		263.89	.00	787.86	.21	78.66	.00	314.63	.23
PHACUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TRACHELOMONAS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF EUGLENOPHYTA		263.89	.00	787.86	.21	78.66	.00	314.63	.23
CRYPTOPHYTA									
CRYPTOPHYTA		.00	.00	.00	.00	99.29	.00	397.16	.29
TOTAL OF CRYPTOPHYTA		.00	.00	.00	.00	99.29	.00	397.16	.29
DIATOMACEAE									
CENTRALES		.00	.00	.00	.00	30.82	.00	123.29	.09

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

		STATION D-DISCHARGE 1 ORGANISMS PER CM2				STATION D-PLEASANT R 1 ORGANISMS PER CM2			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PENNALES		.00	.00	.00	.00	.00	.00	.00	.00
MERIDION	CIRCULARE	66.92	.00	267.70	.05	.00	.00	.00	.00
SYNEDRA	SPECIES	338.46	.00	1353.84	.27	80.18	.00	198.58	.23
SYNEDRA	ACUS	1975.09	.00	5621.65	1.59	109.22	.00	436.87	.32
SYNEDRA	RUMPENS	160.32	.00	641.29	.13	.00	.00	.00	.00
SYNEDRA	ULNA	178.14	.00	712.55	.14	.00	.00	.00	.00
ACHNANTHES	SPECIES	40151.37	9262.33	93552.05	32.35	13290.06	950.06	43687.36	38.69
ACHNANTHES	LANCEOLATA	2898.94	1472.34	3990.27	2.34	.00	.00	.00	.00
COCCONEIS	PEDICULUS	.00	.00	.00	.00	49.64	.00	198.58	.14
COCCONEIS	PLACENTULA	160.32	.00	641.29	.13	.00	.00	.00	.00
RHOICOSPHENIA	CURVATA	4332.45	.00	12605.72	3.49	.00	.00	.00	.00
NAVICULA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NAVICULA	CRYPTOCEPHALA	1817.49	745.43	3939.29	1.46	854.13	244.30	1747.49	2.49
NAVICULA	TRIPUNCTATA	.00	.00	.00	.00	80.18	.00	198.58	.23
NAVICULA	MINIMA	.00	.00	.00	.00	86.52	.00	346.09	.25
NAVICULA	PELLICULOSA	.00	.00	.00	.00	.00	.00	.00	.00
NAVICULA	VIRIDULA	1168.93	481.86	1995.13	.96	.00	.00	.00	.00
NAVICULA	LUZONENSIS	2268.06	240.93	4472.61	1.83	.00	.00	.00	.00
NAVICULA	MUTICA	2230.64	.00	8199.78	1.80	.00	.00	.00	.00
GOMPHONEMA	SPECIES	7447.12	3185.60	16545.01	6.00	579.27	122.15	961.67	1.69
GOMPHONEMA	ANGUSTATUM	.00	.00	.00	.00	.00	.00	.00	.00
GOMPHONEMA	OLIVACEUM	338.46	.00	1353.84	.27	.00	.00	.00	.00
GOMPHONEMA	PARVULUM	4238.21	1353.84	9454.29	3.41	364.42	.00	961.67	1.06
GOMPHONEMA	OLIVACEOIDES	.00	.00	.00	.00	40.07	.00	160.28	.12
AMPHORA	PERPUSILLA	.00	.00	.00	.00	800.25	.00	2382.95	2.33
CYMBELLA	SPECIES	.00	.00	.00	.00	927.42	436.87	1602.78	2.70
CYMBELLA	MINUTA	.00	.00	.00	.00	698.03	597.18	961.67	2.03
CYMBELLA	AFFINIS	.00	.00	.00	.00	7006.44	2831.68	12391.55	20.40
CYMBELLA	SINUATA	178.14	.00	712.55	.14	.00	.00	.00	.00
DENTICULA	TENUIS	.00	.00	.00	.00	140.68	.00	436.87	.41
NITZSCHIA	SPECIES	590.89	.00	2363.57	.48	31.46	.00	125.85	.09
NITZSCHIA	ACICULARIS	534.41	.00	2137.64	.43	.00	.00	.00	.00
NITZSCHIA	APICULATA	1456.49	.00	5344.11	1.17	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

		STATION E-DISCHARGE 1 ORGANISMS PER CM2				STATION D-PLEASANT R 1 ORGANISMS PER CM2			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
NITZSCHIA	DISSIPATA	.00	.00	.00	.00	1051.01	346.09	2581.53	3.06
NITZSCHIA	FONTICOLA	428.32	.00	1713.26	.35	.00	.00	.00	.00
NITZSCHIA	LINEARIS	.00	.00	.00	.00	.00	.00	.00	.00
NITZSCHIA	PALEA	1223.19	481.86	2981.74	.99	430.23	198.58	950.06	1.25
NITZSCHIA	FRUSTULUM	26828.13	8057.70	43458.84	21.61	.00	.00	.00	.00
SURIRELLA	ANGUSTATA	5467.74	963.71	10046.92	4.40	81.11	.00	198.58	.24
SURIRELLA	OVALIS	.00	.00	.00	.00	.00	.00	.00	.00
SURIRELLA	OVATA	4333.22	.00	17332.87	3.49	160.36	.00	397.16	.47
TOTAL OF DIATOMACEAE		110831.45	39967.24	171300.87	89.29	26891.51	13277.45	61082.87	78.29
CYANOPHYTA									
CYANOPHYTA		.00	.00	.00	.00	235.97	.00	943.89	.69
CHROOCOCCALES		657.82	.00	2363.57	.53	2872.95	.00	10697.47	8.36
APHANOTHECE	SPECIES	.00	.00	.00	.00	99.29	.00	397.16	.29
CHROOCOCCUS	SPECIES	2079.29	.00	3939.29	1.68	1128.57	123.29	3460.95	3.29
CHROOCOCCUS	DISPERSUS	178.14	.00	712.55	.14	191.76	.00	397.16	.56
LYNGBYA	SPECIES	.00	.00	.00	.00	297.87	.00	1191.47	.87
OSCILLATORIA	SPECIES	375.10	.00	787.86	.30	794.32	.00	3177.26	2.31
OSCILLATORIA	AGARDHII	.00	.00	.00	.00	.00	.00	.00	.00
OSCILLATORIA	LIMNETICA	601.34	.00	2137.64	.48	.00	.00	.00	.00
OSCILLATORIA	PSEUDOGEMINATA	.00	.00	.00	.00	.00	.00	.00	.00
PHORMIDIUM	SPECIES	2523.79	267.70	5963.48	2.03	471.95	.00	1887.79	1.37
TOTAL OF CYANOPHYTA		6415.47	2944.67	10242.15	5.17	6092.67	135.72	16990.10	17.74
UNKNOWN FLAGELLATE									
LESS THAN 5 U		178.14	.00	712.55	.14	.00	.00	.00	.00
5 TO 10 MICRONS		.00	.00	.00	.00	163.44	.00	407.17	.48

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

SPECIES NAME	STATION B-DISCHARGE 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION D-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
TOTAL OF UNKNOWN FLAGELLATE	178.14	.00	712.55	.14	163.44	.00	407.17	.48
UNKNOWN UNICELLULA								
LESS THAN 5 U	559.08	.00	2236.30	.45	308.06	.00	794.32	.90
5 TO 10 MICRONS	2285.11	787.86	4987.83	1.84	33.93	.00	135.72	.10
TOTAL OF UNKNOWN UNICELLULA	2844.19	787.86	4987.83	2.29	341.99	.00	794.32	1.00
STATION MEAN TOTAL	124131.81			100.00	34346.60			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	41				39			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	71							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	3.3357				2.7294			
ASSOCIATED EVENNESS	.7336				.6331			
REDUNDANCY	.2666				.3678			

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

STATION F-PLEASANT R 1

ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
CHLOROPHYTA					
CHLOROPHYTA		456.59	.00	889.05	2.91
GLOEOCYSTIS	SPECIES	222.26	.00	889.05	1.42
CHLOROCOCCALES		175.39	.00	444.53	1.12
CHARACIUM	SPECIES	203.59	.00	814.34	1.30
ANKISTRODESMUS	SPECIES	15.37	.00	61.49	.10
DICTYOSPHAERIUM	PULCHELLUM	.00	.00	.00	.00
SCENEDESMUS	ABUNDANS	.00	.00	.00	.00
ULOTHRIX	SPECIES	.00	.00	.00	.00
STIGEOCLONIUM	SPECIES	.00	.00	.00	.00
CLADOPHORA	SPECIES	128.52	.00	514.09	.82
TOTAL OF CHLOROPHYTA		1201.73	.00	2222.63	7.65
EUGLENOPHYTA					
EUGLENOPHYTA		207.52	.00	444.53	1.32
PHACUS	SPECIES	32.13	.00	128.52	.20
TRACHELOMONAS	SPECIES	537.61	61.49	889.05	3.42
TOTAL OF EUGLENOPHYTA		777.27	61.49	1333.58	4.95
CRYPTOPHYTA					
CRYPTOPHYTA		.00	.00	.00	.00
TOTAL OF CRYPTOPHYTA		.00	.00	.00	.00
DIATOMACEAE					
CENTRALES		.00	.00	.00	.00

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

STATION F-PLEASANT R 1

ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
PENNALES		15.37	.00	61.49	.10
MERIDION	CIRCULARE	.00	.00	.00	.00
SYNEDRA	SPECIES	30.74	.00	122.98	.20
SYNEDRA	ACUS	.00	.00	.00	.00
SYNEDRA	RUMPENS	.00	.00	.00	.00
SYNEDRA	ULNA	111.13	.00	444.53	.71
ACHNANTHES	SPECIES	512.00	.00	1778.10	3.26
ACHNANTHES	LANCEOLATA	48.20	.00	192.78	.31
COCCONEIS	PEDICULUS	.00	.00	.00	.00
COCCONEIS	PLACENTULA	.00	.00	.00	.00
RHOICOSPHENIA	CURVATA	354.00	.00	889.05	2.25
NAVICULA	SPECIES	349.46	.00	1333.58	2.23
NAVICULA	CRYPTOCEPHALA	1540.57	737.87	3556.20	9.81
NAVICULA	TRIPUNCTATA	762.39	122.98	1778.10	4.86
NAVICULA	MINIMA	.00	.00	.00	.00
NAVICULA	PELLICULOSA	15.37	.00	61.49	.10
NAVICULA	VIRIDULA	281.14	.00	814.34	1.79
NAVICULA	LUZONENSIS	.00	.00	.00	.00
NAVICULA	MUTICA	.00	.00	.00	.00
GOMPHONEMA	SPECIES	451.52	.00	889.05	2.88
GOMPHONEMA	ANGUSTATUM	659.80	.00	1778.10	4.20
GOMPHONEMA	OLIVACEUM	67.47	.00	269.90	.43
GOMPHONEMA	PARVULUM	32.13	.00	128.52	.20
GOMPHONEMA	OLIVACEOIDES	.00	.00	.00	.00
AMPHORA	PERPUSILLA	.00	.00	.00	.00
CYMBELLA	SPECIES	236.19	.00	444.53	1.50
CYMBELLA	MINUTA	126.50	.00	444.53	.81
CYMBELLA	AFFINIS	258.24	.00	526.95	1.64
CYMBELLA	SINUATA	.00	.00	.00	.00
DENTICULA	TENUIS	32.13	.00	128.52	.20
NITZSCHIA	SPECIES	15.37	.00	61.49	.10
NITZSCHIA	ACICULARIS	.00	.00	.00	.00
NITZSCHIA	APICULATA	111.13	.00	444.53	.71

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 20-21, 1981 IN PLEASANT RUN AND SALT CREEK

STATION F-PLEASANT R 1

ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
NITZSCHIA	DISSIPATA	2218.93	184.47	6514.72	14.13
NITZSCHIA	FONTICOLA	32.13	.00	128.52	.20
NITZSCHIA	LINEARIS	238.33	.00	889.05	1.52
NITZSCHIA	PALEA	515.94	128.52	814.34	3.29
NITZSCHIA	FRUSTULUM	.00	.00	.00	.00
SURIRELLA	ANGUSTATA	32.13	.00	128.52	.20
SURIRELLA	OVALIS	15.37	.00	61.49	.10
SURIRELLA	OVATA	631.29	184.47	1333.58	4.02
TOTAL OF DIATOMACEAE		9695.00	3135.93	18670.06	61.74
CYANOPHYTA					
CYANOPHYTA		.00	.00	.00	.00
CHROOCOCCALES		175.39	.00	444.53	1.12
APHANOTHECE	SPECIES	.00	.00	.00	.00
CHROOCOCCUS	SPECIES	908.10	.00	2956.03	5.78
CHROOCOCCUS	DISPERSUS	.00	.00	.00	.00
LYNGBYA	SPECIES	111.13	.00	444.53	.71
OSCILLATORIA	SPECIES	.00	.00	.00	.00
OSCILLATORIA	AGARDHII	111.13	.00	444.53	.71
OSCILLATORIA	LIMNETICA	.00	.00	.00	.00
OSCILLATORIA	PSEUDOGEMINATA	15.37	.00	61.49	.10
PHORMIDIUM	SPECIES	2502.85	.00	9335.03	15.94
TOTAL OF CYANOPHYTA		3823.98	.00	10668.61	24.35
UNKNOWN FLAGELLATE					
LESS THAN 5 U		.00	.00	.00	.00
5 TO 10 MICRONS		47.50	.00	128.52	.30

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY

DATA COLLECTED MAY 21-22, 1981 IN PLEASANT RUN AND SALT CREEK

STATION F-PLEASANT R 1
ORGANISMS PER CM2

SPECIES NAME	MEAN	MIN.	MAX.	PERCENT
TOTAL OF UNKNOWN FLAGELLATE	47.50	.00	128.52	.30
UNKNOWN UNICELLULA				
LESS THAN 5 U	.00	.00	.00	.00
5 TO 10 MICRONS	157.25	.00	444.53	1.00
TOTAL OF UNKNOWN UNICELLULA	157.25	.00	444.53	1.00
STATION MEAN TOTAL	15702.73			100.00
TOTAL NUMBER OF SAMPLES	4			
NUMBER OF SPECIES	45			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	71			
DIVERSITY CALCULATED IN LOG BASE 2				
SHANNONS DIVERSITY	3.6047			
ASSOCIATED EVENNESS	.8344			
REDUNDANCY	.1666			

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1600 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CRYPTOPHYTA			
CRYPTOCHRYSIDACEAE			
RHODOMONAS	SPECIES	1.	515.46
CHRYSOPHYCEAE		1.	515.46
CHROMULINALES			
KEPHYRION	SPECIES	2.	1030.92
DIATOMACEAE			
CENTRALES		2.	1030.92
PENNALES		1.	515.46
ACHNANTHES	SPECIES	1.	515.46
ACHNANTHES	MINUTISSIMA	2.	1030.92
GOMPHONEMA	SPECIES	4.	2061.84
GOMPHONEMA	PARVULUM	2.	1030.92
NITZSCHIA	SPECIES	3.	1546.38
NITZSCHIA	PALEA	11.	5670.06
NITZSCHIA	FRUSTULUM	14.	7216.44
SURIRELLA	ANGUSTATA	2.	1030.92
SURIRELLA	OVALIS	2.	1030.92
SURIRELLA	OVATA	2.	1030.92
CYANOPHYTA		1.	515.46
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	4.	2061.84
MERISMOPEDIA	TENUISSIMA	1.	515.46
OSCILLATORIALES			
PHORMIDIUM	SPECIES	1.	515.46
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	515.46
UNICELLULAR			
LESS THAN 5 U		2.	1030.92

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CRYPTOPHYTA	1.	515.46	1.67
CHRYSOPHYCEAE	3.	1546.38	5.00
DIATOMACEAE	46.	23711.17	76.67
CYANOPHYTA	7.	3608.22	11.67

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1600 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN FLAGELLATE	1.	515.46	1.67
UNKNOWN UNICELLULA	2.	1030.92	3.33
TOTALS	60.	30927.61	100.00

TAXA IN SAMPLE 21

DIVERSITY CALCULATED IN LOG BASE 2
SHANNONS DIVERSITY 3.7717 EVENNESS .8587 REDUNDANCY .1416
MAX. DIVERSITY 4.3923 MIN. DIVERSITY .0106 INFORMATIONAL CONTENT .11665+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1600 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION			NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA				
CLADOPHORACEAE				
CLADOPHORA	GLOMERATA		4.	812.63
EUGLENOPHYTA			3.	609.47
CHRYSOPHYCEAE			3.	609.47
DIATOMACEAE				
CENTRALES			1.	203.16
PENNALES			3.	609.47
ACHNANTHES	SPECIES		8.	1625.27
ACHNANTHES	MINUTISSIMA		6.	1218.95
NAVICULA	SPECIES		1.	203.16
GOMPHONEMA	SPECIES		20.	4063.17
GOMPHONEMA	ANGUSTATUM		2.	406.32
GOMPHONEMA	PARVULUM		11.	2234.74
NITZSCHIA	SPECIES		1.	203.16
NITZSCHIA	FILIFORMIS		1.	203.16
NITZSCHIA	LINEARIS		1.	203.16
NITZSCHIA	PALEA		15.	3047.37
NITZSCHIA	FRUSTULUM		11.	2234.74
SURIPELLA	ANGUSTATA		6.	1218.95
SURIRELLA	OVALIS		1.	203.16
SURIRELLA	OVATA		1.	203.16
CYANOPHYTA				
CHROOCOCCALES				
CHROOCOCCUS	SPECIES		9.	1828.42
OSCILLATORIALES				
OSCILLATORIA	SPECIES		1.	203.16
UNIDENTIFIED ALGAE				
FLAGELLATED				
5 TO 10 MICRONS			1.	203.16
UNICELLULAR				
5 TO 10 MICRONS			3.	609.47

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	4.	812.63	3.54
EUGLENOPHYTA	3.	609.47	2.65

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1600 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHRYSOPHYCEAE	3.	609.47	2.65
DIATOMACEAE	89.	18081.09	78.76
CYANOPHYTA	10.	2031.58	8.85
UNKNOWN FLAGELLATE	1.	203.16	.88
UNKNOWN UNICELLULA	3.	609.47	2.65
TOTALS	113.	22956.89	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 3.666° EVENNESS .8548 REDUNDANCY .1457

MAX. DIVERSITY 4.5236 MIN. DIVERSITY .0153 INFORMATIONAL CONTENT .88773+05

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1600 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	3.	975.57
CLADOPHORACEAE			
CLADOPHORA	GLOMERATA	1.	325.19
EUGLENOPHYTA			
EUGLENALES			
EUGLENA	SPECIES	2.	650.38
LEPOCINCLIS	SPECIES	5.	1625.95
TRACHELOMONAS	SPECIES	2.	650.38
CHRYSOPHYCEAE		1.	325.19
DIATOMACEAE			
PENNALES		1.	325.19
ACHNANTHES	SPECIES	13.	4064.87
ACHNANTHES	LANCEOLATA	4.	1430.83
ACHNANTHES	LINEARIS	10.	3349.45
ACHNANTHES	MINUTISSIMA	4.	1235.72
GOMPHONEMA	SPECIES	11.	3447.01
GOMPHONEMA	PARVULUM	8.	2731.59
CYMBELLA	SPECIES	1.	325.19
NITZSCHIA	APICULATA	1.	325.19
NITZSCHIA	PALEA	9.	2926.71
NITZSCHIA	FRUSTULUM	12.	3902.28
SURIRELLA	OVALIS	1.	325.19
SURIRELLA	OVATA	1.	325.19
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	14.	4552.65
OSCILLATORIALES			
PHORMIDIUM	SPECIES	1.	325.19
NOSTOCALES		2.	650.38
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		3.	975.57

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	4.	1300.76	3.64
EUGLENOPHYTA	9.	2926.71	8.18

TABLE

GENERAL MOTOPS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1600 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION — NO. COUNTED — ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHRYSOPHYCEAE	1.	325.19	.91
DIATOMACEAE	76.	24714.41	69.09
CYANOPHYTA	17.	5528.22	15.45
UNKNOWN UNICELLULA	3.	975.57	2.73
TOTALS	110.	35770.85	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.9560	EVENNESS	.8745	REDUNDANCY	.1258
MAX. DIVERSITY	4.5236	MIN. DIVERSITY	.0102	INFORMATIONAL CONTENT	.14151+06

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1600 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		2.	484.53
TETRASPORALES			
GLOEOCYSTIS	SPECIES	1.	242.27
CLADOPHORACEAE			
CLADOPHORA	GLOMERATA	2.	484.53
EUGLENOPHYTA		2.	484.53
EUGLENALES			
EUGLENA	SPECIES	1.	242.27
PHACUS	SPECIES	6.	1453.60
DIATOMACEAE			
PENNALES		2.	484.53
ACHNANTHES	SPECIES	44.	10732.40
ACHNANTHES	LANCEOLATA	6.	1574.73
ACHNANTHES	LINEARIS	9.	2204.62
GOMPHONEMA	SPECIES	38.	9157.66
GOMPHONEMA	ANGUSTATUM	5.	1187.10
GOMPHONEMA	PARVULUM	8.	1986.58
AMPHORA	SPECIES	1.	242.27
CYMBELLA	MINUTA	1.	242.27
NITZSCHIA	SPECIES	2.	484.53
NITZSCHIA	PALEA	8.	1938.13
NITZSCHIA	FRUSTULUM	21.	5087.59
SURIRELLA	ANGUSTATA	2.	484.53
SURIRELLA	OVATA	2.	484.53
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	14.	3391.73
OSCILLATORIALES			
PHORMIDIUM	SPECIES	3.	726.80
UNIDENTIFIED ALGAE			
FLAGELLATED			
LESS THAN 5 U		2.	484.53

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	5.	1211.33	2.74
EUGLENOPHYTA	9.	2180.40	4.92
DIATOMACEAE	150.	36291.48	81.95

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1600 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: B-DISCHARGE , STATION 1 , DEPTH RANGE FROM SURFACE TO .000000M

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CYANOPHYTA	17.	4118.53	9.30
UNKNOWN FLAGELLATE	2.	484.53	1.09
TOTALS	183.	44286.27	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 3.5270 EVENNESS .7797 REDUNDANCY .2207

MAX. DIVERSITY 4.5236 MIN. DIVERSITY .0084 INFORMATIONAL CONTENT .15620+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1500 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	8.	5498.24
CHLOROCOCCALES		1.	687.28
SCENEDESMUS	ABUNDANS	1.	687.28
ULOTRICHALES			
ULOTHRIX	SPECIES	2.	1374.56
CHAETOPHORALES		7.	4810.96
DESMIDIACEAE			
COSMARIUM	SPECIES	2.	1374.56
EUGLENOPHYTA		2.	1374.56
EUGLENALES			
PHACUS	SPECIES	1.	687.28
TRACHELOMONAS	SPECIES	4.	2749.12
DIATOMACEAE			
CENTRALES			
CYCLOTELLA	MENEGHINIANA	5.	3436.40
PENNALES		1.	687.28
SYNEDRA	ULNA	1.	687.28
ACHNANTHES	LANCEOLATA	2.	1374.56
ACHNANTHES	LINEARIS	21.	14432.88
NAVICULA	CRYPTOCEPHALA	15.	10309.20
GOMPHONEMA	SPECIES	2.	1374.56
CYMBELLA	AFFINIS	4.	2749.12
DENTICULA	TENUIS	3.	2061.84
NITZSCHIA	PALEA	5.	3436.40
DIPLONEIS	PUELLA	1.	687.28
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	25.	17182.00
OSCILLATORIALES			
LYNGBYA	SPECIES	6.	4123.68
OSCILLATORIA	SPECIES	2.	1374.56

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1500 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
NOSTOCALES	2.	1374.56
UNIDENTIFIED ALGAE		
UNICELLULAR		
LESS THAN 5 U	1.	687.28

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	21.	14432.88	16.94
EUGLENOPHYTA	7.	4810.96	5.65
DIATOMACEAE	60.	41236.81	48.39
CYANOPHYTA	35.	24054.81	28.23
UNKNOWN UNICELLULA	1.	687.28	.81
TOTALS	124.	85222.73	100.00

TAXA IN SAMPLE 25

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.8563	EVENNESS	.8305	REDUNDANCY	.1697
MAX. DIVERSITY	4.6439	MIN. DIVERSITY	.0050	INFORMATIONAL CONTENT	.32869+06

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1500 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	6.	8945.22
CHLOROCOCCALES			
SCENEDESMUS	SPECIES	3.	4472.61
SCENEDESMUS	ABUNDANS	1.	1490.87
CHAETOPHORALES		6.	8945.22
EUGLENOPHYTA			
EUGLENALES			
PHACUS	SPECIES	2.	2981.74
CHRYSOPHYCEAE			
CHROMULINALES			
KEPHYRION	SPECIES	1.	1490.87
DIATOMACEAE			
PENNALES		1.	1490.87
ACHNANTHES	LINEARIS	100.	149086.93
NAVICULA	CRYPTOCEPHALA	5.	7454.35
GOMPHONEMA	SPECIES	2.	2981.74
CYMBELLA	MICROCEPHALA	1.	1490.87
CYMBELLA	MINUTA	1.	1490.87
DENTICULA	TENUIS	1.	1490.87
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	8.	11926.95
CHROOCOCCUS	MINOR	8.	11926.95
OSCILLATORIALES			
LYNGBYA	SPECIES	7.	10436.08
OSCILLATORIA	SPECIES	1.	1490.87
OSCILLATORIA	TENUIS	9.	13417.82
PHORMIDIUM	SPECIES	24.	35780.86
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		2.	2981.74

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	16.	23853.91	8.47
EUGLENOPHYTA	2.	2981.74	1.06
CHRYSOPHYCEAE	1.	1490.87	.53
DIATOMACEAE	111.	165486.49	58.73
CYANOPHYTA	57.	84979.55	30.16

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1500 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN UNICELLULA	2.	2961.74	1.06
TOTALS	169.	281774.28	100.00

TAXA IN SAMPLE 20

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.6734	EVENNESS	.6186	REDUNDANCY	.3815
MAX. DIVERSITY	4.3219	MIN. DIVERSITY	.0013	INFORMATIONAL CONTENT	.75330+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1500 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	5.	5100.34
CHLOROCOCCALES			
TETRAEDRON	MINIMUM	1.	1020.07
CHAETOPHORALES		1.	1020.07
EUGLENOPHYTA			
EUGLENALES			
PHACUS	SPECIES	2.	2040.14
DIATOMACEAE			
PENNALES			
ACHNANTHES	LINEARIS	115.	117307.87
COCCONEIS	PLACENTULA	2.	2040.14
NAVICULA	SPECIES	1.	1020.07
NAVICULA	CRYPTOCEPHALA	5.	5100.34
GOMPHONEMA	SPECIES	1.	1020.07
CYMBELLA	MICROCEPHALA	2.	2040.14
CYMBELLA	MINUTA	0.	102.01
CYMBELLA	AFFINIS	3.	3162.21
CYMBELLA	TUMIDA	1.	816.05
DENTICULA	TENUIS	2.	2040.14
NITZSCHIA	SPECIES	1.	1020.07
NITZSCHIA	PALEA	2.	2040.14
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	26.	26521.78
OSCILLATORIALES			
LYNGBYA	SPECIES	12.	12240.82
OSCILLATORIA	TENUIS	8.	8160.55
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	1020.07
UNICELLULAR			
5 TO 10 MICRONS		2.	2040.14

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	7.	7140.48	3.63
EUGLENOPHYTA	2.	2040.14	1.04
DIATOMACEAE	135.	137709.24	69.95
CYANOPHYTA	46.	46923.15	23.83
UNKNOWN FLAGELLATE	1.	1020.07	.52

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1500 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN UNICELLULA	2.	2040.14	1.04
TOTALS	193.	196873.20	100.00

TAXA IN SAMPLE 21

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.3274	EVENNESS	.5299	REDUNDANCY	.4703
MAX. DIVERSITY	4.3923	MIN. DIVERSITY	.0019	INFORMATIONAL CONTENT	.45821+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1500 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	8.	3126.02
CHLOROCOCCALES		1.	390.75
SCENEDESMUS	SPECIES	1.	390.75
EUGLENOPHYTA			
EUGLENALES			
PHACUS	SPECIES	10.	3907.52
CHRYSOPHYCEAE		1.	390.75
DIATOMACEAE			
PENNALES			
NAVICULA	CRYPTOCEPHALA	4.	1563.01
CYMBELLA	SPECIES	2.	781.50
CYMBELLA	MICROCEPHALA	1.	390.75
CYMBELLA	AFFINIS	1.	390.75
NITZSCHIA	PALEA	3.	1172.26
DIPLONEIS	PUELLA	1.	390.75
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	11.	4298.27
CHROOCOCCUS	MINOR	28.	10941.06
DACTYLOCOCCOPSIS	SPECIES	1.	390.75
OSCILLATORIALES			
LYNGBYA	SPECIES	1.	390.75
OSCILLATORIA	SPECIES	1.	390.75
PHORMIDIUM	SPECIES	21.	8205.79
UNIDENTIFIED ALGAE			
FLAGELLATED			
LESS THAN 5 U		1.	390.75
UNICELLULAR			
5 TO 10 MICRONS		2.	781.50

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	10.	3907.52	10.10
EUGLENOPHYTA	10.	3907.52	10.10
CHRYSOPHYCEAE	1.	390.75	1.01
DIATOMACEAE	12.	4689.02	12.12
CYANOPHYTA	63.	24617.38	63.64
UNKNOWN FLAGELLATE	1.	390.75	1.01

TABLE

GENEPAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1500 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: C-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .0######

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
UNKNOWN UNICELLULA	2.	761.50	2.02
TOTALS	99.	38684.45	100.00

TAXA IN SAMPLE 19

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.2064	EVENNESS	.7548	REDUNDANCY	.2456
MAX. DIVERSITY	4.2479	MIN. DIVERSITY	.0078	INFORMATIONAL CONTENT	.12404+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1130 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000M

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		1.	299.09
TETRASPORALES			
GLOEOCYSTIS	SPECIES	4.	1196.38
CHLOROCOCCALES		1.	299.09
TETRAEDRON	MINIMUM	1.	299.09
SCENEDESMUS	SPECIES	6.	1794.56
SCENEDESMUS	ABUNDANS	1.	299.09
EUGLENOPHYTA		7.	2093.66
EUGLENALES			
TRACHELOMONAS	SPECIES	4.	1196.38
CHRYSOPHYCEAE		5.	1495.47
DIATOMACEAE			
PENNALES		1.	299.09
ACHNANTHES	LINEARIS	34.	10318.75
GYROSIGMA	SPECIES	1.	299.09
AMPHORA	PERPUSILLA	10.	3140.49
DENTICULA	TENUIS	1.	299.09
NITZSCHIA	PALEA	2.	598.19
DIPLONEIS	PUELLA	1.	299.09
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	14.	4187.32
CHROOCOCCUS	MINOR	13.	3888.22
DACTYLOCOCCOPSIS	SPECIES	1.	299.09
OSCILLATORIALES			
LYNGBYA	SPECIES	1.	299.09
PHORMIDIUM	SPECIES	8.	2392.75
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	299.09

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1130 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2
UNICELLULAR 5 TO 10 MICRONS	3.	897.28

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	14.	4187.32	11.48
EUGLENOPHYTA	11.	3290.04	9.02
CHRYSOPHYCEAE	5.	1495.47	4.10
DIATOMACEAE	51.	15253.80	41.80
CYANOPHYTA	37.	11066.48	30.33
UNKNOWN FLAGELLATE	1.	299.09	.82
UNKNOWN UNICELLULA	3.	897.28	2.46
TOTALS	122.	36489.48	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.5963	EVENNESS	.7950	REDUNDANCY	.2054
MAX. DIVERSITY	4.5236	MIN. DIVERSITY	.0100	INFORMATIONAL CONTENT	.13123+06

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1130 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
EUGLENOPHYTA		2.	253.68
EUGLENALES			
EUGLENA	SPECIES	2.	253.68
PHACUS	SPECIES	6.	761.05
TRACHELOMONAS	SPECIES	2.	253.68
PYRRHOPHYTA			
DINOKONTAE			
GYMNODINIUM	SPECIES	1.	126.84
DIATOMACEAE			
PENNALES			
SYNEDRA	ULNA	2.	253.68
ACHNANTHES	SPECIES	4.	532.73
ACHNANTHES	LANCEOLATA	6.	748.36
ACHNANTHES	LINEARIS	41.	5149.74
CALONEIS	SPECIES	1.	101.47
GYROSIGMA	SPECIES	3.	380.52
NAVICULA	SPECIES	2.	215.63
NAVICULA	CRYPTOCEPHALA	3.	317.10
NAVICULA	TRIPUNCTATA	2.	215.63
NEIDIUM	DUBIUM	1.	101.47
AMPHORA	PERPUSILLA	6.	748.36
CYMBELLA	AFFINIS	1.	101.47
DENTICULA	TENUIS	1.	101.47
NITZSCHIA	DISSIPATA	1.	126.84
NITZSCHIA	PALEA	7.	887.89
DIPLONEIS	PUELLA	1.	126.84
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	7.	887.89
CHROOCOCCUS	MINOR	9.	1141.57
OSCILLATORIALES			
PHORMIDIUM	SPECIES	24.	3044.18
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	126.84
UNICELLULAR			
5 TO 10 MICRONS		2.	253.68

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
EUGLENOPHYTA	12.	1522.09	8.84

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1130 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaaa

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
PYRRHOPHYTA	1.	126.84	.74
DIATOMACEAE	80.	10109.22	58.73
CYANOPHYTA	40.	5073.64	29.48
UNKNOWN FLAGELLATE	1.	126.84	.74
UNKNOWN UNICELLULA	2.	253.68	1.47
TOTALS	136.	17212.32	100.00

TAXA IN SAMPLE 26

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.6291	EVENNESS	.7721	REDUNDANCY	.2290
MAX. DIVERSITY	4.7004	MIN. DIVERSITY	.0225	INFORMATIONAL CONTENT	.62465+05

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 2, 1981, — 1130 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		1.	213.45
TETRASPORALES			
GLOEOCYSTIS	SPECIES	1.	213.45
DIATOMACEAE			
PENNALES			
DIATOMA	VULGARE	11.	2411.99
ACHNANTHES	LINEARIS	104.	22241.54
GYROSIGMA	SPECIES	1.	213.45
NAVICULA	CRYPTOCEPHALA	6.	1280.70
NAVICULA	RHYNCHOCEPHALA	1.	234.80
AMPHORA	PERPUSILLA	18.	3863.45
CYMBELLA	SINUATA	2.	490.94
NITZSCHIA	DISSIPATA	3.	640.35
NITZSCHIA	PALEA	3.	640.35
DIPLONEIS	PUELLA	2.	426.90
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	2.	426.90
OSCILLATORIALES			
OSCILLATORIA	SPECIES	2.	426.90
PHORMIDIUM	SPECIES	17.	3628.66
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		1.	213.45

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	426.90	1.14
DIATOMACEAE	152.	32444.47	86.36
CYANOPHYTA	21.	4482.46	11.93
UNKNOWN UNICELLULA	1.	213.45	.57
TOTALS	176.	37567.28	100.00

TAXA IN SAMPLE 16

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1130 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.2489	EVENNESS	.5622	REDUNDANCY	.4385
MAX. DIVERSITY	4.0000	MIN. DIVERSITY	.0066	INFORMATIONAL CONTENT	.84487+05

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1130 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		1.	89.23
EUGLENOPHYTA		2.	178.47
EUGLENALES			
EUGLENA	SPECIES	2.	178.47
PHACUS	SPECIES	1.	89.23
DIATOMACEAE			
CENTRALES			
CYCLOTELLA	MENEGHINIANA	1.	89.23
PENNALES		1.	62.46
ACHNANTHES	LANCEOLATA	3.	312.31
ACHNANTHES	LINEARIS	58.	5157.64
COCCONEIS	PLACENTULA	1.	62.46
NAVICULA	SPECIES	1.	124.93
NAVICULA	CRYPTOCEPHALA	2.	187.39
AMPHORA	SPECIES	8.	758.48
AMPHORA	PERPUSILLA	6.	499.70
AMPHORA	SUBMONTANA	3.	249.85
DENTICULA	TENUIS	1.	62.46
NITZSCHIA	SPECIES	1.	124.93
NITZSCHIA	DISSIPATA	1.	89.23
NITZSCHIA	PALEA	2.	178.47
DIPLONEIS	PUELLA	1.	62.46
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	8.	713.86
OSCILLATORIALES			
OSCILLATORIA	SPECIES	1.	89.23
PHORMIDIUM	SPECIES	5.	446.16
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	89.23
UNICELLULAR			
5 TO 10 MICRONS		2.	178.47

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	1.	89.23	.89
EUGLENOPHYTA	5.	446.16	4.43

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 2, 1981, 1130 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION 1 , DEPTH RANGE FROM SURFACE TO .0######

TAXONOMIC IDENTIFICATION NO. COUNTED ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
DIATOMACEAE	90.	8022.00	79.63
CYANOPHYTA	14.	1249.26	12.40
UNKNOWN FLAGELLATE	1.	89.23	.89
UNKNOWN UNICELLULA	2.	178.47	1.77
TOTALS	113.	10074.35	100.00

TAXA IN SAMPLE 24

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 2.9684 EVENNESS .6474 REDUNDANCY .3552

MAX. DIVERSITY 4.5850 MIN. DIVERSITY .0337 INFORMATIONAL CONTENT .29904+05

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 1, 1981, — 1118 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: 1-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA		2.	240.76
TETRASPORALES			
GLOEOCYSTIS	SPECIES	5.	601.90
CHLOROCOCCALES			
COCYSTIS	PUSILLA	1.	120.38
EUGLENOPHYTA			
EUGLENALES			
EUGLENA	SPECIES	1.	120.38
DIATOMACEAE			
PENNALES			
ACHNANTHES	SPECIES	1.	144.46
ACHNANTHES	LINEARIS	2.	276.88
RHOICOSPHENIA	CURVATA	0.	48.15
GYROSIGMA	SPECIES	1.	120.38
NAVICULA	SPECIES	1.	144.46
NAVICULA	CRYPTOCEPHALA	1.	144.46
NAVICULA	TRIPUNCTATA	0.	48.15
AMPHORA	SPECIES	0.	48.15
AMPHORA	SUBMONTANA	0.	48.15
CYMBELLA	MINUTA	0.	48.15
NITZSCHIA	DISSIPATA	1.	96.30
NITZSCHIA	PALEA	1.	180.57
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	1.	120.38
OSCILLATORIALES			
OSCILLATORIA	SPECIES	4.	481.52
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		1.	120.38

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	8.	963.05	30.53
EUGLENOPHYTA	1.	120.38	3.82
DIATOMACEAE	11.	1348.26	42.75
CYANOPHYTA	5.	601.90	19.08
UNKNOWN UNICELLULA	1.	120.38	3.82
TOTALS	26.	3153.98	100.00

TAXA IN SAMPLE 19

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 1118 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.8223	EVENNESS	.6998	REDUNDANCY	.1020
MAX. DIVERSITY	4.2479	MIN. DIVERSITY	.0745	INFORMATIONAL CONTENT	.12056+05

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 1118 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
EUGLENOPHYTA		3.	282.80
EUGLENALES			
LEPOCINCLIS	SPECIES	7.	659.87
DIATOMACEAE			
PENNALES		0.	28.28
ACHNANTHES	SPECIES	1.	47.13
ACHNANTHES	LINEARIS	1.	47.13
COCCONEIS	PLACENTULA	0.	28.28
NAVICULA	SPECIES	1.	122.55
NAVICULA	CRYPTOCEPHALA	1.	75.41
NAVICULA	PUPULA	0.	28.28
AMPHORA	SUBMONTANA	1.	47.13
DENTICULA	TENUIS	0.	28.28
NITZSCHIA	PALEA	0.	28.28
CYMATOPLEURA	SOLEA	1.	94.27
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	5.	471.34
OSCILLATORIALES			
OSCILLATORIA	SPECIES	4.	377.07
UNIDENTIFIED ALGAE			
FLAGELLATED			
LESS THAN 5 U		2.	188.53
UNICELLULAR			
5 TO 10 MICRONS		2.	188.53

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
EUGLENOPHYTA	10.	942.67	34.36
DIATOMACEAE	6.	575.03	20.96
CYANOPHYTA	9.	848.40	30.93
UNKNOWN FLAGELLATE	2.	188.53	6.87
UNKNOWN UNICELLULA	2.	188.53	6.87
TOTALS	29.	2743.17	100.00

TAXA IN SAMPLE 17

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 1118 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.3459	EVENNESS	.8186	REDUNDANCY	.1848
MAX. DIVERSITY	4.0875	MIN. DIVERSITY	.0750	INFORMATIONAL CONTENT	.91785+04

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 1, 1981, — 1118 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
VOLVOCALES			
CHLAMYDOMONAS	SPECIES	3.	359.80
EUGLENOPHYTA			
EUGLENALES			
EUGLENA	SPECIES	1.	119.93
LEPOCINCLIS	SPECIES	5.	599.67
TRACHELOMONAS	SPECIES	1.	119.93
CHRYSOPHYCEAE		1.	119.93
DIATOMACEAE			
CENTRALES			
MELOSIRA	DISTANS	2.	239.87
PENNALES			
ACHNANTHES	SPECIES	1.	131.93
ACHNANTHES	LINEARIS	1.	59.97
GYROSIGMA	SPECIES	1.	59.97
NAVICULA	SPECIES	0.	23.99
NAVICULA	CRYPTOCEPHALA	1.	59.97
NAVICULA	TRIPUNCTATA	1.	155.91
GOMPHONEMA	SPECIES	1.	71.96
GOMPHONEMA	PARVULUM	0.	23.99
AMPHORA	SPECIES	0.	23.99
CYMBELLA	SPECIES	1.	83.95
DENTICULA	TENUIS	2.	191.89
NITZSCHIA	SPECIES	0.	23.99
NITZSCHIA	DISSIPATA	0.	23.99
NITZSCHIA	PALEA	2.	227.87
CYANOPHYTA			
OSCILLATORIALES			
LYNGBYA	SPECIES	33.	3957.82
PHORMIDIUM	SPECIES	3.	359.80
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		1.	119.93

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	3.	359.80	5.03
EUGLENOPHYTA	7.	839.54	11.73
CHRYSOPHYCEAE	1.	119.93	1.68
DIATOMACEAE	12.	1403.23	19.60

TABLE

GENEPAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 1118 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000M

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CYANOPHYTA	36.	4317.62	60.30
UNKNOWN UNICELLULA	1.	119.93	1.68
TOTALS	60.	7160.05	100.00

TAXA IN SAMPLE 23

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.7431	EVENNESS	.6064	REDUNDANCY	.3974
MAX. DIVERSITY	4.5236	MIN. DIVERSITY	.0438	INFORMATIONAL CONTENT	.19641+05

TABLE

GENERAL MOTORS PERIPHYTON DATA — SEPTEMBER 1, 1981, — 1118 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: I-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
EUGLENOPHYTA		2.	148.18
EUGLENALES			
EUGLENA	SPECIES	1.	74.09
DIATOMACEAE			
PENNALES			
NAVICULA	CRYPTOCEPHALA	2.	148.18
NITZSCHIA	PALEA	3.	222.26
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	2.	148.18
OSCILLATORIALES			
LYNGBYA	SPECIES	58.	4297.08
OSCILLATORIA	SPECIES	1.	74.09
UNIDENTIFIED ALGAE			
UNICELLULAR			
5 TO 10 MICRONS		1.	74.09

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
EUGLENOPHYTA	3.	222.26	4.29
DIATOMACEAE	5.	370.44	7.14
CYANOPHYTA	61.	4519.34	87.14
UNKNOWN UNICELLULA	1.	74.09	1.43
TOTALS	70.	5186.13	100.00

TAXA IN SAMPLE 8

DIVERSITY CALCULATED IN LOG BASE 2
SHANNONS DIVERSITY 1.1219 EVENNESS .3740 REDUNDANCY .6299
MAX. DIVERSITY 3.0000 MIN. DIVERSITY .0186 INFORMATIONAL CONTENT .58182+04

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	1.	61.18
CHLOROCOCCALES		1.	61.18
EUGLENOPHYTA		9.	550.61
EUGLENALES			
EUGLENA	SPECIES	1.	61.18
LEPOCINCLIS	SPECIES	14.	856.50
DIATOMACEAE			
PENNALES			
ACHNANTHES	MICROCEPHALA	17.	1040.03
RHOICOSPHENIA	CURVATA	1.	61.18
NAVICULA	SPECIES	2.	122.36
NAVICULA	CRYPTOCEPHALA	5.	305.89
GOMPHONEMA	TRUNCATUM	1.	61.18
NITZSCHIA	PALEA	1.	61.18
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	2.	122.36
OSCILLATORIALES			
LYNGBYA	SPECIES	28.	1712.99
OSCILLATORIA	SPECIES	2.	122.36
PHORMIDIUM	SPECIES	1.	61.18
UNIDENTIFIED ALGAE			
FLAGELLATED			
5 TO 10 MICRONS		1.	61.18

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	122.36	2.30
EUGLENOPHYTA	24.	1468.28	27.59
DIATOMACEAE	27.	1651.82	31.03
CYANOPHYTA	33.	2018.89	37.93
UNKNOWN FLAGELLATE	1.	61.18	1.15
TOTALS	87.	5322.52	100.00

TAXA IN SAMPLE 16

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.5540	EVENNESS	.7385	REDUNDANCY	.2641
MAX. DIVERSITY	4.0000	MIN. DIVERSITY	.0389	INFORMATIONAL CONTENT	.15723+05

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
EUGLENOPHYTA		1.	124.08
EUGLENALES			
LEPOCINCLIS	SPECIES	3.	372.24
DIATOMACEAE			
CENTRALES		2.	248.16
PENNALES			
ACHNANTHES	SPECIES	3.	310.20
GYROSIGMA	SPECIES	1.	124.08
NAVICULA	SPECIES	4.	459.10
NAVICULA	CRYPTOCEPHALA	1.	148.90
NAVICULA	TRIPUNCTATA	3.	310.20
PINNULARIA	SPECIES	1.	124.08
GOMPHONEMA	SPECIES	4.	459.10
GOMPHONEMA	PARVULUM	1.	148.90
AMPHORA	SUBMONTANA	1.	148.90
DENTICULA	TENUIS	1.	148.90
NITZSCHIA	SPECIES	1.	124.08
NITZSCHIA	PALEA	1.	124.08
SURIRELLA	OVATA	1.	148.90
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	3.	372.24
OSCILLATORIALES			
LYNGBYA	SPECIES	49.	6079.92
PHORMIDIUM	SPECIES	2.	248.16

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
EUGLENOPHYTA	4.	496.32	4.85
DIATOMACEAE	24.	3027.55	29.61
CYANOPHYTA	54.	6700.32	65.53
TOTALS	82.	10224.19	100.00

TAXA IN SAMPLE 19

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .Caaaaa#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.5929	EVENNESS	.6104	REDUNDANCY	.3920
MAX. DIVERSITY	4.2479	MIN. DIVERSITY	.0260	INFORMATIONAL CONTENT	.26510+05

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .0aaaaaa#

TAXONOMIC IDENTIFICATION		NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			
TETRASPORALES			
GLOEOCYSTIS	SPECIES	1.	142.09
EUGLENOPHYTA			
EUGLENALES			
LEPOCINCLIS	SPECIES	19.	2699.74
DIATOMACEAE			
CENTRALES		1.	142.09
PENNALES			
ACHNANTHES	SPECIES	2.	284.18
GYROSIGMA	SPECIES	1.	142.09
NAVICULA	SPECIES	2.	241.56
NAVICULA	CRYPTOCEPHALA	0.	56.84
NAVICULA	PUPULA	0.	56.84
NAVICULA	RHYNCHOCEPHALA	2.	298.39
NAVICULA	TRIPUNCTATA	4.	596.78
GOMPHONEMA	SPECIES	1.	113.67
GOMPHONEMA	PARVULUM	0.	56.84
CYMBELLA	AFFINIS	0.	56.84
NITZSCHIA	PALEA	4.	568.37
SURIRELLA	ANGUSTATA	0.	56.84
CYANOPHYTA			
CHROOCOCCALES			
CHROOCOCCUS	SPECIES	3.	426.27
OSCILLATORIALES			
PHORMIDIUM	SPECIES	7.	994.64

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	1.	142.09	2.05
EUGLENOPHYTA	19.	2699.74	38.93
DIATOMACEAE	19.	2671.32	38.52
CYANOPHYTA	10.	1420.92	20.49
TOTALS	49.	6934.07	100.00

TAXA IN SAMPLE 17

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION	NO. COUNTED	ORGANISMS PER CM2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.0584	EVENNESS	.7482	REDUNDANCY	.2538
MAX. DIVERSITY	4.0875	MIN. DIVERSITY	.0328	INFORMATIONAL CONTENT	.21207+05

TABLE

GENERAL MOTORS PERIPHYTON DATA SEPTEMBER 1, 1981, 930 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: K-SALT CREEK, STATION 1 , DEPTH RANGE FROM SURFACE TO .000000#

TAXONOMIC IDENTIFICATION			NO. COUNTED	ORGANISMS PER CM2
CHLOROPHYTA			1.	99.70
VOLVOCALES				
CHLAMYDOMONAS	SPECIES		1.	99.70
EUGLENOPHYTA			6.	598.19
EUGLENALES				
EUGLENA	SPECIES		1.	99.70
LEPOCINCLIS	SPECIES		10.	996.98
DIATOMACEAE				
PENNALES				
ACHNANTHES	SPECIES		1.	49.85
RHOICOSPHENIA	CURVATA		1.	49.85
NAVICULA	TRIPUNCTATA		1.	49.85
GOMPHONEMA	SPECIES		1.	99.70
NITZSCHIA	PALEA		1.	49.85
CYANOPHYTA				
CHROOCOCCALES				
CHROOCOCCUS	SPECIES		1.	99.70
OSCILLATORIALES				
LYNGBYA	SPECIES		62.	6181.28

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL ORGANISMS PER CM2	PERCENT
CHLOROPHYTA	2.	199.40	2.35
EUGLENOPHYTA	17.	1694.87	20.00
DIATOMACEAE	3.	299.09	3.53
CYANOPHYTA	63.	6280.98	74.12
TOTALS	85.	8474.33	100.00

TAXA IN SAMPLE 12

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	1.5166	EVENNESS	.4230	REDUNDANCY	.5800
MAX. DIVERSITY	3.5850	MIN. DIVERSITY	.0128	INFORMATIONAL CONTENT	.12852+05

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION B-DISCHARGE 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION C-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
CHLOROPHYTA									
CHLOROPHYTA		121.13	.00	484.53	.36	.00	.00	.00	.00
CHLAMYDOMONAS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
GLOEOCYSTIS	SPECIES	304.46	.00	975.57	.91	5667.45	3126.02	8945.22	3.76
CHLOROCOCCALES		.00	.00	.00	.00	269.51	.00	687.28	.18
TETRAEDRON	MINIMUM	.00	.00	.00	.00	255.02	.00	1020.07	.17
OOCYSTIS	PUSILLA	.00	.00	.00	.00	.00	.00	.00	.00
SCENEDESMUS	SPECIES	.00	.00	.00	.00	1215.84	.00	4472.61	.81
SCENEDESMUS	ABUNDANS	.00	.00	.00	.00	544.54	.00	1490.87	.36
ULOTHRIX	SPECIES	.00	.00	.00	.00	343.64	.00	1374.56	.23
CHAETOPHORALES		.00	.00	.00	.00	3694.06	.00	8945.22	2.45
CLADOPHORA	GLOMERATA	405.59	.00	812.63	1.21	.00	.00	.00	.00
COSMARIUM	SPECIES	.00	.00	.00	.00	343.64	.00	1374.56	.23
TOTAL OF CHLOROPHYTA		831.18	.00	1300.76	2.48	12333.70	3907.52	23853.91	8.19
EUGLENOPHYTA									
EUGLENOPHYTA		273.50	.00	609.47	.82	343.64	.00	1374.56	.23
EUGLENA	SPECIES	223.16	.00	650.38	.67	.00	.00	.00	.00
LEPOCINCLIS	SPECIES	406.49	.00	1625.95	1.21	.00	.00	.00	.00
PHACUS	SPECIES	363.40	.00	1453.60	1.09	2404.17	687.28	3907.52	1.60
TRACHELOMONAS	SPECIES	162.59	.00	650.38	.49	687.28	.00	2749.12	.46
TOTAL OF EUGLENOPHYTA		1429.14	.00	2926.71	4.27	3435.09	2040.14	4810.96	2.28
PYRRHOPHYTA									
GYMNODINIUM	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION B-DISCHARGE 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION C-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
TOTAL OF PYRRHOPHYTA		.00	.00	.00	.00	.00	.00	.00	.00
CRYPTOPHYTA									
RHODOMONAS	SPECIES	128.87	.00	515.46	.38	.00	.00	.00	.00
TOTAL OF CRYPTOPHYTA		128.87	.00	515.46	.38	.00	.00	.00	.00
CHRYSOPHYCEAE									
CHRYSOPHYCEAE		362.53	.00	609.47	1.08	97.69	.00	390.75	.06
KEPHYRION	SPECIES	257.73	.00	1030.92	.77	372.72	.00	1490.87	.25
TOTAL OF CHRYSOPHYCEAE		620.26	.00	1546.38	1.85	470.41	.00	1490.87	.31
DIATOMACEAE									
CENTRALES		308.52	.00	1030.92	.92	.00	.00	.00	.00
MELOSIRA	DISTANS	.00	.00	.00	.00	.00	.00	.00	.00
CYCLOTELLA	MENEGHINIANA	.00	.00	.00	.00	859.10	.00	3436.40	.57
PENNALES		483.66	325.19	609.47	1.44	544.54	.00	1490.87	.36
DIATOMA	VULGARE	.00	.00	.00	.00	.00	.00	.00	.00
SYNEDRA	ULNA	.00	.00	.00	.00	171.82	.00	687.28	.11
ACHNANTHES	SPECIES	4234.50	515.46	10732.40	12.65	.00	.00	.00	.00
ACHNANTHES	LANCEOLATA	751.39	.00	1574.73	2.24	343.64	.00	1374.56	.23
ACHNANTHES	LINEARIS	1388.52	.00	3349.45	4.15	70206.92	.00	149086.93	46.61
ACHNANTHES	MINUTISSIMA	871.40	.00	1235.72	2.60	.00	.00	.00	.00
ACHNANTHES	MICROCEPHALA	.00	.00	.00	.00	.00	.00	.00	.00
COCCONEIS	PLACENTULA	.00	.00	.00	.00	510.03	.00	2040.14	.34

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

		STATION B-DISCHARGE 1 ORGANISMS PER CM2				STATION C-PLEASANT R 1 ORGANISMS PER CM2			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
RHOICOSPHENIA	CURVATA	.00	.00	.00	.00	.00	.00	.00	.00
CALONEIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
GYROSIGMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NAVICULA	SPECIES	50.79	.00	203.16	.15	255.02	.00	1020.07	.17
NAVICULA	CRYPTOCEPHALA	.00	.00	.00	.00	6106.72	1563.01	10309.20	4.05
NAVICULA	PUPULA	.00	.00	.00	.00	.00	.00	.00	.00
NAVICULA	RHYNCHOCEPHALA	.00	.00	.00	.00	.00	.00	.00	.00
NAVICULA	TRIPUNCTATA	.00	.00	.00	.00	.00	.00	.00	.00
NEIDIUM	DUBIUM	.00	.00	.00	.00	.00	.00	.00	.00
PINNULARIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
GOMPHONEMA	SPECIES	4682.42	2061.84	9157.66	13.98	1344.09	.00	2981.74	.89
GOMPHONEMA	ANGUSTATUM	398.36	.00	1187.10	1.19	.00	.00	.00	.00
GOMPHONEMA	PARVULUM	1995.96	1030.92	2731.59	5.96	.00	.00	.00	.00
GOMPHONEMA	TRUNCATUM	.00	.00	.00	.00	.00	.00	.00	.00
AMPHORA	SPECIES	60.57	.00	242.27	.18	.00	.00	.00	.00
AMPHORA	PERPUSILLA	.00	.00	.00	.00	.00	.00	.00	.00
AMPHORA	SUBMONTANA	.00	.00	.00	.00	.00	.00	.00	.00
CYMBELLA	SPECIES	81.30	.00	325.19	.24	195.38	.00	781.50	.13
CYMBELLA	MICROCEPHALA	.00	.00	.00	.00	980.44	.00	2040.14	.65
CYMBELLA	MINUTA	60.57	.00	242.27	.18	398.22	.00	1490.87	.26
CYMBELLA	AFFINIS	.00	.00	.00	.00	1575.52	.00	3162.21	1.05
CYMBELLA	TUMIDA	.00	.00	.00	.00	204.01	.00	816.05	.14
CYMBELLA	SINUATA	.00	.00	.00	.00	.00	.00	.00	.00
DENTICULA	TENUIS	.00	.00	.00	.00	1398.21	.00	2061.84	.93
NITZSCHIA	SPECIES	558.52	.00	1546.38	1.67	255.02	.00	1020.07	.17
NITZSCHIA	APICULATA	81.30	.00	325.19	.24	.00	.00	.00	.00
NITZSCHIA	DISSIPATA	.00	.00	.00	.00	.00	.00	.00	.00
NITZSCHIA	FILIFORMIS	50.79	.00	203.16	.15	.00	.00	.00	.00
NITZSCHIA	LINEARIS	50.79	.00	203.16	.15	.00	.00	.00	.00
NITZSCHIA	PALEA	3395.57	1938.13	5670.06	10.14	1662.20	.00	3436.40	1.10
NITZSCHIA	FRUSTULUM	4610.26	2234.74	7216.44	13.77	.00	.00	.00	.00
CYMATOPLEURA	SOLEA	.00	.00	.00	.00	.00	.00	.00	.00
SURIRELLA	ANGUSTATA	683.60	.00	1218.95	2.04	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1961 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION B-DISCHARGE 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION C-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
SURIRELLA	OVALIS	389.82	.00	1030.92	1.16	.00	.00	.00	.00
SURIRELLA	OVATA	510.95	203.16	1030.92	1.53	.00	.00	.00	.00
DIPLONEIS	PUELLA	.00	.00	.00	.00	269.51	.00	687.28	.18
TOTAL OF DIATOMACEAE		25699.54	18081.09	36291.48	76.75	87280.39	4689.02	165486.49	57.94
CYANOPHYTA									
CYANOPHYTA		128.87	.00	515.46	.38	.00	.00	.00	.00
CHROOCOCCUS	SPECIES	2959.66	1828.42	4552.65	8.84	14982.25	4298.27	26521.78	9.95
CHROOCOCCUS	MINOR	.00	.00	.00	.00	5717.00	.00	11926.95	3.80
MERISMOPEDIA	TENUISSIMA	128.87	.00	515.46	.38	.00	.00	.00	.00
DACTYLOCOCCOPSIS	SPECIES	.00	.00	.00	.00	97.69	.00	390.75	.06
LYNGBYA	SPECIES	.00	.00	.00	.00	6797.83	390.75	12240.82	4.51
OSCILLATORIA	SPECIES	50.79	.00	203.16	.15	814.05	.00	1490.87	.54
OSCILLATORIA	TENUIS	.00	.00	.00	.00	5394.59	.00	13417.82	3.58
PHORMIDIUM	SPECIES	391.86	.00	726.80	1.17	10996.66	.00	35780.86	7.30
NOSTOCALES		162.59	.00	650.38	.49	343.64	.00	1374.56	.23
TOTAL OF CYANOPHYTA		3821.64	2031.58	5528.22	11.41	45143.72	24054.81	84979.55	29.97
UNKNOWN FLAGELLATE									
LESS THAN 5 U		121.13	.00	484.53	.36	97.69	.00	390.75	.06
5 TO 10 MICRONS		179.65	.00	515.46	.54	255.02	.00	1020.07	.17
TOTAL OF UNKNOWN FLAGELLATE		300.79	.00	515.46	.90	352.71	.00	1020.07	.23
UNKNOWN UNICELLULA									
LESS THAN 5 U		257.73	.00	1030.92	.77	171.82	.00	687.28	.11

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1961 IN PLEASANT RUN ANDSALT CREEK

	STATION B-DISCHARGE 1 ORGANISMS PER CM2				STATION C-PLEASANT R 1 ORGANISMS PER CM2			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
5 TO 10 MICRONS	396.26	.00	975.57	1.18	1450.84	.00	2981.74	.96
TOTAL OF UNKNOWN UNICELLULA	653.99	.00	1030.92	1.95	1622.66	.00	2981.74	1.08
STATION MEAN TOTAL	33485.40			100.00	150638.63			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	43				43			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	83							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	3.7804				3.0160			
ASSOCIATED EVENNESS	.8419				.6834			
REDUNDANCY	.1584				.3168			

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION D-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION I-SALT CREEK 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
CHLOROPHYTA									
CHLOROPHYTA		150.44	.00	299.09	.59	60.19	.00	240.76	1.32
CHLAMYDOMONAS	SPECIES	.00	.00	.00	.00	89.95	.00	359.80	1.97
GLOEOCYSTIS	SPECIES	352.46	.00	1196.38	1.39	150.48	.00	601.90	3.30
CHLOROCOCCALES		74.77	.00	299.09	.30	.00	.00	.00	.00
TETRAEDRON	MINIMUM	74.77	.00	299.09	.30	.00	.00	.00	.00
OOCYSTIS	PUSILLA	.00	.00	.00	.00	30.10	.00	120.38	.66
SCENEDESMUS	SPECIES	448.64	.00	1794.56	1.77	.00	.00	.00	.00
SCENEDESMUS	ABUNDANS	74.77	.00	299.09	.30	.00	.00	.00	.00
ULOTHRIX	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CHAETOPHORALES		.00	.00	.00	.00	.00	.00	.00	.00
CLADOPHORA	GLOMERATA	.00	.00	.00	.00	.00	.00	.00	.00
COSMARIUM	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHLOROPHYTA		1175.86	.00	4187.32	4.64	330.71	.00	963.05	7.25
EUGLENOPHYTA									
EUGLENOPHYTA		631.45	.00	2093.66	2.49	107.74	.00	282.80	2.36
EUGLENA	SPECIES	108.04	.00	253.68	.43	78.60	.00	120.38	1.72
LEPOCINCLIS	SPECIES	.00	.00	.00	.00	314.88	.00	659.87	6.90
PHACUS	SPECIES	212.57	.00	761.05	.84	.00	.00	.00	.00
TRACHELOMONAS	SPECIES	362.51	.00	1196.38	1.43	29.98	.00	119.93	.66
TOTAL OF EUGLENOPHYTA		1314.57	.00	3290.04	5.19	531.21	.00	942.67	11.65
PYRRHOPHYTA									
GYMNODINIUM	SPECIES	31.71	.00	126.84	.13	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION D-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION I-SALT CREEK 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
TOTAL OF PYRRHOPHYTA		31.71	.00	126.84	.13	.00	.00	.00	.00
CRYPTOPHYTA									
RHODOMONAS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CRYPTOPHYTA		.00	.00	.00	.00	.00	.00	.00	.00
CHRYSOPHYCEAE									
CHRYSOPHYCEAE		373.87	.00	1495.47	1.48	29.98	.00	119.93	.66
KEPHYRION	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHRYSOPHYCEAE		373.87	.00	1495.47	1.48	29.98	.00	119.93	.66
DIATOMACEAE									
CENTRALES		.00	.00	.00	.00	.00	.00	.00	.00
MELOSIRA	DISTANS	.00	.00	.00	.00	59.97	.00	239.87	1.31
CYCLOTELLA	MENEGHINIANA	22.31	.00	89.23	.09	.00	.00	.00	.00
PENNALES		90.39	.00	299.09	.36	7.07	.00	28.28	.16
DIATOMA	VULGARE	603.00	.00	2411.99	2.38	.00	.00	.00	.00
SYNEDRA	ULNA	63.42	.00	253.68	.25	.00	.00	.00	.00
ACHNANTHES	SPECIES	133.18	.00	532.73	.53	80.88	.00	144.46	1.77
ACHNANTHES	LANCEOLATA	265.17	.00	748.36	1.05	.00	.00	.00	.00
ACHNANTHES	LINEARIS	10716.92	5149.74	22241.54	42.30	95.99	.00	276.88	2.10
ACHNANTHES	MINUTISSIMA	.00	.00	.00	.00	.00	.00	.00	.00
ACHNANTHES	MICROCEPHALA	.00	.00	.00	.00	.00	.00	.00	.00
COCCONEIS	PLACENTULA	15.62	.00	62.46	.06	7.07	.00	28.28	.16

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1961 IN PLEASANT RUN ANDSALT CREEK

SPECIES NAME		STATION D-PLEASANT R 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT	STATION I-SALT CREEK 1 ORGANISMS PER CM2 MEAN	MIN.	MAX.	PERCENT
RHOICOSPHENIA	CURVATA	.00	.00	.00	.00	12.04	.00	48.15	.26
CALONEIS	SPECIES	25.37	.00	101.47	.10	.00	.00	.00	.00
GYROSIGMA	SPECIES	223.27	.00	380.52	.88	45.09	.00	120.38	.99
NAVICULA	SPECIES	85.14	.00	215.63	.34	72.75	.00	144.46	1.60
NAVICULA	CRYPTOCEPHALA	446.30	.00	1280.70	1.76	107.00	59.97	148.18	2.35
NAVICULA	PUPULA	.00	.00	.00	.00	7.07	.00	28.28	.16
NAVICULA	RHYNCHOCEPHALA	58.70	.00	234.80	.23	.00	.00	.00	.00
NAVICULA	TRIPUNCTATA	53.91	.00	215.63	.21	51.02	.00	155.91	1.12
NEIDIUM	DUBIUM	25.37	.00	101.47	.10	.00	.00	.00	.00
PINNULARIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
GOMPHONEMA	SPECIES	.00	.00	.00	.00	17.99	.00	71.96	.39
GOMPHONEMA	ANGUSTATUM	.00	.00	.00	.00	.00	.00	.00	.00
GOMPHONEMA	PARVULUM	.00	.00	.00	.00	6.00	.00	23.99	.13
GOMPHONEMA	TRUNCATUM	.00	.00	.00	.00	.00	.00	.00	.00
AMPHORA	SPECIES	189.62	.00	758.48	.75	18.03	.00	48.15	.40
AMPHORA	PERPUSILLA	2063.00	499.70	3863.45	8.14	.00	.00	.00	.00
AMPHORA	SUBMONTANA	62.46	.00	249.85	.25	23.82	.00	48.15	.52
CYMBELLA	SPECIES	.00	.00	.00	.00	20.99	.00	83.95	.46
CYMBELLA	MICROCEPHALA	.00	.00	.00	.00	.00	.00	.00	.00
CYMBELLA	MINUTA	.00	.00	.00	.00	12.04	.00	48.15	.26
CYMBELLA	AFFINIS	25.37	.00	101.47	.10	.00	.00	.00	.00
CYMBELLA	TUMIDA	.00	.00	.00	.00	.00	.00	.00	.00
CYMBELLA	SINUATA	122.73	.00	490.94	.48	.00	.00	.00	.00
DENTICULA	TENUIS	115.76	.00	299.09	.46	55.04	.00	191.89	1.21
NITZSCHIA	SPECIES	31.23	.00	124.93	.12	6.00	.00	23.99	.13
NITZSCHIA	APICULATA	.00	.00	.00	.00	.00	.00	.00	.00
NITZSCHIA	DISSIPATA	214.11	.00	640.35	.85	30.07	.00	96.30	.66
NITZSCHIA	FILIFORMIS	.00	.00	.00	.00	.00	.00	.00	.00
NITZSCHIA	LINEARIS	.00	.00	.00	.00	.00	.00	.00	.00
NITZSCHIA	PALEA	576.22	178.47	887.89	2.27	164.75	28.28	227.87	3.61
NITZSCHIA	FRUSTULUM	.00	.00	.00	.00	.00	.00	.00	.00
CYMATOPLEURA	SOLEA	.00	.00	.00	.00	23.57	.00	94.27	.52
SURIRELLA	ANGUSTATA	.00	.00	.00	.00	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

		STATION D-PLEASANT R 1 ORGANISMS PER CM2				STATION I-SALT CREEK 1 ORGANISMS PER CM2			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
SURIRELLA	OVALIS	.00	.00	.00	.00	.00	.00	.00	.00
SURIRELLA	OVATA	.00	.00	.00	.00	.00	.00	.00	.00
DIPLONEIS	PUELLA	228.82	62.46	426.90	.90	.00	.00	.00	.00
TOTAL OF DIATOMACEAE		16457.37	8022.00	32444.47	64.96	924.24	370.44	1403.23	20.26
CYANOPHYTA									
CYANOPHYTA		.00	.00	.00	.00	.00	.00	.00	.00
CHROOCOCCUS	SPECIES	1553.99	426.90	4187.32	6.13	184.97	.00	471.34	4.06
CHROOCOCCUS	MINOR	1257.45	.00	3888.22	4.96	.00	.00	.00	.00
MERISMOPEDIA	TENUISSIMA	.00	.00	.00	.00	.00	.00	.00	.00
DACTYLOCOCCOPSIS	SPECIES	74.77	.00	299.09	.30	.00	.00	.00	.00
LYNGBYA	SPECIES	74.77	.00	299.09	.30	2063.72	.00	4297.08	45.25
OSCILLATORIA	SPECIES	129.03	.00	426.90	.51	233.17	.00	481.52	5.11
OSCILLATORIA	TENUIS	.00	.00	.00	.00	.00	.00	.00	.00
PHORMIDIUM	SPECIES	2377.94	446.16	3628.66	9.39	89.95	.00	359.80	1.97
NOSTOCALES		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CYANOPHYTA		5467.96	1249.26	11066.48	21.58	2571.82	.00	4519.34	56.39
UNKNOWN FLAGELLATE									
LESS THAN 5 U		.00	.00	.00	.00	47.13	.00	188.53	1.03
5 TO 10 MICRONS		128.79	.00	299.09	.51	.00	.00	.00	.00
TOTAL OF UNKNOWN FLAGELLATE		128.79	.00	299.09	.51	47.13	.00	188.53	1.03
UNKNOWN UNICELLULA									
LESS THAN 5 U		.00	.00	.00	.00	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

	STATION D-PLEASANT R 1 ORGANISMS PER CM2				STATION I-SALT CREEK 1 ORGANISMS PER CM2			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
5 TO 10 MICRONS	385.72	178.47	897.28	1.52	125.73	74.09	188.53	2.76
TOTAL OF UNKNOWN UNICELLULA	385.72	178.47	897.28	1.52	125.73	74.09	188.53	2.76
STATION MEAN TOTAL	25335.85			100.00	4560.83			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	45				37			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	83							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	3.1107				2.7583			
ASSOCIATED EVENNESS	.6942				.6747			
REDUNDANCY	.3070				.3285			

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
CHLOROPHYTA					
CHLOROPHYTA		24.92	.00	99.70	.32
CHLAMYDOMONAS	SPECIES	24.92	.00	99.70	.32
GLOEOCYSTIS	SPECIES	50.82	.00	142.09	.66
CHLOROCOCCALES		15.29	.00	61.18	.20
TETRAEDRON	MINIMUM	.00	.00	.00	.00
OOCYSTIS	PUSILLA	.00	.00	.00	.00
SCENEDESMUS	SPECIES	.00	.00	.00	.00
SCENEDESMUS	ABUNDANS	.00	.00	.00	.00
ULOTHRIX	SPECIES	.00	.00	.00	.00
CHAETOPHORALES		.00	.00	.00	.00
CLADOPHORA	GLOMERATA	.00	.00	.00	.00
COSMARIUM	SPECIES	.00	.00	.00	.00
TOTAL OF CHLOROPHYTA		115.96	.00	199.40	1.50
EUGLENOPHYTA					
EUGLENOPHYTA		318.22	.00	598.19	4.11
EUGLENA	SPECIES	40.22	.00	99.70	.52
LEPOCINCLIS	SPECIES	1231.36	372.24	2699.74	15.91
PHACUS	SPECIES	.00	.00	.00	.00
TRACHELOMONAS	SPECIES	.00	.00	.00	.00
TOTAL OF EUGLENOPHYTA		1589.80	496.32	2699.74	20.54
PYRRHOPHYTA					
GYMNODINIUM	SPECIES	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
TOTAL OF PYRRHOPHYTA		.00	.00	.00	.00
CRYPTOPHYTA					
RHODOMONAS	SPECIES	.00	.00	.00	.00
TOTAL OF CRYPTOPHYTA		.00	.00	.00	.00
CHRYSOPHYCEAE					
CHRYSOPHYCEAE		.00	.00	.00	.00
KEPHYRION	SPECIES	.00	.00	.00	.00
TOTAL OF CHRYSOPHYCEAE		.00	.00	.00	.00
DIATOMACEAE					
CENTRALES		97.56	.00	248.16	1.26
MELOSIRA	DISTANS	.00	.00	.00	.00
CYCLOTELLA	MENEGHINIANA	.00	.00	.00	.00
PENNALES		.00	.00	.00	.00
DIATOMA	VULGARE	.00	.00	.00	.00
SYNEDRA	ULNA	.00	.00	.00	.00
ACHNANTHES	SPECIES	161.06	.00	310.20	2.08
ACHNANTHES	LANCEOLATA	.00	.00	.00	.00
ACHNANTHES	LINEARIS	.00	.00	.00	.00
ACHNANTHES	MINUTISSIMA	.00	.00	.00	.00
ACHNANTHES	MICROCEPHALA	260.01	.00	1040.03	3.36
COCCONEIS	PLACENTULA	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
RHOICOSPHENIA	CURVATA	27.76	.00	61.18	.36
CALONEIS	SPECIES	.00	.00	.00	.00
GYROSIGMA	SPECIES	66.54	.00	142.09	.86
NAVICULA	SPECIES	205.75	.00	459.10	2.66
NAVICULA	CRYPTOCEPHALA	127.91	.00	305.89	1.65
NAVICULA	PUPULA	14.21	.00	56.84	.18
NAVICULA	RHYNCHOCEPHALA	74.60	.00	298.39	.96
NAVICULA	TRIPUNCTATA	239.21	.00	596.76	3.09
NEIDIUM	DUBIUM	.00	.00	.00	.00
PINNULARIA	SPECIES	31.02	.00	124.08	.40
GOMPHONEMA	SPECIES	168.12	.00	459.10	2.17
GOMPHONEMA	ANGUSTATUM	.00	.00	.00	.00
GOMPHONEMA	PARVULUM	51.43	.00	148.90	.66
GOMPHONEMA	TRUNCATUM	15.29	.00	61.18	.20
AMPHORA	SPECIES	.00	.00	.00	.00
AMPHORA	PERPUSILLA	.00	.00	.00	.00
AMPHORA	SUBMONTANA	37.22	.00	148.90	.48
CYMBELLA	SPECIES	.00	.00	.00	.00
CYMBELLA	MICROCEPHALA	.00	.00	.00	.00
CYMBELLA	MINUTA	.00	.00	.00	.00
CYMBELLA	AFFINIS	14.21	.00	56.84	.18
CYMBELLA	TUMIDA	.00	.00	.00	.00
CYMBELLA	SINUATA	.00	.00	.00	.00
DENTICULA	TENUIS	37.22	.00	148.90	.48
NITZSCHIA	SPECIES	31.02	.00	124.08	.40
NITZSCHIA	APICULATA	.00	.00	.00	.00
NITZSCHIA	DISSIPATA	.00	.00	.00	.00
NITZSCHIA	FILIFORMIS	.00	.00	.00	.00
NITZSCHIA	LINEARIS	.00	.00	.00	.00
NITZSCHIA	PALEA	200.87	49.85	568.37	2.60
NITZSCHIA	FRUSTULUM	.00	.00	.00	.00
CYMATOPLEURA	SOLEA	.00	.00	.00	.00
SURIRELLA	ANGUSTATA	14.21	.00	56.84	.18

TABLE

MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1961 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME		MEAN	MIN.	MAX.	PERCENT
SURIRELLA	OVALIS	.00	.00	.00	.00
SURIRELLA	OVATA	37.22	.00	148.90	.48
DIPLONEIS	PUELLA	.00	.00	.00	.00
TOTAL OF DIATOMACEAE		1912.45	299.09	3027.55	24.71
CYANOPHYTA					
CYANOPHYTA		.00	.00	.00	.00
CHROOCOCCUS	SPECIES	255.14	99.70	426.27	3.30
CHROOCOCCUS	MINOR	.00	.00	.00	.00
MERISMOPEDIA	TENUISSIMA	.00	.00	.00	.00
DACTYLOCOCCOPSIS	SPECIES	.00	.00	.00	.00
LYNGBYA	SPECIES	3493.55	.00	6181.28	45.14
OSCILLATORIA	SPECIES	30.59	.00	122.36	.40
OSCILLATORIA	TENUIS	.00	.00	.00	.00
PHORMIDIUM	SPECIES	325.99	.00	994.64	4.21
NOSTOCALES		.00	.00	.00	.00
TOTAL OF CYANOPHYTA		4105.28	1420.92	6700.32	53.05
UNKNOWN FLAGELLATE					
LESS THAN 5 U		.00	.00	.00	.00
5 TO 10 MICRONS		15.29	.00	61.18	.20
TOTAL OF UNKNOWN FLAGELLATE		15.29	.00	61.18	.20
UNKNOWN UNICELLULA					
LESS THAN 5 U		.00	.00	.00	.00

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME	MEAN	MIN.	MAX.	PERCENT
5 TO 10 MICRONS	.00	.00	.00	.00
TOTAL OF UNKNOWN UNICELLULA	.00	.00	.00	.00
STATION MEAN TOTAL	7738.78			100.00
TOTAL NUMBER OF SAMPLES	4			
NUMBER OF SPECIES	33			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	83			
DIVERSITY CALCULATED IN LOG BASE 2				
SHANNONS DIVERSITY	2.5305			
ASSOCIATED EVENNESS	.6300			
REDUNDANCY	.3725			

TABLE
MEAN, MINIMUM, AND MAXIMUM DENSITY OF PERIPHYTON SPECIES AND GROUPS WITH PERCENT COMPOSITION AND DIVERSITY
DATA COLLECTED SEPTEMBER 1-2, 1981 IN PLEASANT RUN ANDSALT CREEK

STATION K-SALT CREEK 1
ORGANISMS PER CM2

SPECIES NAME	MEAN	MIN.	MAX.	PERCENT
5 TO 10 MICRONS	.00	.00	.00	.00
TOTAL OF UNKNOWN UNICELLULA	.00	.00	.00	.00
STATION MEAN TOTAL	7738.78			100.00
TOTAL NUMBER OF SAMPLES	4			
NUMBER OF SPECIES	33			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	83			
DIVERSITY CALCULATED IN LOG BASE 2				
SHANNONS DIVERSITY	2.5305			
ASSOCIATED EVENNESS	.6300			
REDUNDANCY	.3725			

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.7	6.7

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
PLATYHELMINTHES				
TURBELLARIA				
PLANARIIDAE			1.	10.76
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	UNIDENT. TUBIFICID WITH CAP. CHAETAE		1.	10.76
	UNIDENT. TUBIFICID WITHOUT CAP. CHAET		3.	32.28
NAIDIDAE				
	PRISTINA	IDRENSIS	2.	21.52
	SLAVINA	APPENDICULATA	1.	10.76
	NAIS	BRETSCHERI	1.	10.76
	NAIS	PARDALIS	1.	10.76
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	11.	118.36
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	2.	21.52
LEPTOPHLEBIIDAE				
	PARALEPTOPHLEBIA	SPECIES	2.	21.52
COLEOPTERA				
ELMIDAE				
	STENELMIS	SPECIES	8.	86.08
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	MICROTENDIPES	SPECIES	1.	10.76
	TANYTARSUS	SPECIES	2.	21.52
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	11.	118.36
	RHEOCRICOTOPUS	SPECIES	1.	10.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	1.	10.76	2.08
TUBIFICIDAE	4.	43.04	8.33
NAIDIDAE	5.	53.80	10.42
CRUSTACEA	11.	118.36	22.92

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
	SURFACE	11.5 52.7	11.7	6.7

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
EPHEMEROPTERA	4.	43.04	8.33
COLEOPTERA	8.	86.08	16.67
CHIRONOMIDAE	15.	161.40	31.25
TOTALS	48.	516.48	100.00

TAXA IN SAMPLE 15

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.2737	EVENNESS	.8277	REDUNDANCY	.1858
MAX. DIVERSITY	3.9069	MIN. DIVERSITY	.2829	INFORMATIONAL CONTENT	.16701+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.7	6.7

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
PLATYHELMINTHES				
TURBELLARIA				
PLANARIIDAE			1.	10.76
NEMATODA			2.	21.52
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	2.	21.52
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	1.	10.76
NAIDIDAE				
	PRISTINA	IDRENSIS	7.	75.32
	PRISTINA	FORELI	1.	10.76
	SLAVINA	APPENDICULATA	16.	172.16
	NAIS	COMMUNIS	18.	193.68
	NAIS	PARDALIS	4.	43.04
ENCHYTRAEIDAE			1.	10.76
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	188.	2022.88
AMPHIPODA				
GAMMARIDAE				
	CRANGONYX	SPECIES	1.	10.76
EPHEMEROPTERA				
BAETIDAE				
	BAETIS	SPECIES	2.	21.52
CAENIDAE				
	CAENIS	SPECIES	5.	53.80
LEPTOPHLEBIIDAE				
	PARALEPTOPHLEBIA	SPECIES	3.	32.28
SIPHLONURIDAE				
	ISONYCHIA	SPECIES	1.	10.76

TABLE

BENTHIC DATA FROM GENERAL MOTORS, OLDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.7	6.7

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
TRICHOPTERA				
HYDROPSYCHIDAE			1.	10.76
COLEOPTERA				
ELMIDAE				
	STENELMIS	SPECIES	3.	32.28
PSEPHENIDAE				
	ECTOPRIA	NERVOSA	1.	10.76
	PSEPHUS	HERRICKI	1.	10.76
DIPTERA				
TIPULIDAE			1.	10.76
CHIRONOMIDAE				
TANYPODINAE				
	LARSIA	SPECIES	1.	10.76
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	3.	32.28
	MICROTENDIPES	SPECIES	1.	10.76
	TANYTARSUS	SPECIES	5.	53.80
ORTHOCLADIINAE				
	PUPA		1.	10.76
	CORYNONEURA	SPECIES	1.	10.76
	CRICOTOPUS	SPECIES	21.	225.96
	EUKIEFFERIELLA	SPECIES	6.	64.56
MOLLUSCA				
GASTROPODA				
LYMNAEIDAE				
	LYMNAEA	SPECIES	2.	21.52

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	3.	32.28	1.00
TUBIFICIDAE	3.	32.28	1.00
NAIDIDAE	46.	494.96	15.28
OTHER ANNELIDA	1.	10.76	.33
CRUSTACEA	189.	2033.64	62.79
EPHEMEROPTERA	11.	118.36	3.65
TRICHOPTERA	1.	10.76	.33
COLEOPTERA	5.	53.80	1.66
DIPTERA GRP I	1.	10.76	.33
CHIRONOMIDAE	39.	419.64	12.96
GASTROPODA	2.	21.52	.66

TOTALS	391.	3238.76	100.00

TAXA IN SAMPLE 30

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
	SURFACE	11.5 52.7	11.7	6.7

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.4522	EVENNESS	.4997	REDUNDANCY	.5125
MAX. DIVERSITY	4.9069	MIN. DIVERSITY	.1173	INFORMATIONAL CONTENT	.79421+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1330 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: C-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE ROCK, COBBLE, GRAVEL

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.7	6.7

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
NAIDIDAE				
	NAIS	COMMUNIS	1.	10.76
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	12.	129.12
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	4.	43.04
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	1.	10.76
	MICROTENDIPES	SPECIES	2.	21.52
	POLYPEDILUM	SPECIES	1.	10.76
	POLYPEDILUM	(SCALAENUM GROUP)	1.	10.76
	TANYTARSUS	SPECIES	3.	32.28
	RHEOTANYTARSUS	SPECIES	1.	10.76
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	2.	21.52
	RHEOCRICOTOPUS	SPECIES	1.	10.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
NAIDIDAE	1.	10.76	3.45
CRUSTACEA	12.	129.12	41.38
EPHEMEROPTERA	4.	43.04	13.79
CHIRONOMIDAE	12.	129.12	41.38
TOTALS	29.	312.04	100.00

TAXA IN SAMPLE 11

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.7969	EVENNESS	.8085	REDUNDANCY	.2105
MAX. DIVERSITY	3.4594	MIN. DIVERSITY	.3110	INFORMATIONAL CONTENT	.87271+03

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
COELENTERATA				
HYDROZOA				
HYDRIDAE				
	HYDRA	SPECIES	2.	86.12
ANNELIDA				
OLIGOCHAETA				
NAIDIDAE				
	NAIS	PARDALIS	11.	473.66
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	2.	86.12
DIPTERA				
CERATOPOGONIDAE			1.	43.06
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	13.	576.45
	MICROTENDIPES	SPECIES	5.	230.58
	STICTOCHIRONOMUS	SPECIES	8.	345.87
	TANYTARSUS	SPECIES	32.	1383.48
	LICROTENDIPES	SPECIES	5.	230.58
	CLADOTANYTARSUS	SPECIES	5.	230.58
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	13.	576.45

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	2.	86.12	2.02
NAIDIDAE	11.	473.66	11.11
EPHEMEROPTERA	2.	86.12	2.02
DIPTERA CRF I	1.	43.06	1.01
CHIRONOMIDAE	87.	3573.98	83.84
TOTALS	99.	4262.94	100.00

TAXA IN SAMPLE 11

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.5311	EVENNESS	.8473	REDUNDANCY	.1541
MAX. DIVERSITY	3.4594	MIN. DIVERSITY	.0317	INFORMATIONAL CONTENT	.12495+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			2.	86.12
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	6.	258.36
	AULODRILUS	PIGUETI	2.	86.12
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	6.	258.36
NAIDIDAE				
	NAIS	PARDALIS	8.	344.48
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	6.	258.36
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	8.	344.48
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	12.	504.76
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	129.	5552.35
	PARATENDIPES	SPECIES	12.	504.76
	STICTOCHIRONOMUS	SPECIES	70.	3028.55
	TANYTARSUS	SPECIES	152.	6561.87
	DICROTENDIPES	SPECIES	12.	504.76
	CLADOTANYTARSUS	SPECIES	23.	1009.52
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	12.	504.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	2.	86.12	.43
TUBIFICIDAE	14.	602.84	3.04
NAIDIDAE	8.	344.48	1.74
CRUSTACEA	6.	258.36	1.30
EPHEMEROPTERA	8.	344.48	1.74
CHIRONOMIDAE	422.	18171.32	91.74
TOTALS	460.	19807.60	100.00

TAXA IN SAMPLE 19

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BLDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.7717	EVENNESS	.6992	REDUNDANCY	.3017
MAX. DIVERSITY	3.9069	MIN. DIVERSITY	.0111	INFORMATIONAL CONTENT	.54108+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION				NO./SAMPLE	NUMBER/SQ M
ANNELIDA					
OLIGOCHAETA					
TUBIFICIDAE					
	UNIDENT. TUBIFICID WITHOUT CAP. CHAET		.....	1.	43.06
NAIDIDAE					
	PRISTINA	IDRENSIS	.....	2.	86.12
	NAIS	COMMUNIS	.....	3.	129.18
	NAIS	PARDALIS	.....	17.	732.02
CRUSTACEA					
ISOPODA					
ASELLIDAE					
	LIRCEUS	FONTINALIS	.....	5.	215.30
EPHEMEROPTERA					
CAENIDAE					
	CAENIS	SPECIES	.....	18.	775.08
DIPTERA					
CHIRONOMIDAE					
CHIRONOMINAE					
	CHIRONOMUS	SPECIES	.....	40.	1725.84
	POLYPEDILUM	(SCALAENUM GROUP)	.....	13.	575.28
	TANYTARSUS	SPECIES	.....	67.	2876.41
	DICROTENDIPES	SPECIES	.....	13.	575.28
ORTHOCLADIINAE					
	CRICOTOPUS	SPECIES	.....	33.	1438.20
MOLLUSCA					
GASTROPODA					
PHYSIDAE					
	PHYSA	SPECIES	.....	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	1.	43.06	.47
NAIDIDAE	22.	947.22	10.28
CRUSTACEA	5.	215.30	2.34
EPHEMEROPTERA	18.	775.08	8.41
CHIRONOMIDAE	167.	7191.02	78.04
GASTROPODA	1.	43.06	.47
TOTALS	214.	9214.24	100.00

TAXA IN SAMPLE 12

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 7

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.8232	EVENNESS	.7905	REDUNDANCY	.2106
MAX. DIVERSITY	3.5850	MIN. DIVERSITY	.0174	INFORMATIONAL CONTENT	.26113+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
COELENTERATA				
HYDROZOA				
HYDRIDAE				
	HYDRA	SPECIES	12.	516.72
NEMATODA	.....	.....	2.	86.12
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	6.	258.36
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	8.	344.48
NAIDIDAE				
	DERO	DIGITATA	4.	172.24
	NAIS	COMMUNIS	2.	86.12
	NAIS	PARDALIS	36.	1550.16
ARACHNOIDEA				
HYDRACARINA	.....	.....	2.	86.12
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	16.	688.96
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	10.	428.50
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	30.	1285.50
	CRYPTOCHIRONOMUS	SPECIES	10.	428.50
	PARACLADOPELMA	SPECIES	10.	428.50
	STICTOCHIRONOMUS	SPECIES	30.	1285.50
	TANYTARSUS	SPECIES	259.	11140.99
	DICROTENDIPES	SPECIES	30.	1285.50
	CLADOTANYTARSUS	SPECIES	10.	428.50
	STEMPELLINELLA	SPECIES	10.	428.50

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1050 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: D-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.C	53.6	11.2	6.9

TAXONOMIC IDENTIFICATION				NO./SAMPLE	NUMBER/SQ M
ORTHOCLADIINAE					
	CRICOTOPUS	SPECIES	.....	10.	428.50
MOLLUSCA					
PELECYPODA					
SPHAERIIDAE					
	SPHAERIUM	STRIATINIUM	.....	6.	258.36

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	14.	602.84	2.79
TUBIFICIDAE	14.	602.84	2.79
NAIDIDAE	42.	1808.52	8.37
HYDRACARINA	2.	c6.12	.4C
EPHEMEROPTERA	16.	688.96	3.19
CHIRONOMIDAE	408.	17568.48	81.27
PELECYPODA	6.	258.36	1.2C
TOTALS	502.	21616.12	100.0C

TAXA IN SAMPLE 2C

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.8506	EVENNESS	.6596	REDUNDANCY	.3415
MAX. DIVERSITY	4.3219	MIN. DIVERSITY	.0139	INFORMATIONAL CONTENT	.6161E+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 900 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	10.8	51.4	10.5	7.3

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	1.	43.06
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	4.	172.24
NAIDIDAE				
	NAIS	PARDALIS	1.	43.06
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	THIENEMANNIMYIA	GROUP	1.	43.06
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	3.	129.18
	POLYPEDILUM	(CONVICTUM GROUP)	1.	43.06
	TANYTARSUS	SPECIES	6.	258.36
	DICROTENDIPES	SPECIES	3.	129.18
	CONSTEMPELLINA	SPECIES	1.	43.06
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	29.	1248.74

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	5.	215.30	10.00
NAIDIDAE	1.	43.06	2.00
CHIRONOMIDAE	44.	1894.64	88.00
TOTALS	50.	2153.00	100.00

TAXA IN SAMPLE 10

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.1653	EVENNESS	.6520	REDUNDANCY	.3536
MAX. DIVERSITY	3.3219	MIN. DIVERSITY	.0523	INFORMATIONAL CONTENT	.46630+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 900 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	10.8	51.4	10.5	7.3

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			2.	86.12
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	128.	5526.03
	LIMNODRILUS	UDEKEMIANUS	9.	388.40
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	154.	6631.24
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	2.	86.12
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	MICROTENDIPES	SPECIES	5.	206.07
	TANYTARSUS	SPECIES	5.	206.07
	DICROTENDIPES	SPECIES	38.	1648.58
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	81.	3503.24
	HETEROTRISSOCLAD.	SPECIES	5.	206.07

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	2.	86.12	.47
TUBIFICIDAE	291.	12525.68	67.82
EPHEMEROPTERA	2.	86.12	.47
CHIRONOMIDAE	134.	5770.04	31.24
TOTALS	429.	18467.95	100.00

TAXA IN SAMPLE 10

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 2.2195 EVENNESS .6661 REDUNDANCY .3326

MAX. DIVERSITY 3.3219 MIN. DIVERSITY .0076 INFORMATIONAL CONTENT .40990+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, OLDFORD, INDIANA — MAY 20, 1981, 900 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	10.8	51.4	10.5	7.3

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			3.	129.18
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	20.	880.34
	LIMNODRILUS	UDEKEMIANUS	2.	73.36
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	29.	1247.15
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	1.	43.06
	TANYTARSUS	SPECIES	1.	43.06
	DICROTENDIPES	SPECIES	4.	172.24
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	4.	172.24
	PARAKIEFFERIELLA	SPECIES	2.	86.12

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	3.	129.18	4.54
TUBIFICIDAE	51.	2200.84	77.31
CHIRONOMIDAE	12.	516.72	18.15
TOTALS	66.	2846.74	100.00

TAXA IN SAMPLE 6

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.2050	EVENNESS	.6969	REDUNDANCY	.3066
MAX. DIVERSITY	3.1699	MIN. DIVERSITY	.0363	INFORMATIONAL CONTENT	.62886+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 900 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE GRAVEL, SAND

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	10.8	51.4	10.5	7.3

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			1.	43.06
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	79.	3406.52
	LIMNODRILUS	UDEKEMIANUS	5.	212.91
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	5.	212.91
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	114.	4896.68
COLEOPTERA				
ELMIDAE				
	STENELMIS	SPECIES	1.	43.06
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	2.	86.12
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	2.	86.12
	TANYTARSUS	SPECIES	1.	43.06
	DICROTENDIPES	SPECIES	2.	86.12
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	8.	344.48

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	1.	43.06	.46
TUBIFICIDAE	203.	8729.22	92.26
COLEOPTERA	1.	43.06	.46
CHIRONOMIDAE	15.	645.90	6.83
TOTALS	220.	9461.24	100.00

TAXA IN SAMPLE 11

DIVERSITY CALCULATED IN LOG BASE e

SHANNONS DIVERSITY	1.7241	EVENNESS	.5013	REDUNDANCY	.5010	
MAX. DIVERSITY	3.4594	MIN. DIVERSITY	.0155	INFORMATIONAL CONTENT	.16407+05	

TABLE

BENTHIC DATA FROM GENERAL MOTORS, ELDFORD, INDIANA — MAY 19, 1981, 1150 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE SAND, CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.0	7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	6.	258.36
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	46.	1980.76
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	1.	43.06
	DICROTENDIPES	SPECIES	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	52.	2239.12	94.55
CHIRONOMIDAE	2.	86.12	3.64
PELECYPODA	1.	43.06	1.82
TOTALS	55.	2368.30	100.00

TAXA IN SAMPLE 3

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	.3797	EVENNESS	.3788	REDUNDANCY	.6269
MAX. DIVERSITY	2.3219	MIN. DIVERSITY	.0214	INFORMATIONAL CONTENT	.20833+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1150 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.0	7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	5.	215.30
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	13.	559.78
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	1.	43.06
CHIRONOMINAE				
	POLYPEDILUM	(CONVICTUM GROUP)	1.	43.06
	DICROTENDIPES	SPECIES	3.	129.18
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	18.	775.08	75.00
CHIRONOMIDAE	6.	258.36	25.00
TOTALS	24.	1033.44	100.00

TAXA IN SAMPLE 6

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	1.0987	EVENNESS	.7345	REDUNDANCY	.2713
MAX. DIVERSITY	2.5850	MIN. DIVERSITY	.0554	INFORMATIONAL CONTENT	.19622+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1150 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: E-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.0	7.6

TAXONOMIC IDENTIFICATION				NO./SAMPLE	NUMBER/SQ M
ANNELIDA					
OLIGOCHAETA					
TUBIFICIDAE					
	LIMNODRILUS	HOFFMEISTERI	.....	93.	4004.58
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	.....	12.	533.94
DIPTERA					
CHIRONOMIDAE					
TANYPODINAE					
	PROCLADIUS	SPECIES	.....	1.	43.06
CHIRONOMINAE					
	CHIRONOMUS	SPECIES	.....	2.	86.12
ORTHOCLADIINAE					
	PARAKIEFFERIELLA	SPECIES	.....	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	105.	4538.52	96.34
CHIRONOMIDAE	4.	172.24	3.66
TOTALS	109.	4710.76	100.00

TAXA IN SAMPLE 5

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	.2246	EVENNESS	.3379	REDUNDANCY	.6654
MAX. DIVERSITY	2.3219	MIN. DIVERSITY	.0116	INFORMATIONAL CONTENT	.36961+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 19, 1981, 1150 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: F-PLEASANT R, STATION , DEPTH 1.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	11.5	52.7	11.0	7.6

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M
ANNELIDA		
OLIGOCHAETA		
TUBIFICIDAE		
LIMNODRILUS HOFFMEISTERI	18.	780.46
UNIDENT. TUBIFICID WITHOUT CAP. CHAET.....	17.	728.43

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	35.	1508.89	100.00
TOTALS	35.	1508.89	100.00

TAXA IN SAMPLE 2

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	.9991	EVENNESS	.9991	REDUNDANCY	.0009
MAX. DIVERSITY	1.0000	MIN. DIVERSITY	.0000	INFORMATIONAL CONTENT	.15076+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 21, 1981, 900 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: G-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE LIMESTONE, COBBLE, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.C	53.6	9.6	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	20.	215.20
	ILYODRILUS	TEMPLETONI	5.	53.80
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	1.	10.76
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	12.	129.12
CRUSTACEA				
DECAPODA				
ASTACIDAE	.....	.....	8.	86.08
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	1.	10.76
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	3.	32.28
	TANYTARSUS	SPECIES	1.	10.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	39.	408.88	74.51
CRUSTACEA	8.	86.08	15.69
CHIRONOMIDAE	5.	53.80	9.80
TOTALS	51.	548.76	100.00

TAXA IN SAMPLE 9

DIVERSITY CALCULATED IN LOG BASE e

SHANNONS DIVERSITY 2.3424 EVENNESS .7609 REDUNDANCY .2294

MAX. DIVERSITY 3.0CCC MIN. DIVERSITY .1344 INFORMATIONAL CONTENT .12855+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 21, 1981, 900 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: G-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE LIMESTONE, COBBLE, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	9.6	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	105.	1124.62
	ILYODRILUS	TEMPLETONI	6.	66.15
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	18.	198.46
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	123.	1323.08
DIPTERA				
CHIRONOMIDAE				
TANYTODINAE				
	PROCLADIUS	SPECIES	4.	45.73
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	42.	457.30
	CRYPTOCHIRONOMUS	SPECIES	4.	45.73
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	1.	10.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	252.	2712.32	82.90
CHIRONOMIDAE	51.	548.76	16.77
PELECYPODA	1.	10.76	.33
TOTALS	304.	3271.84	100.00

TAXA IN SAMPLE 5

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.0135	EVENNESS	.6710	REDUNDANCY	.3321
MAX. DIVERSITY	3.0000	MIN. DIVERSITY	.0281	INFORMATIONAL CONTENT	.65861+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 21, 1981, 900 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: G-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE LIMESTONE, COBBLE, SILT

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	9.6	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	59.	632.08
	ILYODRILUS	TEMPLETONI	2.	21.80
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	6.	65.39
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	43.	457.71
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	PROCLADIUS	SPECIES	1.	10.76
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	1.	10.76
	POLYPEDILUM	(SCALAENUM GROUP)	1.	10.76
ORTHOCLADIINAE				
	CRICOTOPUS	SPECIES	10.	107.60

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	109.	1176.98	89.38
CHIRONOMIDAE	13.	139.88	10.62
TOTALS	122.	1316.86	100.00

TAXA IN SAMPLE 9

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 1.8165 EVENNESS .6055 REDUNDANCY .4029

MAX. DIVERSITY 3.0000 MIN. DIVERSITY .0627 INFORMATIONAL CONTENT .2392D+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 21, 1981, 900 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: G-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE LIMESTONE, COBBLE, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	12.0	53.6	9.6	6.9

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	16.	172.16
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	13.	139.88
ENCHYTRAEIDAE	.....	.....	2.	21.52
EPHEMEROPTERA				
HEPTAGENIIDAE	.....	.....	1.	10.76
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	APSECTRACLADIUS	SPECIES	1.	10.76
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	11.	118.36
	PHAENOPSECTRA	SPECIES	3.	32.28
	POLYPEDILUM	(FALLAX GROUP)	1.	10.76
	POLYPEDILUM	(SCALAENUM GROUP)	1.	10.76
	DICROTENDIPES	SPECIES	1.	10.76
	PARATANYTARSUS	SPECIES	1.	10.76
ORTHOCLADIINAE				
	CORYNONEURA	SPECIES	2.	21.52
	CRICOTOPUS	SPECIES	4.	43.04
	SMITTIA	SPECIES	1.	10.76
	TRILLIA	SPECIES	2.	21.52
	NANOCLADIUS	SPECIES	1.	10.76

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	29.	312.04	47.54
OTHER ANNELIDA	2.	21.52	3.28
EPHEMEROPTERA	1.	10.76	1.64
CHIRONOMIDAE	29.	312.04	47.54
TOTALS	61.	656.36	100.00

TAXA IN SAMPLE 16

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA MAY 21, 1981, 900 HOURS
SAMPLE NO. 4

COLLECTED AT LOCATION: G-PLEASANT R, STATION , DEPTH .2 M, SUBSTRATE LIMESTONE, COBBLE, SILT

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN ME/L	PH
SURFACE	12.0	53.6	5.6	6.9

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.1616	EVENNESS	.7904	REDUNDANCY	.2233		
MAX. DIVERSITY	4.0000	MIN. DIVERSITY	.2465	INFORMATIONAL CONTENT	.20752+04		

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	ILYODRILUS	TEMPLETONI	4.	172.24
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	1.	43.06
NAIDIDAE				
	NAIS	PARDALIS	1.	43.06
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	1.	43.06
COLEOPTERA				
ELMIDAE				
	DUBIRAPHIA	SPECIES	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINUM	2.	86.12

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	5.	215.30	50.00
NAIDIDAE	1.	43.06	10.00
CRUSTACEA	1.	43.06	10.00
COLEOPTERA	1.	43.06	10.00
PELECYPODA	2.	86.12	20.00
TOTALS	10.	430.60	100.00

TAXA IN SAMPLE 6

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.3219	EVENNESS	.8962	REDUNDANCY	.1066
MAX. DIVERSITY	2.5850	MIN. DIVERSITY	.1163	INFORMATIONAL CONTENT	.99982+03

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.C	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	1.	43.06
	ILYODRILUS	TEMPLETONI	1.	43.06
	BRANCHIURA	SOWERBYI	1.	43.06
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	1.	43.06
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	1.	43.06
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	4.	172.24
EPHEMEROPTERA				
EPHEMERIDAE				
	HEXAGENIA	SPECIES	1.	43.06
MEGALOPTERA				
SIALIDAE				
	SIALIS	SPECIES	2.	86.12
DIPTERA				
CHIRONOMIDAE				
TANYPODINAE				
	THIENEMANNIMYIA	GROUP	1.	43.06
CHIRONOMINAE				
	CRYPTOCHIRONOMUS	SPECIES	1.	43.06
	PARACLADOPELMA	SPECIES	1.	43.06
	CLADOPELMA	SPECIES	5.	215.30
ORTHOCLADIINAE				
	CONYNONEURA	SPECIES	1.	43.06
	NANOCLADIUS	SPECIES	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINUM	9.	387.54

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	5.	215.30	16.13
CRUSTACEA	4.	172.24	12.90
EPHEMEROPTERA	1.	43.06	3.23
MEGALOPTERA-NEUROP	2.	86.12	6.45

CHIRONOMIDAE	10.	430.60	32.26

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.C	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
PELECYPODA	9.	387.54	29.03
TOTALS	31.	1334.86	100.00

TAXA IN SAMPLE 15

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.2768	EVENNESS	.8541	REDUNDANCY	.1507
MAX. DIVERSITY	3.9069	MIN. DIVERSITY	.1239	INFORMATIONAL CONTENT	.44542+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
COELENTERATA				
HYDROZOA				
HYDRIDAE				
	HYDRA	SPECIES	1.	43.06
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	BRANCHIURA	SOWERBYI	1.	43.06
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	1.	43.06
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	1.	43.06
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	4.	172.24
EPHEMEROPTERA				
EPHEMERIDAE				
	HEXAGENIA	SPECIES	1.	43.06
DIPTERA				
TIPULIDAE	.....	.....	1.	43.06
CERATOPOGONIDAE	.....	.....	1.	43.06
CHIRONOMIDAE				
CHIRONOMIDAE				
	POLYPEDILUM	PUPA	1.	43.06
	POLYPEDILUM	(SCALAENUM GROUP)	2.	86.12
	POLYPEDILUM	(SIMULANS GROUP)	2.	86.12
	TANYTARSUS	SPECIES	1.	43.06
	CLADOTANYTARSUS	SPECIES	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	3.	129.18
CORBICULIDAE				
	CORBICULA	MANILENSIS	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	1.	43.06	4.55
TUBIFICIDAE	3.	129.18	13.64

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
	SURFACE 13.0	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
CRUSTACEA	4.	172.24	18.18
EPHEMEROPTERA	1.	43.06	4.55
DIPTERA GRP I	2.	86.12	9.09
CHIRONOMIDAE	7.	301.42	31.82
PELECYPODA	4.	172.24	18.18
TOTALS	22.	947.32	100.00

TAXA IN SAMPLE 15

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	3.6975	EVENNESS	.9465	REDUNDANCY	.0559
MAX. DIVERSITY	3.9069	MIN. DIVERSITY	.1673	INFORMATIONAL CONTENT	.35030+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1430 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: I-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.3	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	UNIDENT. TUBIFICID WITHOUT CAP. CHAET	.....	1.	43.06
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	1.	43.06
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	POLYPEDILUM	(SIMULANS GROUP)	2.	86.12
	CLADOTANYTARSUS	SPECIES	1.	43.06
	PAGASTIELLA	SPECIES	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	1.	43.06	16.67
CRUSTACEA	1.	43.06	16.67
CHIRONOMIDAE	4.	172.24	66.67
TOTALS	6.	258.36	100.00

TAXA IN SAMPLE 3

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.2516	EVENNESS	.9697	REDUNDANCY	.0323
MAX. DIVERSITY	2.3219	MIN. DIVERSITY	.1462	INFORMATIONAL CONTENT	.58173+03

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1505 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: J-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.8	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	1.	43.06
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	4.	172.24

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
CRUSTACEA	1.	43.06	16.67
CHIRONOMIDAE	1.	43.06	16.67
PELECYPODA	4.	172.24	66.67
TOTALS	6.	258.36	100.00

TAXA IN SAMPLE 3

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	1.2516	EVENNESS	.7897	REDUNDANCY	.2205
MAX. DIVERSITY	1.5850	MIN. DIVERSITY	.6732	INFORMATIONAL CONTENT	.32337+03

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1505 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: J-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE BED ROCK

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.8	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

NO ORGANISMS IN SAMPLE

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1505 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: J-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE BED ROCK

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.C	55.4	8.8	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	UNIDENT. TUBIFICID WITHOUT CAP. CHAET.....		3.	129.18
EPHEMEROPTERA				
EPHEMERIDAE				
	HEXAGENIA	SPECIES	2.	86.12
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	6.	258.36
	HARNISCHIA	SPECIES	3.	129.18
	PHAENOPSECTRA	SPECIES	2.	86.12
	POLYPEDILUM	(SIMULANS GROUP)	1.	43.06
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	1.	43.06
CORBICULIDAE				
	CORBICULA	MANILENSIS	1.	43.06

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	3.	129.18	15.79
EPHEMEROPTERA	2.	86.12	10.53
CHIRONOMIDAE	12.	516.72	63.16
PELECYPODA	2.	86.12	10.53
TOTALS	19.	818.14	100.00

TAXA IN SAMPLE 8

DIVERSITY CALCULATED IN LOG BASE e

SHANNONS DIVERSITY	2.720A	EVENNESS	.9069	REDUNDANCY	.0962
MAX. DIVERSITY	3.0C0C	MIN. DIVERSITY	.0951	INFORMATIONAL CONTENT	.2225E+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BLDFORD, INDIANA — MAY 20, 1981, 1505 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: J-SALT CREEK, STATION , DEPTH 4.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.C	55.4	8.8	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
COELENTERATA				
HYDROZOA				
HYDRIDAE				
	HYDRA	SPECIES	1.	43.06
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	ILYODRILUS	TEMPLETONI	2.	86.12
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	4.	172.24
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	2.	86.12
NAIDIDAE				
	NAIS	PARDALIS	3.	129.18
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	8.	344.48
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	MICROTENDIPES	SPECIES	1.	43.06
	POLYPEDILUM	(SCALAENUM GROUP)	2.	86.12

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	1.	43.06	4.35
TUBIFICIDAE	8.	344.48	34.78
NAIDIDAE	3.	129.18	13.04
CRUSTACEA	8.	344.48	34.78
CHIRONOMIDAE	3.	129.18	13.04
TOTALS	23.	990.38	100.00

TAXA IN SAMPLE 5

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.0647	EVENNESS	.8882	REDUNDANCY	.1149
MAX. DIVERSITY	2.3220	MIN. DIVERSITY	.0805	INFORMATIONAL CONTENT	.26390+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION				NO./SAMPLE	NUMBER/SQ M
ANNELIDA					
OLIGOCHAETA					
TUBIFICIDAE					
	LIMNODRILUS	HOFFMEISTERI	.....	2.	85.48
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	.....	2.	85.48
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	.....	6.	256.44
NAIDIDAE	.....		.....	4.	170.96
CRUSTACEA					
ISOPODA					
ASELLIDAE					
	LIRCEUS	FONTINALIS	.....	16.	683.84
DIPTERA					
CHIRONOMIDAE					
CHIRONOMINAE					
	CHIRONOMUS	SPECIES	.....	6.	256.44
	POLYPEDILUM	(SCALAENUM GROUP)	.....	2.	85.48
	POLYPEDILUM	(SIMULANS GROUP)	.....	4.	170.96

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	10.	427.40	23.81
OTHER ANNELIDA	4.	170.96	9.52
CRUSTACEA	16.	683.84	38.10
CHIRONOMIDAE	12.	512.88	28.57
TOTALS	42.	1795.08	100.00

TAXA IN SAMPLE 6

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.0061	EVENNESS	.8687	REDUNDANCY	.1334
MAX. DIVERSITY	3.0000	MIN. DIVERSITY	.0479	INFORMATIONAL CONTENT	.46782+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, ELDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			2.	85.48
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	6.	256.44
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	4.	170.96
NAIDIDAE				
	NAIS	PARDALIS	6.	256.44
ENCHYTRAEIDAE			4.	170.96
HIRUDINEA				
ERPOBDELLIDAE				
	MOORECOBDELA	MICROSTOMA	2.	85.48
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	ASELLUS	SPECIES	2.	85.48
	LIRCEUS	FONTINALIS	102.	4359.48
AMPHIPODA				
GAMMARIDAE				
	CRANGONYX	SPECIES	18.	769.32
COLEOPTERA				
ELMIDAE				
	DUBIRAPHIA	SPECIES	2.	85.48
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	2.	85.48
	POLYPEDILUM	(SCALAENUM GROUP)	4.	170.96
	POLYPEDILUM	(SIMULANS GROUP)	4.	170.96
	TRIBELOS	SPECIES	2.	85.48

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	2.	85.48	1.25
TUBIFICIDAE	10.	427.40	6.25
NAIDIDAE	6.	256.44	3.75
OTHER ANNELIDA	6.	256.44	3.75
CRUSTACEA	122.	5214.28	76.25

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
	SURFACE	13.0 55.4	8.4	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
COLEOPTERA	2.	85.48	1.25
CHIRONOMIDAE	12.	512.98	7.50
TOTALS	160.	6838.40	100.00

TAXA IN SAMPLE 14

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.1703	EVENNESS	.5595	REDUNDANCY	.4436
MAX. DIVERSITY	3.8074	MIN. DIVERSITY	.0270	INFORMATIONAL CONTENT	.14568+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
NEMATODA			2.	85.48
ANNELIDA				
OLIGOCHAETA			2.	85.48
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	14.	598.36
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	2.	85.48
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	18.	769.32
NAIDIDAE				
	NAIS	PARDALIS	2.	85.48
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	ASELLUS	SPECIES	4.	170.96
	LIRCEUS	FONTINALIS	96.	4103.04
DECAPODA				
ASTACIDAE			8.	341.92
EPHEMEROPTERA				
CAENIDAE				
	CAENIS	SPECIES	2.	85.48
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	TRIBELOS	SPECIES	2.	85.48
MOLLUSCA				
GASTROPODA				
PHYSIDAE				
	PHYSA	SPECIES	2.	85.48
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINUM	2.	85.48

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
MISCELLANEOUS	2.	85.48	1.28
TUBIFICIDAE	36.	1538.64	23.08
NAIDIDAE	2.	85.48	1.28

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BLUFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.0	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
CRUSTACEA	107.	4615.92	69.23
EPHEMEROPTERA	2.	85.48	1.28
CHIRONOMIDAE	2.	85.48	1.28
GASTROPODA	2.	85.48	1.28
PELECYPODA	2.	85.48	1.28
TOTALS	156.	6667.44	100.00

TAXA IN SAMPLE 13

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.1026	EVENNESS	.5682	REDUNDANCY	.4348
MAX. DIVERSITY	3.7004	MIN. DIVERSITY	.0255	INFORMATIONAL CONTENT	.14019+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	OXYGEN MG/L	PH
SURFACE	13.C	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	8.	341.92
	LIMNODRILUS	CERVIX	2.	85.48
	ILYODRILUS	TEMPLETONI	4.	170.96
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	4.	170.96
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	18.	769.32
NAIDIDAE				
	NAIS	PARDALIS	2.	85.48
ENCHYTRAEIDAE	.....	.....	2.	85.48
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	ASELLUS	SPECIES	2.	85.48
	LIRCEUS	FONTINALIS	30.	1282.20
COENATA				
ANISOPTERA				
GOMPHIDAE				
	GOMPHUS	SPECIES	2.	85.48
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	2.	85.48
	TANYTARSUS	SPECIES	4.	170.96

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	36.	1538.64	45.0C
NAIDIDAE	2.	85.48	2.5C
OTHER ANNELIDA	2.	85.48	2.5C
CRUSTACEA	32.	1367.68	40.0C
ODONATA	2.	85.48	2.5C
CHIRONOMIDAE	6.	256.44	7.5C
TOTALS	80.	3419.20	100.0C

TAXA IN SAMPLE 12

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1525 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: K-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:	TEMPERATURE C	F	OXYGEN MG/L	PH
	SURFACE 13.0	55.4	8.4	7.1

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.7936	EVENNESS	.7793	REDUNDANCY	.2234
MAX. DIVERSITY	3.5850	MIN. DIVERSITY	.0424	INFORMATIONAL CONTENT	.95519+04

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS: TEMPERATURE C F PH

SURFACE 14.C 57.2 7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	PROFUNDICOLA	5.	229.11
	LIMNODRILUS	HOFFMEISTERI	27.	1145.56
	LIMNODRILUS	UDEKEMIANUS	5.	229.11
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	11.	458.22
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	229.	9851.80
NAIDIDAE				
	NAIS	COMMUNIS	5.	229.11
EPHEMEROPTERA				
EPHEMERIDAE				
	HEXAGENIA	SPECIES	6.	258.36
COLEOPTERA				
ELMIDAE				
	DUBIRAPHIA	SPECIES	2.	86.12
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	HARNISCHIA	SPECIES	2.	86.12
	POLYPEDILUM	(SCALAENUM GROUP)	4.	172.24
	POLYPEDILUM	(SIMULANS GROUP)	2.	86.12
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	4.	172.24

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	277.	11913.31	91.62
NAIDIDAE	5.	229.11	1.76
EPHEMEROPTERA	6.	258.36	1.99
COLEOPTERA	2.	86.12	.66
CHIRONOMIDAE	8.	344.48	2.65
PELECYPODA	4.	172.24	1.32
TOTALS	302.	13004.12	100.00

TAXA IN SAMPLE 12

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BLOFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 1

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	PH
SURFACE	14.0	57.2	7.6

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	1.5116	EVENNESS	.4217	REDUNDANCY	.5804
MAX. DIVERSITY	3.5850	MIN. DIVERSITY	.0128	INFORMATIONAL CONTENT	.19657+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS: TEMPERATURE C F PH

SURFACE 14.0 57.2 7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	5.	205.63
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	19.	822.53
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	205.	8842.24
ENCHYTRAEIDAE	.....	.....	5.	205.63
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	2.	86.12
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	POLYPEDILUM	(SCALAENUM GROUP)	4.	172.24
ORTHOCLADIINAE				
	NANOCLADIUS	SPECIES	4.	172.24
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINUM	8.	344.48

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	229.	9870.41	90.96
OTHER ANNELIDA	5.	205.63	1.90
CRUSTACEA	2.	86.12	.79
CHIRONOMIDAE	8.	344.48	3.17
PELECYPODA	8.	344.48	3.17
TOTALS	252.	10851.12	100.00

TAXA IN SAMPLE 5

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 1.1427 EVENNESS .3809 REDUNDANCY .6211

MAX. DIVERSITY 3.0000 MIN. DIVERSITY .0096 INFORMATIONAL CONTENT .12400+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, OLDFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 2

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS: TEMPERATURE C F PH

SURFACE 14.C 57.2 7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	4.	170.96
	LIMNODRILUS	CLAPAREDIANUS	4.	170.96
	UNIDENT. TUBIFICID	WITH CAP. CHAETAE	4.	170.96
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	16.	683.84
ENCHYTRAEIDAE	.....	.....	20.	854.80
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	ASELLUS	SPECIES	40.	1709.60
	LIRCEUS	FONTINALIS	96.	4103.04
AMPHIPODA				
GAMMARIDAE				
	CRANGONYX	SPECIES	4.	170.96
EPHEMEROPTERA				
EPHEMERIDAE				
	HEXAGENIA	SPECIES	8.	341.92
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	4.	170.96
	POLYPEDILUM	(SCALAENUM GROUP)	4.	170.96
LEPIDOPTERA	.....	.....	12.	512.88
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	4.	170.96

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	28.	1196.72	18.73
OTHER ANNELIDA	20.	854.80	9.05
CRUSTACEA	140.	5983.60	63.64
EPHEMEROPTERA	8.	341.92	3.64
CHIRONOMIDAE	8.	341.92	3.64
COLLEMBOLA-LEPIDOP	12.	512.88	5.45

TABLE

BENTHIC DATA FROM GENERAL MOTORS, BEDFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 3

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS:

	TEMPERATURE C	F	PH
SURFACE	14.C	57.2	7.6

TAXONOMIC IDENTIFICATION	NO./SAMPLE	NUMBER/SQ M

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
PELECYPODA	4.	17C.96	1.82
TOTALS	2.C.	9402.80	100.0C

TAXA IN SAMPLE 13

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY	2.6973	EVENNESS	.7269	REDUNDANCY	.2725
MAX. DIVERSITY	3.7004	MIN. DIVERSITY	.0167	INFORMATIONAL CONTENT	.25362+05

TABLE

BENTHIC DATA FROM GENERAL MOTORS, OLDFORD, INDIANA — MAY 20, 1981, 1540 HOURS

SAMPLE NO. 4

COLLECTED AT LOCATION: L-SALT CREEK, STATION , DEPTH 1.0 M, SUBSTRATE CLAY, DETRITUS

PHYSICAL PARAMETERS: TEMPERATURE C F PH

SURFACE 14.0 57.2 7.6

TAXONOMIC IDENTIFICATION			NO./SAMPLE	NUMBER/SQ M
ANNELIDA				
OLIGOCHAETA				
TUBIFICIDAE				
	LIMNODRILUS	HOFFMEISTERI	6.	256.44
	UNIDENT. TUBIFICID	WITHOUT CAP. CHAET.....	26.	1111.24
ENCHYTRAEIDAE	.....	.....	12.	512.88
CRUSTACEA				
ISOPODA				
ASELLIDAE				
	LIRCEUS	FONTINALIS	14.	598.36
DIPTERA				
CHIRONOMIDAE				
CHIRONOMINAE				
	CHIRONOMUS	SPECIES	6.	256.44
MOLLUSCA				
PELECYPODA				
SPHAERIIDAE				
	SPHAERIUM	STRIATINIUM	6.	256.44

TAXONOMIC GROUP	TOTAL NO./SAMPLE	TOTAL NUMBER/SQ M	PERCENT
TUBIFICIDAE	32.	1367.68	45.71
OTHER ANNELIDA	12.	512.88	17.14
CRUSTACEA	14.	598.36	20.00
CHIRONOMIDAE	6.	256.44	8.57
PELECYPODA	6.	256.44	8.57
TOTALS	70.	2991.80	100.00

TAXA IN SAMPLE 6

DIVERSITY CALCULATED IN LOG BASE 2

SHANNONS DIVERSITY 2.3427 EVENNESS .9063 REDUNDANCY .0945

MAX. DIVERSITY 2.5850 MIN. DIVERSITY .0217 INFORMATIONAL CONTENT .70086+04

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
NAIS	COMMUNIS	.00	.00	.00	.00	51.11	.00	193.68	5.01
NAIS	BRETSCHERI	.00	.00	.00	.00	2.69	.00	10.76	.26
NAIS	PARDALIS	.00	.00	.00	.00	13.45	.00	43.04	1.32
TOTAL OF NAIDIDAE		.00	.00	.00	.00	139.88	.00	494.96	13.72
OTHER ANNELIDA									
ENCHYTRAEIDAE		13.45	.00	43.04	8.47	2.69	.00	10.76	.26
MOOPIGGDELA	MICROSTOMA	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF OTHER ANNELIDA		13.45	.00	43.04	8.47	2.69	.00	10.76	.26
CRUSTACEA									
ASELLUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LIRCEUS	FONTINALIS	16.14	.00	43.04	10.17	567.59	.00	2022.68	55.67
CRANGONYX	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
AESTACIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CRUSTACEA		16.14	.00	43.04	10.17	570.28	.00	2033.64	55.94
HYDRACARINA									
HYDRACARINA		5.38	.00	10.76	3.39	.00	.00	.00	.00
TOTAL OF HYDRACARINA		5.38	.00	10.76	3.39	.00	.00	.00	.00
EPHEMEROPTERA									
HEPTAGENIIDAE		.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
MISCELLANEOUS									
HYDRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PLANARIIDAE		.00	.00	.00	.00	5.38	.00	10.76	.53
NEMATODA		2.69	.00	10.76	1.69	5.38	.00	21.52	.53
TOTAL OF MISCELLANEOUS		2.69	.00	10.76	1.69	10.76	.00	32.28	1.06
TUBIFICIDAE									
OLIGOCHAETA		.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	PROFUNDICOLA	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	HOFFMEISTERI	10.76	.00	43.04	6.78	5.38	.00	21.52	.53
LIMNODRILUS	CLAPAREDIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	UDEKEMIANUS	40.35	21.52	64.56	25.42	.00	.00	.00	.00
LIMNODRILUS	CERVIX	.00	.00	.00	.00	.00	.00	.00	.00
ILYODRILUS	TEMPLETONI	.00	.00	.00	.00	.00	.00	.00	.00
AULODRILUS	PIGUETI	.00	.00	.00	.00	.00	.00	.00	.00
BRANCHIURA	SOWERBYI	.00	.00	.00	.00	.00	.00	.00	.00
UNIDENT. TUBIFICID	WITH CAP. CHAETAE	.00	.00	.00	.00	5.38	.00	10.76	.53
UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	24.21	.00	53.80	15.25	8.07	.00	32.28	.79
TOTAL OF TUBIFICIDAE		75.32	21.52	139.68	47.46	18.83	.00	43.04	1.85
NAIDIDAE									
PRISTINA	IDRENSIS	.00	.00	.00	.00	24.21	.00	75.32	2.37
PRISTINA	FORELI	.00	.00	.00	.00	2.69	.00	10.76	.26
DERO	DIGITATA	.00	.00	.00	.00	.00	.00	.00	.00
SLAVINA	APPENDICULATA	.00	.00	.00	.00	45.73	.00	172.16	4.49

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
BAETIS	SPECIES	.00	.00	.00	.00	5.38	.00	21.52	.53
CAENIS	SPECIES	.00	.00	.00	.00	29.59	.00	53.80	2.90
PARALEPTOPHLEBIA	SPECIES	.00	.00	.00	.00	13.45	.00	32.28	1.32
HEXAGENIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ISONYCHIA	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
TOTAL OF EPHEMEROPTERA		.00	.00	.00	.00	51.11	.00	119.36	5.01
ODONATA									
GOMPHUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LESTES	SPECIES	2.69	.00	10.76	1.69	.00	.00	.00	.00
TOTAL OF ODONATA		2.69	.00	10.76	1.69	.00	.00	.00	.00
MEGALOPTERA-NEUROP									
SIALIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MEGALOPTERA-NEUROP		.00	.00	.00	.00	.00	.00	.00	.00
TRICHOPTERA									
HYDROPSYCHIDAE		.00	.00	.00	.00	2.69	.00	10.76	.26
TOTAL OF TRICHOPTERA		.00	.00	.00	.00	2.69	.00	10.76	.26
COLEOPTERA									
DUBIRAPHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BLDFORD, INDIANA, MAY 19-20,1981

		STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STENELMIS	SPECIES	.00	.00	.00	.00	29.59	.00	86.08	2.90
ECTOPRIA	NERVOSA	.00	.00	.00	.00	2.69	.00	10.76	.26
PSEPHUS	HERRICKI	.00	.00	.00	.00	2.69	.00	10.76	.26
TOTAL OF COLEOPTERA		.00	.00	.00	.00	34.97	.00	86.08	3.43
DIPTERA GRP I									
TIPULIDAE		.00	.00	.00	.00	2.69	.00	10.76	.26
PSYCHODA	SPECIES	2.69	.00	10.76	1.69	.00	.00	.00	.00
CERATOPOGONIDAE		5.38	.00	21.52	3.39	.00	.00	.00	.00
TOTAL OF DIPTERA GRP I		8.07	.00	32.28	5.08	2.69	.00	10.76	.26
CHIRONOMIDAE									
THIENEMANNIMYIA	GROUP	2.69	.00	10.76	1.69	.00	.00	.00	.00
PROCLADIUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LARSIA	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
CHIRONOMUS	SPECIES	2.69	.00	10.76	1.69	10.76	.00	32.28	1.06
CRYPTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HARNISCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
MICROTENDIPES	SPECIES	.00	.00	.00	.00	10.76	.00	21.52	1.06
PARACLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PHAENOPSECTRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
POLYPEDILUM	(FALLAX GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(CONVICTUM GROUP)	5.38	.00	21.52	3.39	.00	.00	.00	.00
POLYPEDILUM	(SCALAENUM GROUP)	.00	.00	.00	.00	2.69	.00	10.76	.26
POLYPEDILUM	(SIMULANS GROUP)	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BLUFFORD, INDIANA, MAY 19-20,1981

		STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STICTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TANYTARSUS	SPECIES	.00	.00	.00	.00	26.90	.00	53.80	2.64
RHEOTANYTARSUS	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
TRIFELOS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
DICROTENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
STEMPELLINELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PSEUDOSTIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CONSTEMPELLINA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ORTHOCLADIINAE	PUPA	.00	.00	.00	.00	2.69	.00	10.76	.26
CORYNONEURA	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.26
CRICOTOPUS	SPECIES	21.52	.00	64.56	13.56	94.15	10.76	225.96	9.23
HETEROTRISSOCLAD.	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
EUKIEFFERIELLA	SPECIES	.00	.00	.00	.00	16.14	.00	64.56	1.58
SMITTIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
RHEOCRICOTOPUS	SPECIES	.00	.00	.00	.00	5.38	.00	10.76	.53
BRILLIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NANOCLADIUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAMETRIOCNEMUS	SPECIES	2.69	.00	10.76	1.69	.00	.00	.00	.00
TOTAL OF CHIRONOMIDAE		34.97	.00	96.08	22.03	180.23	129.12	419.64	17.68
COLLEMBOLA-LEPIDOP									
LEPIDOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLLEMBOLA-LEPIDOP		.00	.00	.00	.00	.00	.00	.00	.00
GASTROPODA									
LYMNAEA	SPECIES	.00	.00	.00	.00	5.38	.00	21.52	.53

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

	STATION B-DISCHARGE NUMBER/SQ M				STATION C-PLEASANT R NUMBER/SQ M			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PHYSA SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF GASTROPODA	.00	.00	.00	.00	5.38	.00	21.52	.53
PELECYPODA								
SPHAERIUM STRIATINIUM	.00	.00	.00	.00	.00	.00	.00	.00
CORBICULA MANILENSIS	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF PELECYPODA	.00	.00	.00	.00	.00	.00	.00	.00
STATION MEAN TOTAL	158.71			100.00	1019.51			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	15				36			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	87							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	2.2771				2.1207			
ASSOCIATED EVENNESS	.7176				.5340			
REDUNDANCY	.0944				.2272			

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION D-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION E-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
NAIS	COMMUNIS	53.02	.00	129.16	.39	.00	.00	.00	.00
NAIS	BRETSCHERI	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	PARDALIS	771.38	344.48	1550.16	5.65	10.76	.00	43.06	.13
TOTAL OF NAIDIDAE		893.49	344.48	1808.52	6.51	10.76	.00	43.06	.13
OTHER ANNELIDA									
ENCHYTRAEIDAE		.00	.00	.00	.00	.00	.00	.00	.00
MOGREDDELA	MICROSTOMA	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF OTHER ANNELIDA		.00	.00	.00	.00	.00	.00	.00	.00
CRUSTACEA									
ASELLUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LIRCEUS	FONTINALIS	115.41	.00	258.76	.86	.00	.00	.00	.00
CRANGONYX	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
AESTACIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CRUSTACEA		115.41	.00	258.76	.86	.00	.00	.00	.00
HYDRACARINA									
HYDRACARINA		21.53	.00	86.12	.16	.00	.00	.00	.00
TOTAL OF HYDRACARINA		21.53	.00	86.12	.16	.00	.00	.00	.00
EPHEMEROPTERA									
HEPTAGENIIDAE		.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION D-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION E-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
MISCELLANEOUS									
HYDRA	SPECIES	150.71	.00	516.72	1.10	.00	.00	.00	.00
PLANARIIDAE		.00	.00	.00	.00	.00	.00	.00	.00
NEMATODA		42.06	.00	86.12	.31	64.59	.00	129.18	.78
TOTAL OF MISCELLANEOUS		193.77	.00	602.84	1.41	64.59	.00	129.18	.78
TUBIFICIDAE									
OLIGOCHAETA		.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	PROFUNDICOLA	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	HOFFMEISTERI	129.18	.00	258.36	.94	2463.99	43.06	5526.03	29.93
LIMNODRILUS	CLAPAREDIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	UDEKEMIANUS	.00	.00	.00	.00	163.67	.00	368.40	1.99
LIMNODRILUS	CERVIX	.00	.00	.00	.00	.00	.00	.00	.00
ILYODRILUS	TEMPLETONI	.00	.00	.00	.00	.00	.00	.00	.00
AULODRILUS	PIGUETI	21.53	.00	86.12	.16	.00	.00	.00	.00
BRANCHIURA	SOWERBYI	.00	.00	.00	.00	.00	.00	.00	.00
UNIDENT. TUBIFICID	WITH CAP. CHAETAE	.00	.00	.00	.00	53.23	.00	212.91	.65
UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	161.47	.00	344.48	1.18	3236.89	172.24	6631.24	39.32
TOTAL OF TUBIFICIDAE		312.18	.00	602.84	2.27	5917.76	215.30	12525.68	71.89
NAIDIDAE									
PRISTINA	IDRENSIS	21.53	.00	86.12	.16	.00	.00	.00	.00
PRISTINA	FOREL I	.00	.00	.00	.00	.00	.00	.00	.00
DERO	DIGITATA	43.06	.00	172.24	.31	.00	.00	.00	.00
SLAVINA	APPENDICULATA	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION D-PLEASANT R NUMBER/SQ M				STATION E-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
BAETIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CAENIS	SPECIES	473.66	86.12	775.08	3.45	21.53	.00	86.12	.26
PARALEPTOPHLEBIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HEXAGENIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ISONYCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF EPHEMEROPTERA		473.66	86.12	775.08	3.45	21.53	.00	86.12	.26
ODONATA									
GOMPHUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LESTES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF ODONATA		.00	.00	.00	.00	.00	.00	.00	.00
MEGALOPTERA-NEUROP									
SIALIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MEGALOPTERA-NEUROP		.00	.00	.00	.00	.00	.00	.00	.00
TRICHOPTERA									
HYDROPSYCHIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF TRICHOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
COLEOPTERA									
DUBIRAPHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION D-PLEASANT R NUMBER/SQ M				STATION E-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STENELMIS	SPECIES	.00	.00	.00	.00	10.76	.00	43.06	.13
ECTOPRIA	NERVOSA	.00	.00	.00	.00	.00	.00	.00	.00
PSEPHUS	HERRICKI	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLEOPTERA		.00	.00	.00	.00	10.76	.00	43.06	.13
DIPTERA GRP I									
TIPULIDAE		.00	.00	.00	.00	.00	.00	.00	.00
PSYCHODA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CERATOPOGONIDAE		10.76	.00	43.06	.08	.00	.00	.00	.00
TOTAL OF DIPTERA GRP I		10.76	.00	43.06	.08	.00	.00	.00	.00
CHIRONOMIDAE									
THIENEMANNIMYIA	GROUP	.00	.00	.00	.00	10.76	.00	43.06	.13
PROCLADIUS	SPECIES	237.31	.00	504.76	1.70	21.53	.00	86.12	.26
LARSIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMUS	SPECIES	2269.03	576.45	5552.35	16.65	64.59	.00	129.18	.78
CRYPTOCHIRONOMUS	SPECIES	107.12	.00	429.50	.78	.00	.00	.00	.00
HARNISCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
MICROTENDIPES	SPECIES	57.64	.00	230.58	.42	51.52	.00	206.07	.63
PARACLADOPELMA	SPECIES	107.12	.00	429.50	.78	.00	.00	.00	.00
PARATENDIPES	SPECIES	126.19	.00	504.76	.92	.00	.00	.00	.00
PHAENOPSECTRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(FALLAX GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(CONVICTUM GROUP)	.00	.00	.00	.00	10.76	.00	43.06	.13
POLYPEDILUM	(SCALAENUM GROUP)	143.92	.00	575.28	1.05	.00	.00	.00	.00
POLYPEDILUM	(SIMULANS GROUP)	.00	.00	.00	.00	.00	.00	.00	.00

TABLE
MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION D-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION E-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
STICTOCHIRONOMUS	SPECIES	1164.98	.00	3028.55	6.49	.00	.00	.00	.00
TANYTARSUS	SPECIES	5490.68	1393.48	11140.99	40.00	137.64	43.06	258.36	1.67
RHEOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TRIPEDS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
DICROTENDIPES	SPECIES	649.03	230.58	1265.50	4.73	509.03	86.12	1648.58	6.16
CLADOTANYTARSUS	SPECIES	417.15	.00	1009.52	3.04	.00	.00	.00	.00
PARATANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
STEMPELLINELLA	SPECIES	107.12	.00	428.50	.78	.00	.00	.00	.00
PAGASTIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CONSTEMPELLINA	SPECIES	.00	.00	.00	.00	10.76	.00	43.06	.13
ORTHOCLADIINAE	PUPA	.00	.00	.00	.00	.00	.00	.00	.00
CORYNONEURA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CRICOTOPUS	SPECIES	736.98	428.50	1439.20	5.37	1317.17	172.24	3503.24	16.00
HETEROTRISSOCLAD.	SPECIES	.00	.00	.00	.00	51.52	.00	206.07	.63
EUKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
SMITTIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAMETRIOCNEMUS	SPECIES	.00	.00	.00	.00	21.53	.00	86.12	.26
RHEOCRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
BRILLIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NANOCLADIUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAMETRIOCNEMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHIRONOMIDAE		11626.20	3573.98	19171.32	84.71	2206.82	516.72	5770.04	26.81
COLLEMBOLA-LEPIDOP									
LEPIDOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLLEMBOLA-LEPIDOP		.00	.00	.00	.00	.00	.00	.00	.00
GASTROPODA									
LYMNAEA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

	STATION D-PLEASANT R NUMBER/SQ M				STATION E-PLEASANT R NUMBER/SQ M			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PHYSA SPECIES	10.76	.00	43.06	.08	.00	.00	.00	.00
TOTAL OF GASTROPODA	10.76	.00	43.06	.08	.00	.00	.00	.00
PELECYPODA								
SPHAERIUM STRIATINIUM	64.59	.00	258.36	.47	.00	.00	.00	.00
CORBICULA MANILENSIS	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF PELECYPODA	64.59	.00	258.36	.47	.00	.00	.00	.00
STATION MEAN TOTAL	13725.37			100.00	8232.23			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	28				19			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	37							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	2.8366				2.0821			
ASSOCIATED EVENNESS	.7491				.6296			
REDUNDANCY	.2520				.3735			

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION F-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION G-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
MISCELLANEOUS									
HYDRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PLANARIIDAE		.00	.00	.00	.00	.00	.00	.00	.00
NEMATODA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MISCELLANEOUS		.00	.00	.00	.00	.00	.00	.00	.00
TUBIFICIDAE									
OLIGOCHAETA		.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	PROFUNDICOLA	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	HOFFMEISTERI	1314.68	215.32	4004.58	54.66	536.02	172.16	1124.62	37.01
LIMNODRILUS	CLAPAREDIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	UDEKEMIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	CERVIX	.00	.00	.00	.00	.00	.00	.00	.00
ILYODRILUS	TEMPLETONI	.00	.00	.00	.00	35.44	.00	66.15	2.45
AULODRILUS	PIGUETI	.00	.00	.00	.00	.00	.00	.00	.00
BRANCHIURA	SOWERBYI	.00	.00	.00	.00	.00	.00	.00	.00
UNIDENT. TUFIFICID	WITH CAP. CHAETAE	.00	.00	.00	.00	68.65	.00	198.46	4.74
UNIDENT. TUFIFICID	WITHOUT CAP. CHAET	950.73	533.94	1980.76	39.53	512.45	129.12	1323.08	35.38
TOTAL OF TUBIFICIDAE		2265.40	775.08	4536.52	94.18	1152.55	312.04	2712.32	79.57
NAIDIDAE									
PRISTINA	IDRENSIS	.00	.00	.00	.00	.00	.00	.00	.00
PRISTINA	FORELI	.00	.00	.00	.00	.00	.00	.00	.00
DERO	DIGITATA	.00	.00	.00	.00	.00	.00	.00	.00
SLAVINA	APPENDICULATA	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, OLDFORD, INDIANA, MAY 19-20,1981

		STATION F-PLEASANT R NUMBER/SQ M				STATION G-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
NAIS	COMMUNIS	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	BRETSCHERI	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	PAPDALIS	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF NAIDIDAE		.00	.00	.00	.00	.00	.00	.00	.00
OTHER ANNELIDA									
ENCHYTRAEIDAE		.00	.00	.00	.00	5.38	.00	21.52	.37
MOOREOLDELLA	MICROSTOMA	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF OTHER ANNELIDA		.00	.00	.00	.00	5.38	.00	21.52	.37
CRUSTACEA									
ASELLUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LIRCEUS	FONTINALIS	.00	.00	.00	.00	.00	.00	.00	.00
CRANGONYX	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
AESTACIDAE		.00	.00	.00	.00	21.52	.00	86.08	1.49
TOTAL OF CRUSTACEA		.00	.00	.00	.00	21.52	.00	86.08	1.49
HYDRACARINA									
HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
EPHEMEROPTERA									
HEPTAGENIDAE		.00	.00	.00	.00	2.69	.00	10.76	.19

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION F-PLEASANT R NUMBER/SQ M				STATION G-PLEASANT R NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
BAETIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CAENIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARALEPTOPHLEBIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HEXAGENIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ISONYCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF EPHEMEROPTERA		.00	.00	.00	.00	2.69	.00	10.76	.19
ODONATA									
GOMPHUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LESTES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF ODONATA		.00	.00	.00	.00	.00	.00	.00	.00
MEGALOPTERA-NEUROP									
SIALIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MEGALOPTERA-NEUROP		.00	.00	.00	.00	.00	.00	.00	.00
TRICHOPTERA									
HYDROPSYCHIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF TRICHOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
COLEOPTERA									
DUBIRAPHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1951

SPECIES NAME		STATION F-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION G-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
STENELMIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ECTOPRIA	NERVOSA	.00	.00	.00	.00	.00	.00	.00	.00
PSEPHUS	HERRICKI	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLEOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
DIPTERA GRP I									
TIPULIDAE		.00	.00	.00	.00	.00	.00	.00	.00
PSYCHODA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CERATOPOGONIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF DIPTERA GRP I		.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMIDAE									
THIENEMANNIMYIA	GROUP	.00	.00	.00	.00	.00	.00	.00	.00
PROCLADIUS	SPECIES	21.53	.00	43.06	.90	19.50	10.76	45.73	1.35
LARSIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMUS	SPECIES	32.29	.00	86.12	1.34	154.67	10.76	457.30	10.68
CRYPTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	11.43	.00	45.73	.79
HARNISCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
MICROTENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARACLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PHAENOPSECTRA	SPECIES	.00	.00	.00	.00	8.07	.00	32.28	.56
POLYPEDILUM	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(FALLAX GROUP)	.00	.00	.00	.00	2.69	.00	10.76	.19
POLYPEDILUM	(CONVICTUM GROUP)	10.76	.00	43.06	.45	.00	.00	.00	.00
POLYPEDILUM	(SCALAENUM GROUP)	.00	.00	.00	.00	5.38	.00	10.76	.37
POLYPEDILUM	(SIMULANS GROUP)	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION F-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION G-PLEASANT R NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
STICTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TANYTARSUS	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.19
RHEOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TRIBELOS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOTELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
DICROTENDIPES	SPECIES	47.06	.00	129.18	1.79	2.69	.00	10.76	.19
CLADOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATANYTARSUS	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.19
STEMPELLINELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PAGASTIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CONSTEMPELLINA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ORTHOCLADIINAE	PUPA	.00	.00	.00	.00	.00	.00	.00	.00
CORYNONEURA	SPECIES	.00	.00	.00	.00	5.38	.00	21.52	.37
CRICOTOPUS	SPECIES	10.76	.00	43.06	.45	37.66	.00	107.60	2.60
HETEROTRISSOCLAD.	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
EUKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
SMITTIA	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.19
PARAMIEFFERIELLA	SPECIES	10.76	.00	43.06	.45	.00	.00	.00	.00
RHEOCRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
BRILLIA	SPECIES	.00	.00	.00	.00	5.38	.00	21.52	.37
NANOCLADIUS	SPECIES	.00	.00	.00	.00	2.69	.00	10.76	.19
PARAMITRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHIRONOMIDAE		129.18	.00	258.36	5.37	263.62	53.80	548.76	18.20
COLLEMBOLA-LEPIDOP									
LEPIDOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLLEMBOLA-LEPIDOP		.00	.00	.00	.00	.00	.00	.00	.00
GASTROPODA									
LYMNAEA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

	STATION F-PLEASANT R NUMBER/SQ M				STATION G-PLEASANT R NUMBER/SQ M			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PHYSA SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF GASTROPODA	.00	.00	.00	.00	.00	.00	.00	.00
PELECYPODA								
SPHAERIUM STRIATINIUM	10.76	.00	43.06	.45	2.69	.00	10.76	.19
CORBICULA MANILLENSIS	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF PELECYPODA	10.76	.00	43.06	.45	2.69	.00	10.76	.19
STATION MEAN TOTAL	2405.35			100.00	1448.45			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	9				22			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	37							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	1.1405				2.3334			
ASSOCIATED EVENNESS	.6126				.7119			
REDUNDANCY	.3911				.2970			

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION I-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION J-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
MISCELLANEOUS									
HYDRA	SPECIES	10.76	.00	43.06	1.45	10.76	.00	43.06	2.08
PLANARIIDAE		.00	.00	.00	.00	.00	.00	.00	.00
NEMATODA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MISCELLANEOUS		10.76	.00	43.06	1.45	10.76	.00	43.06	2.08
TUBIFICIDAE									
OLIGOCHAETA		.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	PROFUNDICOLA	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	HOFFMEISTERI	10.76	.00	43.06	1.45	.00	.00	.00	.00
LIMNODRILUS	CLAPAREDIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	UDEKEMIANUS	.00	.00	.00	.00	.00	.00	.00	.00
LIMNODRILUS	CERVIX	.00	.00	.00	.00	.00	.00	.00	.00
ILYODRILUS	TEMPLETONI	53.82	.00	172.24	7.25	21.53	.00	86.12	4.17
AULODRILUS	PIGUETI	.00	.00	.00	.00	.00	.00	.00	.00
BRANCHIURA	SOWERBYI	21.53	.00	43.06	2.90	.00	.00	.00	.00
UNIDENT. TUBIFICID	WITH CAP. CHAETAE	21.53	.00	43.06	2.90	43.06	.00	172.24	8.33
UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	43.06	43.06	43.06	5.80	53.82	.00	129.18	10.42
TOTAL OF TUBIFICIDAE		150.71	43.06	215.30	20.29	118.41	.00	344.48	22.92
NAIDIDAE									
PRISTINA	IDRENSIS	.00	.00	.00	.00	.00	.00	.00	.00
PRISTINA	FOREL I	.00	.00	.00	.00	.00	.00	.00	.00
DERO	DIGITATA	.00	.00	.00	.00	.00	.00	.00	.00
SLAVINA	APPENDICULATA	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BLDFORD, INDIANA, MAY 19-20,1981

		STATION I-SALT CREEK NUMBER/SQ M				STATION J-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
NAIS	COMMUNIS	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	PRETSCHERI	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	PARDALIS	10.76	.00	43.06	1.45	32.29	.00	129.18	6.25
TOTAL OF NAIDIDAE		10.76	.00	43.06	1.45	32.29	.00	129.18	6.25
OTHER ANNELIDA									
ENCHYTRAEIDAE		.00	.00	.00	.00	.00	.00	.00	.00
MOOREODRILA	MICROSTOMA	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF OTHER ANNELIDA		.00	.00	.00	.00	.00	.00	.00	.00
CRUSTACEA									
ASELLUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LIRCEUS	FONTINALIS	107.65	43.06	172.24	14.49	96.88	.00	344.48	18.75
CRANGONYX	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
AESTACIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CRUSTACEA		107.65	43.06	172.24	14.49	96.88	.00	344.48	18.75
HYDRACARINA									
HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
EPHEMEROPTERA									
HEPTAGENIIDAE		.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION I-SALT CREEK NUMBER/SQ M				STATION J-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
BAETIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CAENIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARALEPTOPHLEBIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HEPTAGENIA	SPECIES	21.53	.00	43.06	2.90	21.53	.00	86.12	4.17
ISONYCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF EPHEMEROPTERA		21.53	.00	43.06	2.90	21.53	.00	86.12	4.17
ODONATA									
GOMPHUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LESTES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF ODONATA		.00	.00	.00	.00	.00	.00	.00	.00
MEGALOPTERA-NEUROP									
SIALIS	SPECIES	21.53	.00	86.12	2.90	.00	.00	.00	.00
TOTAL OF MEGALOPTERA-NEUROP		21.53	.00	86.12	2.90	.00	.00	.00	.00
TRICHOPTERA									
HYDROPSYCHIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF TRICHOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
COLEOPTERA									
DUBIRAPHIA	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION I-SALT CREEK NUMBER/SQ M				STATION J-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STENELMIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ECTOPRIA	NERVOSA	.00	.00	.00	.00	.00	.00	.00	.00
PSEPHUS	HERRICKI	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLEOPTERA		10.76	.00	43.06	1.45	.00	.00	.00	.00
DIPTERA GRP I									
TIPULIDAE		10.76	.00	43.06	1.45	.00	.00	.00	.00
PSYCHODA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CERATOPOGONIDAE		10.76	.00	43.06	1.45	.00	.00	.00	.00
TOTAL OF DIPTERA GRP I		21.53	.00	86.12	2.90	.00	.00	.00	.00
CHIRONOMIDAE									
THIENEMANNIMYIA	GROUP	10.76	.00	43.06	1.45	.00	.00	.00	.00
PROCLADIUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LARSIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMUS	SPECIES	.00	.00	.00	.00	75.35	.00	258.36	14.58
CRYPTOCHIRONOMUS	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
HARNISCHIA	SPECIES	.00	.00	.00	.00	32.29	.00	129.18	6.25
MICROTENDIPES	SPECIES	.00	.00	.00	.00	10.76	.00	43.06	2.08
PARACLADOPELMA	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
PARATENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PHAENOPSECTRA	SPECIES	.00	.00	.00	.00	21.53	.00	86.12	4.17
POLYPEDILUM	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
POLYPEDILUM	(FALLAX GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(CONVICTUM GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(SCALAENUM GROUP)	21.53	.00	86.12	2.90	21.53	.00	86.12	4.17
POLYPEDILUM	(SIMULANS GROUP)	43.06	.00	86.12	5.80	10.76	.00	43.06	2.08

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION I-SALT CREEK NUMBER/SQ M				STATION J-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STICTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TANYTARSUS	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
RHECTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TRICLLOS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOPELMA	SPECIES	53.82	.00	215.30	7.25	.00	.00	.00	.00
DICROTENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOTANYTARSUS	SPECIES	21.53	.00	43.06	2.90	.00	.00	.00	.00
PARATANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
STEMPELLINELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PAGASTIELLA	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
CONSTEMPELLINA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ORTHOCLADIINAE	PUPA	.00	.00	.00	.00	.00	.00	.00	.00
CORYNONEURA	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
CRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HETEROTRISSOCLAD.	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
EUKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
SMITTIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PHAENOPSECTRUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
BRILLIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NANOCLADIUS	SPECIES	10.76	.00	43.06	1.45	.00	.00	.00	.00
PARAMETRIOCNEMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHIRONOMIDAE		226.06	.00	430.60	30.43	172.24	.00	516.72	33.33
COLLEMBOLA-LEPIDOP									
LEPIDOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLLEMBOLA-LEPIDOP		.00	.00	.00	.00	.00	.00	.00	.00
GASTROPODA									
LYMNAEA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

	STATION 1-SALT CREEK NUMBER/SQ M				STATION J-SALT CREEK NUMBER/SQ M			
SPECIES NAME	MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PHYSA SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF GASTROPODA	.00	.00	.00	.00	.00	.00	.00	.00
PELECYPODA								
SPHAERIUM STRIATINIUM	150.71	.00	387.54	20.29	53.82	.00	172.24	10.42
CORBICULA MANILLENSIS	10.76	.00	43.06	1.45	10.76	.00	43.06	2.08
TOTAL OF PELECYPODA	161.47	.00	387.54	21.74	64.59	.00	172.24	12.50
STATION MEAN TOTAL	742.78			100.00	516.72			100.00
TOTAL NUMBER OF SAMPLES	4				4			
NUMBER OF SPECIES	27				15			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS	87							
DIVERSITY CALCULATED IN LOG BASE 2								
SHANNONS DIVERSITY	2.9021				1.6592			
ASSOCIATED EVENNESS	.9171				.6462			
REDUNDANCY	.0864				.1079			

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION K-SALT CREEK NUMBER/SQ M				STATION L-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
MISCELLANEOUS									
HYDRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PLANARIIDAE		.00	.00	.00	.00	.00	.00	.00	.00
NEMATODA		42.74	.00	85.48	.91	.00	.00	.00	.00
TOTAL OF MISCELLANEOUS		42.74	.00	85.48	.91	.00	.00	.00	.00
TUBIFICIDAE									
OLIGOCHAETA		21.37	.00	85.48	.46	.00	.00	.00	.00
LIMNODRILUS	PROFUNDICOLA	.00	.00	.00	.00	57.28	.00	229.11	.63
LIMNODRILUS	HOFFMEISTERI	220.55	85.48	599.36	6.85	444.65	170.96	1145.56	4.91
LIMNODRILUS	CLAPAREDIANUS	.00	.00	.00	.00	42.74	.00	170.96	.47
LIMNODRILUS	UDEKEMIANUS	.00	.00	.00	.00	57.28	.00	229.11	.63
LIMNODRILUS	CERVIX	21.37	.00	85.48	.46	.00	.00	.00	.00
ILYODRILUS	TEMPLETONI	42.74	.00	170.96	.91	.00	.00	.00	.00
AULODRILUS	PIGUETI	.00	.00	.00	.00	.00	.00	.00	.00
BRANCHIURA	SOWERBYI	.00	.00	.00	.00	.00	.00	.00	.00
UNIDENT. TUBIFICID	WITH CAP. CHAETAE	85.48	.00	170.96	1.83	362.93	.00	822.53	4.00
UNIDENT. TUBIFICID	WITHOUT CAP. CHAET	491.51	170.96	769.32	10.50	5122.28	683.84	9851.80	56.52
TOTAL OF TUBIFICIDAE		993.02	427.40	1538.64	21.00	6087.15	1196.72	11913.81	67.17
NAIDIDAE									
PRISTINA	IDRENSIS	.00	.00	.00	.00	.00	.00	.00	.00
PRISTINA	FOREL I	.00	.00	.00	.00	.00	.00	.00	.00
DERO	DIGITATA	.00	.00	.00	.00	.00	.00	.00	.00
SLAVINA	APPENDICULATA	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION K-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION L-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
NAIS	COMMUNIS	.00	.00	.00	.00	57.28	.00	229.11	.63
NAIS	BRETSCHERI	.00	.00	.00	.00	.00	.00	.00	.00
NAIS	PARDALIS	106.85	.00	256.44	2.26	.00	.00	.00	.00
TOTAL OF NAIDIDAE		106.85	.00	256.44	2.26	57.28	.00	229.11	.63
OTHER ANNELIDA									
ENCHYTRAEIDAE		106.85	.00	170.96	2.26	393.33	.00	854.80	4.34
MOOREOBDELA	MICROSTOMA	21.37	.00	85.48	.46	.00	.00	.00	.00
TOTAL OF OTHER ANNELIDA		128.22	.00	256.44	2.74	393.33	.00	854.80	4.34
CRUSTACEA									
ASELLUS	SPECIES	85.46	.00	170.96	1.83	427.40	.00	1709.60	4.72
LIRCEUS	FONTINALIS	2607.14	683.84	4359.48	55.71	1196.88	.00	4103.04	13.21
CRANGONYX	SPECIES	192.33	.00	769.32	4.11	42.74	.00	170.96	.47
ASTACIDAE		85.46	.00	341.92	1.83	.00	.00	.00	.00
TOTAL OF CRUSTACEA		2970.43	683.84	5214.28	63.47	1667.02	.00	5983.60	18.39
HYDRACARINA									
HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF HYDRACARINA		.00	.00	.00	.00	.00	.00	.00	.00
EPHEMEROPTERA									
HEPTAGENIIDAE		.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION K-SALT CREEK NUMBER/SQ M				STATION L-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
BAETIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CAENIS	SPECIES	21.37	.00	85.48	.46	.00	.00	.00	.00
PARALEPTOPHLEBIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HEXAGENIA	SPECIES	.00	.00	.00	.00	150.07	.00	341.92	1.66
ISONYCHIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF EPHEMEROPTERA		21.37	.00	85.48	.46	150.07	.00	341.92	1.66
ODONATA									
GOMPHUS	SPECIES	21.37	.00	85.48	.46	.00	.00	.00	.00
LESTES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF ODONATA		21.37	.00	85.48	.46	.00	.00	.00	.00
MEGALOPTERA-NEUROP									
SIALIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF MEGALOPTERA-NEUROP		.00	.00	.00	.00	.00	.00	.00	.00
TRICHOPTERA									
HYDROPSYCHIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF TRICHOPTERA		.00	.00	.00	.00	.00	.00	.00	.00
COLEOPTERA									
DUBIRAPHIA	SPECIES	21.37	.00	85.48	.46	21.53	.00	86.12	.24

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

SPECIES NAME		STATION K-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT	STATION L-SALT CREEK NUMBER/SQ M MEAN	MIN.	MAX.	PERCENT
STENELMIS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ECTOPRIA	NERVOSA	.00	.00	.00	.00	.00	.00	.00	.00
PSEPHUS	HERRICKI	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF COLEOPTERA		21.37	.00	85.48	.46	21.53	.00	86.12	.24
DIPTERA GRP I									
TIPULIDAE		.00	.00	.00	.00	.00	.00	.00	.00
PSYCHODA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CERATOPOGONIDAE		.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF DIPTERA GRP I		.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMIDAE									
THIENEMANNIMYIA	GROUP	.00	.00	.00	.00	.00	.00	.00	.00
PROCLADIUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
LARSIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CHIRONOMUS	SPECIES	106.85	.00	256.44	2.28	106.85	.00	256.44	1.16
CRYPTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HARNISCHIA	SPECIES	.00	.00	.00	.00	21.53	.00	86.12	.24
MICROTENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARACLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PHAENOPSECTRA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(FALLAX GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(CONVICTUM GROUP)	.00	.00	.00	.00	.00	.00	.00	.00
POLYPEDILUM	(SCALAENUM GROUP)	64.11	.00	170.96	1.37	128.66	.00	172.24	1.42
POLYPEDILUM	(SIMULANS GROUP)	85.48	.00	170.96	1.83	21.53	.00	86.12	.24

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BLDFORD, INDIANA, MAY 19-20,1981

		STATION K-SALT CREEK NUMBER/SQ M				STATION L-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
STICTOCHIRONOMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TANYTARSUS	SPECIES	42.74	.00	170.96	.91	.00	.00	.00	.00
RHEOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TRIBELOS	SPECIES	42.74	.00	85.48	.91	.00	.00	.00	.00
CLADOPELMA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
DICROTENDIPES	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CLADOTANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARATANYTARSUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
STEMPELLINELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PAGASTIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CONSTEMPELLINA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
ORTHOCLADIINAE	PUPA	.00	.00	.00	.00	.00	.00	.00	.00
CORYNONEURA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
CRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
HETEROTRISSOCLAD.	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
EUKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
SMITTIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
PARAKIEFFERIELLA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
RHEOCRICOTOPUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
BRILLIA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
NANOCLADIUS	SPECIES	.00	.00	.00	.00	43.06	.00	172.24	.48
PARAMETRICNEMUS	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF CHIRONOMIDAE		341.92	.00	512.88	7.31	321.83	.00	344.48	3.55
COLLEMBOLA-LEPIDOP									
LEPIDOPTERA		.00	.00	.00	.00	128.22	.00	512.88	1.41
TOTAL OF COLLEMBOLA-LEPIDOP		.00	.00	.00	.00	128.22	.00	512.88	1.41
GASTROPODA									
LYMNAEA	SPECIES	.00	.00	.00	.00	.00	.00	.00	.00

TABLE

MEAN, MINIMUM, MAXIMUM, AND PERCENT COMPOSITION OF BENTHIC MACROINVERTEBRATE TAXA FROM THE DISCHAGE STREAM, PLEASANT RUN AND SALT CREEK, FOR GENERAL MOTORS, BEDFORD, INDIANA, MAY 19-20,1981

		STATION K-SALT CREEK NUMBER/SQ M				STATION L-SALT CREEK NUMBER/SQ M			
SPECIES NAME		MEAN	MIN.	MAX.	PERCENT	MEAN	MIN.	MAX.	PERCENT
PHYSA	SPECIES	21.37	.00	85.48	.46	.00	.00	.00	.00
TOTAL OF GASTROPODA		21.37	.00	85.48	.46	.00	.00	.00	.00
PELECYPODA									
SPHAERIUM	STRIATINIUM	21.37	.00	85.48	.46	236.03	170.96	344.48	2.60
CORBICULA	MANILENSIS	.00	.00	.00	.00	.00	.00	.00	.00
TOTAL OF PELECYPODA		21.37	.00	85.48	.46	236.03	170.96	344.48	2.60
STATION MEAN TOTAL		4680.03			100.00	9062.46			100.00
TOTAL NUMBER OF SAMPLES		4				4			
NUMBER OF SPECIES		24				20			
MAXIMUM NUMBER OF SPECIES AT ALL STATIONS		87							
DIVERSITY CALCULATED IN LOG BASE 2									
SHANNONS DIVERSITY		2.4032				1.9236			
ASSOCIATED EVENNESS		.6939				.6094			
REDUNDANCY		.3098				.3921			

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MAY 25, 2001

APPENDIX F.4

U.S.EPA ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

DATE: January 12, 1983

SUBJECT: Preliminary Health Risk Asessment for Salt Creek, Indiana

FROM: Randall J.F. Bruins RJFBruins
Environmental Scientist, ECAO-Cin

TO: Barbara Magel
Assistant Regional Counsel, Region V

THRU: Jerry F. Stara, Director, ECAO-Cin JFStara

THRU: Elizabeth Anderson, Director, OHEA [signature] 1-24-83

The attached report is provided in response to your request for an assessment of potential human health risks from PCBs in Salt Creek, Indiana. As stated in the introduction to the report, this is not an assessment of actual risks, because actual consumption of water, fish or sediments from the stream and the changes in contaminant levels which have occurred over time are not known. Instead, the report suggests risks which could occur if consumption at present (i.e., 1980) contaminant levels occurred over a lifetime. Given our limitations of time and resources, we were not able to perform the requested analyses of time trends and source contribution.

This report has received limited review within the Office of Health and Environmental Assessment (OHEA). It has not received peer and administrative review clearance under Executive Order 2200 and therefore should not be cited, quoted or copied.

I hope that this report assists your efforts.

RJFB:sf

Attachment

cc: C. Riordan
V. Adamkus

United States
Environmental Protection
Agency

Final
ECAO-CIN-307
January, 1983

EPA

Research and Development

Preliminary Health Risk Assessment for Salt Creek, Indiana

Prepared for

Region V Enforcement

FOR INTERNAL USE ONLY:
DO NOT CITE, QUOTE OR COPY

Prepared by

Environmental Criteria and
Assessment Office
Cincinnati OH 45268

DISCLAIMER

This report has been reviewed by the Environmental Criteria and Assessment Office, U.S. Environmental Protection Agency. It is an internal draft for review purposes only and does not constitute Agency policy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

AVAILABILITY NOTICE

This document has received limited review and is for internal use only. For information regarding release or data contained in the document, please contact Randall Bruins, Project Officer, at (513) 684-7573.

Preliminary Health Risk Assessment for Salt Creek, Indiana

1. INTRODUCTION

This report provides a preliminary assessment of health risks which may result from the contamination of Salt Creek, Indiana by polychlorinated biphenyls (PCBs). Monitoring data are available for several streams in this drainage basin for 1976, 1977 and 1980. However, no analysis of temporal or geographic trends of contamination has been attempted in this report. Rather, 1980 data from Salt Creek alone are used to suggest potential risks to human health associated with recent levels of PCBs in this stream. These risks should not be considered actual risks, since data on stream use (e.g., annual catch, drinking water use, etc.) are not available, and because human exposure probably has varied over time. This information is presented only to assist decision-makers in judging the adequacy of measures currently in force and the need (if any) for additional measures to be taken. This assessment should be considered preliminary; a more detailed analysis could alter the results.

2. EXPOSURE

2.1. EXPOSURE VIA FISH CONSUMPTION

The 1980 monitoring data include fish tissue levels of total PCBs for fish species in Clear Creek, Salt Creek and East Fork White River. Some analyses were made on the basis of whole fish and some on the basis of fish fillets. In either case, the fat content of the tissue analyzed was reported, and PCB content on a fat basis was also given.

The fat content of a fish tissue sample is an important determinant of PCB content. The level of a lipophilic contaminant in fatty tissues tends to be at equilibrium with the level in the surrounding water in a manner

influenced by its lipid-water partitioning coefficient (K_{ow}) (Kenaga and Goring, 1980). PCBs are among the most highly lipophilic substances with K_{ow} ranging from 760,000-8,130,000 depending on degree of chlorination (Veith et al., 1979). When measured equilibrium bioconcentration factors (BCFs) for various Aroclors in several fish species were normalized by fat content, a mean, normalized BCF of 10,400 per 1% fat content resulted (U.S. EPA, 1980).

Fat content of a fish may vary widely according to season and nutritional status as well as by species. This variability can be observed in the monitoring data provided. Much of the fat is excluded when the fish is filleted. However, in many species the skin or eggs are often consumed, and therefore PCB analysis of a fillet (which presumably excludes the skin) may underestimate likely human exposure. For example, the PCB level in "flesh plus skin" was 1.4 times that of "flesh" in pinfish exposed to Aroclor 1016 (Kenaga and Goring, 1980).

Another source of variability is the movement of fish into and out of areas where PCB accumulation can occur. Therefore, fish taken in a particular area may not be representative of the local population, unless a large number are sampled. In Salt Creek, only 1-5 individuals of each species were sampled in a given location, and pooled analyses were usually done so that variability is difficult to examine.

For these reasons, and because species sampled also varied, it is difficult to compare tissue PCB levels from different areas. Data for longear sunfish and largemouth bass, the species most frequently sampled, showed that tissue PCB levels at Salt Creek station 5 tended to be higher than those at Salt Creek stations 2 or 3, which are above the entrance of Pleas-

ant Run. This finding would be consistent with the idea, but does not conclusively show, that Pleasant Run is an important source of contamination to the lower portion of Salt Creek.

For the purpose of estimating average PCB levels in consumed tissues from Salt Creek using the few data available, 1980 data for the three Salt Creek sites were combined for each species to give an average value for PCB contamination of fat (Table 1). Data on fat content, which was assumed to vary independently of fat contamination level, was combined over all three streams and all years of sampling to give representative means for fat content of fillet and whole-body for these species in this drainage basin. Values for fat content were then multiplied by values for fat contamination to arrive at mean PCB content for each species. The fillet PCB values were taken as averages for consumed tissue, and whole-body PCB values were taken as an upper limit, to allow for consumption of other parts.

The resulting estimates for average PCB content of fillets for Salt Creek are as follows: 1.38 mg/kg for bluegill, 2.30 mg/kg for longear sunfish, 6.06 mg/kg for largemouth bass. Since data are not available on relative size of catch for these species, the values were weighted by number of each species sampled to give a combined average of 3.29 mg/kg. The whole-body value of 17.3 mg/kg for largemouth bass was used as a maximum value. The variability in these calculations was carried through to illustrate the range of PCB levels likely to be observed in fish from this stream (see Table 1).

Since actual catch and consumption of fish from Salt Creek is not known, several values will be used to assess various levels of exposure. Per capita consumption of fish caught recreationally in the United States has been estimated to be between 3 and 4 lb/year (SRI International, 1980). An

TABLE 1

Summary Statistics for PCB Content of Fish Tissues from Salt Creek, Indiana, 1980

Species	Site	PCB Content of Fat (mg/kg)[a]	Mean PCB Content of Fat (mg/kg)[b]	Fat Content of Fillet (%)[b,c]	Fat Content of Whole Body (%)[b,c]	Mean PCB Content of Fillets (mg/kg)[d]	Mean PCB Content of Whole Body (mg/kg)[d]
Bluegill	SC-2	91.3(3)	91.3 (NA)	1.51 (1.18-4.24)	5.05 (1.47-6.98)	1.38 (1.08-3.87)	4.61 (1.34-6.37)
Longear Sunfish	SC-2 SC-3 SC-3 SC-5	176(2) 198(2) 210(2) 406(5)	255 (176-406)	0.90 (0.04-1.44)	5.70 (4.18-8.08)	2.30 (0.07-5.85)	14.5 (7.36-32.8)
Largemouth Bass	SC-3 SC-3 SC-5 SC-5	101(1) 173(1) 911(2) 928(2)	659 (101-928)	0.92 (0.09-3.29)	2.62 (1.04-4.2)	6.06 (0.09-30.5)	17.3 (1.05-39.0)
Mean[e]						3.29	

[a]Number in parentheses is number of fish in sample

[b]Numbers in parentheses are observed range

[c]Weighted mean of 1976, 1977 and 1980 data from Clear Creek, Salt Creek and East Fork White River

[d]Numbers in parentheses are calculated range

[e]Weighted mean of three species

NA = Not available

average of 1.6 kg/year (3.5 lb/year) would correspond to 4.3 g/day. If Salt Creek were taken to be the primary source of recreational fish for local residents, the average exposure would be 0.0043 kg/day x 3.29 mg PCB/kg = 0.014 mg/day, or 0.2 µg/kg body weight (bw) per day for a man of 70 kg bw. At the higher contaminant level (17.3 mg/kg) exposure would be 1.1 µg/kg bw/day.

At the level of one fish-containing meal per week recommended as a maximum for this area by the Indiana State Board of Health (Blankenbaker, 1981), assuming that one meal is 0.25 kg (≈0.5 lb) of fish, daily exposure would be as follows:

$$\frac{0.25 \text{ kg}}{7 \text{ day}} \times \frac{3.29 \text{ mg PCB}}{\text{kg}} \times \frac{1}{70 \text{ kg bw}} = 1.7 \text{ µg/kg bw/day}$$

At the higher contaminant level, exposure would be 8.8 µg/kg bw/day.

2.2. EXPOSURE VIA WATER CONSUMPTION

The PCB concentration (as Aroclor 1242) in Salt Creek water in 1980 was at or below the detection limit of 0.1 µg/ℓ in four analyses from three sites. The detection limit was therefore used as the maximum level in estimating potential human exposure from drinking water. The U.S. EPA uses 2 ℓ/day as an estimate of water intake for a 70 kg man. Maximum exposure from this route would therefore be 0.2 µg/day or 0.003 µg/kg bw/day.

2.3. EXPOSURE VIA CONSUMPTION OF SEDIMENTS

Three analyses of sediments from Salt Creek in 1980 gave similar values (range, 1.9-2.2 mg/kg) with a mean of 2.1 mg/kg. A fourth value (0.15 mg/kg) from the short stretch above the confluence with Clear Creek was not included.

Children playing in or near Salt Creek could conceivably disturb the sediments and swallow turbid water. A highly turbid water may contain suspended sediments at up to ≈50,000 mg/ℓ (Wallen et al., 1957). Using 60

mℓ (≈2 fl. oz.) as an estimate of a large swallow of water, a contact of this type could result in ingestion of ≈3 g of sediment containing ≈6 µg PCB. Exposure once a week for a small (20 kg) child could conceivably result in an average intake level of 0.043 µg/kg bw/day.

Consumption of dirt from the hands by children exhibiting frequent mouthing behavior ("pica") has been estimated to be at least 100 mg/day (Lepow et al., 1975). For children playing in daily contact with Salt Creek sediments, PCB ingestion was therefore estimated to be ≈0.2 µg/day, or 0.01 µg/kg bw/day for a 20 kg child.

3. HEALTH EFFECTS

PCBs are a class of compounds which vary in their physical, chemical and toxicological properties. Because both sampling data and toxicological data on PCBs are inadequate to permit assessment of effects for individual isomers or even for given commercial preparations (i.e., Aroclors), the PCBs have been treated as a group in the following discussion.

PCBs have been found in the human diet; typical consumption decreased from 15 µg/day in 1971 to 8.7 µg/day (or 0.12 µg/kg bw/day) in 1975. PCBs have low acute toxicity. With the exception of a well-known incident of acute poisoning in Japan (Yusho disease) in which an average of 2 g PCB was ingested, most instances of human toxicity have resulted from long-term exposure and accumulation in the body. Occupational exposure by inhalation and dermal contact may result, after months or years, in problems such as chloracne, irritation of eye, nose or throat or gastrointestinal disturbance. Fat metabolism and liver function have also been affected. Studies with mammals have shown various metabolic, hormonal and immunosuppressive effects of PCBs. Cancer and reproductive effects have also been demonstrated (U.S. EPA, 1980). These latter effects form the basis for the assessments which follow.

3.1. CANCER RISK ESTIMATE

The International Agency for Research on Cancer (IARC, 1980) has classified PCBs as a "group 2B" carcinogen, or a "probable" human carcinogen based on suggestive evidence. This classification derives from "sufficient" evidence of animal carcinogenicity and "inadequate" evidence of human carcinogenicity. The U.S. EPA used a presumption of human carcinogenicity in deriving water quality criteria for PCBs.

The data used in the Ambient Water Quality Criteria Document on PCBs (U.S. EPA, 1980) for determining cancer potency at low doses consist of two dose groups (including the control) from a study in which rats were fed Aroclor 1260 (Kimbrough et al., 1975):

Dose (mg/kg/day)	No. responses/No. animals
0	1/173
4.42	170/184

The upper limit on lifetime excess cancer risk to humans is calculated assuming that the fitted extrapolation model (the linearized multistage model) is a fair approximation of the true dose-response curve; and that the dose-per-surface-area conversion from animal to man is appropriate. Table 2 presents the exposure estimates from Section 2 and their associated, upper-bound estimates of expected excess cancer risk. Included for comparison is the 1975 estimate for typical dietary consumption in the United States (current levels of consumption may be somewhat lower). The upper confidence limit on risk is used because of its superior numerical stability over the MLE.

Some qualifications must accompany these risk estimates:

- Expected risk estimates based on maximum likelihood estimation are extremely sensitive to model selection and data uncertainties. No method has yet been approved by the U.S. EPA for the estimation of expected cancer cases.

TABLE 2

Possible Levels of Human Exposure to PCBs from
Salt Creek and Associated Estimates of Excess Cancer Risk[a]

Exposure Source	Assumed Consumption	Estimated Daily Exposure (µg/kg bw/day)	Upper 95% Limit on Excess Cancer Risk
Salt Creek water	PCB detection limit, 2 ℓ/day	0.003	1.3×10^{-5}
Salt Creek sediment	Daily ingestion by child of 100 mg sediment ("pica")	0.01	NC[b]
	Weekly ingestion by child of 60 mℓ turbid water	0.043	NC[b]
Typical U.S. diet in 1975[c]		0.12	5.2×10^{-4}
Salt Creek fish	Average fillet, 1.6 kg/yr	0.20	8.7×10^{-4}
	Whole largemouth bass, 1.6 kg/yr	1.1	4.8×10^{-3}
	Average fillet, 0.25 kg/wk	1.7	7.4×10^{-3}
	Whole largemouth bass, 0.25 kg/wk	8.8	3.8×10^{-2}

[a]Based on 1980 monitoring data. See text for full explanation of exposure and risk estimates.

[b]Risk not computed since exposure not reasonably expected to occur over lifetime.

[c]Source: U.S. EPA, 1980

- The data set used for calculating cancer potency for PCB consists of only two points, a control group and one exposed group. The exposed group had nearly 100% response while the control group had near zero, so no midrange data exist.
- As discussed previously, the human carcinogenicity of PCBs is considered "probable" but has not been demonstrated.

In spite of these qualifications, the risk estimates could serve as a rough guide for regulatory purposes. For each exposure estimate given in Table 2, there is 95% confidence that the true risks are not greater than the risks presented, bearing in mind the other qualitative uncertainties discussed previously. See also Appendix A for further explanation of cancer risk calculations.

The lowest risk estimate in Table 2 is that based on consumption of Salt Creek water. It cannot be stated whether or not this estimated risk level (1.3×10^{-5}) is acceptable, but it is well below that estimated for typical United States dietary exposure. Risk estimates for exposure via sediments were not given since such exposure, as described in Section 2.3, was not reasonably expected to occur over a lifetime. PCB exposure and consequent cancer risk for occasional or regular consumers of Salt Creek fish were higher than the typical dietary exposure, and the highest consumption level gives an upper limit on excess cancer risk of 3.8×10^{-2} or ≈4%.

3.2. TOXICITY-BASED PREDICTION OF SAFE AND EFFECTIVE LEVELS

Acceptable daily intake levels (ADIs) are determined from human or animal studies by adjusting no-observed-adverse-effect levels (NOELs), no-observed-adverse-effect levels (NOAELs) or lowest-observed-adverse-effect levels (LOAELs), the latter being the lowest level (not the lowest effect) at which adverse effects were observed. The term "acceptable" applies only with respect to toxic effects, since cancer risk is considered to exist even at levels below the ADI. The toxicity studies presented in the following

discussion were also discussed in the Ambient Water Quality Criteria Document for PCBs (U.S. EPA, 1980), but the derived ADI and effect levels given here were not presented in that document.

Two animal studies are available that evaluate the toxicity of PCBs after oral administration of low concentrations (Allen and Barsotti, 1976; Aulerich and Ringer, 1977). A perusal of the latter study indicates a chronic LOAEL in mink at 2 ppm in diet. This LOAEL is supported by a chronic adverse-effect level (AEL) in monkeys (Allen and Barsotti, 1976) at 2.5 ppm in diet. Both effect levels caused decreased reproductive performance in adults and toxicity to the offspring. The LOAEL is also supported by a subchronic NOAEL in mink at 1 ppm.

The chronic LOAEL in ppm can be converted to mg/kg bw/day units by the following equation:

$$\text{Chronic LOAEL} = \frac{2 \text{ mg/kg diet (ppm)} \times 0.15 \text{ kg diet/day}}{1 \text{ kg bw}}$$

$$= 0.30 \text{ mg/kg bw/day}$$

where 0.15 kg of diet/day is the assumed amount of food consumed by adult female mink (Aulerich and Ringer, 1977) and 1 kg bw is the assumed adult female mink weight (U.S. EPA, 1980).

The human ADI, considered a protective level, can be found by the following equation:

$$\text{ADI} = \frac{0.30 \text{ mg/kg bw/day}}{1000}$$

$$= 0.3 \text{ µg/kg bw/day}$$

where the 1000-fold uncertainty factor represents the standard 100-fold factor used to extrapolate chronic animal data to the human (45 FR 79353) and an additional 10-fold factor because a LOAEL, rather than a NOAEL, was used in the derivation of the ADI (in this latter case, 10-fold is recommended due to the severity of the adverse effects observed).*

The chronic LOAEL for mink (0.30 mg/kg bw/day) can also be adjusted by a predictive, rather than protective, approach to estimate a LOAEL for the average human. This approach, unlike ADI estimation does not incorporate a margin of uncertainty as required for protection of sensitive individuals. The adjustment may be done by dividing by 4.1, the mink-to-human conversion based on respective body surface areas. The resulting estimated human LOAEL is 73 µg/kg bw/day.

The subchronic NOAEL for mink similarly may be adjusted to an estimated human NOAEL, but in this case an additional factor of 10 must be added as a subchronic-to-chronic conversion:

$$\text{Subchronic NOAEL} = \frac{1 \text{ mg/kg diet} \times 0.15 \text{ kg diet/day}}{1 \text{ kg bw}}$$

$$= 0.15 \text{ mg/kg bw/day}$$

$$\text{Estimated human NOAEL} = \frac{0.15 \text{ mg/kg bw/day}}{4.1 \times 10}$$

$$= 3.7 \text{ µg/kg bw/day}$$

The ADI, NOAEL and LOAEL are compared with the various PCB exposure levels in Table 3. The exposure levels postulated for consumption of Salt Creek water and sediments and the typical United States dietary exposure were below the ADI calculated above. However, the possible range for expo-

---

*See 45 FR 79353 for a discussion of this area of uncertainty. Note that if the subchronic NOAEL was chosen instead of the chronic LOAEL the total uncertainty factor would still be 1000. This is because an additional 10-fold factor would be required due to the shorter "subchronic" exposure period of the NOAEL. (The 10-fold because of the LOAEL, of course, would not be used.) Since the NOAEL is lower than the LOAEL, and the assumptions are the same, using the NOAEL would result in a protective water level of 0.05 µg/ℓ.

TABLE 3

Comparison of PCB Exposure Levels and Various Protective or Predictive Levels Based on Toxic (i.e., noncancer) Effects[a]

Exposure Level (µg/kg bw/day)	Description
0.003	Salt Creek water consumption
0.01-0.043	Salt Creek sediment consumption
0.12	Typical U.S. diet in 1975
0.3	ADI (human)
3.7	NOAEL (adjusted for average human)
0.20-8.8	Salt Creek fish consumption
73	LOAEL (adjusted for average human)

[a]See Table 2 and text for explanation of levels and acronyms.

sure via fish consumption extended above the ADI and adjusted NOAEL. Although the assumed exposure did not exceed the adjusted LOAEL, exposures exceeding the ADI, and especially those exceeding the adjusted NOAEL, cannot be assumed to be sufficiently low to preclude adverse reproductive or other toxic effects. While a numerical risk level cannot be assigned, it can be stated qualitatively that there is a risk of noncancer, adverse effects associated with consumption of Salt Creek fish when the ADI for PCBs is exceeded. Note again that exposure levels below the toxicity-based ADI may pose a carcinogenic risk.

4. ENVIRONMENTAL PARTITIONING OF PCBs

The respective equilibrium concentrations of PCBs in the water, biota and sediments of an ecosystem tend to be interrelated according to the physicochemical property of the compound(s) (Kenaga and Goring, 1980; Neely, 1982). It is worthwhile to be aware of these interrelationships when concerned about the level in a particular medium.

The relationship between concentration in biota, especially in fat, and concentration in water (i.e., the BCF) has been mentioned. A BCF of 10,400 per 1% fat has been derived (U.S. EPA, 1980). A weighted mean for fish sampled in Salt Creek gives an average PCB content of 352 mg PCB/kg fat. The mean water concentration can be estimated as follows:

$$\frac{352 \text{ mg PCB/kg}}{100 \text{ \% fat}} \times \frac{1\% \text{ fat}}{10{,}400 \text{ } \ell/\text{kg}} = 0.34 \text{ } \mu g/\ell$$

The relationship between concentrations in sediment and water may be estimated from the organic carbon-water partitioning coefficient (K_{OC}) if the amount of organic carbon in the sediments is known. K_{OC} was estimated from reported values for K_{OW} and BCF (Veith et al., 1979) and water solubility (Kenaga and Goring, 1980), using regression equations from Kenaga and

Goring (1980). Values for Aroclor 1016 were used because of its similarity to Aroclor 1242, for which sediment and water concentrations were given. The resulting estimates of K_{OC} ranged from 17,000-1,040,000. Since no information was available on organic content of the 1980 sediment samples, a value of 10% was used as an approximation. Organic matter (OM) was assumed related to organic carbon (OC) by a factor of 1.72 (Kenaga and Goring, 1980). By the equation:

$$\text{Water concentration} = \frac{2.1 \text{ mg PCB}}{\text{kg sediment}} \times \frac{100\% \text{ sediment}}{10\% \text{ OM}} \times \frac{1.72 \text{ OM}}{\text{OC}} \times \frac{1}{K_{OC}}$$

values for water concentration based on various estimates of K_{OC} ranged from 0.035-2.1 µg/ℓ. If sediment organic content were higher, these values would be proportionately lower, and vice versa. These values define a range of two orders of magnitude containing the estimate based on BCF (0.34 µg/ℓ). The latter estimate slightly exceeds the measured water concentration, which was at or below the detection limit of 0.1 µg/ℓ.

The above calculations are based on a superficial treatment of environmental partitioning concepts and do not comprise an indepth examination of the monitoring data. Nor do they consider imports and exports from the system via the various media. However, the estimates appear to be in rough agreement with the measured water concentration, and therefore tend to support the notion that observed PCB concentrations in water, biota and sediments of Salt Creek are in dynamic equilibrium, and that changes in one would reflect or be reflected by changes in the others. This fact is important since the water concentration is usually below detection. Over time, improvements in terms of the water concentration may be undetectable, whereas changes in fish and sediment concentrations should be measurable and interrelated. This also indicates that mitigation of hazard due to fish

consumption cannot be predicted by considering the depuration rate of any organism, but will depend on the depuration of PCB from the system as a whole, including the sediments.

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APPENDIX A

Some Notes on Cancer Risk Calculations

- Potency = slope of dose-response curve.
- We use the upper 95% confidence limit on slope, which we call q_1^*. Eventually this can be converted to an equivalent human potency.
- Note that q_1^* depends on the risk level or dose, i.e., it is <u>not</u> constant for all doses, unless (unlikely) the dose-response curve is a straight line through all doses. Likewise a "unit-risk" estimate is dose-dependent.
- The conversion from animal data to equivalent human data can be done at any time. Thus the multistage model can use human equivalent doses, or the animal q_1^* can be converted to a human equivalent potency.
- The use of the 95% confidence limit means that we cannot <u>predict</u> the likely number of cases from a given exposure. We can only give an upper bound.
- The resultant risk estimate can be interpreted equally well as the risk or probability of a randomly chosen individual contracting cancer (from continuous lifetime exposure) or as the incidence rate in the population. Remember that the risk estimates are upper bounds on actual risk.
- The maximum likelihood estimate on the dose is not used by EPA for risk estimation because of its strong sensitivity to slight changes in the original data set and its strong dependence on the choice of mathematical model.
- Excess risk is conditional risk, conditioned on surviving the background exposure. If total (excess plus background) risk at dose d is P(d), then

$$\text{excess risk} = \frac{P(d) - P(0)}{1 - P(0)}$$

The calculation is roughly as follows. Assume the data are on animals.

Define: R = risk level (e.g., 1/100, 10^{-5}, etc.)
d_R = lower 95% confidence limit on dose at risk R from the computer output.

Then, potency = R/d_R. The conversion to human potency requires several adjustments. The dose must be expressed as average daily dose over lifetime, and the risk must be based on this assumed average daily exposure. The potency or dose is then adjusted for differences between the test animal and humans.

Define: l_e = length of exposure
L_e = length of observation or experiment
L = length of lifetime of test animal

Then, the adjusted animal potency is:

$$q_1^* = (\text{potency})/[(l_e/L_e)(L_e/L)^3].$$

The first adjustment (l_e/L_e) averages the exposure over the length of the experiment. This reduces the effective daily dose, and thus is a divisor here to increase the potency estimate. The second divisor $(L_e/L)^3$ also increases the potency estimate. The belief is that the incidence should increase as the cube of the duration of exposure, so this term adjusts the potency based on the expected incidence had the exposure been continued for a lifetime.

Conversion to human equivalent potency is accomplished using the assumption that equitoxic "dose" is represented by

$$(\text{exposure level})/(\text{body surface area}).$$

One can use the approximation of

$$\text{body surface area} \approx (K)\ (bw)^{2/3}$$

and assume K is constant across species. Then the human potency B is, in $(mg/kg\text{-}d)^{-1}$,

$$B = q_1^*\ (W_h/W_a)^{1/3},$$

Where W_h and W_a are human and animal body weights in kg. Keep in mind that any multiplicative adjustment to dose becomes a division adjustment to potency.

APPENDIX F.5

CDM 1985 STREAM STUDY

CDM

environmental engineers, scientists, planners, & management consultants

CAMP DRESSER & McKEE INC.

3489 North 124th Street
Brookfield, Wisconsin 53005
414 781-4890

August 26, 1985

Mr. Gregory Etzel
General Motors Corporation
Central Foundry Division
901 North Jackson Street
Bedford Plant
Bedford, Indiana 47421

Dear Mr. Etzel:

Please find enclosed the final report for the Static Acute Toxicity Testing Program at various streams near Bedford, Indiana. It was enjoyable getting to Bedford again and working on the streams.

Do not hesitate to contact me if you have any questions or require any assistance in the future.

Sincerely,

CAMP DRESSER & McKEE INC.

Daniel F. Buss, P.E.
Environmental Affairs

DFB:jf

File: 8001-804-SS-AD

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

Corporate Headquarters
Hunt Valley/Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(301) 771-4950

22 August 1985

Mr. Dan Buss
Camp, Dresser and McKee
3489 North 124th Street
Brookfield, Wisconsin 53005

Dear Dan:

Enclosed is a revised copy of EA Engineering, Science, and Technology, Inc. (EA) report entitled "Daphnia pulex 48-hour acute toxicity tests". Please do not hesitate to contact me if you should have any questions or require additional information regarding this report.

Thank you again.

Sincerely,

W. L. Goodfellow, Jr.

William L. Goodfellow, Jr.
Associate Scientist

WLG:cam

cc: Wayne L. McCulloch
EAB 52

Daphnia pulex

48-HOUR ACUTE TOXICITY TESTS

Prepared for

Camp, Dresser and McKee
3489 North 124th Street
Brookfield, Wisconsin 53005

Prepared by

EA Engineering, Science, and Technology, Inc.
Hunt Valley/Loveton Center
15 Loveton Circle
Sparks, Maryland 21152

AUGUST 1985

1. INTRODUCTION

At the request of Camp, Dresser and McKee, EA Engineering, Science, and Technology, Inc. (EA) performed static acute toxicity tests using samples relevant to the General Motors Foundry process with Daphnia pulex. The objective of the tests were to determine the 48-hour median lethal concentration of the effluents to the test species using lethality as the end point.

2. METHODS AND MATERIALS

2.1 SAMPLE DESCRIPTION

Samples were shipped to EA via Federal Express next day service, and were received at EA at 11:30 on 20 July 1985. Samples were received in containers labeled with client, date sampled (19 July), and sample source (type). The four samples were labeled Salt Creek intake, Pleasant Run confluence, below confluence with GM, and GM discharge (two containers for each sample location). The samples were logged in and assigned EA toxicology laboratory accession numbers. Tests were initiated on the same day as the samples were received.

2.2 TEST ORGANISMS

The test species, Daphnia pulex, is cultured in EA's laboratory in dechlorinated tap water at 20 C with a 16-hour light, 8-hour dark photoperiod. The cultures are fed three times weekly in a manner described in the Draft ASTM (1985) Standard Method and thinned as necessary to inhibit ephippia production.

Gravid adults from these cultures were segregated into 20 cm culture bowls with dechlorinated tap water several days before test initiation. Twenty-four (24) hours before each test initiation, all neonates (young) were removed leaving only adults. This ensured that neonates used in testing the next day were a maximum of 24 hours old. In addition to the normal feeding regime, the adults were supplemented with the algae Selenastrum capricornutum. The organisms were not fed during the test.

2.3 DILUTION WATER

Dilution water for D. pulex test solutions was dechlorinated tap water obtained at EA.

2.4 TOXICITY TEST OPERATIONS AND PERFORMANCE

General toxicity test methods were performed in accordance to those described in EA's protocols (Attachment I). The concentrations were 1, 3, 10, 30 and 100 percent effluent diluted with dechlorinated tap water as well as a dilution water control.

Definitive 48-hour static tests were run with D. pulex neonates in 400 ml beakers containing 200 ml of test solution. All test concentrations were measured using Class A glassware. Neonates (less than 24 hours) were then randomly added to each beaker until there were 10 neonates per test vessel.

Water quality determination during testing was performed on the following schedule: dissolved oxygen and pH were measured in one replicate of each concentration at 0, 24 and 48 hours. Temperature was measured in each replicate of each concentration at 0, 24 and 48 hours. Test vessels were

kept at 20 $\pm$ 2 C on a 16-hour light, 8-hour dark photoperiod cycle at a light intensity of 100 fc (foot candle). Analytical methods were conducted according to APHA et al. (1981).

Observations were made at 0, 24 and 48 hours to determine the number of survivors in each replicate and recorded on the data sheet. A slight prodding of an organism was occasionally necessary to distinguish between those animals which were dead and those which were immobilized.

Calculation of LC50 values at 48 hours by the binomial, moving average, and probit analysis methods were performed as described by Stephan (1977). Data sheets and summary sheets are presented in Attachment II.

3. RESULTS AND DISCUSSION

Results of the four Daphnia pulex 48-hour static acute toxicity tests are presented in Table 1. The LC50's for all samples were greater than 100 percent sample. In no case did more than 30 percent of the organisms die in a 100 percent effluent treatment. Overall percent survival was greatest at the Salt Creek Intake (95.8 percent) and lowest at the GM discharge (83.3 percent) when control survival is included. A similar trend exists when control survival is not included in the calculation.

Over the testing period, temperature ranged from 18.7 to 21.4 C, dissolved oxygen from 6.5 to 8.7 mg/l, and pH from 7.6 to 8.5 S.U. Conductivity, hardness and alkalinity are shown in Table 2. The Salt Creek Intake samples had markedly different conductivity, hardness and alkalinity values from the other three samples which were similar to one another.

4. REFERENCES

American Public Health Association, American Water Work Association, Water Pollution Control Federation. 1980. Standard Methods for the Examination of Water and Wastewater, 15th edition. APHA, Washington.

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EA Engineering, Science, and Technology, Inc. (EA). 1984. Aquatic Toxicological Studies Quality Control and Standard Operating Procedures Manual. Revised editing of 1981 publications. EA, Sparks, MD.

Stephan, C.E. 1977. Methods for Calculating an LC50 in Aquatic Toxicology and Hazard Evaluation, pp 65-84. ASTM STP 634. American Society of Testing and Materials, Philadelphia.

TABLE 1 Results of 48-Hour *Daphnia pulex* Static Acute Toxicity Tests

	Percent Survival After 48-Hour Exposure				
Percent Effluent	Salt Creek Intake	Pleasant Run Confluence	Below Confluence	GM Discharge	$\bar{X}$ % Survival
0 (control)	100	90	100	100	97.5
1	95	95	95	95	95.0
3	95	90	80	75	85.0
10	90	95	80	90	88.8
30	95	100	85	70	87.5
100	100	70	95	70	83.8
$\bar{X}$ Percent Survival Including Controls	95.8	90.0	89.2	83.3	
$\bar{X}$ Percent Survival Excluding Controls	95.0	90.0	87.0	80.0	
48-hour LC50 Values Expressed as percent effluent	>100	>100	>100	>100	

TABLE 2 Final Measurements for Conductivity, Hardness and Alkalinity of GM Samples

Parameter Measured	Salt Creek Intake	Pleasant Run Confluence	Below Confluence	Discharge
Conductivity (umhos/cm)	109	2,000	2,850	2,350
Hardness (mg/l $CaCO_3$)	96	521	592	548
Alkalinity (mg/l $CaCO^3$)	82	222	201	171

EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.

REPORT/ANALYSIS REVIEW RECORD

LEVEL NO. C2

CLIENT Camp Dresser and McKee — DATE SUBMITTED _____

PROJECT NUMBER FA1552R — DATE DUE TO CLIENT _____

PROGRAM Aquatic Toxicology — QC TEST NO. 8-5-85-181, 182, 183, 184

AUTHOR J.A. Berg — TYPE ANALYSIS STATIC ACUTE

REPORT/ANALYSIS CHECKLIST

QA/QC ITEM	REVIEWER	DATE
1. Samples/data collected, transported, and received according to study plan requirements.	W.J. Stonefelder, Jr.	31 July 85
2. Samples prepared and processed according to study plan requirements.	W.J. Stonefelder, Jr.	31 July 85
3. Samples and data collected and analyzed using calibratedquipment.	W.J. Stonefelder, Jr.	31 July 85
4. Quality control activities completed.	W.J. Stonefelder, Jr.	31 July 85
5. Data checked for correctness, source identification, and data confirmation.	[illegible]	[illegible]
6. Calculations checked: - Hand calculations checked by reviewer	[illegible]	[illegible]
- Documented and verified computer programs used.	[illegible]	[illegible]
7. Results reviewed for compliance with study plan requirements.	[illegible]	[illegible]
8. Reported results and facts checked against original sources.	[illegible]	[illegible]
9. Figures and tables checked for correct presentation of data.	[illegible]	[illegible]

	AUTHOR	DATE
10. Commentary reviewed and resolved.	[illegible]	[illegible]

11. All study plan and quality assurance/control requirements have been met and the Report/Analysis is approved:

William J. Stonefelder, Jr. — PROGRAM MANAGER	15 August 85 — DATE
Wayne McGibbon — PROJECT MANAGER	15 Aug 85 — DATE
[signature] — QC OFFICER	21 August 1985 — DATE

FILED BY PROJECT MANAGER

EA-QA-07

Aquatic Toxicology Sample Custody Form

Species to be tested:

___ D. magna
✓ D. pulex
___ Ceriodaphnia sp.
___ P. promelas
___ Other _____

___ M. menidia
___ P. pugio
___ M. mercenaria
___ C. variegatus
___ M. bahia
___ Other _____

Federal Airbill no. 2738148 22

Client	Sample Number	Collection Date	Collection Time	Sample Description	Number of Containers
CM ATS-351	1	7/19	7:30	SAN Creek Intake	2
[illegible] ATS-352	2	7/19	10 AM	Plant Rm Cooling Bay Discharge Canal	2
[illegible] ATS-353	3	7/19	12:00	Plant Cooling Bay Discharge	2
[illegible] ATS-354	4	7/19	11:30	Gas Discharge Pump House	2

Relinquished by:	Date/Time	Received by:	Date/Time
Dave Fabian	7/19 2:15pm	M. A. Hodella Jr.	7/20/85 1130
Relinquished by:	Date/Time	Received by:	Date/Time

ATTACHMENT I

Protocol for 48-Hour Static Acute
Toxicity Test Using *Daphnia pulex*

STATIC ACUTE 48-HOUR LC50 STUDY WITH *Daphnia*

1. TEST OBJECTIVE

To assess the toxicity of a test article to *Daphnia* and determine the 48-hour LC50 or EC50 using lethality or immobilization, respectively, as the test end point.

2. TEST ARTICLE

2.1 Description/Identification

Unless otherwise specified, the test article will be supplied by the sponsor. Adequate chemical specifications with special reference to hazardous properties and storage conditions also will be supplied by the sponsor.

2.2 Methods of Synthesis

If the test article is a pesticide, it is subject to applicable regulations of the Environmental Protection Agency. Information on the methods of synthesis, stability, and data on composition or other characteristics which define the test article are on file with the sponsor.

3. EXPERIMENTAL DESIGN

3.1 Test Organisms

Cladoceran water fleas will constitute the test species.

3.2 Source

Daphnia used for acute toxicity tests are obtained from stock cultures maintained in Ecological Analysts Environmental Toxicology Laboratory.

3.3 Culture Conditions

Daphnia cultures are maintained at 20 C and a 16-hour light, 8-hour dark photoperiod cycle in environmental growth chambers. Cultures are contained in 1.5-gal all-glass aquaria, and fed a food suspension in the manner described in the Draft ASTM (1981) Standard Method. Cultures are initiated on a routine basis, and organisms from cultures producing ephippia are not used for toxicity tests.

3.4 Age of Test Organism at Test Initiation

Zero to 24-hour old neonates are obtained for testing by segregating adult females from the mass cultures on the day before a test is initiated. On the day of the test, neonates are segregated from the parent organisms prior to test initiation.

3.5 Dilution Water

The source of dilution water is the City of Baltimore Municipal Water System. Upon entry to the laboratory, the water is passed through a high-capacity, activated-carbon filtration system to remove chlorine, detergents, and hexane soluble organic materials. This water source has proven safe for aquatic organism toxicity testing as evidenced by maintenance of the multigeneration Daphnia cultures, with no evident loss of fecundity. If requested, reconstituted fresh water may be used.

3.6 Test Concentration Series

The test concentration series to be used for definitive toxicity tests will be selected following preliminary tests to bracket appropriate concentration ranges. A minimum of five concentrations and diluent water controls will be used. If it proves necessary to use a carrier solvent to disperse the test article in aqueous solution, an additional set of solvent controls will be used. All test concentrations and controls will normally be conducted with two replicates. Additional replicates or concentrations may be used.

3.7 Test Concentration Preparation

Test concentrations will be prepared by standard serial dilution (APHA et al. 1975) using Class A volumetric glassware and dilution water. Test organisms will be added to prepared test solutions.

3.8 Test Vessels and Test Volume

Test vessels will consist of 400-ml pyrex beakers and the final test volume of each replicate will be 0.2 L.

3.9 Test Organism Number

A minimum of 10 test organisms will be used in each test replicate, constituting a minimum number of 20 Daphnia per treatment group. Neonates will be randomly assigned to each test replicate.

3.10 Test Environment

The test vessels will be maintained in environmental growth chambers at 20 C and a 16-hour light, 8-hour dark photoperiod cycle.

3.11 Analysis of Test Concentrations for Test Article

If required, test solution replicates may be analyzed for chemical analytical verification of achieved test concentrations. The analytical method and number of determinations will be formulated after consultation with the sponsor. Where chemical analyses are necessary, both nominal and actual measured test solution concentrations will be reported.

3.12 Test Observations

Test organisms will be observed at a minimum of 24 and 48 hours after test initiation to determine number of animals killed by the test article concentrations. The study will terminate after completion of the 2-day observation period. The study may be extended, however, at the request of the sponsor.

Water quality characteristics of the test concentrations and diluent water controls are recorded in the following manner: dissolved oxygen, temperature, and pH will be measured in each test replicate at test initiation and at 24-hour intervals until test termination. Specific conductance, total alkalinity, and total hardness will be measured in one control, one high concentration, one medium concentration, and one low concentration replicate at test initiation and at 24-hour intervals thereafter. Test solutions will not be aerated. Analytical methods will be conducted according to APHA et al. (1975) and EPA (1979).

3.13 Data Analysis

The LC50 or EC50 values and associated statistics will be derived by the probit analysis (SAS) or moving average, and binomial test methods as described by Stephan (1977). Depending on the nature of the data, other methods may be used including the probit approximation method of Litchfield and Wilcoxon (1949), or by graphical interpolation using the log concentration vs. percent lethality as described by APHA et al. (1975). The methods used will be specified in the report.

4. FINAL REPORT

The final report will be prepared to contain the following information:

- Objectives and procedures stated in the approved protocol, including any changes made to the original protocol
- Identity of the test articles by name or code number and their strength (quality/purity)
- Source of the dilution water, its chemical characteristics, and a description of any pretreatment

- Test concentration series used and duration of treatment
- Average lengths and weights of test fish, the respective ranges, and approximate loadings of fish to test volume (g/L)
- Water quality characteristics of dilution water and selected test concentrations
- Any unforeseen circumstances that may have affected the quality or integrity of the study
- Signature of the project manager and director as authorization of the report.
- Location of all raw data and the original copy of the final report at EA

Items of data to be included in the report consist of: experimental design; effects on general appearance; morbidity and mortality; tabular presentation and appropriate statistical evaluation of water quality characteritics, and survival data where necessary.

5. QUALITY ASSURANCE

5.1 Amendments to Protocol

Amendments to the authorized protocol instigated by EA or by the client will only be made after proper authorization. Such authorization is achieved by completion of the Amendment to Protocol form by EA and the client.

5.2 Standard Operating Procedures

Unless otherwise specified all procedures mentioned in the protocol are subject to detailed Standard Operating Procedures which are contained in the SOP manuals of the participating departments.

5.3 Quality Assurance Evaluation

The study described in this protocol may be subject to internal audit by the Quality Assurance Unit.

5.4 Inspection by Regulatory Authorities

In the event of an inspection of EA by an outside authority during the course of the study, the client will be consulted before the inspectors are permitted access to any of the project records or the experimental areas.

5.5 Archives

Original project-specific records shall be transferred to the client promptly after the project is completed or as negotiated and budgeted with each client. Primary data will be retained for a period of five years. Primary data include laboratory data sheets, records, memoranda, notes, photographs, microfilm, and computer printout that are a result of the original observations and activities of the study and which are necessary for the reconstruction and evaluation of the report of the study.

5.6 Location

This study will be conducted by the Environmental Toxicology Services Department of the Scientific Operations Division of Ecological Analysts, Inc. at the Mid-Atlantic Regional Offices, Sparks, Md. 21152.

6. DAPHNIA ACUTE TOXICITY TEST SPECIFICATIONS

6.1 Basic Reference

American Society for Testing and Materials. 1981. Standard Practice for Conducting Acute Toxicity tests on Wastewaters with Daphnia. ASTM, Philadelphia. Draft, February 1981.

6.2 Test Specifications

Test organism	Daphnia magna or D. pulex
Age:	Less than 24 hours old
Temperature:	20±2 C
Light quality:	Wide-spectrum fluorescent light
Light intensity:	50-100 f.c.
Photoperiod:	16-hour light, 8-hour dark
Aeration:	None
Dilution water:	Dechlorinated municipal water or reconstituted water
Test container:	400-ml beaker
Test volume:	200 ml
No. of concentrations:	Minimum of 5 test concentrations and a control

No. of replicates:	Two, unless otherwise specified
No. of animals per replicate:	10
Feeding regime:	Animals will not be fed during test
Test type and duration:	Range-finding--24 hours Definitive--48 hours Reference toxicant--24 hours
End points:	Immobilization (EC50)--defined as inability to move except for minor activity of appendages Lethality (LC50)--all movements cease for periods of at least 5 seconds even when test container is tapped or rotated

ATTACHMENT II

Data Sheets for Toxicity Tests Conducted on Four Samples
with Associated Water Quality Measurements

SALT CREEK INTAKE

EABSRT

Test Article: ABS 351

Client: General Motors

OC Test No.: SA 01-10 85 IR1

Test Container: 4 liter

Test Volume: 2 liter

Test Duration: 48 hr

Common Name: Water flea

Scientific Name: Daphnia pulex

Lot No.: C/A

Source: EA stocks from 24 hr old

Acclimation: 10 days

Beginning Date: 2/4/85 Time: 1300

Ending Date: 2/6/85 Time: 1105

Test Temperature Range: 18.7 - 20.8

Mean Acclimation Temperature: 20 °C

Acclimation Temperature Range: 19-21C

CONC: or %	TEST CONTAINER NUMBER	NUMBER OF LIVE ORGANISMS 0	24	48	72	96	ALL TESTS TEMPERATURE (C) 0	24	48	72	96	DISSOLVED OXYGEN (mg/liter) 0	24	48	72	96	pH 0	24	48	72	96	FRESHWATER TESTS TOTAL ALKALINITY (mg/liter as CaCO3) 0	24	48	72	96	TOTAL HARDNESS (mg/liter as CaCO3) 0	24	48	72	96	SALT OR BRACKISH WATER TESTS SALINITY (ppt) 0	24	48	72	96	2/4/85 Tuesday 0	24	48	72	96
Control	A	10	10	10			20.3	20.0	20.4			9.5	8.3	7.9			7.6	8.1	8.2			116					78											
	B	10	10	10			20.1	20.4	20.8			9.5		7.9			7.7		8.2																			
1%	A	10	10	10			20.6	20.0	20.1			9.5	8.2	8.0			7.9	8.1	8.2																			
	B	10	9	9			20.4	20.0	20.1			9.5		8.1			7.9		8.2																			
3%	A	10	10	9			20.4	20.0	20.1			9.5		8.1			7.8		8.2																			
	B	10	10	10			20.2	20.0	20.1			9.5		8.0			7.8		8.1																			
10%	A	10	10	10			20.2	20.0	20.1			9.5	8.2	8.1			7.8	8.1	8.2																			
	B	10	8	8			20.1	20.0	20.5			9.5		8.1			7.6		8.2																			
30%	A	10	10	9			19.9	20.0	20.5			7.9		8.0			7.7		8.2																			
	B	10	10	10			19.9	20.0	20.4			7.7		7.9			7.1		8.1																			
100%	A	10	10	10			19.4	20.0	20.4			10.5	8.0	8.0			7.6	8.0	8.2																			
	B	10	10	10			18.7	20.0	20.2			6.4		8.0			7.6		8.2			92					76										10%	
INSTRUMENT NUMBER		N.A.					2	2	2			2	2	2			231	231	231																			
CALIBRATION VALUE		N.A.					KL	KL	KL			9.08	9.08	9.08			7.10	7.10	7.10																			
CORRECTION FACTOR (if applicable)		N.A.					NA	NA	NA			NA	NA	NA			NA	NA	NA																			
INVESTIGATOR SIGNATURE & INITIALS							KLS	KLS	KLS			KLS	KLS	KLS			KLS	KLS	KLS																			

NA NOT APPLICABLE

PLEASANT RUN CONFLUENCE

EMAP

Test Article: ATS-352

Client: General Motors

OC Test No.: 89 01-10 85 182

Test Container: 2 L

Test Volume: 2 L

Test Duration: 96 h

Common Name: Water flea

Scientific Name: Daphnia pulex

Lot No: 4/4

Source: 21 Stock 4 Hour 24 hr old

Acclimation: N/A days

Beginning Date 2/4/85 Time 1408

Ending Date 2/8/85 Time 1607

Test Temperature Range 19.9 - 21.2C

Mean Acclimation Temperature 20C

Acclimation Temperature Range 19-21C

%	Test Container Number	Number of Live Organisms 0	24	48	72	96	Temperature (C) 0	24	48	72	96	Dissolved Oxygen (mg/liter) 0	24	48	72	96	pH 0	24	48	72	96	Total Alkalinity (mg/liter as CaCO3) 0	24	48	72	96	Total Hardness (mg/liter as CaCO3) 0	24	48	72	96	Salt or Brackish Water Tests — Salinity (ppt) 0	24	48	72	96	0	24	48	72	96
Ctrl	A	10	10	9			20.3	20.0	20.1			8.1	8.3	9.0			7.9	8.2	9.2			46					78														
	B	10	9	9			20.2	20.0	20.3			8.2		8.1			7.9		8.2																					
1%	A	10	9	9			20.0	20.0	20.1			8.7	8.3	9.1			7.9	8.1	9.2																					
	B	10	10	10			20.0	20.0	20.5			8.7		9.2			7.9		9.2																					
3%	A	10	10	10			19.9	20.0	20.5			8.7		9.1			7.9		9.2																					
	B	10	9	8			19.9	20.1	20.5			8.7		8.1			8.0		9.2																					
10%	A	10	10	10			19.9	20.0	20.1			9.0	8.3	9.2			8.0	8.1	9.2																					
	B	10	10	9			19.9	20.0	20.1			8.7		9.2			8.0		9.2																					
30%	A	10	10	10			20.0	20.0	20.4			9.0		9.1			8.1		9.3																					
	B	10	10	10			20.0	20.0	20.3			8.6		8.1			8.1		9.3																					
100%	A	10	8	6			21.2	20.0	20.2			8.4	8.3	7.7			8.2	8.4	9.5																					
	B	10	9	8			21.0	20.0	20.2			8.1		7.9			8.1		9.5			334					321											20.0				
Instrument Number		NA					2	2	2			2	2	2			231	231	231																					
Calibration Value		NA					RL	RL	RL			9.00	8.40	6.45			10.0	7.00	4.00																					
Correction Factor (if applicable)		NA					NA	NA	NA			NA	NA	NA			NA	NA	NA																					
Investigator Signature & Initials							KAB	KAB	KAB			KAB	KAB	KAB			KAB	KAB	KAB																					

NA - Not Applicable

EA Form 1 12/1/84

BELOW CONFLUENCE

Project no.: EMB521
Test Article: AES-353
Client: Gurbax Mooss
OC Test No.: S1 87-20-85-183

TEST: (Static, Flow through, Renewal
Test Container: 4 ltrs
Test Volume: 1 ltrs
Test Duration: 96-hrs

TEST ORGANISM:
Common Name: Cerio. dubia
Scientific Name: Daphnia pulex
Lot No.:
Source:
Acclimation: N/A days

Beginning Date: 2 July 87 Time: 1530
Ending Date: 4 July 87 Time: 1505
Test Temperature Range: 20.0 - 21°C
Mean Acclimation Temperature: 20.5°C
Acclimation Temperature Range: 19-21°C

CONC. or %	TEST ENHANCEMENT NUMBER	NUMBER OF LIVE ORGANISMS 0	24	48	72	96	ALL TESTS TEMPERATURE (°C) 0	24	48	72	96	DISSOLVED OXYGEN (mg/liter) 0	24	48	72	96	pH 0	24	48	72	96	FRESHWATER TESTS TOTAL ALKALINITY (mg/liter as $CaCO_3$) 0	24	48	72	96	TOTAL HARDNESS (mg/liter as $CaCO_3$) 0	24	48	72	96	SALT OR BRACKISH WATER TESTS SALINITY (ppt) 0	24	48	72	96	Daphnia Acidity 0	24	48	72	96
Control	A	10	10	10			20.5	20.0	20.0			8.5	8.1	8.0			7.9	8.1	8.2			116				120	120										
	B	10	10	10			20.1	20.0	20.8			8.5		8.1			7.9		8.2								128										
1%	A	10	10	10			20.1	20.0	20.8			8.5	8.2	8.1			7.9	8.0	8.2																		
	B	10	7	9			20.0	20.0	20.9			8.6		8.2			7.9		8.2																		
3%	A	10	10	10			20.1	20.0	20.7			8.5		8.2			7.9		8.2																		
	B	10	7	6			20.2	20.0	20.5			8.5		8.2			7.9		8.2																		
10%	A	10	8	8			20.4	20.0	20.5			8.5	8.2	8.2			7.8	8.0	8.2																		
	B	10	8	8			20.4	20.0	20.5			8.5		8.2			7.8		8.2																		
30%	A	10	8	9			20.3	20.0	20.4			8.4		8.1			7.9		8.2																		
	B	10	8	8			20.4	20.0	20.3			8.4		8.1			7.9		8.3																		
100%	A	10	10	10			20.4	20.0	20.3			7.9	7.7	7.6			7.8	8.1	8.4			201					382										
	B	10	9	9			20.4	20.0	20.2			7.9		7.6			7.8		8.4																		
INSTRUMENT NUMBER		N.A.					1	2	2			2	2	2			201	211	231																		
CALIBRATION VALUE		N.A.					NA	RL	RL			RL	RL	RL			7.14	7.00	7.00																		
CORRECTION FACTOR (if applicable)		N.A.					NA	NA	NA			NA	NA	NA			NA	NA	NA																		
INVESTIGATOR SIGNATURE & INITIALS							MW	MW	MW			MW	MW	MW			MW	MW	MW																		

NA - NOT APPLICABLE

EA 8029-1 12/88

DISCHARGE

EPA 821

Test Article: AES-354

Client: Chemed Monsanto

QC Test No.: SDC-20-85-154

Test Type: Static, Flow Through, Renewal

Test Container: 400 mL

Test Volume: 200 mL

Test Duration: 48 hrs

TEST ORGANISM:

Common Name: Water flea

Scientific Name: Daphnia magna

Lot No.: 1/19

Source: Stock Mon. TM.W 24 hrs old

Acclimation: 4/P days

Beginning Date: 4 Aug 85 Time: 1545

Ending Date: 7 Aug 85 Time: 1545

Test Temperature Range: 19.5 - 21.2C

Mean Acclimation Temperature: 20.5C

Acclimation Temperature Range: 19 - 21C

CONC. or %	TEST CONTAINER NUMBER	NUMBER OF LIVE ORGANISMS 0	24	48	72	96	ALL TESTS TEMPERATURE (C) 0	24	48	72	96	DISSOLVED OXYGEN (mg/liter) 0	24	48	72	96	pH 0	24	48	72	96	FRESHWATER TESTS TOTAL ALKALINITY (mg/liter as $CaCO_3$) 0	24	48	72	96	TOTAL HARDNESS (mg/liter as $CaCO_3$) 0	24	48	72	96	SALT OR BRACKISH WATER TESTS SALINITY (ppt) 0	24	48	72	96	Chemistry 0	24	48	72	96
Control	A	10	10	10			19.2	19.5	20.1			9.6	9.3	8.0			8.0	8.1	8.2			116					76											
	B	10	10	10			20.2	19.5	20.3			8.5		9.2			8.0		8.2																		
1%	A	10	10	9			20.2	19.5	20.2			8.5	8.3	8.1			7.9	8.1	8.2																		
	B	10	10	10			20.3	19.5	20.2			9.0		8.2			7.9		8.2																		
3%	A	10	8	8			20.2	19.5	20.1			8.6		8.1			7.9		8.2																		
	B	10	8	7			20.2	19.5	20.2			8.6		8.2			7.9		8.2																		
10%	A	10	8	9			20.3	19.5	20.2			8.6	8.4	8.2			7.9	8.0	8.2																		
	B	10	10	10			20.2	19.5	20.2			8.6		8.2			7.9		8.2																		
30%	A	10	7	10			20.2	19.5	20.2			8.6		7.9			7.8		8.2																		
	B	10	8	8			20.1	19.5	20.2			8.5		8.0			7.9		8.2																		
100%	A	10	10	8			21.2	19.5	20.1			8.2	8.4	8.0			7.6	8.0	8.3							548									8.3	8.0		
	B	10	8	6			21.2	19.5	20.1			8.2		8.1			7.7		8.3			171																
INSTRUMENT NUMBER		N.A.					3	2	2			2	2	2			231	231	231																		
CALIBRATION VALUE		N.A.					21	21	21			8.4	8.4	8.3			7.10	7.10	7.10			172															
CORRECTION FACTOR (if applicable)		N.A.					N/A	N/A	N/A			N/A	N/A	N/A			N/A	N/A	N/A			171															
INVESTIGATOR SIGNATURE & INITIALS							MB	MB	MB			MB	MB	MB			MB	MB	MB																		

N.A. - NOT APPLICABLE

EA 8029-1 12/79

APPENDIX F.6

COMPLIANCE SAMPLING INSPECTION REPORT DATED NOVEMBER 28, 1989

B. Schoonhoven
Please answer this and return
MVI
11-29-89

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317/232-8603

November 28, 1989

Mr. Robert W. Herr, Plant Manager
Central Foundry Division
General Motors Corporation
North Jackson Street
Bedford, Indiana 47421-0271

Re: Compliance Sampling Inspection Report
GMC-Central Foundry
NPDES Permit No. IN 003573
July 25-26, 1989

Dear Mr. Herr:

Enclosed are laboratory results of the Compliance Sampling Inspection conducted at your facility on July 25-26, 1989. This information will supplement the inspection portion of the report previously sent to you.

Based on statistical evaluation on sampling analyses data from U.S. EPA in comparison of split samples, your analyses for copper is considered unsatisfactory, and your zinc analysis is considered marginal. We suggest that your laboratory personnel check their analytical procedures for these parameters.

Please respond in writing within twenty (20) days of the receipt of this letter concerning your success in reevaluation of laboratory techniques, or your plans for further reevaluation.

Although no permit limits were exceeded, significant levels of PCBs were found in the receiving stream water and sediment samples during this survey.

If you have any questions regarding this matter, please contact Mr. J. Larry McFall at 317/243-5064.

Very truly yours,

Stephen H Boswell

Stephen H. Boswell, Chief
Surveys Section
Office of Water Management

JLM/bs
Enclosure
cc: Lawrence County Health Department
Tim Galloway
U.S. E.P.A. - Water Division
Mr. Donald Schregardus, Chief

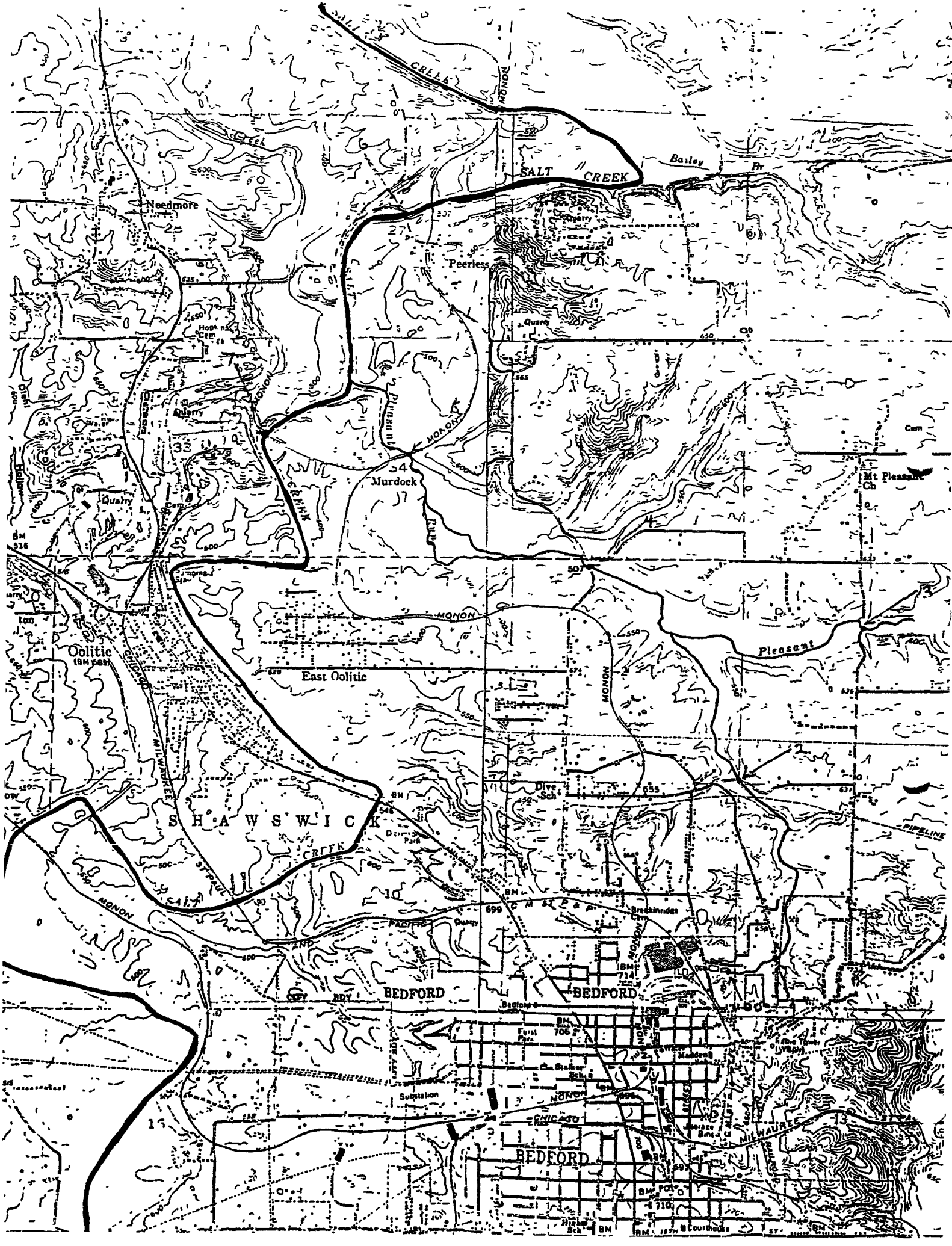

SALT CREEK
Needmore
Peerless
Murdock
Oolitic
East Oolitic
SHAWSWICK
BEDFORD
BEDFORD
BEDFORD
MONON
Pleasant
Mt Pleasant Cb
Dive Sch
Breckinridge Cem
Hoosier Cem
Quarry
Sub Station
Courthouse
PIPELINE

TABLE I
PCBs IN GMC - CENTRAL FOUNDRY
EFFLUENT AND RECIEVING STREAM
UNIT IN PPB

CSI Date	GMC Outfall 002	GMC Sludge	#1 WQ/Sed	#2 WQ/Sed	#3 WQ/Sed	#4 WQ/Sed	#5 WQ/Sed	#6 WQ/Sed	#7 WQ/Sed
10/25-26/83	6.7	NC	NC	NC	NC	NC	NC	NC	NC
6/11-12/85	<D.L.	750,000	16.3/NC	11.0/NC	NC	6.6/NC	NC	NC	NC
11/6-7/86	<D.L.	61,000	4.0/NC	<D.L./3,200	NC	1.6/NC	NC	NC	NC
7/25-26/89	<5.0	120,000	8.1/33,000	3.7/67,000	<D.L./<D.L.	0.61/96.00	NC/5,500	NC/55.	NC/770

NC - not collected

0698b

IDEM - WATER MANAGEMENT

COMPARISON OF IDEM LABORATORY AND FACILITY LABORATORY RESULTS

Date of Sampling: July 25-26, 1989

Facility: GMC Central Foundry Permit No: IN0003573

Location: Bedford, In Receiving Stream: Baily Branch to Pleasant Run Creek

	*NPDES Parameters		NPDES Limits In (lbs/day) mg/l	IDEM Results Outfall 002	Facility Results outfall 002				
*	Flow (mgd) Monitor		5 X weekly		.389mgd				
*	Ammonia-N Daily Max.	mg/l	3.6	1.2	0.9				
	Arsenic	ug/l		0.4					
*	BOD_5 Daily Max.	mg/l	30.	1.1	5.0				
	Magnesium	mg/l		24.					
	Cadmium	ug/l		<2.					
	Chlorides	mg/l		1,500.					
	Chrom.- Hex	ug/l		<10.					
	Chrom. - Tot	ug/l		<4.					
	COD	mg/l		420.					
*	Copper Daily Max.	ug/l	140.	16.	30.				
	Cyanide - CN	mg/l		.006					
	Fluoride	mg/l		1.2					
	Diss. Reac. Silica	ug/l		5.					
*	Lead Daily Max.	ug/l	200.	14.	<50.				
	Manganese	ug/l		80.					
	Mercury	ug/l		<0.1					
	Nickel	ug/l		10.					
	$NO_2 + NO_3$ - N	mg/l		7.4					
*	Oil and Grease Daily Max.	mg/l	10.	3.0	10.				
*	pH (lab) S.U.		6.0 to 9.0	7.7	7.8				
*	Phenol (4AAP) Daily Max.	ug/l	0.76 (lbs/day)	(.036)	(.065)				
	Phos. - P	mg/l		0.45					
	Surfactants	mg/l		0.2					
*	Susp. Solids	mg/l	15.	2.0	<1.0				
	Total Solids	mg/l		3,320.					
	Sulfate	mg/l		135.					
	TKN	mg/l		2.2					
	TOC	mg/l		87.					
*	Zinc Daily Max.	ug/l	1.62 (lbs/day)	(.42)	(.55)				
	E. Coli./100 ml			<10.					
	Potassium			45.					
	Chlorine Residue Daily Max.	mg/l	0.2	0.1					
*	PCB	ug/l	1.0	1.0 Aroclor 1260	<0.5				
	Spec. Cond.			5,400					
	Alkaline/Hardness ($CaCO_3$)			138/474					

GMC Central Foundry CSI with Stream Samples July 25-26, 1989

INTENSIVE SURVEY DATA

STATION NO.	GMC 002 Outfall	D/S #1 First D/S Bridge .19 mi. D/S	D/S #2 Second D/S Bridge 1.14 mi. D/S	#3 Pleasant Run Creek	D/S #4 Third D/S Bridge 2.46 mi. D/S
FIELD — Flow cfs	.389 mgd	.69	.848	2.27	Approx. 3.2
Temp — Low	26°	25°	24°	21°	
Temp — Avg	28°	26°	23°	23°	
Temp — High	30°	28°	22°	26°	
D.O. — Low	5.9	5.8	5.5	6.1	
D.O. — Avg	6.5	6.2	6.4	7.0	
D.O. — High	7.3	6.4	7.8	8.3	
pH — Low	7.0	7.5	7.4	7.4	
pH — Avg	7.3	7.7	8.3	7.6	
pH — High	7.8	7.9	7.9	7.8	
LABORATORY ANALYSES — Alkalinity	138.	124.	183.	221.	234.
Ammonia - N	1.2	<0.1	0.2	<0.1	<0.1
Arsenic	0.4	0.5	0.9	0.4	1.0
BOD_5	1.1	1.6	1.2	<1.0	<1.0
Cadmium	<2.	2.0	<2.	<2.	<2.
Chlorides	1,500	860.	585.	10.	100.
Chromium - Hex	<10.		<10.		
Chromium - Tot	<4.	<4.	<4.	<4.	<4.
COD	420.	380.	290.	9.	80.
Copper	16.	13.	8.	<4.	<4.
Cyanide - CN	.006	<.005	<.005	<.005	<.005
Fluoride	1.2	0.9	0.7	<0.1	0.2
Hardness	474.	376.	376.	243.	280.
Lead	14.	14.	11.	<6.	<6.
Manganese	80.	40.	90.		130.
Mercury	<0.1	0.1	0.1	0.2	0.2
Nickel	10.	8.0	6.0	<0.4	<4.
$NO_2 + NO_3$ - N	7.4	6.4	4.1	1.6	1.4
Oil & Grease	3.0	5.0	2.0	<1.	<1.
pH (lab)	7.7	8.0	8.0	8.0	7.9
Phenol	11.				
Phosphorus - P	0.45	0.40	0.37	<0.03	0.13
Solids - Susp	2.0	5.0	9.0	7.	6.
Solids (total)	3,320.	2,050.	1,590.	302.	540.
Sulfate	135.	140.	130.	22.	45.
TKN	2.2	1.2	1.0	0.4	0.7
TOC	87.	98.	69.	2.2	17.5
Zinc	130.	130.	80.	10.	20.
E. coliform	<10.	170.	2,600	7,000.	600.

GMC Intval Foundry CST) Sludge and Sediment Samples : July 25 26, 1989

INTENSIVE SURVEY DATA

STATION NO.	GMC Sludge	D/S #1 First D/S Bridge .19 mi D/S	D/S #2 Second D/S Bridge 1.1 + mi D/S	#3 Pleasant Run Creek	D/S #4 Third D/S Bridge 2.46 mi D/S	D/S #5 RR Bridge 3.6 mi D/S	#6 Salt Creek Bridge at Peerless	D/S #7 Salt Cr. RR Bridge 4.7 mi D/S
FIELD								
Flow								
Temp								
D.O.								
pH								
LABORATORY ANALYSES								
Alkalinity								
Ammonia - N								
Arsenic	2,300.	5,000.	26,000	28,000	4,900.	7,800.	5,900.	5,800.
BOD_5								
Cadmium	3,800.	680.	730.	570.	<2000.	<1,300.	<1,300.	<1,200.
Chlorides								
Chromium - Hex								
Chromium - Tot	70,000.	32,000	69,000	79,000	12,000.	18,000.	12,000.	14,000.
COD								
Copper	830,000	39,000	27,000	13,000	18,000.	17,000.	12,000.	12,000
Cyanide - CN mg/kg Wet Basis	.56	.50	2.4	1.2	.18	1.2	9.6	1.2
Fluoride								
Iron								
Lead	76,000	49,000	40,000.	43,000.	14,000.	17,000.	15,000	11,000
Manganese	290,000	300,000	2,700,000	2,900,000	750,000	960,000	1,000,000	1,100,000
Mercury	88.	36.	77.	23.	60.	68.	74.	54.
Nickel	25,000	10,000	27,000	31,000	10,000.	14,000.	14,000	17,000.
$NO_2 + NO_3$ - N								
Oil & Grease								
pH (lab)								
Phenol								
Phosphorus - P								
Solids - Susp								
Solids (total) Vol.	42.34%	2.53%	2.71%	1.82%	8.12%	4.84%	3.12%	6.7%
Solids, Total	38.76%	79.13%	80.48%	80.68%	52.08%	62.22%	68.29%	57.15%
TKN								
TOC								
Zinc	400,000	120,000	110,000	130,000	59,000	70,000.	64,000	61,000
Fecal coliform								

mg/kg

Survey Summary
GMC - Central Foundry
July 25-26, 1989

A Compliance Sampling Inspection (CSI) was conducted at GMC-Central Foundry located in Bedford, Indiana on July 25-26, 1989. This facility produces aluminum die, permanent and semi-permanent mold castings and is serviced by a Class D industrial wastewater treatment plant. The main process water outfall, 002 (carbon column effluent), discharges to an unnamed tributary of Pleasant Run Creek which in turn flows into Salt Creek. A second outfall 003 (overflow from a stormwater retention lagoon) seldom flows except during prolonged rainfall events. This outfall was not flowing at the time of the survey.

This survey was performed in conjuction with an inspection by Kevin Hotz of the Inspection Group. Mr. Tim Galloway represented GMC-Central Foundry during the inspection.

This 24 hour CSI was conducted along with a stream survey which included water quality and sediment sampling at four downstream locations. (See attached map.) These sampling sites were located on the unnamed receiving stream at .19 miles (#1) and 1.14 miles (#2), on Pleasant Run Creek upstream of the confluence with the unnamed tributary (#3), and 2.46 miles downstream in Pleasant Run Creek (#4). The outfall and stream samples were composited manually on a two hour basis except for VOA samples which were collected as three discreet grab samples. Due to the logistics of compositing every two hours, no water quality samples were taken further downstream than station #4. Additionally, oil and grease and E. coli samples were grabbed at the end of the 24 hour compositing period.

Previous CSIs conducted on October 25-26, 1983, June 11-12, 1985, and November 6-7, 1986 have documented PCB contamination in either the outfall and/or the recieving stream. See table I. In order to further document the extent of this contamination, sediment samples were collected at seven downstream locations. Additionally, a sludge sample was collected from the wastewater treatment facility to determine the level of PCBs and metals being removed in the treatment process.

Laboratory analyses indicated that GMC-Central Foundry was meeting permit limits for all parameters. Although not limited by the permit, chlorides were found at 1500 mg/l in the final effluent. Chlorides have been found at elevated levels in previous surveys. This situation was explained in the November 6-7, 1986 CSI report. In short, this problem is caused by drainage from railroad property adjacent to the GMC-Central Foundry treatment plant. This drainage is then routed through the treatment system. These levels are causing no apparent acute aquatic life toxicities. This was evidenced in a bioassay test of the effluent which caused no significant mortalities of the test organism (daphnia magna) over the 48 hour test period.

PCBs were found at very elevated levels in the recieving stream water and in the sediment samples. This has been the case during the two previous CSIs. The elevated levels found in the composite water samples could be due in part to continual leaching from PCB build-up in the sediments. PCB removal within the treatment system must still be a major concern of GMC-Central Foundry as can be seen by the levels (120,000 ppb) found in the sludge sample from this most recent CSI.

As documented in Table I, PCB levels are of serious concern at all sampling sites except for station #3 on Pleasant Run Creek which is upstream of the confluence with the receiving stream. Station #5 (3.6 miles downstream) was found to have 5,500 ug/kg PCBs in the sediment. This site is bordered by pastureland where cattle were observed to be disturbing the sediment while wading instream for drinking. Station #7 (4.7 miles downstream in Salt Creek) was found to have 770 ug/kg PCBs in the sediment. Due to the height of the railroad bridge and high stream velocity at this location making mid stream sampling impossible, the sediment sample was taken near the bank. Significantly, the Bedford standby water intake pumping station is approximately .8 miles downstream of this site. The upstream sampling site on Salt Creek (Station #6) also revealed significant levels of PCBs (55. mg/kg). This indicates a contributary source from upstream in Salt Creek to the levels found at station #7.

Cyanide was also found unexpectedly in the sediment at Station #6 on Salt Creek. Again due to the high river stage, this sample was collected close to the bank instead of midstream. The results revealed a level of 9.6 mg/kg which appeared high compared to maximum natural background concentrations in Indiana lakes and streams. Cyanide breaks down over time in soil and water from bacterial action. As is the case with the PCB contamination, further sampling would be justified to identify the source of this problem.

The full toxics scan for metals, base neutrals, phenols, pesticides, and VOAs (volatile organic aromatics) revealed no significant levels for any of these parameters in the water or sediment.

Based on sampling analyses data from U.S. EPA in comparisons of split samples the GMC-Central Foundry analysis for zinc was considered marginal and the analysis for copper was considered unacceptable.

Comparative flow measurement was not attainable due to the lack of a primary device. This facility monitors flow by means of a magnetic meter located near the final discharge. Facility personnel were able to maintain a constant flow rate throughout the entire sampling period to facilitate flow weighting of samples. The total plant flow for the 24 hour sampling period was .389 mgd. All flow monitoring totalizers, charts, and controls appeared to be state of the art and in good working order.

In general, the wastewater treatment facility appears to be well operated and maintained. Public Water Supply and Solid and Hazardous Waste Staff should be apprised of findings from this study.

MAY 25, 2001

APPENDIX F.7

COMMONWEALTH BIOMONITORING 1990 REPORT

COMPANY BACKGROUND

Central Foundry is an aluminum die casting facility. Water used by the company in air scrubbers and the cooling of dies and castings is treated by oil separation, aerobic digestion, chemical coagulation, flocculation, and clarification, and by filtration and activated carbon adsorption. The treated wastewater and stormwater runoff are discharged through outfall 002. More than 80% of the water used in the die casting process is recycled within the system. Water softeners are used to facilitate the use of recycled water. The wastewater normally contains elevated concentrations of calcium, magnesium, sodium, and chlorides originating from the water softening process. Small amounts of copper, lead, and zinc in the wastewater are thought to originate from the air pollution scrubbing process.

Recent toxicity testing by IDEM has shown that no acute toxicity to Daphnia magna was present in effluent samples collected on July 25-26, 1989. Additional testing by Central Foundry since that time has determined that there is also little or no acute or chronic effluent toxicity to fathead minnows (100% survival and no growth inhibition in 4 of 5 tests). Ceriodaphnia dubia appear to be the organisms most sensitive to the effluent. Three of six samples have exhibited acute toxicity and all six have exhibited some degree of chronic toxicity.

will this statement hurt us in change type of organism we want to use.

SECTION 2
Summary of Objectives and Methods

Site-specific Criteria

The objective of this part of the study was to determine whether copper, lead, or zinc cause acute or chronic toxicity in the Central Foundry effluent. This was done in several ways. First, toxicity tests were conducted using "laboratory" and "site" waters as dilution waters. If there is a "site water" effect observable for several species, an appropriate correction factor can be used to adjust the aquatic toxicity criterion (EPA Water Quality Standards Handbook, 1983).

A second method was to conduct whole effluent toxicity tests and measure metals concentrations concurrently. Endpoints observed in these tests were compared to endpoints observed in laboratory tests reported in the scientific literature. If levels of metals in the effluent were less toxic than those observed to be toxic in laboratory tests, the results confirm that a "site effect" has occurred and provide additional evidence that a "site-specific criterion" is justified.

Third, "artificial effluents" were created using reagent grade chemicals in receiving stream water and a "laboratory" water. These artificial effluents contained ions of calcium, magnesium, sodium, chlorides, and metals in concentrations matching maximum values presently observed in the effluent. The objective was to observed whether the chemicals interacted to modify toxicity expected with single chemicals. A second objective was to determine whether receiving stream water had an effect on toxicity.

REVIEW OF AQUATIC TOXICITY DATABASE FOR LEAD

The objective of this part of the study was to review the recent scientific literature on lead toxicity. The EPA Gold Book states that "confidence in a criterion usually increases as the amount of available pertinent data increases. Thus, additional data are usually desirable" (Appendix A, II,E). EPA's 1984 water quality criteria document for lead contains toxicity data on only 10 species for acute toxicity and 3 species for chronic toxicity. If this data base is updated, new criteria can be calculated which are more accurate than the original criteria. These criteria were re-calculated using techniques described by EPA in the Gold Book. Alternative permit limits were re-calculated using these new criteria and IDEM's methods for translating criteria to permits.

Biosurveys

The objective was to observe the numbers and kinds of fish and benthic invertebrates within Bailey Branch and to determine whether the Central Foundry discharge is adversely affecting the aquatic community of the stream. Fish were collected by seine and dipnet. Benthos was collected by kick samples from riffle areas.

Sampling dates - 12/28/89 (benthos only)

SECTION 3
Physical Description of Bailey Branch and its Watershed

Bailey Branch is a small tributary of Pleasant Run Creek in Lawrence County, Indiana. Pleasant Run flows into Salt Creek, a major tributary of the East Fork of White River Basin. The entire watershed lies in the Mitchell Plain physiographic region of Indiana, an area characterized by its karst topography of caves and sinkholes.

Central Foundry discharges wastewater to the extreme headwaters of an unnamed tributary of Bailey Branch. At this site, the stream has a drainage area of less than 100 hectares, most of which is Central Foundry property. Estimated Q7,10 of the stream is 0.0 cfs, and it is probable that during extended rainless periods each year, flow in the receiving stream consists entirely of treated effluent from Central Foundry.

Near Central Foundry's outfall, Bailey Branch is 1-2 meters wide and has a maximum depth of 15 centimeters. The substrate consists almost entirely of limestone bedrock, cobble, gravel and sand. Riffles are common and current speed within the riffle areas is about 30 cm/sec. There are no pools in the upper sections of the stream. The slope of the stream is very steep (it drops approximately 45 meters over its entire 2.7 km course between Central Foundry property and Pleasant Run Creek). Because of this, small waterfalls with abrupt drops of 30 cm or more are common in the upper reaches of the stream.

Riparian habitat is excellent along most of the stream's banks. Second-growth forest lines much of the stream, and a shading canopy exists in most areas. Most of the Bailey Branch watershed (consisting of approximately 6.5 square kilometers) is heavily wooded and the stream channel is natural.

Site-specific Criteria

Since Central Foundry discharges to a zero-flow stream, there is no dilution water available during portions of each year. This means that in order to meet Indiana water quality standards for toxicity, the effluent must be neither acutely or chronically toxic before dilution. Comparison to a "site" water is impossible in this case. Therefore, to study the interactions of effluent chemistry on metals toxicity, reagent-grade chemicals containing the various metal ions were added directly to the effluent. The concentrations causing acute toxicity were compared to concentrations causing toxicity in "laboratory" water or to toxicity predicted by the LC50-hardness relationship established by EPA in individual water quality criteria documents. A "site-specific effect" was then determined from these results.

Toxicity tests with Daphnia magna initiated on effluent samples collected on January 10, 1990 showed the following results:

Initial 48-hr LC50 = >100% effluent (no mortalities)

lead = <50 ug/l
zinc =
copper = <20 ug/l

need explan on what this mean

LC50 values (ug/l) with metals additions

	zinc	copper	hardness
effluent	2748	>240	524 mg/l
predicted	781	101	
"site effect"	3.5	>2.4	

REVIEW OF LEAD TOXICITY DATA AND RE-CALCULATION OF CRITERIA

Since the publication of EPA's criteria document for lead in 1984, several new studies on lead toxicity have been published. These studies appear to have been conducted according to EPA requirements (acceptable dilution waters, control mortalities, etc.). Results of these tests are as follows:

Ceriodaphnia reticulata 48-hr LC50 = 1878 ug/l (hardness 240)
Environ. Toxicol. Chem. 5: 393-398
Crangonyx pseudogracilis 96-hr LC50 = 27.6 mg/l (hardness 50)
Water Res. 20:1137-1147.
Pimephales promelas chronic value = 329 ug/l (hardness 44)
P. promelas acute/chronic ratio = 6.4
Environ. Toxicol. Chem. 5:917-931.

By adding the acute toxicity results above to the existing EPA database, the new acute criterion for lead becomes:

$$AAC = e^{1.273\,(\ln \text{hardness}) - 1.110}$$

(see Appendix A for calculations)

By adding the new A/C ratio to the EPA database, the requirement that the ratios not differ by a factor of 10 is not met. However, one of the A/C ratios used in the EPA calculations was for mysid shrimp, a saltwater species. If the data for this species is dropped from the calculations and the data for fathead minnows is added in its place, the A/C ratios still lie within a factor of 10 and are all from freshwater species. The geometric mean of these A/C ratios is 24. By substituting this value into the chronic equation, the chronic equation becomes:

$$CAC = e^{1.273\,(\ln \text{hardness}) - 3.594}$$

(see Appendix A for calculations)

Biosurvey Results

Benthic invertebrate sample results are shown in Table 2. The benthic community downstream from the Central Foundry discharge was dominated by dipteran larvae, primarily midges and blackflies. Environmentally sensitive forms such as caddisflies, mayflies, stoneflies, and amphipods were present in each sample, but in reduced numbers compared to those found in similar, unimpacted streams in the area. It is unlikely that the benthic community was negatively affected by low dissolved oxygen or suspended solids, since organisms sensitive to these stresses (megalopterans, plecopterans, and certain coleopterans) were present in all samples in normal numbers.

The reduced numbers and kinds of ephemeropterans (mayfly larvae) in the samples suggests that the benthos was negatively affected by a toxicant. However, it is unlikely that the toxicant responsible for this effect was a heavy metal such a lead, copper, or zinc. Metals toxicity is often accompanied by a predictable increase in metals-tolerant forms such as the midge larva Cricotopus bicinctus. Samples collected from Bailey Branch contained few of this species. Instead, the midge fauna consisted mostly of the relatively pollution sensitive species Orthocladius obumbratus. Other metals-sensitive organisms such as amphipods and snails were present in normal numbers.

A more likely toxicant responsible for the relatively mild impact of the Central Foundry outfall on the benthos of Bailey Branch is chloride. Chloride ions are known to have a chronic impact to freshwater organisms at concentrations less than 500 mg/l (EPA Water Quality Criteria Document for Chloride, 1989). IDEM measured chloride concentrations as high as 860 mg/l in Bailey Branch during July 1989 (CSI sample results). The EPT taxa (especially mayflies) are among the most highly affected groups, disappearing from the benthic community when chloride concentrations exceed 600 mg/l. (Call et al. 1988. NABS Bulletin. p.43).

Fish collected from Bailey Branch downstream from the Central Foundry outfall are shown in Table 3. (Data not yet collected)

SECTION 6
Application to the
NPDES Permit

REVISED LEAD LIMITS DERIVED FROM THE NEW LEAD CRITERIA

When the new, proposed criteria for lead are substituted into IDEM's method for calculating permit limits, the new proposed limits are as follows:

	Monthly Average	Daily Maximum
Pb (total recoverable)		

That these limits will be protective to designated uses of Bailey Branch (aquatic life) is supported by the following evidence:

Need more samples?

Table 2
RESULTS OF BENTHOS BIOSURVEYS

Bailey Branch at Bailey Scales Rd., first bridge 0.3 km downstream from the Central Foundry outfall. Kick sample from cobble in a riffle. 12/28/89.

Diptera	
Chironomidae	33
Simuliidae	69
Trichoptera	
Hydropsychidae	3
Coleoptera (Elmidae)	3
Odonata	
Argia	3
Calopteryx	1
Oligochaeta	
Tubificidae	5
Lumbricidae	1
Isopoda (Asellidae)	4
Amphipoda (Hyalella azteca)	1
Gastropoda	
Physa	1
Helisoma	1

Bailey Branch, at second bridge, 1.8 km downstream from the Central Foundry outfall. Kick sample from cobble in a riffle. 12/28/89.

Diptera	
Chironomidae	75
Simuliidae	27
Trichoptera	
Hydropsychidae	5
Hydroptilidae	1
Ephemeroptera (Baetidae)	1
Plecoptera	1
Megaloptera	2
Coleoptera (Elmidae)	4
Isopoda (Asellidae)	29
Amphipoda (Hyalella azteca)	6
Gastropoda	
Physa	3
others	3
Oligochaeta	
Tubificidae	4
Lumbricidae	1

TABLE 3.
RESULTS OF FISH COLLECTIONS

Fish collected from Bailey Branch Seining time = minutes
(Data not yet collected)

APPENDIX F.8

IDEM FIELD INSPECTION FORM – 1996 STREAM STUDY

Post-it® Fax Note 7671	Date 1-4-96	# of pages ▶ 4
To GREG BRIGHT	From BILL SCHOONHAKER	
Co./Dept COMM BIOMONIT.	Co GMPTG BEDFORD	
Phone # 317-887-5855	Phone # 812-279-7308	
Fax # 317-887-8641	Fax # 812-279-7258	

State Form 4336

DEPARTMENT OF ENVIR

INDIANAPOLIS

OFFICE MEMORANDUM

Date: December 7, 1995

To: Kevin Hotz
OWM-Inspector, Area 13

Thru:

From: Anthony R. Branam ARB
OWM-Biological Studies

Subject: Request for Inspection/Investigation of Stream Impairment

While performing site reconnaissance and sample collections members of the OWM-Biological Studies Section, BSS, occasionally encounter streams exhibiting signs of impairment by point or non-point sources. Stream impairment reported by the BSS are either water quality or stream quality problems.

Listed below are those streams and locations observed by the BSS during the 1995 field season as having degraded water quality and/or degraded stream habitat quality attributed to probable point sources. Conditions observed at each site by the BSS should warrant further investigation by the Water Quality Surveillance and Standards Branch to determine if Indiana Water Standards are being violated, and by whom.

Area 13

Lawrence County; Pleasant Run; upstream of Peerless Road; topo H-34, T1W, R5N, Section 6; fish tissue and sediment samples were collected; impairment was observed by Eric Edberg, Tony Branam, and Lisa Ritter, at 1:00pm on December 5, 1995;

> "eutrophication obvious, there is an odor of detergent in the water, water foams easily when stirred or agitated, eight dead fish were observed and few live fish were collected."

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER MANAGEMENT: INSPECTION SECTION

Complaint Report Form

A. Complaint Date Reported: 6 DEC 95

Received by _____ via ( ) phone; ( ) letter; ( ) in person; (✓) by referral

"Confidential Information"
yes____ no✓

Complaintant: A.R. Branam County: _____
Address: Biological Studies
City: _____ Phone: 243-5061

Nature of Complaint: Very eutrophic conditions; odor of effluent/detergent; water foamed easily when agitated; few fish were observed while sampling; 5 dead (recent) were observed.

Site Location (directions): Pleasant Run at Peerless Road, north of Bedford, IN

Responsible Party Most likely the General Motors Corporation

B. Report of Investigation

Inspector: _____ Investigation Date: _____

1. Nature of pollution found: _____

samples taken (?)_____; pictures taken (?)_____
2. Is condition a State Water Quality violation? _____
3. Name (& title) of individuals contacted: _____
Address: _____
4. Corrective action taken: _____
5. ( ) written or ( ) verbal orders issued. (Attached copy of written order, or give brief summary of verbal order). _____

C. Follow-up

Pollution abated _____ (date) by _____ (action)

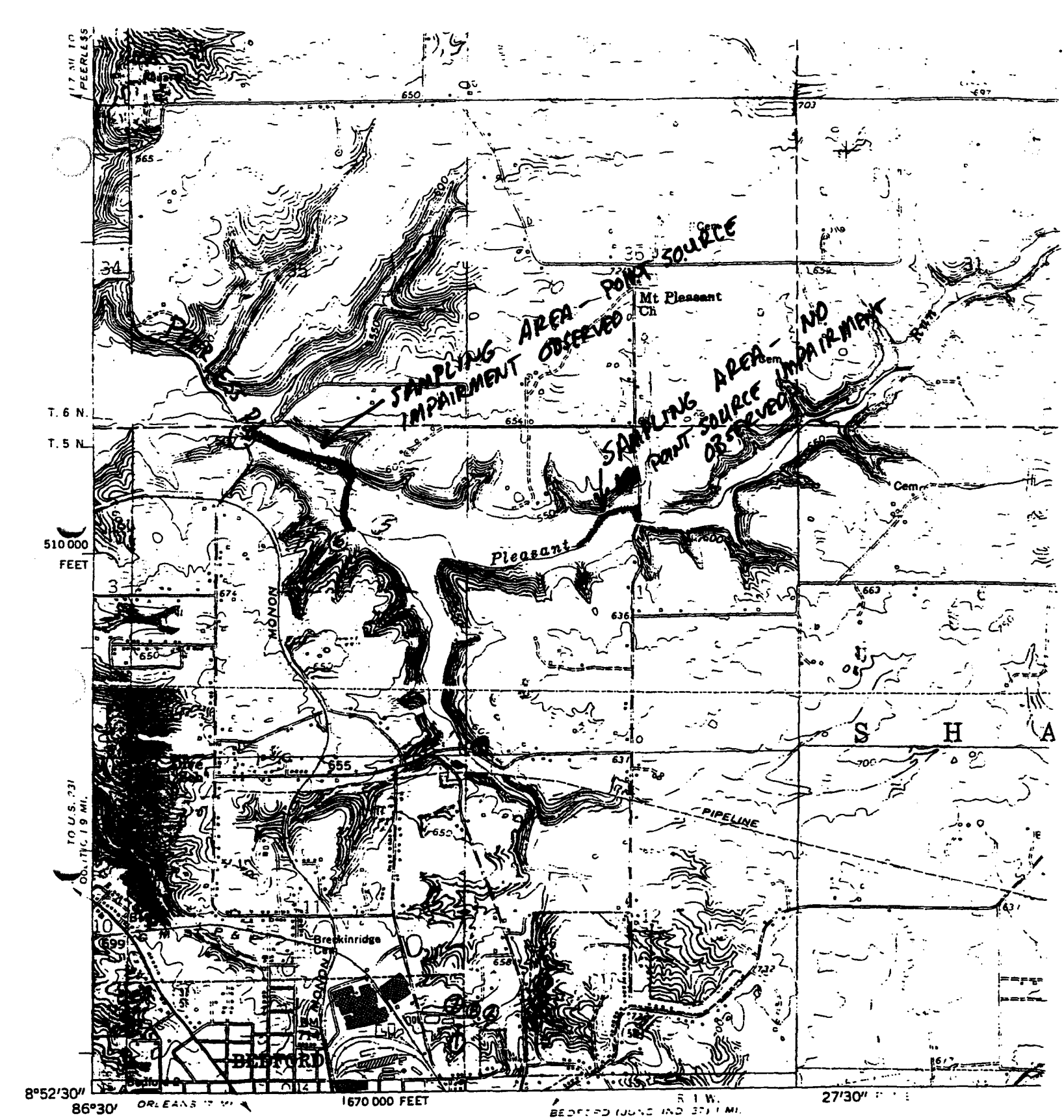
Re-inspection dates: _____ _____ _____
Findings: _____

Other/action/taken: _____

Signature: _____

D. Referred To:

0096b



Mapped, edited, and published by the Geological Survey

Control by USGS, USC&GS, and Indiana Flood Control and Water Resources Commission

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1956. Field check 1958

Polyconic projection. 1927 North American datum
10,000-foot grid based on Indiana coordinate system, west zone
1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue

Red tint indicates areas in which only landmark buildings are shown

1000 0 1

TRUE NORTH
MAGNETIC NORTH

APPROXIMATE MEAN DECLINATION, 1958

THI
FOR SAI
AND INDIAN

STREAM Pleasant Run

LOCATION Peerless Road d/s GMC

SAMPLED? ✓ YES ___ NO SEGMENT NO. 84

INDIANA DEPARTMENT OF ENVIRONMENTAL MGMT.
OWM - BIOLOGICAL MONITORING SECTION
STREAM SURVEY RECORD

COUNTY Lawrence DATE 5 DEC 95

EVALUATOR ARB, EDE TIME 1:00 pm

TWNSHP SEC. T1W, R5W Sect. 2 TOPO H-34

RIPARIAN DEVELOPMENT

U/S L	U/S R	D/S L	D/S R	*
○	○	○	○	EXCELLENT
○	○	✓	○	GOOD
✓	✓	○	✓	FAIR
○	○	○	○	POOR

RIPARIAN WIDTH

○	○	>50 m
○	✓	10-50m
✓	○	5-10m
○	○	<5m

SLOPING BANK COVER**

○	○	TREE
○	○	SHRUB
○	○	GRASS
✓	✓	BARE
○	○	ARTIFICIAL

FLOOD PLAIN LAND USE

✓	✓	WOODLAND
○	○	ROWCROP
✓	✓	FIELD/PASTURE
○	○	RESIDENTIAL/INDUSTRIAL

BANK EROSION

U/S L	U/S R	D/S L	D/S R	
○	○	✓	✓	LITTLE OR NONE
✓	✓	○	○	MODERATE
○	○	○	○	SEVERE

CHANNELIZATION

U/S	D/S	
○	✓	NONE
○	○	RECOVERED
✓	○	RECOVERING
○	○	RECENT

SINUOSITY

○	○	HIGH
✓	✓	MODERATE
○	○	LOW
○	○	NONE

POOLS PRESENT?

✓	✓	YES
○	○	NO

VELOCITY

- ○ TORRENTIAL
- ○ FAST
- ○ MODERATE
- ✓ SLOW

TURBIDITY

- ○ CLEAR
- ✓ SLIGHTY TURBID
- ○ TURBID
- ○ MUDDY/OPAQUE

SILTATION

- ○ HEAVY
- ✓ MODERATE
- ○ NORMAL
- ○ NONE

POTENTIAL NPS?

U/S	D/S	
✓	✓	YES
○	○	NO

POINT SOURCE DISCHARGE IMPACT?

✓	○	YES
○	✓	NO

KICK SAMPLABILITY

- ○ EXCELLENT
- ○ GOOD
- ○ FAIR
- ✓ POOR

KICK AREA**

- ○ ARTIFICIAL DAM
- ○ RIFFLE
- ✓ RUN

CPOM SAMPLABILITY

- ✓ EXCELLENT
- ○ GOOD
- ○ FAIR
- ○ POOR

CPOM QUALITY**

- ✓ LEAVES
- ✓ WOODY DEBRIS
- ✓ FORBS
- ○ FPOM

* LOOKING D/S

** CHECK ALL THAT APPLY

COMMENTS: Eutrophic; odor of detergent; water foams easily when agitated; 8 dead fish observed; very few fish observed fish had blackspot.

ESTIMATED STREAM DEPTH: .5 m

ESTIMATED STREAM WIDTH: 3 m

ESTIMATED BANK HEIGHT: 1.5 m

APPENDIX F.9

COMMONWEALTH BIOMONITORING WATER QUALITY INVESTIGATION FEBRUARY 22, 1996

COMMONWEALTH BIOMONITORING

Water Quality Investigation
Bailey Branch (Bedford, Indiana)
February 22, 1996

INTRODUCTION

On December 5, 1995, field biologists with the Indiana Department of Environmental Management (IDEM) observed a small fish kill and evidence of degraded water quality ("eutrophic, odor of detergent, water foams easily") in Pleasant Run at Peerless Road near Bedford. Bailey Branch, the receiving stream for GM Powertrain's effluent discharge, enters Pleasant Run upstream from this location and IDEM identified GM Powertain as the most likely source of degraded conditions.

GM Powertrain personnel reviewed their discharge monitoring reports for several months prior to the complaint and observed no signs of abnormal plant conditions during this time. Because IDEM identified GM as the most likely source of observed stream conditions, GM commissioned an investigation of all potential water quality impacts within the Bailey Branch watershed.

METHODS

Greg Bright of Commonwealth Biomonitoring conducted a stream investigation on February 22, 1996. After determining that no visual signs of degraded water quality were present in Pleasant Run near Peerless Road downstream from Bailey Branch, he also examined Pleasant Run at one upstream site (Mt. Pleasant Road). Again, he saw no obvious signs of degraded water quality, but a small amount of foam was present in the water (Photo 2).

At Bailey Branch, he walked most of the stream from Pleasant Run to the GM Powertrain outfall. As he looked for obvious physical signs of degradation (sludge deposits, discolored water, unusual odors, etc.) he also examined the stream for biological indicators (lack of fish, dominance of pollution-tolerant macroinvertebrates, Sphaerotilus ["sewage fungus"] growth, and algae blooms). He took pictures at sites where degraded conditions were observed.

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RESULTS

Figure 1 shows the Bailey Branch watershed, including sites where visual signs of degraded water quality were found. Numerous live minnows were observed at all sites downstream from the "second bridge" and no sources of degraded water quality were observed downstream from this bridge. However, a PVC pipe from an unknown source extended into Bailey Branch from the west bank just upstream of the bridge (see photo 3). Also near this site, a small tributary enters Bailey Branch on the west bank. This tributary appeared to carry a very heavy silt load at times. Every hard surface on the bottom of this small stream was covered by a 1/4 inch layer of light-colored sediment. Sediment deposits from the stream were visually observed in downstream areas of Bailey Branch as well.

Upstream from the "second bridge" increased evidence of water quality degradation was present. Several dead creek chubs were observed and the numbers of fish declined. Macroinvertebrate communities were dominated by air-breathing snails (Physa spp.) and blackfly larvae (Simulium spp.), two groups which are usually tolerant to organic (sewage-related) pollution. A few caddisfly larvae, which are more intolerant to pollution, were also present but their numbers declined upstream from the "second bridge".

Photo 4 shows another small tributary entering Bailey Branch from the west, about 800 yards upstream from the "second bridge." This stream does not appear on the USGS topographic map, but the amount of water flowing from it was greater than any other Bailey Branch tributary. There was a heavy algae growth in this little stream, indicating nutrient enrichment. Numerous horse footprints and droppings were present in the area.

Photo 5 shows a lift station near the east bank of Bailey Branch about 1000 yards upstream from the "second bridge." Although no overflows from this lift station were observed, there was abundant evidence of past raw sewage overflows (toilet paper, sanitary napkins, etc. [photo 6]). Nearby, abundant Sphaerotilus growths were present on the stream bottom. Another 100 yards upstream from this lift station, several manholes were present on the west bank of Bailey Branch. There were pools of raw sewage on the ground between these manholes, indicating a leaking underground sewer. Sewage was flowing into Bailey Branch from this site (photo 7). Water quality conditions upstream from this leaking sewer were much improved and no additional physical evidence of degraded water quality was observed at any point up to and including the GM Powertrain outfall.

In the process of determining the exact location of the lift station shown in photo 5, a second lift station was discovered. This lift station also showed signs of recent raw sewage overflows to a small tributary of Bailey Branch. The location of both lift stations is shown in Figure 1.

SUMMARY

During his investigation, Greg Bright of Commonwealth Biomonitoring saw potential signs of water quality impacts entering Bailey Branch from two small tributaries. An even more obvious source of degraded water quality originated from faulty sewers and lift station overflows along the stream. These sources are more likely to be the cause of degraded stream conditions observed by IDEM on December 5, 1995 than the treated wastewater discharge from GM Powertrain.

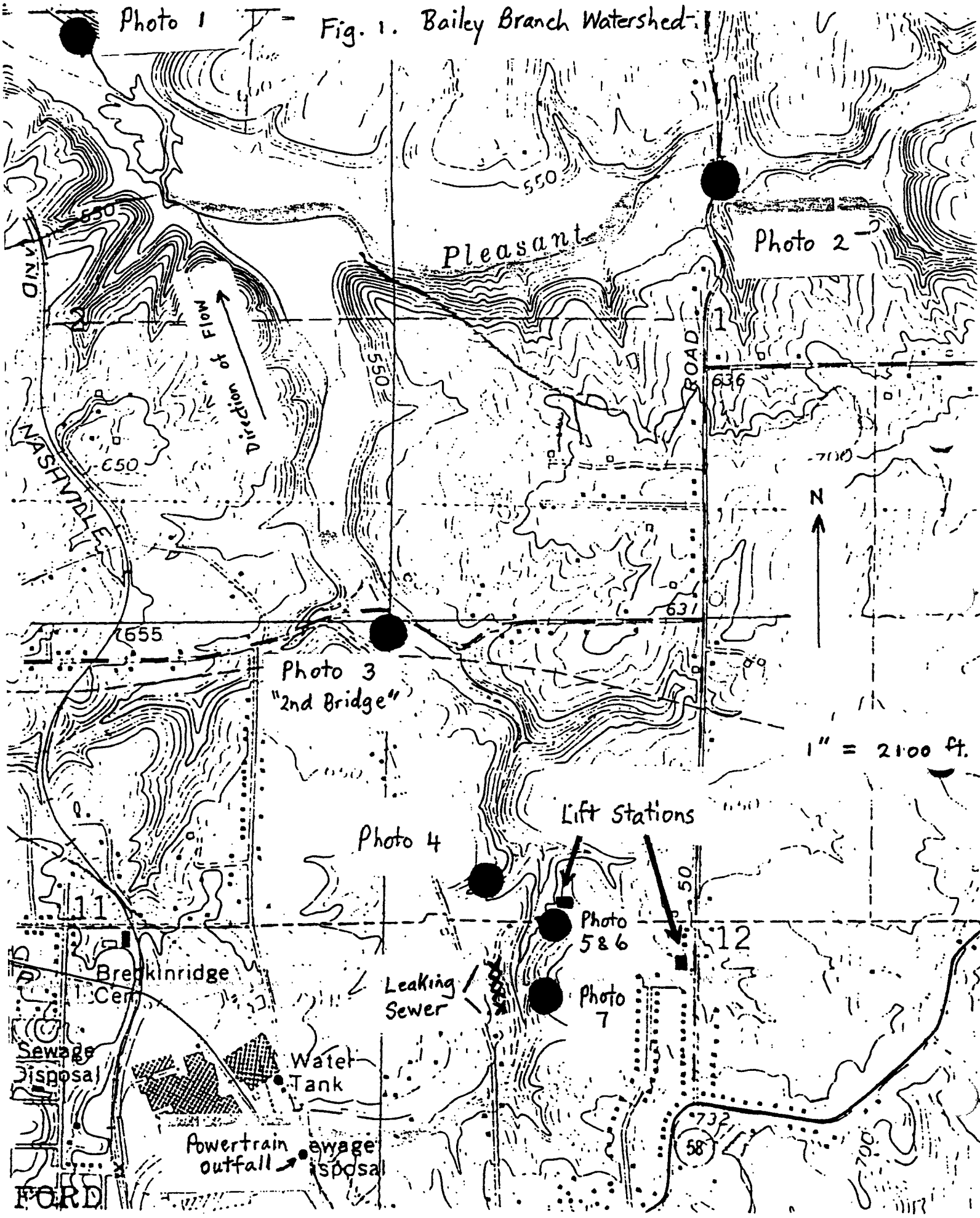
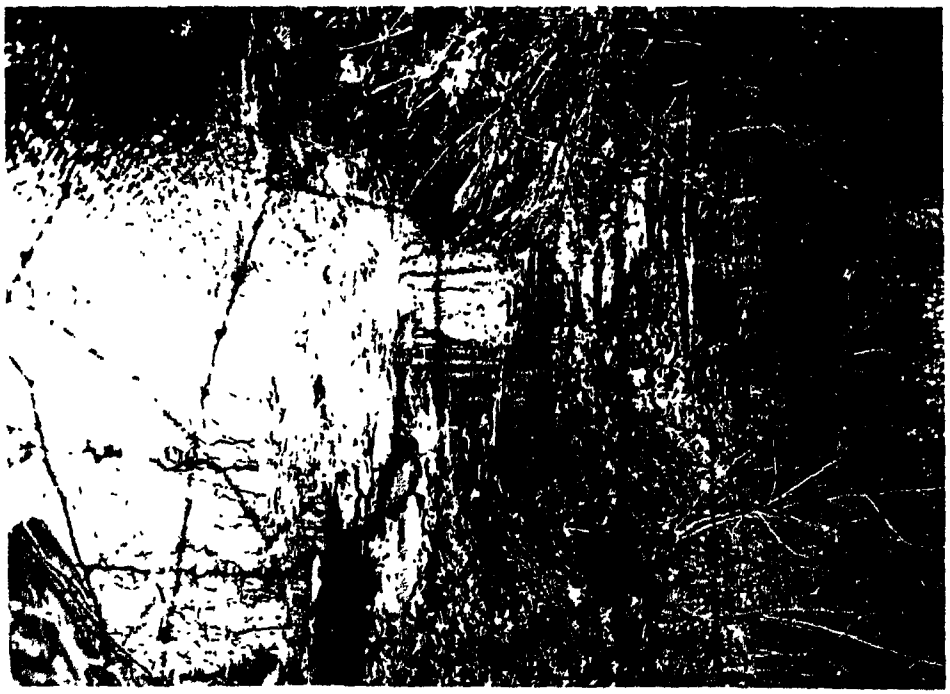


Photo 1
Fig. 1. Bailey Branch Watershed
Pleasant
Photo 2
ROAD
Direction of Flow
NASHVILLE
N
1" = 2100 ft.
Photo 3
"2nd Bridge"
Photo 4
Lift Stations
Photo 5&6
Photo 7
Leaking Sewer
Breckinridge
Sewage Disposal
Water Tank
Powertrain outfall
sewage disposal
FORD
550
650
655
631
636
732
700
11
12
1
58

Photo 3 - Bailey Branch at the "second bridge"
Photo 4 - Bailey Branch tributary showing algae growth

Photo 1 - Pleasant Run at Peerless Road
Photo 2 - Pleasant Run at Mt. Pleasant Road



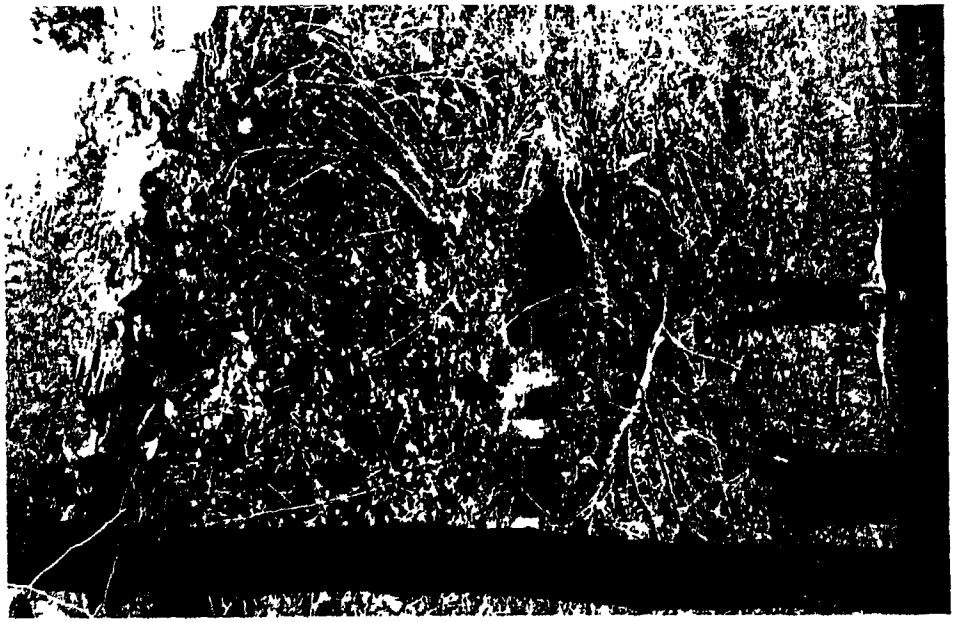


Photo 7 - Leaking sewer line into Bailey Branch

Photo 5 - Lift Station along Bailey Branch
Photo 6 - Evidence of lift station overflows

APPENDIX F.10

ISPCB AND ISBH LETTERS DATED JANUARY 1973

cc: Herr, Imbrano, Pearson, Estes, Schneider, & Illuminati

STATE OF INDIANA

INDIANAPOLIS 46206

1330 West Michigan Street
633-4420

STREAM POLLUTION CONTROL BOARD

Follow-up 11-1-73

RF 1-22-73

January 16, 1973

Mr. R. V. Stumph, General Superintendent
General Motors Corporation
Central Foundries Division
Bedford, Indiana 47421

Dear Mr. Stumph:

Re: Wastewater Treatment
Central Foundries Division

You are hereby notified that the Stream Pollution Control Board of the State of Indiana has, this 16th day of January, 1973, approved plans for a waste treatment facility to be located at Central Foundries Division, Bedford.

The company proposes a complete separation of storm and process water flows from the manufacturing plant area. The storm sewer will flow directly to the fourth pond of the existing five pond system south of the plant while the process water will flow to a new treatment facility prior to discharge to the third pond of that system. Ponds one and two will be drained and filled.

The new wastewater treatment system will include a 280-gallon diversion chamber controlling the flow to either or both of two identical clarifiers of 40-foot diameter by 11-foot SWD, Eimco Corporation Type C2T (or equal) clarithickeners. Each clarithickener can take the total 450-gpm maximum flow and provide four hours of detention with a surface settling rate of 520 gallons per day per square foot or can be operated in parallel to provide twice the detention time. Each clarithickener has a sludge storage and thickening capacity of 2,100 gallons which will contain an anticipated three days of storage at a 700-gallon per day accumulation rate. The thickened sludge will be essentially hydraulic oil in combination with colloidal graphite. Blowdown from the sludge compartment of the clarithickeners will have density monitoring as it is transferred to a 19,700-gallon hydraulic oil storage tank that will provide an anticipated 28 days of storage capacity at a maximum blowdown rate of 700 gallons per day. Hydraulic oil will be heated and centrifuged to remove gross solids with oil fractions returned to the hydraulic storage tank.

The plans were approved with the following conditions:

1. That additional wastewater treatment facilities will be provided if the proposed facilities fail to provide adequate treatment.

2. That the Board will be notified of the completion of these facilities prior to the start of their operation.

3. That a certified wastewater treatment operator will be in responsible charge of the operation.

WP

4. That the company shall submit monthly reports of the effluent from these facilities covering daily determinations of flow and pH and once per week determinations of oil and suspended solids.

5. That sludges shall be disposed of in a manner that is approved by the Board.

The plans were prepared by Environmental Consultants, Inc., Clarksville, and submitted for consideration on December 7, 1972.

Very truly yours,

Oral H. Hert

Oral H. Hert
Technical Secretary

I. W. Approval No. 825
CLGough/lbw
cc: Lawrence County Health Department
Environmental Consultants, Inc.

STATE OF INDIANA

INDIANAPOLIS

STATE BOARD OF HEALTH

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206

January 17, 1973

Mr. R. V. Stumph, General Superintendent
General Motors Corporation
Central Foundries Division
Bedford, Indiana 47421

Dear Mr. Stumph:

Re: Wastewater Treatment
Central Foundries Division

You are hereby notified that the State Health Commissioner of the State of Indiana has, this 17th day of January, 1973, approved plans for a waste treatment facility to be located at Central Foundries Division, Bedford.

The company proposes a complete separation of storm and process water flows from the manufacturing plant area. The storm sewer will flow directly to the fourth pond of the existing five pond system south of the plant while the process water will flow to a new treatment facility prior to discharge to the third pond of that system. Ponds one and two will be drained and filled.

The new wastewater treatment system will include a 280-gallon diversion chamber controlling the flow to either or both oftwo identical clarifiers of 40-foot diameter by 11-foot SWD, Eimco Corporation Type C2T (or equal) clarithickeners. Each clarithickener can take the total 450-gpm maximum flow and provide four hours of detention with a surface settling rate of 520 gallons per day per square foot or can be operated in parallel to provide twice the detention time. Each clarithickener has a sludge storage and thickening capacity of 2,100 gallons which will contain an anticipated three days of storage at a 700-gallon per day accumulation rate. The thickened sludge will be essentially hydraulic oil in combination with colloidal graphite. Blowdown from the sludge compartment of the clarithickeners will have density monitoring as it is transferred to a 19,700-gallon hydraulic oil storage tank that will provide an anticipated 28 days of storage capacity at a maximum blowdown rate of 700 gallons per day. Hydraulic oil will be heated and centrifuged to remove gross solids with oil fractions returned to the hydraulic storage tank.

The plans were approved with the following conditions:

1. That additional wastewater treatment facilities will be provided if the proposed facilities fail to provide adequate treatment.

2. That the Board will be notified of the completion of these facilities prior to the start of their operation.

Mr. R. V. Stumph January 16, 1973

3. That a certified wastewater treatment operator will be in responsible charge of the operation.

4. That the company shall submit monthly reports of the effluent from these facilities covering daily determinations of flow and pH and once per week determinations of oil and suspended solids.

5. That sludges shall be disposed of in a manner that is approved by the Board.

The plans were prepared by Environmental Consultants, Inc., Clarksville, and submitted for consideration on December 7, 1972.

Sincerely,

A. C. OFFUTT, M.D.
STATE HEALTH COMMISSIONER
INDIANA STATE BOARD OF HEALTH

I. W. Approval No. 825
cc: Lawrence County Health Department
Environmental Consultants, Inc.

APPENDIX G.1

ISBH COMPLIANCE SAMPLING INSPECTION
DATED NOVEMBER 9, 1979

STATE OF INDIANA

INDIANAPOLIS

STATE BOARD OF HEALTH

AN EQUAL OPPORTUNITY EMPLOYER

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
P. O. Box 1964
Indianapolis, IN 46206

NOV 9 1979

Mr. Floyd M. McCurdy
Plant Manager
Central Foundry Division
General Motors Corporation
P.O. Box 271
Bedford, IN 47421

Dear Mr. McCurdy:

Re: Compliance Sampling Inspection (3560-3)
Central Foundry Division
NPDES Permit No. IN0003573

Enclosed please find the Compliance Sampling Inspection report written in conjunction with the inspection and survey conducted at your facility on July 27, 1979, and July 24-25, 1979, respectively. This report is for your information and files.

Item 2 in the "Summary" indicates a violation of the daily maximum permit limitation for suspended solids at discharge 001. However, because the ISBH laboratory shows that the parameter was just slightly exceeded and the Central Foundry laboratory shows no violation, no conclusion concerning compliance is being made at this time.

Any questions that you may have concerning the report may be directed to Mr. Mike Mott at 317/633-8490.

Very truly yours,

Joseph H. Snyder

for Joseph C. Stallsmith, Chief
Enforcement & Operations Branch
Division of Water Pollution Control

JET/reg
cc: U.S. EPA,
Enforcement Division
Mr. Lee Townsend,
Central District Office, U.S. EPA

Summary: Findings and Conclusions

Subject: Compliance Sampling Inspection (3560-3)
Central Foundry Division
NPDES Permit No. IN0003573

Relative to the Compliance Sampling Inspection conducted by Jim Traylor on July 27, 1979, with a corresponding survey conducted by the Survey Section on July 24-25, 1979, the following findings and conclusions have been made:

1. Samples of what appears to be the surfacing of an underground spring that emerges at the southwest corner of the treatment plant area were taken at the time of the survey. These samples indicated that chlorides and dissolved solids are relatively high. Subsequent samples of this same area taken by ISBH staff indicate that this discharge also contains significant concentrations of PCBs. The ISBH plans further efforts to attempt to determine the source of the PCBs; however, the company should develop and carry out a plan for investigating the source of the contamination. This office will cooperate with and assist the company within staff capability.

2. Laboratory analysis for permit parameters at discharges 001 and 002 indicate a violation of permit conditions for suspended solids at 001.

O.K.

ITEM 2

GERRY BRENT, CFD, AND BILL MCELHANEY, INDSBH, DISCUSSED THEIR DIFFERENT RESULTS FOR TSS. THEY AGREED THAT THE RESULTS FOR THIS TEST LEFT SOME DOUBT ABOUT THE ACCURACY OF THE READINGS.

1. BOTH LABS ANALYZED SAMPLES FROM SAME BOTTLE OF WATER. THIS SOUNDS GOOD, BUT GERRY SAYS THIS IS NOT THE CORRECT WAY TO COLLECT SOLID SAMPLES. THERE IS A CHANCE THAT WATER WAS NOT MIXED PROPERLY BEFORE POURING OFF CFD SAMPLE.
2. TECHNICALLY YOU COULD ARGUE THAT THE RESULTS SHOULD BE AVERAGED SINCE THE SAME BOTTLE OF WATER WAS TESTED BY TWO LABORATORIES.

B. Ohl
11-19-79

NPDES COMPLIANCE INSPECTION REPORT *(Coding Instructions on back of last page)*

TRANSACTION CODE	NPDES	YR	MO	DA	TYPE	INSPECTOR	FAC TYPE	TIME
W	IN0001373	79	07	27	S	S	4	8:30 a.m / p.m

REMARKS

ADDITIONAL

SECTION A - Permit Summary

NAME AND ADDRESS OF FACILITY *(Include County, State and ZIP code)*	EXPIRATION DATE / ISSUANCE DATE
CENTRAL FOUNDRY DIVISION GENERAL MOTORS CORPORATION BEDFORD, IN 47421	APRIL 1, 1978 MAY 30, 1974

RESPONSIBLE OFFICIAL	TITLE	PHONE
FLOYD M. McCUNDY	PLANT MANAGER	1-812-275-7000
FACILITY REPRESENTATIVE	**TITLE**	**PHONE**
GLEN OHL	SENIOR ENGINEER	1-812-275-7000

SECTION B - Effluent Characteristics *(Additional sheers attached* YES *)*

PARAMETER/ OUTFALL		MINIMUM	AVERAGE	MAXIMUM	ADDITIONAL
	SAMPLE MEASUREMENT				
	PERMIT REQUIREMENT				
	SAMPLE MEASUREMENT				
	PERMIT REQUIREMENT				
	SAMPLE MEASUREMENT				
	PERMIT REQUIREMENT				
	SAMPLE MEASUREMENT				
	PERMIT REQUIREMENT				
	SAMPLE MEASUREMENT				
	PERMIT REQUIREMENT				

SECTION C - Facility Evaluation *(S = Satisfactory, U = Unsatisfactory, N/A = Not applicable)*

	EFFLUENT WITHIN PERMIT REQUIREMENTS	S	OPERATION AND MAINTENANCE	S	SAMPLING PROCEDURES
S	RECORDS AND REPORTS	N/A	COMPLIANCE SCHEDULE	S	LABORATORY PRACTICES
S	PERMIT VERIFICATION	U	FLOW MEASUREMENTS		OTHER:

SECTION D - Comments

SECTION E - Inspection/Review

SIGNATURES	AGENCY	DATE
INSPECTED BY James C. Dyer	ISBH	7/27/79
INSPECTED BY		
REVIEWED BY		

ENFORCEMENT DIVISION USE ONLY

COMPLIANCE STATUS

☐ COMPLIANCE

☐ NONCOMPLIANCE

Sections F thru L: Complete on all inspections, as appropriate. N/A = Not Applicable

PERMIT NO. IN0003573

SECTION F - Facility and Permit Background

ADDRESS OF PERMITTEE IF DIFFERENT FROM FACILITY (Including City, County and ZIP code)

DATE OF LAST PREVIOUS INVESTIGATION BY EPA/STATE: JUNE 5, 1979

FINDINGS: PCB SURVEY OF PERMITTED DISCHARGES AND DISCHARGES TO SANITARY COLLECTION SYSTEM.

SECTION G - Records and Reports

RECORDS AND REPORTS MAINTAINED AS REQUIRED BY PERMIT. ☑ YES ☐ NO ☐ N/A (Further explanation attached ____)

DETAILS:

(a) ADEQUATE RECORDS MAINTAINED OF:			
(i) SAMPLING DATE, ~~TIME~~, EXACT LOCATION	☑ YES	☐ NO	☐ N/A
(ii) ANALYSES DATES, TIMES	☑ YES	☐ NO	☐ N/A
(iii) INDIVIDUAL PERFORMING ANALYSIS	☑ YES	☐ NO	☐ N/A
(iv) ANALYTICAL METHODS/TECHNIQUES USED STANDARD METHODS	☑ YES	☐ NO	☐ N/A
(v) ANALYTICAL RESULTS (e.g., consistent with self-monitoring report data)	☑ YES	☐ NO	☐ N/A
(b) MONITORING RECORDS (e.g., flow, pH, D.O., etc.) MAINTAINED FOR A MINIMUM OF THREE YEARS INCLUDING ALL ORIGINAL STRIP CHART RECORDINGS (e.g. continuous monitoring instrumentation, calibration and maintenance records).	☑ YES	☐ NO	☐ N/A
(c) LAB EQUIPMENT CALIBRATION AND MAINTENANCE RECORDS KEPT.	☑ YES	☐ NO	☐ N/A
(d) FACILITY OPERATING RECORDS KEPT INCLUDING OPERATING LOGS FOR EACH TREATMENT UNIT.	☑ YES	☐ NO	☐ N/A
(e) QUALITY ASSURANCE RECORDS KEPT.	☑ YES	☐ NO	☐ N/A
(f) RECORDS MAINTAINED OF MAJOR CONTRIBUTING INDUSTRIES (and their compliance status) USING PUBLICLY OWNED TREATMENT WORKS.	☐ YES	☐ NO	☑ N/A

SECTION H - Permit Verification

INSPECTION OBSERVATIONS VERIFY THE PERMIT. ☑ YES ☐ NO ☐ N/A (Further explanation attached ____)

DETAILS:

(a) CORRECT NAME AND MAILING ADDRESS OF PERMITTEE.	☑ YES	☐ NO	☐ N/A
FACILITY IS AS DESCRIBED IN PERMIT.	☑ YES	☐ NO	☐ N/A
(c) PRINCIPAL PRODUCT(S) AND PRODUCTION RATES CONFORM WITH THOSE SET FORTH IN PERMIT APPLICATION.	☑ YES	☐ NO	☐ N/A
(d) TREATMENT PROCESSES ARE AS DESCRIBED IN PERMIT APPLICATION.	☑ YES	☐ NO	☐ N/A
(e) NOTIFICATION GIVEN TO EPA/STATE OF NEW, DIFFERENT OR INCREASED DISCHARGES.	☐ YES	☐ NO	☑ N/A
(f) ACCURATE RECORDS OF RAW WATER VOLUME MAINTAINED.	☑ YES	☐ NO	☐ N/A
(g) NUMBER AND LOCATION OF DISCHARGE POINTS ARE AS DESCRIBED IN PERMIT.	☑ YES	☐ NO	☐ N/A
(h) CORRECT NAME AND LOCATION OF RECEIVING WATERS.	☑ YES	☐ NO	☐ N/A
(i) ALL DISCHARGES ARE PERMITTED.	☑ YES	☐ NO	☐ N/A

SECTION I - Operation and Maintenance

TREATMENT FACILITY PROPERLY OPERATED AND MAINTAINED. ☑ YES ☐ NO ☐ N/A (Further explanation attached ____)

DETAILS:

(a) STANDBY POWER OR OTHER EQUIVALENT PROVISIONS PROVIDED. GRAVITY FLOW THRU TREATMENT	☐ YES	☑ NO	☐ N/A
(b) ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES AVAILABLE COMMERCIAL MONITORING	☑ YES	☐ NO	☐ N/A
(c) REPORTS ON ALTERNATE SOURCE OF POWER SENT TO EPA/STATE AS REQUIRED BY PERMIT.	☐ YES	☐ NO	☑ N/A
(d) SLUDGES AND SOLIDS ADEQUATELY DISPOSED. BENEFICIAL FOR ULTIMATE DISPOSAL	☐ YES	☐ NO	☑ N/A
(e) ALL TREATMENT UNITS IN SERVICE.	☑ YES	☐ NO	☐ N/A
(f) CONSULTING ENGINEER RETAINED OR AVAILABLE FOR CONSULTATION ON OPERATION AND MAINTENANCE PROBLEMS.	☑ YES	☐ NO	☐ N/A
(g) QUALIFIED OPERATING STAFF PROVIDED.	☑ YES	☐ NO	☐ N/A
(h) ESTABLISHED PROCEDURES AVAILABLE FOR TRAINING NEW OPERATORS. OJT	☑ YES	☐ NO	☐ N/A
(i) FILES MAINTAINED ON SPARE PARTS INVENTORY, MAJOR EQUIPMENT SPECIFICATIONS, AND PARTS AND EQUIPMENT SUPPLIERS.	☑ YES	☐ NO	☐ N/A
(j) INSTRUCTIONS FILES KEPT FOR OPERATION AND MAINTENANCE OF EACH ITEM OF MAJOR EQUIPMENT.	☑ YES	☐ NO	☐ N/A
(k) OPERATION AND MAINTENANCE MANUAL MAINTAINED.	☑ YES	☐ NO	☐ N/A
(l) SPCC PLAN AVAILABLE.	☑ YES	☐ NO	☐ N/A
REGULATORY AGENCY NOTIFIED OF BY PASSING. (Dates ____ ____)	☐ YES	☐ NO	☑ N/A
(n) ANY BY-PASSING SINCE LAST INSPECTION.	☐ YES	☑ NO	☐ N/A
(o) ANY HYDRAULIC AND/OR ORGANIC OVERLOADS EXPERIENCED.	☐ YES	☑ NO	☐ N/A

PERMIT NO IN0003573

SECTION J - Compliance Schedules

PERMITTEE IS MEETING COMPLIANCE SCHEDULE. ☐ YES ☐ NO ☑ N/A *(Further explanation attached _____)*

CHECK APPROPRIATE PHASE(S).

- ☐ (a) THE PERMITTEE HAS OBTAINED THE NECESSARY APPROVALS FROM THE APPROPRIATE AUTHORITIES TO BEGIN CONSTRUCTION.
- ☐ (b) PROPER ARRANGEMENT HAS BEEN MADE FOR FINANCING *(mortgage commitments, grants, etc.)*.
- ☐ (c) CONTRACTS FOR ENGINEERING SERVICES HAVE BEEN EXECUTED.
- ☐ (d) DESIGN PLANS AND SPECIFICATIONS HAVE BEEN COMPLETED.
- ☐ (e) CONSTRUCTION HAS COMMENCED.
- ☐ (f) CONSTRUCTION AND/OR EQUIPMENT ACQUISITION IS ON SCHEDULE.
- ☐ (g) CONSTRUCTION HAS BEEN COMPLETED.
- ☐ (h) START-UP HAS COMMENCED.
- ☐ (i) THE PERMITTEE HAS REQUESTED AN EXTENSION OF TIME.

SECTION K - Self-Monitoring Program

Part 1 – Flow measurement *(Further explanation attached _____)*

PERMITTEE FLOW MEASUREMENT MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☑ YES	☐ NO	☐ N/A
(a) PRIMARY MEASURING DEVICE PROPERLY INSTALLED.	☑ YES	☐ NO	☐ N/A
TYPE OF DEVICE: ☐ WEIR ☑ PARSHALL FLUME ☐ MAGMETER ☐ VENTURI METER ☐ OTHER *(Specify* For temporary flow *Impeller Coo*			
(b) CALIBRATION FREQUENCY ADEQUATE. *(Date of last calibration* WEEKLY *)*	☑ YES	☐ NO	☐ N/A
(c) PRIMARY FLOW MEASURING DEVICE PROPERLY OPERATED AND MAINTAINED.	☑ YES	☐ NO	/A
(d) SECONDARY INSTRUMENTS *(totalizers, recorders, etc.)* PROPERLY OPERATED AND MAINTAINED.	☑ YES	☐ NO	☐ N/A
(e) FLOW MEASUREMENT EQUIPMENT ADEQUATE TO HANDLE EXPECTED RANGES OF FLOW RATES.	☑ YES	☐ NO	☐ N/A

Part 2 – Sampling *(Further explanation attached _____)*

PERMITTEE SAMPLING MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☑ YES	☐ NO	☐ N/A
LOCATIONS ADEQUATE FOR REPRESENTATIVE SAMPLES.	☑ YES	☐ NO	☐ N/A
(b) PARAMETERS AND SAMPLING FREQUENCY AGREE WITH PERMIT.	☑ YES	☐ NO	☐
(c) PERMITTEE IS USING METHOD OF SAMPLE COLLECTION REQUIRED BY PERMIT. IF NO, ☐ GRAB ☐ MANUAL COMPOSITE ☐ AUTOMATIC COMPOSITE FREQUENCY _____	☑ YES	☐ NO	☐ N/A
(d) SAMPLE COLLECTION PROCEDURES ARE ADEQUATE.	☑ YES	☐ NO	☐ N/A
(i) SAMPLES REFRIGERATED DURING COMPOSITING	☑ YES	☐ NO	☐ N/A
(ii) PROPER PRESERVATION TECHNIQUES USED	☑ YES	☐ NO	☐ N/A
(iii) FLOW PROPORTIONED SAMPLES OBTAINED WHERE REQUIRED BY PERMIT	☐ YES	☐ NO	☑ N/A
(iv) SAMPLE HOLDING TIMES PRIOR TO ANALYSES IN CONFORMANCE WITH 40 CFR 136.3	☑ YES	☐ NO	☐ N/A
(e) MONITORING AND ANALYSES BEING PERFORMED MORE FREQUENTLY THAN REQUIRED BY PERMIT.	☐ YES	☑ NO	/A
(f) IF (e) IS YES, RESULTS ARE REPORTED IN PERMITTEE'S SELF-MONITORING REPORT.	☐ YES	☐ NO	/A

Part 3 – Laboratory *(Further explanation attached _____)*

PERMITTEE LABORATORY PROCEDURES MEET THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS:	☑ YES	☐ NO	☐ N/A
(a) EPA APPROVED ANALYTICAL TESTING PROCEDURES USED. *(40 CFR 136.3)*	☑ YES	☐ NO	☐ N/A
(b) IF ALTERNATE ANALYTICAL PROCEDURES ARE USED, PROPER APPROVAL HAS BEEN OBTAINED.	☐ YES	☐ NO	☑ N/A
(c) PARAMETERS OTHER THAN THOSE REQUIRED BY THE PERMIT ARE ANALYZED.	☐ YES	☑ NO	☐ N/A
(d) SATISFACTORY CALIBRATION AND MAINTENANCE OF INSTRUMENTS AND EQUIPMENT.	☑ YES	☐ NO	☐ N/A
(e) QUALITY CONTROL PROCEDURES USED.	☑ YES	☐ NO	☐ N/A
(f) DUPLICATE SAMPLES ARE ANALYZED. _____ % OF TIME.	☐ YES	☑ NO	☐ N/A
(g) SPIKED SAMPLES ARE USED. _____ % OF TIME.	☐ YES	☑ NO	☐ N/A
(h) COMMERCIAL LABORATORY USED.	☑ YES	☐ NO	☐ N/A
(i) COMMERCIAL LABORATORY STATE CERTIFIED.	☐ YES	☐ NO	☑ N/A

LAB NAME TEN-ECH

LAB ADDRESS SOUTH BEND

PERMIT NO. MI0003573

SECTION L - Effluent/Receiving Water Observations *(Further explanation attached ____)*

UTFALL NO.	OIL SHEEN	GREASE	TURBIDITY	VISIBLE FOAM	VISIBLE FLOAT SOL	COLOR	OTHER
001	No	No	SLIGHT	No	No	SLIGHT	
002	No	No	No	No	No	No	

(Sections M and N: Complete as appropriate for sampling inspections)

SECTION M - Sampling Inspection Procedures and Observations *(Further explanation attached ____)*

- ☑ GRAB SAMPLES OBTAINED
- ☐ COMPOSITE OBTAINED
- ☐ FLOW PROPORTIONED SAMPLE
- ☐ AUTOMATIC SAMPLER USED
- ☑ SAMPLE SPLIT WITH PERMITTEE
- ☐ CHAIN OF CUSTODY EMPLOYED
- ☐ SAMPLE OBTAINED FROM FACILITY SAMPLING DEVICE

COMPOSITING FREQUENCY ____ PRESERVATION YES

SAMPLE REFRIGERATED DURING COMPOSITING: ☑ YES ☐ NO

SAMPLE REPRESENTATIVE OF VOLUME AND NATURE OF DISCHARGE ____

SECTION N - Analytical Results *(Attach report if necessary)*

1
001
DATE OF SAMPLING: July 24-25, 1979

FACILITY: Central Foundry
LOCATION: Bedford, IN
IN0003573
Pleasant Run Creek

Parameters *	NPDES Limits Daily Avg.	NPDES Limits Daily Max.	ISSE Lab.	Facility Lab.
Flow MGD			0.463	
BOD_5			18.	10.
Suspended Solids	10.	15.	17.	10.
pH	6.0-9.0	6.0-9.0	7.3	8.6
Fecal Coli MPN/100 ml				
Arsenic ug/l			1.0	
Phosphorus - P				
Total Solids			940.	750.
Sulfate			79.	30.
Cadmium ug/l			10.	
Chlorides			360.	
Cr (Hex) ug/l			10.	
Cr (Total) ug/l			10.	
Temperature-C			26-30	
Copper ug/l			20.	
Fluoride			0.9	
Total Iron ug/l			1,100	
Lead ug/l			20.	
Manganese ug/l			20.	
Nickel ug/l			20.	
PCB ug/l as Arochlor 1242			41.	
Oil-Grease			4.4	4.0
Zinc ug/l			130.	

SBII65-039
1/79
State Form 3965

Units included if other than mg/l.

TABLE NO. 2
OUTFALL NO. 002
DATE OF SAMPLING: July 24-25, 1979

FACILITY: Central Foundry
LOCATION: Bedford, IN
PERMIT NO. IN0003573
RECEIVING STREAM: Pleasant Run Creek

Parameters *	NPDES Limits		ISBH Lab.	Facility Lab.
	Daily Avg.	Daily Max.		
Flow MGD			0.361	0.361
BOD_5			5.8	6.5
Suspended Solids	10.	15.	6.	5.
pH	6.0-9.0	6.0-9.0	7.2	7.1
Fecal Coli MPN/100 ml				
Arsenic			1.	
Phosphorus - P				
Total Solids			280.	600.
Temperature-C			27-31	
Cadmium ug/l			10.	
Sulfate			100.	60.
Cr (Hex) ug/l			10.	
Cr (Total) ug/l			10.	
PCB ug/l as Arochlor	1242		0.98	
Copper ug/l			20.	
Fluoride			1.1	0.55
Total Iron ug/l			200.	
Lead ug/l			20.	
Manganese ug/l			80.	
Nickel ug/l			20.	
$NO_2 + NO_3 - N$				
Oil-Grease			2.7	3.
Zinc ug/l			30.	

SBH65-039
1/79
State Form 3965

Units included if other than mg/l.

TABLE NO. 3
OUTFALL NO. 002 South
DATE OF SAMPLING: July 24-25, 1979

FACILITY: Central Foundry
LOCATION: Bedford, IN
PERMIT NO. IN0003573
RECEIVING STREAM: Pleasant Run Creek

Parameters *	NPDES Limits Daily Avg.	NPDES Limits Daily Max.	ISBH Lab.	Facility Lab.
Flow MGD				
BOD_5			8.7	
Suspended Solids			150.	
pH			6.5	
Fecal Coli MPN/100 ml				
Residual Cl				
Phosphorus - P				
Total Solids			2,500	
Ammonia - N				
Sulfate			100.	
Chlorides			1,200	
Cr (Hex)				
Cr (Total)				
COD				
Copper				
Fluoride				
Total Iron				
Lead				
Manganese				
Nickel				
$NO_2 + NO_3 - N$				
Oil-Grease			3.4	
Zinc				

SBH65-039
1/79
State Form 3965

* Units included if other than mg/l.

APPENDIX G.2

LETTER DATED SEPTEMBER 24, 1979

2 COPIES TO D. GRAVES FOR MAILING TO EPA & STATE

Division of General Motors Corporation
Bedford Plant
Bedford, Indiana 47421

September 24, 1979

Mr. Joe Stallsmith, Chief
Enforcement and Operations
Branch, Div. of Water
Pollution Control
1330 W. Michigan St.
Indianapolis, IN 46202

Dear Sir:

In compliance with your instructions given during the meeting held at your office Thursday afternoon, August 30, 1979, I am enclosing the following CFD readings of fluid samples taken from the seepage that appears to be flowing from Milwaukee Railroad property adjacent to CFD Treatment Plant.

Date of Analysis	Sample Type and Count	
9-27-76	Oil Water Mix	1.6 PPM PCB
9-27-76	Bottom Scraping	10.8 PPM PCB
4-27-78	Oil Water Mix	1453 PPM PCB
4-27-78	CFD Fuel Oil	0 PPM PCB
5-29-78	Oil Water Mix	1.5 PPM PCB
6-25-79	Oil Water Mix	200 PPM PCB
6-27-79	Oil Water Mix	33 PPM PCB
6-28-79	Oil Water Mix	33 PPM PCB
8-22-79	Oil Water Mix	70 PPM PCB
8-27-79	Water	15,000 PPM Chlorides

Very truly yours,

James E. Hoon

James E. Hoon

cc. Ms. Kaye Jacobs
Enforcement
US EPA
250 S. Dearborn Ave.
Chicago, IL 60657
Phone: 312-353-2094

MAY 25, 2001

APPENDIX G.3

EMR-MIDWEST ENVIRONMENTAL ASSESSMENT

MINERALS PROCESSING CORPORATION

Post Office Box 723

Bedford, Indiana 47421

Telephone (812) 279-4487

December 23, 1988

Central Foundry
Division of General Motors Corporation
Bedford Plant, Box 271
Bedford, Indiana 47421

Attention: Mr. Stan Kleiss

Dear Stan:

Per your request I am enclosing a recent environmental assesment study of Minerals Processing Corporation prepared by ERM Midwest, Inc. although the report was not dated I believe it was done either late November or early December 1988.

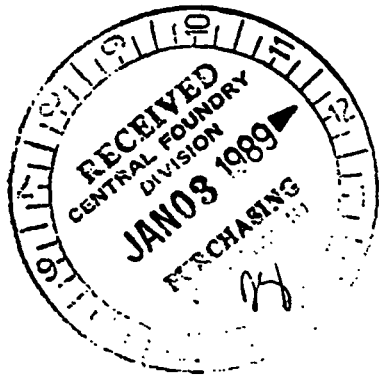
As I advised you, both Minerals and Bamar are in the process of refinancing to increase their processing so that we can better serve you. As you already know we are in the process of putting in a new dryer operation for Needmore Processing and at least on more furnace at Minerals Processing in Bedford, Indiana.

I would like to thank you for all the help you have been in the past and assure you that we feel that in the future we will be able to handle your material more expidiously. We have already made arrangements for our personel to get involved with the new General Motors program which I understand will start some time next month I would like to take this opportunity to thank you for your aid in getting the lease increased from three years to five years for the Minerals Property.

Very truly yours,

William T. Teller
President
Minerals Processing Corp.

WT:tc
enc.



48 EAST LONG LAKE RD. BLOOMFIELD HILLS

MICA RESOURCES LTD.

May 6, 1991

Mr. Kevin J. Moore
GM Central Foundry Division
North Jackson Street
Bedford, IN 47429-0271

Dear Kevin:

Enclosed please find a copy of the environmental assessment of the Minerals and Needmore properties which was conducted by ERM-Midwest, Inc. at the end of 1988, in connection with the acquisition of those properties by MICA Resources.

In interpreting this report, start with the proposition that no environmental consultant has ever not found something wrong! I think their pricing philosophy is to do the initial assessments for a low price, and then make their profit on the recommended follow-ons.

In the case of the Minerals' property, you will note that the principal problem was the waste oil above-ground tank, which was removed and disposed of in an approved manner in early 1989. In addition, ERM recommended that soil samples be taken as a follow-on step: this activity was undertaken in the early months of 1989, and the results indicated that there was no meaningful environmental contamination. I have not yet located the follow-on report, but when we find it, I will send you a copy.

On the strength of the assessment, we were quite satisfied to proceed with the acquisition of the properties. Just as telling is the fact that our Bank was willing to provide the financing.

Yours sincerely,

William A. Zebedee
President

WAZ:hs
cc: Stuart Burton

ERM-Midwest, inc.

8910 Purdue Road Suite 150 • Indianapolis Indiana 46268 • (317) 872-0212 Telefax (317) 872-6363

ENVIRONMENTAL ASSESSMENT
OF
MINERAL PROCESSING CORPORATION
AND
NEEDMORE PROCESSING CORPORATION
LAWRENCE COUNTY, INDIANA

Project No. I-006-01-01

Submitted

to

Mica Resources Limited

Prepared
by
ERM-Midwest, Inc.
8910 Purdue Road, Suite 150
Indianapolis, IN 46268

An affiliate of The Environmental Resources Management Group with offices throughout North America

TABLE OF CONTENTS

Section		Page
1.0	Introduction	1
2.0	Objective	1
3.0	Approach and Scope	2
4.0	Executive Summary	2
5.0	History of Site Development and Use	3
	5.1 Mineral Processing Corporation	3
	5.1.1 General Description	3
	5.2 Needmore Processing Corporation	4
	5.2.1 General Description	4
6.0	Site Document Review	4
	6.1 On-Site Files	4
	6.2 Public Records	5
	6.3 Public Service Indiana	7
7.0	Site Inspection	8
	7.1 On-Site Operations	8
	7.2 Site Grounds	8
	7.3 Chemical and Material Usage	8
	7.4 Adjacent Properties	8
	7.5 Surface Waters	9
	7.6 Solid, Hazardous Wastes and CERCLA Issues	9
	7.7 TSCA Issues	9
	7.8 Groundwater Issues	10
	7.9 Air Issues	10
	7.10 Wastewater Issues	11

7.11 Tank Issues 11

8.0 Conclusions and Recommendations 11

9.0 Information Sources 13

Appendix A-ERM's Phased Approach to Environmental Assessments

ERM-Midwest, inc.

8910 Purdue Road Suite 150 • Indianapolis Indiana 46268 • (317) 872-0212 Telefax (317) 872-8363

ENVIRONMENTAL ASSESSMENT
of
MINERAL PROCESSING CORPORATION
and
NEEDMORE PROCESSING CORPORATION

Submitted

to

Mica Resources Limited

1.0 INTRODUCTION

ERM-Midwest, Inc. was contracted by Mica Resources Limited to conduct an environmental assessment of specifically identified parcels of real estate in Indiana that are the object of a transfer of ownership. It is our understanding that Mica Resources Limited is considering the acquisition of two industrial sites in Lawrence County and desires the results of these assessments prior to closure on the property transfer transaction agreements.

The properties that were assessed for purposes of this particular project report were identified as: Mineral Processing Corporation at 1000 Third Street in Bedford, and Needmore Processing Corporation on County Road 425 North in Needmore; both in Lawrence County, Indiana.

2.0 OBJECTIVE

The purpose of ERM-Midwest's investigation is to provide, based on existing and readily available information, an information base regarding the potential presence or absence of contaminants in the form of hazardous substances. Hazardous substances in this case refers to RCRA (Resource Conservation and Recovery Act) and CERCLA (Comprehensive Environmental Response Compensation and Liability Act) materials. Such an assessment produces a set of professional observations and conclusions based on those observations which are used to judge the likelihood of significant environmental issues having existed in the past or currently, that would present potential environmental liabilities to the owners/operators of the property.

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3.0 APPROACH AND SCOPE

We have focused our efforts in the tasks described below to address the **Level 1** scope and objectives agreed upon during the formulation of this project. The approach ERM-Midwest has adopted for making property transfer assessments involves work in four task areas:

1. Compilation of a history of site development and use with emphasis on any chemical substances which might have been on site that could have contributed to contamination;

2. Review of environmental regulatory agency documents to determine site compliance with applicable regulations;

3. Inspection of the property to detect indications of the presence of hazardous contaminants; and

4. Reporting conclusions and recommendations for each of the noted sites.

The scope of work conducted for Mica Resources did not include sampling or analysis of environmental media in a limited effort to detect the presence, or confirm the absence, of contaminants. Typically, it is determined during a **Level 1** assessment that such sampling and analysis is indicated, and the specifics of such an effort are presented in the CONCLUSIONS AND RECOMMENDATIONS section of the final project report.

4.0 EXECUTIVE SUMMARY

Based on our professional experience and expertise in environmental affairs, particularly in the area of potential liabilities associated with property transfers, it is our qualified opinion that there exists the potential for historical contamination of sediments, surface water and groundwater at, or in the vicinity of, the properties assessed by this report.

However, any potential contamination would not be of a hazardous nature. The waste materials generated at the assessed properties are not regulated as hazardous wastes. It is worth noting that approximately 4000 gallons of a fuel oil/waste oil mixture is present in an above-ground vertical storage tank at the Mineral Processing Corporation facility. The mixture was formerly used as a fuel source for the rotary furnaces that are used for aluminum smelting. An analysis of the waste oil, in 1979, indicated trace levels of heavy metals and no PCB's present in the oil. The concern here is that while waste oil is not currently regulated as a hazardous waste, the U.S. Supreme Court recently ordered the U.S. Environmental Protection Agency to reconsider listing waste oil as

a hazardous waste subject to regulation by the Resource Conservation and Recovery Act.

It is possible, however, that PCB issues may exist relative to the electrical transformers located on each property. Such a potential situation prudently calls for further evaluation and action as deemed appropriate. The findings, conclusions, and recommendations made part of this project report are not to be construed as legal advice.

To the extent that the services described herein require subjective judgment, there can be no assurance that definitive results are obtained or those results that are obtained are usable. Moreover, the services provided include the application of subjective judgment to scientific principles and to that extent the results of this work are subject to human error.

5.0 HISTORY OF SITE DEVELOPMENT AND USE

5.1 Mineral Processing Corporation

The operations of Mineral Processing Corporation (MPC) located at 1000 Third Street, Bedford, Indiana, involves secondary smelting of aluminum by mixing rock salt, aluminum dross and grindings to resmelt aluminum. Figure 1 shows the location of the facility. The property that MPC is sited on, is currently owned by General Motors Corporation (GMC). GMC purchased the property from the Milwaukee Railroad in 1977.

MPC began operations at this location in 1971 and leased the property from the Milwaukee Railroad until the property was sold to GMC in 1977. MPC has leased the property from GMC since 1978. The current president of MPC is Mr. William Tiller.

5.1.1 General Description

MPC commenced operations in 1971, and the facility consists of an office building, truck scales, two separate baghouses for emissions collection, three rotary gas-fired furnaces housed in a building which also contains areas for rock salt storage, hot aluminum dross storage and cold scrap aluminum storage. Another small shelter is provided for aluminum dross storage, separate from the main building. A large part of the yard area is used for the stockpiling of 1000 pound aluminum/salt blocks. Each block is referred to as a "sow" and these blocks are the finished product at MPC.

MPC receives hot aluminum dross from the adjacent GMC Central Foundry, cold aluminum clips and borings from Needmore Processing, and cold aluminum dross from the Sheller-Ryobi facility located in Columbus, Indiana.

5.2 Needmore Processing Corporation

The operations of Needmore Processing Corporation (NPC), located on Lawrence County Road 425 North, approximately one-half mile southeast of Needmore, Indiana, involves processing aluminum borings and clips from part stamping at the GMC Central Foundry in

Bedford, Indiana. Figure 2 shows the location of the facility. Iron/aluminum borings from Central Foundry and U.S. Reduction are also processed at this facility. The NPC operations are owned by Mineral Processing Corporation, which purchased the operations from Barmet of Needmore in approximately 1981.

Barmet had purchased the grounds, that house the facility, from Indiana Limestone in approximately 1973. Indiana limestone had operated a stone processing mill on these grounds since approximately 1910.

5.2.1 General Description

NPC began operations at the current location in approximately 1981, and the facility consists of an office building, truck scales, off-loading area for materials that are loaded onto a conveyor belt which feeds a crusher/shredder, and a main building which houses storage areas for raw materials, processed scrap, and a gas-fired rotary dryer equipped with an afterburner. Junk equipment and machinery, railroad ties, etc. are stored in the eastern portion of the yard area.

Semi-truck trailers, containing aluminum scrap, are stored in the southeast portion of the yard. Currently, the south central portion of the yard is being prepared for the construction of a building addition which will house an additional rotary dryer and aluminum scrap processing activities. A portion of the yard is also being developed as a storage area for semi-truck trailers.

6.0 SITE DOCUMENT REVIEW

6.1 On-Site Files

Mr. Stuart Burton, General Manager of Mineral Processing Corporation, was contacted by ERM to obtain background information on the two sites being assessed. Mr. Burton has been with MPC since 1971, and he is knowledgeable of the history of both of the sites.

Mr. Burton provided copies of all permits, lease arrangements, site maps, waste disposal approval letters, etc. for each of the two facilities. He was not aware of any recorded environmental regulations violations, consent orders, enforcement actions, fines, litigation or identification as a CERCLA "potentially responsible party."

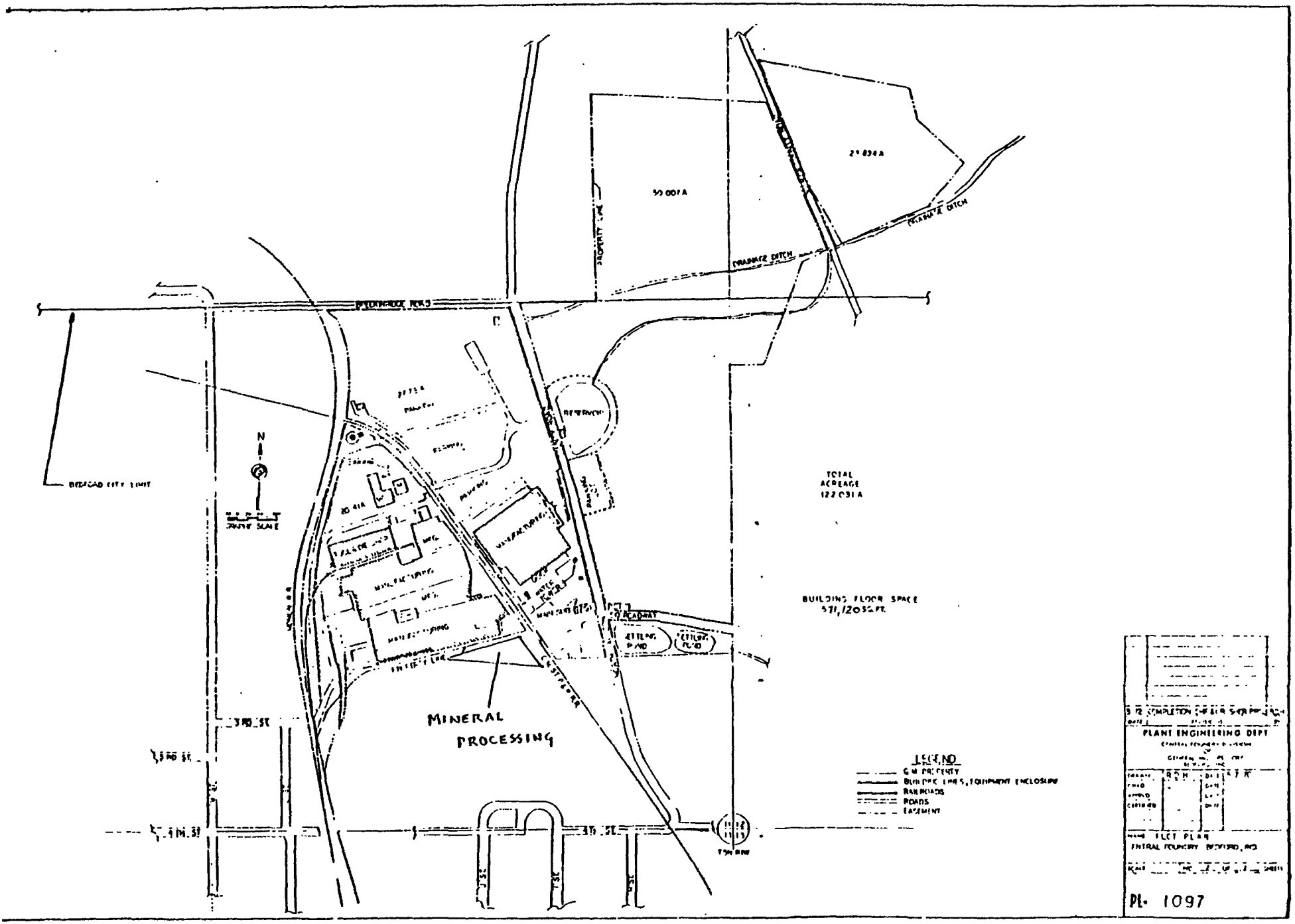
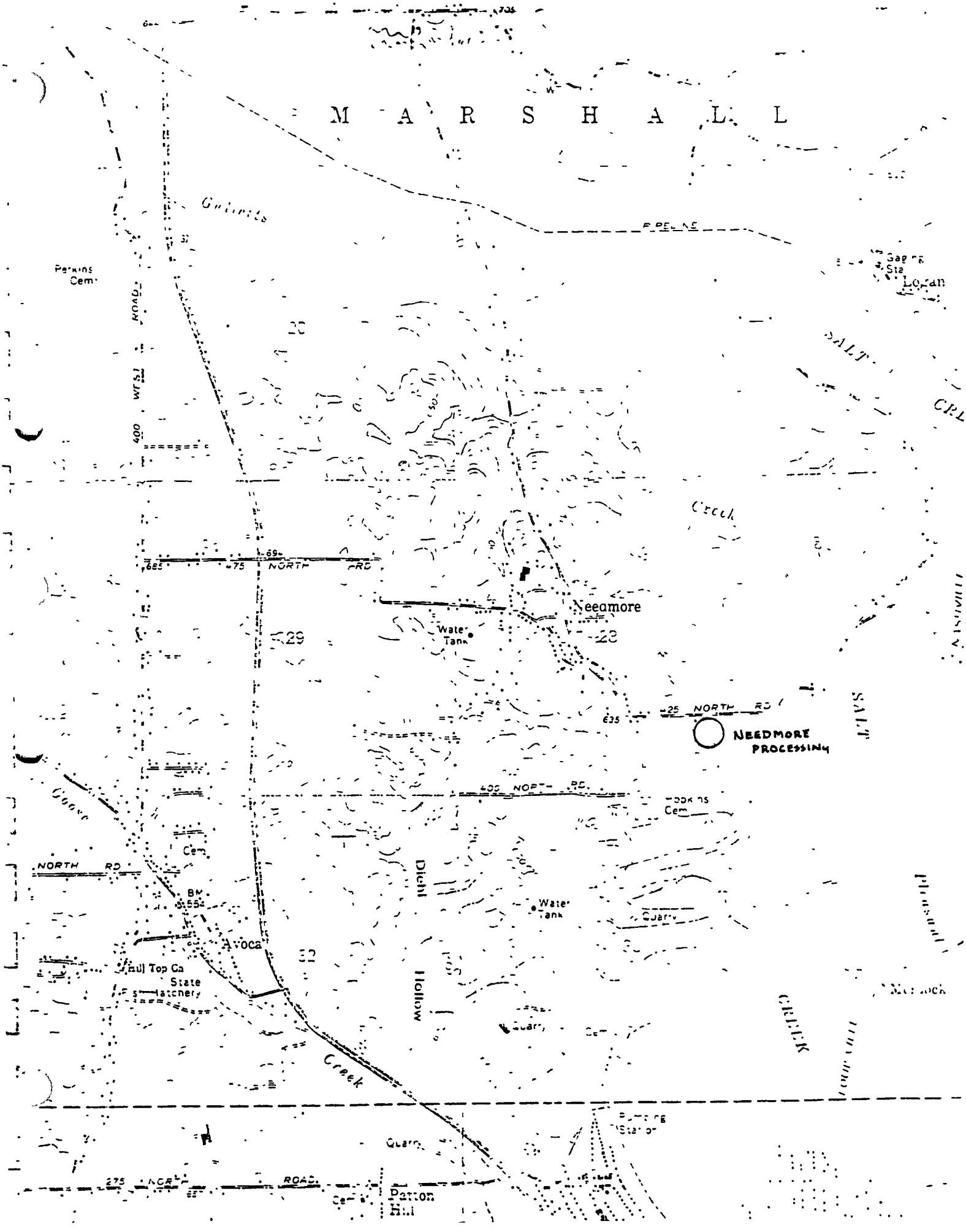

PYCKNIRDGE ROAD
DRAINAGE DITCH
PROPERTY LINE
RESERVOIR
TOTAL ACREAGE 122.031 A
BUILDING FLOOR SPACE 571,120 SQ. FT.
MINERAL PROCESSING
3RD ST
4TH ST
LEGEND
PLANT ENGINEERING DEPT
PLANT FOUNDRY DEARBORN, MICH.
PL- 1097

Figure 2


MARSHALL
Gutnitts
PIPELINE
Perkins Cem
ROAD
WEST
400
Gas Pipeline Sta
Logan
SALT CRK
Creek
NORTH RD
Needmore
Water Tank
29
28
NEEDMORE PROCESSING
SALT
400 NORTH RD
Cem
NORTH RD
BM 554
Avoca
Hull Top Ca
State Fish Hatchery
Diehl
Hollow
Water Tank
Quarry
Creek
CREEK
Quarry
275 NORTH ROAD
Dutton Hill

6.2 Public Records

City of Bedford Records

1) Water Department: Mr. Ernie Mitchell, of the Bedford Water Department, indicated that Bedford's water supply is derived from the East Fork of the White River. The Water Treatment Plant has intakes just south of Bedford. Mineral Processing Corporation is within the Bedford City Limits and is therefore supplied with municipal water.

2) Sewer Department: The Bedford Wastewater Treatment Plant is located approximately 1000 yards downstream from the Bedford Water Treatment Plant. MPC is connected to the Bedford Sanitary Sewer system.

3) Fire Department: Mr. Don Tyree, Chief of the Bedford Fire Department, was contacted with regards to underground storage tanks. Mr. Tyree indicated that his department has no files or permits relative to underground storage tanks at the MPC facility.

Lawrence County Records

1) Health Department: Mr. Paul McBride, Chief Sanitary Officer for the Lawrence County Health Department, indicated that the Needmore Processing facility utilizes a septic tank and drainage field for disposal of sanitary wastes. Mr. McBride has filed complaints, with the Indiana Department of Environmental Management's Air Pollution Control Division (APCD), on behalf of residents complaining about emissions from both Mineral Processing and Needmore Processing.

   The APCD responded to a complaint of particulate emissions fall-out covering automobiles in the vicinity of Mineral Processing, in 1983. An inspector from APCD did not observe any noticeable violation on the day that he visited the area. It was further noted that it would be difficult to determine if particulate fall-out was originating from MPC or the adjacent GM Central Foundry.

   In 1987, the APCD responded to a complaint of heavy smoke emissions from Needmore Processing. The situation was remedied by adding an afterburner to the rotary dryer to more effectively remove oil from the aluminum scrap that is processed at the facility. The complaint was closed, and no enforcement action was pursued, by the APCD after two successive inspections revealed acceptable emissions.

2) Marshall Township Fire Department: Mr. Steve Cobb, Chief of the Marshall Township Fire Department indicated that his

The ERM Group

department has no files or permits relative to underground storage tanks at Needmore Processing.

State of Indiana Records

1) Indiana Department of Natural Resources (IDNR): This state agency does not involve itself with environmental pollution issues relative to private properties, such as Mineral Processing or Needmore Processing. The IDNR concentrates primarily on the identification, characterization, and profiling of groundwater and surface water within Indiana.

The IDNR was contacted with regards to floodplain status for the two facilities. Floodplain insurance would not be required for either facility, as they exist outside of any floodplain, as currently defined by IDNR.

2) Indiana Department of Environmental Management (IDEM) Files.

a) Solid Waste: There are no records of solid waste disposal at either Mineral Processing or Needmore Processing. All paper trash or sanitary refuse generated at either facility is disposed of at the Lawrence County Landfill, Operating Permit 47-2.

The salt/dross cake generated at Mineral Processing is disposed of as a Special Waste regulated by 329 IAC. This material is disposed of at Southside Landfill (Operating Permit 84-2) in Vigo County and Worthington Landfill (Operating Permit 28-2) in Greene County. Waste analyses for the salt/dross cake are on file with IDEM.

b) RCRA Hazardous Waste: Mineral Processing notified U.S. EPA on 11/19/80 as a generator of hazardous waste (Notifier No. IND 0720511279). However, a 1/19/88 letter from IDEM to Mr. Stuart Burton indicated that Mineral Processing does not generate hazardous waste and is therefore not subject to 40 CFR 261 and/or 320 IAC 4.1-3 requirements. Needmore Processing does not generate any solid waste, as all material received there is recycled or sent to Mineral Processing for handling at that facility.

c) CERCLA: Neither of the facilities (Mineral Processing or Needmore Processing) are on the U.S. EPA CERCLIS List, a list of identified hazardous waste sites potentially requiring remedial action. However, the Southside Landfill site which receives the salt/dross cake from Mineral Processing is on the CERCLIS List. Therefore,

The ER

Mineral Processing would be a Potentially Responsible Party (PRP) for any clean-up activity which might be required at Southside Landfill. The likelihood of any clean-up that would be required at this landfill, is difficult to predict.

d) Spill Responses: No reports or incidents are on file for either Mineral Processing or Needmore Processing.

e) Groundwater: No records exist documenting groundwater quality for either Mineral Processing or Needmore Processing.

f) Water Pollution Control Division: No process wastewaters are generated at either facility. Therefore, no requirements pertaining to NPDES permits are required.

g) Public Water Supply: The Mineral Processing facility receives municipal water from the City of Bedford. Needmore Processing receives municipal water from the North Lawrence Water Corporation, which buys water from the City of Bedford, and provides chlorination of the water prior to piping to it's customers.

h) Air Pollution Control Division: No permit is required at the Needmore Processing facility, according to a 3/14/80 letter from the Indiana State Board of Health (predecessor to IDEM).

The three rotary gas-fired furnaces at Mineral Processing are permitted by the IDEM APCD (C.P. Nos. 47-03-90-0089, 90, and 91), and regulated by 325 IAC Article 2. The permits expire on 3/1/90.

6.3 Public Service Indiana (PSI)

Mr. John White, a superintendent with PSI, indicated that he has no knowledge of significant concentrations of PCBs in any electrical transformers at the Mineral Processing facility. Mr. White thought that these transformers had been installed in the mid-seventies, and they are owned by PSI. Mr. White further indicated that PSI supplies electricity to both Mineral Processing and Needmore Processing. The transformers at Needmore Processing are owned by Needmore Processing and they were probably originally purchased by the previous property owner, Barmet. A discussion of the potential significance of this issue will be included in this report under the PCB heading.

7.0 SITE INSPECTION

7.1 On-Site Operations

On December 9, 1988, Mr. Robert A. Downey of ERM-Midwest, Inc. conducted an inspection of the two facilities. The industrial activities at each of the properties identified for purposes of this report are as follows:

- Mineral Processing

  This facility consists of an office building, truck scales, primary operations building, a storage building for scrap aluminum dross, two baghouses for emissions, and a large yard area for the storage of processed aluminum/salt dross blocks.

- Needmore Processing

  The facility consists of an office building, truck scales, off-loading area for scrap aluminum, a primary operations building, and a large yard area for the storage of semi-trailers filled with scrap aluminum.

7.2 Site Grounds

The buildings at both facilities show normal signs of wear, typical for the operations conducted at the facilities. There was evidence of some spillage of fuel or gasoline on the ground beneath the above ground storage tanks at both facilities. Run-off water at Needmore Processing appeared cloudy, undoubtedly from emissions from the operations conducted at the facility. Some staining of the building floor was noted beneath the 55 gallon solvent drums at Needmore Processing. The amount of material spilled for any one event is thought to be insignificant. The yard area of Needmore Processing is the site of miscellaneous junked material including empty solvent drums, motor oil drums, railroad ties, etc.

7.3 Chemical and Material Usage

Small quantities of solvent degreasers and lubricating oils are kept at both facilities in 55 gallon metal containers. Typically, less than 3-4 drums are present at either facility at any time. The empty containers are typically returned to the manufacturer that supplies the material, for reconditioning.

7.4 Adjacent Properties

Mineral Processing is bordered by the GM Central Foundry to the north, Kaiser Tech to the south, and residential areas to the east and west. Railroad lines and spurs are south, east and west of the facility.

Needmore Processing is bordered by Gulletts Creek to the east and woodland to the north, east, and south. An abandoned railroad spur is present, southeast of the site. Numerous large piles of limestone blocks are located to the west of the site.

7.5 Surface Waters

Surface run-off water from the building roofs, site grounds, and cooling water for the rotary dryer at Needmore Processing flows into Gulletts Creek which is located immediately east of the site. Gulletts Creek empties into Salt Creek approximately 1/2-mile south of the facility. A small continual flow of run-off was noted on the date of the inspection.

There was no standing water or surface water noted during the inspection of the Mineral Processing site. Rainwater running onto the pavement outside and beside the buildings drains to the adjacent GM Central Foundry property. The nearest surface water is Pleasant Run Creek, located approximately 2 miles north of the facility.

7.6 Solid, Hazardous Waste, and CERCLA Issues

Sanitary solid wastes, generated at both facilities, are disposed of at the Lawrence County Landfill. No hazardous wastes are generated, stored, transported, or disposed of at either facility. The salt dross cake, generated at Mineral Processing, is disposed of as an Indiana Special Waste at the Worthington Landfill (Greene County) and Southside Landfill (Vigo County). The Southside Landfill is on the U.S. EPA CERCLIS List, which makes Mineral Processing a PRP for any potential remedial activity that might be required at the landfill in the future.

7.7 TSCA Issues

PCB

As mentioned earlier in this report, Mr. John White, a superintendent with PSI, indicated that it is not likely that significant quantities of PCBs are present in the transformers at Mineral Processing.

The transformers at Needmore Processing are owned by Needmore Processing, according to Mr. White. These transformers should be investigated to determine who manufactured them. The manufacturer can then be contacted to determine if PCBs are likely to be present in significant quantities, in any of the transformers.

The adjacent GM Central Foundry was the subject of a recent voluntary clean-up of PCB-contaminated sediment, sludge, and water. A former wastewater lagoon at the GM facility was found to contain

significant quantities of PCBs, and the water, sludge and underlying sediments were removed as part of a voluntary clean-up undertaken by GM. The sediment was removed to expose the bedrock in some portions of the lagoon. The lagoon was backfilled with clean clay backfill and the former lagoon area has successfully been revegetated.

Asbestos

It does not appear that asbestos insulation is present at either property. Mr. Burton was not aware of any asbestos having been used at either facility.

7.8 Groundwater Issues

Municipal water is available at both of the facilities, however there are some groundwater users in the vicinity of each of the facilities. Groundwater is withdrawn from Mississippian-Age limestone bedrock, and the quantity and/or occurrence of groundwater is primarily dependent upon intercepting a fracture or fissure within the bedrock. Water well logs obtained from the IDNR indicate the static groundwater levels, as measured in wells, are typically 60-70 feet below grade. The typical well depth is greater than 150 feet.

Due to the complex nature of the karst limestone drainage patterns in the vicinity of the facilities, it is difficult to predict groundwater flow patterns and/or the likelihood of any historical groundwater contamination at the sites. However, since no hazardous wastes are generated, stored, or disposed of at either site; it is not likely that significant groundwater contamination has occurred.

7.9 Air Issues

The emissions from the three rotary gas-fired furnaces at Mineral Processing are regulated by 325 IAC Article 2. The IDEM APCD issues the permits for these furnaces and is responsible for the enforcement of the law. No major violations or enforcement has been pursued by the APCD with regards to Mineral Processing. The U.S. EPA requested a stack test at the facility, which was successfully conducted in 1979.

The rotary gas-fired dryer and afterburner, at Needmore Processing, do not require a permit according to a 3/14/80 letter from the Indiana State Board of Health (predeseccor to IDEM). A complaint was filed with IDEM APCD in 1987 due to heavy smoke emissions from the facility. This was apparently the result of "oily" loads of aluminum scrap that were received at the facility. The excessive amounts of oil resulted in heavy smoke production as the oil was "burnt off" in the dryer. This situation was remedied by adding

an afterburner to handle any "oily" loads of scrap aluminum. The complaint was closed in early 1988, by APCD, after two successive inspections revealed acceptable emissions.

7.10 Wastewater Issues

There are no industrial wastewater discharges from either facility. Normal sanitary discharges go directly into the city sewer system at Mineral Processing. A septic system is used for sanitary discharges at Needmore Processing.

7.11 Tank Issues

The City of Bedford and Marshall Towrship Fire Departments, have no permits or registrations for underground tanks at either Mineral Processing or Needmore Processing, respectively.

Mr. Burton indicated that in 1978, two underground storage tanks containing gasoline and fuel oil in 1000 gallon vessels were removed at Mineral Processing. He further indicated that no records existed as to the procedures employed for this removal project. Both Mineral Processing and Needmore Processing have a few (2-3) small above ground storage tanks containing gasoline or diesel fuel for on-site equipment fueling.

A large vertical above ground tank, that was once used to store a fuel mixture for the furnaces, is present at Mineral Processing. This tank is contained within a concrete diked area with a sand liner.

In December, 1979, Mineral Processing requested permission with the State of Indiana to remove and dispose of approximately 900 cubic yards of oil-contaminated sand from within the diked area. The State granted approval for this activity in January, 1980, and the material was disposed of at Southside Landfill in Vigo County. Mr. Burton indicated that approximately 4,000 gallons of a fuel oil/waste oil mixture is currently stored in the aforementioned vertical storage tank. This mixture is a reserve emergency supply of fuel for the furnaces should the availability of natural gas ever become scarce. The waste oil was tested in 1979, and the analysis revealed the presence of trace levels of heavy metals. However, PCBs were non-detectable.

The potential significance of the waste oil in the tank is that the U.S. Supreme Court has recently ordered the U.S. EPA, to reconsider listing waste oil as a hazardous waste subject to regulation.

8.0 CONCLUSIONS AND RECOMMENDATIONS

No environmental media samples of any type were collected or analyzed by ERM-Midwest, Inc. for purposes of this assessment. Our

conclusions are based on information obtained through interviews, agency inquiries, and observations made during the site inspection.

During this environmental assessment process, no documentation, physical signs, or citizen involvement issues were discovered at either site relative to:

- The generation, treatment, transportation or disposal of RCRA hazardous wastes
- Involvement as a "potentially responsible party" in any Superfund activities
- Releases of reportable quantities of hazardous substances
- Unacceptable building and grounds maintenance, i.e. housekeeping practices
- Surface water issues
- Groundwater issues
- Mismanagement of raw material or chemical handling practices
- CERCLA issues

However, there has been some evidence of historical air quality problems at Needmore Processing which have apparently been remedied. There is also some potential concern with the presence of significant amounts of PCBs in the transformers at this facility.

The waste oil/fuel oil mixture in the above ground tank at Mineral Processing is also a potential regulatory concern. On the basis of these observations it would appear that some potentially significant environmental issues exist that could negatively impact either of the sites. However, considering that the operations at either site do not result in the generation, treatment, or disposal on-site of hazardous wastes; it is unlikely that past operations and practices have adversely impacted human health or the environment at either location.

Nevertheless, due to the existence of documented environmental contamination at the adjacent GM Central Foundry; it appears as though the likelihood of existing or potential environmental contamination could be present in the vicinity of the Mineral Processing site. Accordingly, it may be prudent for Mica Resources Ltd. to initiate a Level 2 or Level 3 assessment as outlined in Appendix A.

Specifically, the additional tasks that would be performed under a level 2 or Level 3 assessment are as follows:

- o Sampling of soil media on-site at the Inland property
- o Screening of soil samples for volatile organics
- o Analysis of selected soil samples for volatile and semi-volatile organics and priority pollutant metals.

9.0 INFORMATION SOURCES

For the purpose of establishing an information base to provide useful and sufficient data on which to judge the likelihood of significant environmental issues existing or having existed at the sites, ERM elicited site information as available from the following sources:

Site History

- o Mr. Stuart Burton, Mineral Processing Corporation

Environmental Files

City:

Bedford Fire Department

Bedford Wastewater Treatment Plant

Bedford Water Department

County:

Lawrence County Health Department

Public Service Indiana

Marshall Township Fire Department

North Lawrence Water Corporation

State:

Indiana Department of Environmental Management - Solid and Hazardous Waste Management Division and Air Pollution Contral Division.

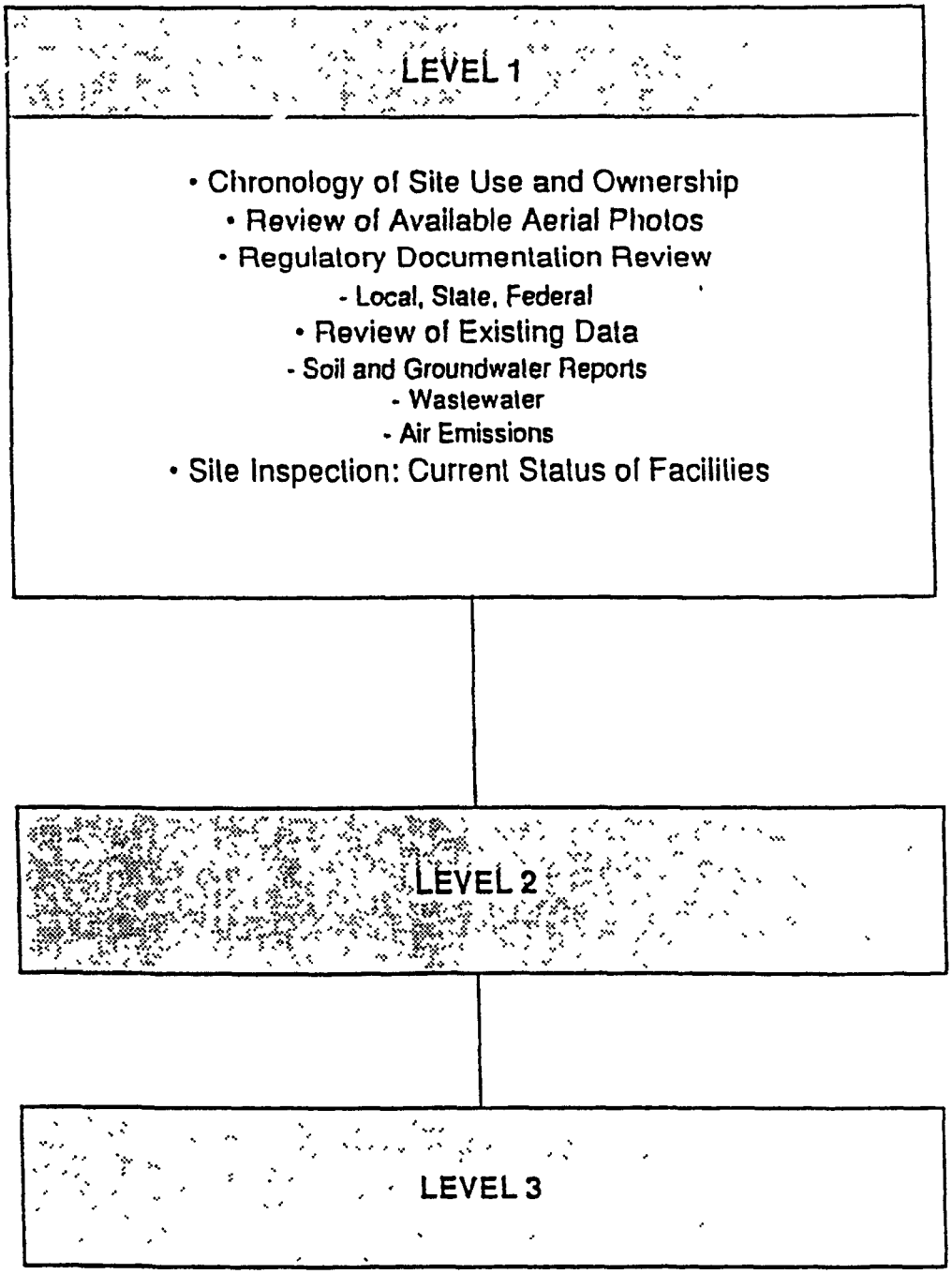
Indiana Department of Natural Resources - Division of Water

APPENDIX A

ERM'S PHASED APPROACH TO ENVIRONMENTAL ASSESSMENTS

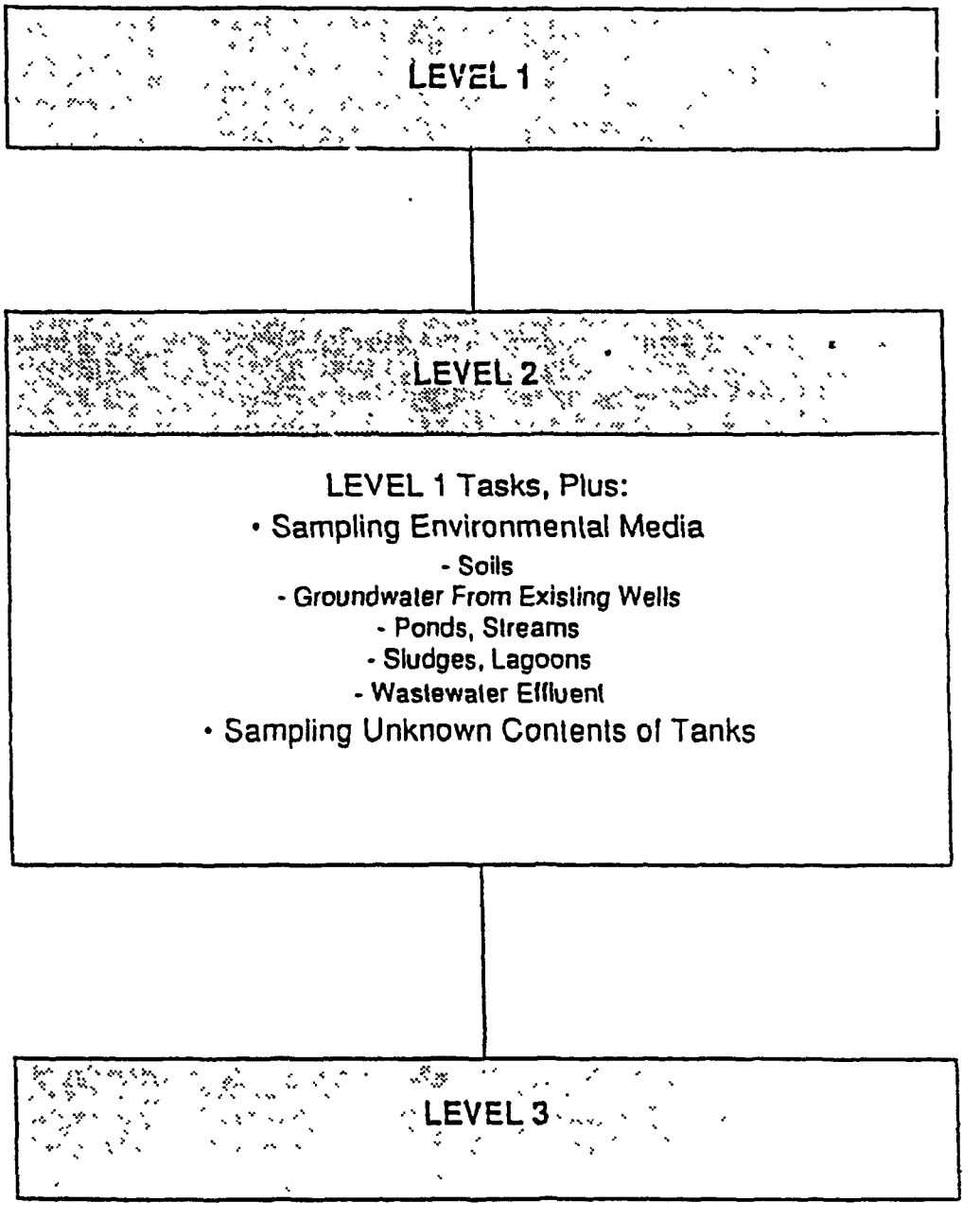
Property Transfer
Environmental Liability Asessments

ERM'S PHASED APPROACH



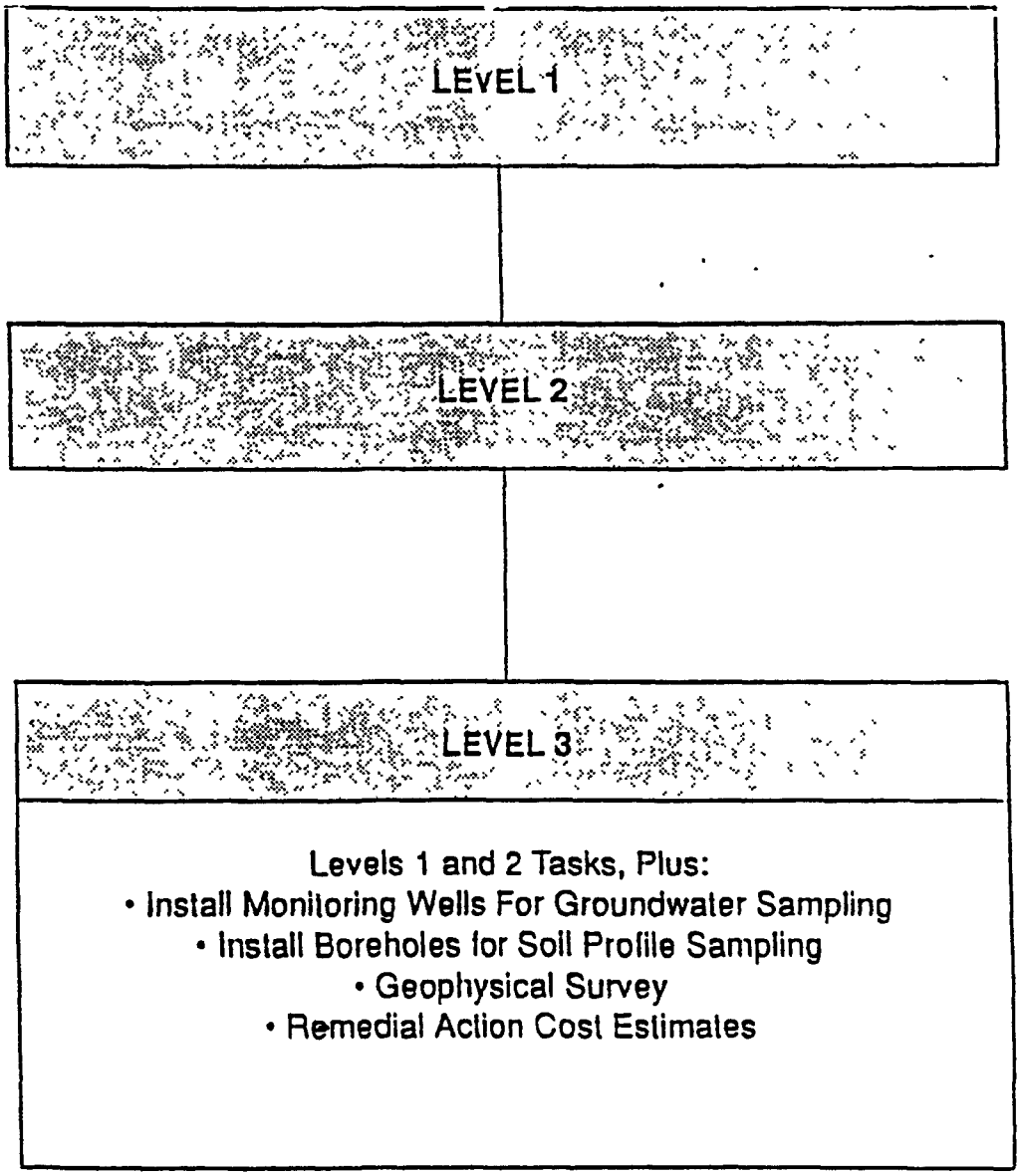
Property Transfer
Environmental Liability Assessments

ERM'S PHASED APPROACH

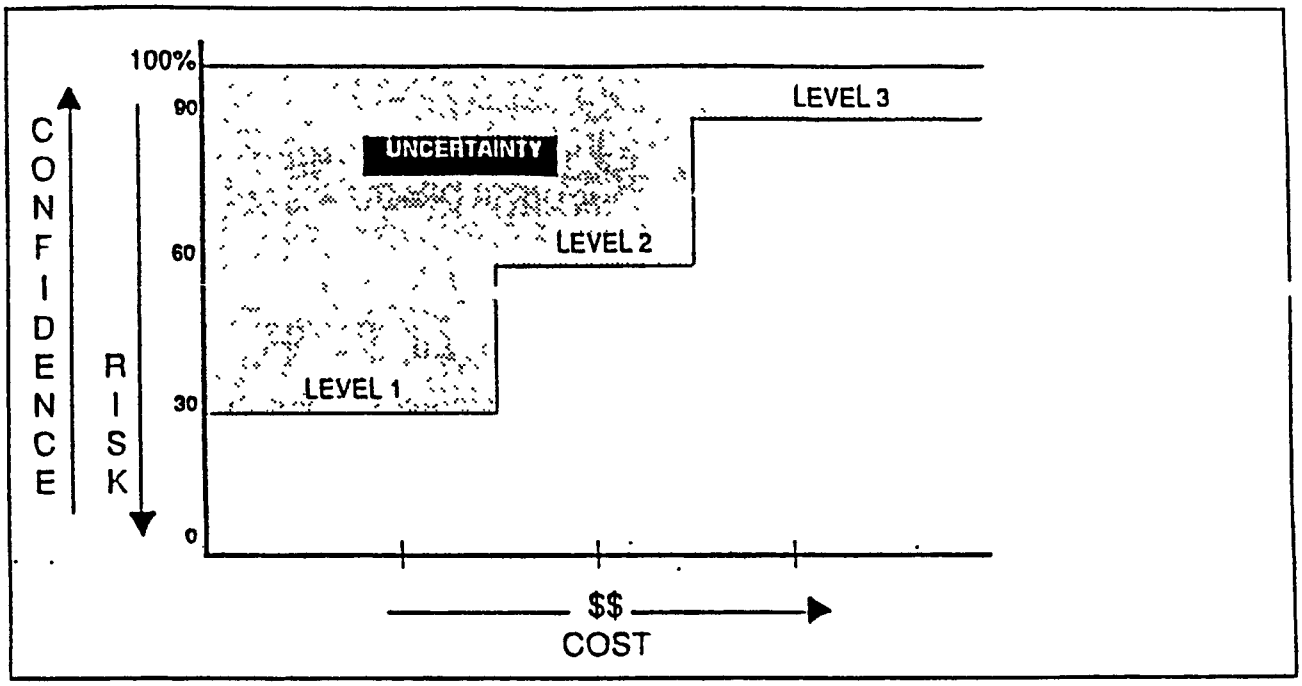


Property Transfer
Environmental Liability Assessments

ERM'S PHASED APPROACH



CONFIDENCE AND RISK VERSUS COST



With Each Increasing Level:

- Cost Increases
- Confidence Increases
- Risk Decreases
- Defensibility Increases

But, 100 percent Confidence is Unattainable.

APPENDIX G.4

ALUMINUM COMPANY OF AMERICA LETTER AND LABORATORY REPORT DATED JULY 31, 1991

ALUMINUM COMPANY OF AMERICA
1200 RIVERVIEW TOWER
900 SOUTH GAY STREET
KNOXVILLE, TENNESSEE 37902

ALCOA

1991 July 31

C.C. W. Schoonmaker

Mr.

Dear Mr.

As you know, there is recent evidence that a small, but significant, amount of saltcake must be treated as a hazardous waste. The data indicates that certain saltcake will fail either the RCRA Reactivity Test for reactive cyanides or sulfides or the RCRA TCLP Test for Metals. If a sample fails these tests, the saltcake would be deemed a hazardous waste and you must handle it in accordance with the storage, treatment, and disposal requirements of RCRA. In your compliance with these regulations, it is our understanding that it will be necessary to perform the EP Toxicity Tests on any hazardous wastes to determine what disposal options are allowed.

If you have not yet begun to characterize any saltcake you dispose of, we would urge that this begin immediately. We are also requesting that within 90 days you make arrangements to begin disposing of all saltcake generated from our skim, dross, and/or scrap in a RCRA Subtitle C hazardous waste landfill. Failure to comply with this request could result in the loss of our business.

We recognize that disposal in a hazardous waste landfill may temporarily increase your costs, although we are aware of several recyclers with competitive prices today who have elected similarly cautious approaches with respect to saltcake. We are prepared to discuss the short-term effects of this decision with you.

We also presume that you, as we continue to do, will be investigating other options for the appropriate handling of saltcake. Until we understand there is a better alternative, we believe that this conservative approach is the most prudent course of action, and will insure that your competitiveness is not jeopardized by long-term environmental liabilities associated with inappropriate saltcake disposal.

Very truly yours,

Mark S. Scrock

MARK S. SCROCK
METAL MANAGER

MSS/lap

VIRONMENTAL CONSULTANTS, INC.
Newman Avenue • Clarksville, Indiana 47130 • Phone (812) 282-8481

Environmental Consultants

Professional Laboratory Services

Laboratory Report

Date: 10/16/90 Page 1 of 4

Lab Control No.: 12,161

P.O. Number: Job No. 085129

mple Source

Minerals Processing
Corporation
P.O. Box 723
Bedford, IN 47420-
Attn: Mr. Stuart Burton

I To:

[redacted]

mple Description	Sample Type	Location
Solid	GRAB	Salt Dross

e Collected	Date Received	Collected By	Time of Collection
09-21-90	09/24/90	Client	00:00

ameter	Results	Date Analyzed	Analyst	Method of Analysis
ZHE Extraction Procedure	COMPLETED	10/01/90	Clark, R.	
Benzene (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas chromatography Mass spectrometry
Carbon tetrachloride (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas Chromatography Mass Spectrometry
Chlorobenzene (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas Chromatography Mass Spectrometry
Chloroform (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas chromatography Mass spectrometry
1,2-Dichloroethane (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas chromatography Mass spectrometry
1,1-Dichloroethylene (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas chromatography Mass spectrometry
Methyl ethyl ketone (TCLP)	38. ug/l	10/12/90	Wilson	Gas Chromatography Mass Spectrometry
Tetrachloroethylene (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas Chromatography Mass Spectrometry

narks

tate Certification No. M-10-1

Analysis Reviewed By

RONMENTAL CONSULTANTS, INC.
ewman Avenue • Clarksville, Indiana 47130 • Phone (812) 282-8481

Environmental Consultants

Professional Laboratory Services

Laboratory Report

Date 10/16/90 Page 2 of 4

Lab Control No. 12,161

P.O. Number

Job No. 085129

e Source

Minerals Processing
Corporation
P.O. Box 723
Bedford, IN 47420-
Attn: Mr. Stuart Burton

ie Description	Sample Type	Location
Solid	GRAB	Salt Dross

Collected	Date Received	Collected By	Time of Collection
09-21-90	09/24/90	Client	00:00

ete	Results	Date Analyzed	Analyst	Method of Analysis
richloroethylene (TCLP)	None Detected DL = 5 ug/l	10/12/90	Wilson	Gas Chromatography Mass Spectrometry
inyl chloride (TCLP)	None Detected DL = 10 ug/l	10/12/90	Wilson	Gas chromatography Mass spectrometry
CL' xtraction (ABN)	COMPLETED	09/26/90	Young	
CLP Acid/BN Preparation	PERFORMED	09/28/90	Clark, R.	
-Cresol (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
-C ol (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
-Cresol (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
4-Dichlorobenzene (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
4-Dinitrotoluene (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry

Analysis Reviewed By

ORIGINAL

/IRONMENTAL CONSULTANTS, INC.
Newman Avenue • Clarksville, Indiana 47130 • Phone (812) 282-8481

Environmental Consultants

Professional Laboratory Services

Laboratory Report

ple Source

Minerals Processing
Corporation
P.O. Box 723
Bedford, IN 47420-
Attn: Mr. Stuart Burton

Date: 10/16/90 Page 3 of 4

Lab Control No: 12,161

P.O. Number

Job No. 085129

To: [redacted]

nple Description	Sample Type	Location
Solid	GRAB	Salt Dross

e Collected	Date Received	Collected By	Time of Collection
09-21-90	09/24/90	Client	00:00

ameter	Results	Date Analyzed	Analyst	Method of Analysis
Hexachlorobenzene (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
Hexachlorobutadiene (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
Hexachloroethane (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
Nitrobenzene (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas Chromatography Mass Spectrometry
Pentachlorophenol (TCLP)	None Detected DL = 50 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
Pyridine (TCLP)	None Detected DL = 50 ug/l	10/10/90	Cropper	Gas Chromatography Mass Spectrometry
2,4,5-Trichlorophenol (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
2,4,6-Trichlorophenol (TCLP)	None Detected DL = 20 ug/l	10/10/90	Cropper	Gas chromatography Mass spectrometry
TCLP Extraction Procedure	COMPLETED	09/26/90	Young	

narks

tate Certification No. M-10-1

Analysis Reviewed By [signature]

NVIRONMENTAL CONSULTANTS, INC
31 Nevman Avenue • Clarksville, Indiana 47130 • Phone (812) 282 8481

Environmental Consultants

Professional Laboratory Services

Laboratory Report

mple Source

Minerals Processing
Corporation
P.O. Box 723
Bedford, IN 47420-
Attn: Mr. Stuart Burton

Date: 10/16/90

Lab Control No: 12,161

PO Number:

Job No: 085129

ill To:

Sample Description	Sample Type	Location
Solid	GRAB	Dross

Date Collected	Date Received	Collected By	Time of Collection
09-21-90	09/24/90	Client	00:00

Parameter	Results	Date Analyzed	Analyst	Method of Analysis
Arsenic (TCLP)	0.800 mg/l	09/28/90	Isler	Atomic absorption Graphite furnace
Barium (TCLP)	1.52 mg/l	10/02/90	Isler	Flame atomic abs.
Cadmium (TCLP)	0.006 mg/l	10/01/90	Isler	Flame atomic abs.
Chromium (TCLP)	0.32 mg/l	10/02/90	Isler	Flame atomic abs.
Lead (TCLP)	0.15 mg/l	10/01/90	Isler	Flame atomic abs.
Mercury (TCLP)	<0.0002 mg/l	09/28/90	Hostettler	Atomic absorption Cold vapor
Selenium (TCLP)	0.048 mg/l	10/03/90	Isler	Atomic absorption Graphite furnace
Silver (TCLP)	0.081 mg/l	10/01/90	Isler	Flame atomic abs.
Quality Control Data	See Attached	10/16/90		

emar

Analysis Reviewed By

Environmental Consultants
Professional Laboratory Services

SPIKE SAMPLE RECOVERY
TCLP EXTRACT
METALS

SAMPLE NUMBER
Soil Cross

Lab Sample ID Number: 11216 / Menical Rec. Date:

Data Release Authorized by: BRL Units: mg/1

Date Extracted: 9.26 90

Date Digested: 9.27-90

Date Analyzed. 9.28 -10.3 90

Conc/Dil Factor:

Metal	Spike Smpl Result	Sample Result	Amount Spiked	Percent Recovery	Method of Std Addns
2) Arsenic		.800	.020		☐ PERFORMED
Barium	2.16	1.52	1.00	64%	☐ PERFORMED
Cadmium	.186	.006	.200	90%	☐ PERFORMED
Chromium	1.39	.32	1.00	107%	☐ PERFORMED
Lead	1.06	.15	1.00	91%	☐ PERFORMED
Mercury	.0021	<.0002	.002	105%	☐ PERFORMED
Selenium	.072	.048	.020	120%	☐ PERFORMED
1) Silver	.281	.081	.200	100%	☐ PERFORMED
					☐ PERFORMED
					☐ PERFORMED
					☐ PERFORMED
					☐ PERFORMED
					☐ PERFORMED
					☐ PERFORMED

Comments: ~~spiked~~ after digestion

2 Unable to analyze spike due to high dilution

Environmental Consultants
Professional Laboratory Services

SPIKE SAMPLE RECOVERY
TCLP EXTRACT
VOLATILES

SAMPLE I.D.
Salt Dross

Lab Sample ID Number: 112161
Date: 10/15/90
Data Release Authorized by: BRL
Units: ug/1
Date Extracted:
Date Analyzed: 10/12/90
Conc/Dil Factor: 1

Compound	Spike Smpl Result	Sample Result	Amount Spiked	Percent Recovery	Method 8240 QC Limits
1,1-Dichloroethene	43	ND	100	43	61%-145%
Trichloroethene	69	ND	100	69	71%-120%
Chlorobenzene	91	ND	100	91	75%-130%
Toluene	71	ND	100	71	76%-125%
Benzene	72	ND	100	72	76%-127%

NOTE: All quantitation performed using an internal standard calibration method.

Comments: ND- None Detected

Environmental Consultants
Professional Laboratory Services

SPIKE SAMPLE RECOVERY
TCLP EXTRACT
SEMI-VOLATILES

SAMPLE I.D.
Salt Dross

Lab Sample ID Number:

Date:

Data Release Authorized by: BAC

Units: ug/l

TCLP Extraction Date:

Extract Prep. Date:

Date Analyzed:

Conc/Dil Factor:

Compound	Spike Smpl Result	Sample Result	Amount Spiked	Percent Recovery	Method 8270 QC Limits
1,2,4-Trichlorobenzene	37	ND	100	37	39%-98%
Acenaphthene	67	ND	100	67	46%-118%
2,4-Dinitrotoluene	82	ND	100	82	24%-96%
Di-n-butylphthalate	<10	ND	100	<10	11%-117%
Pyrene	16	ND	100	16	26%-127%
N-nitroso-Di-n-propylamine	80	ND	100	80	41%-116%
1,4-Dichlorobenzene	34	ND	100	34	36%-90%
Pentachlorophenol	144	ND	200	72	9%-103%
Phenol	76	ND	200	38	12%-89%
2-Chlorophenol	109	ND	200	55	27%-123%
4-Chloro-3-methylphenol	105	ND	200	53	23%-97%
4-Nitrophenol	101	ND	200	51	10%-80%

NOTE: All quantitation performed using an internal standard calibration method.

Comments: ND- None Detected

APPENDIX G.5

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY (EPA FORM 8700-12)

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTALLATION'S EPA I.D. NO.	
I. NAME OF INSTALLATION	
II. INSTALLATION MAILING ADDRESS	
III. LOCATION OF INSTALLATION	

PLEASE PLACE LABEL IN THIS SPACE

INSTRUCTIONS: If you received a preprinted label, affix it in the space at left. If any of the information on the label is incorrect, draw a line through it and supply the correct information in the appropriate section below. If the label is complete and correct, leave Items I, II, and III below blank. If you did not receive a preprinted label, complete all items. "Installation" means the single site where hazardous waste is generated, treated, stored and/or disposed of, or a transporter's principal place of business. Refer regularly to the INSTRUCTIONS FOR FILING NOTIFICATION before completing this form. The information requested herein is required by law *(Section 3010 of the Resource Conservation and Recovery Act).*

DETACH A

FOR OFFICIAL USE ONLY

COMMENTS: C

INSTALLATION'S EPA I.D. NUMBER: F

APPROVED:

DATE RECEIVED (yr., mo. & day):

I. NAME OF INSTALLATION

CENTRAL FOUNDRY DIVISION OF GMC

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX: 3 P.O. BOX 271

CITY OR TOWN: 4 BEDFORD — ST.: IN — ZIP CODE: 47421

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER: 5 NORTH JACKSON STREET

CITY OR TOWN: 6 BEDFORD — ST.: IN — ZIP CODE: 47421

IV. INSTALLATION CONTACT

NAME AND TITLE *(last, first, & job title)*: 2 OHL, GLEN SENIOR ENGINEER

PHONE NO. *(area code & no.)*: 812-279-7302

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER: 8 GENERAL MOTORS CORPORATION

B. TYPE OF OWNERSHIP *(enter the appropriate letter into box)*: M

F = FEDERAL
M = NON-FEDERAL

VI. TYPE OF HAZARDOUS WASTE ACTIVITY *(enter "X" in the appropriate box(es))*

- [X] A. GENERATION
- [ ] B. TRANSPORTATION *(complete item VII)*
- [X] C. TREAT/STORE/DISPOSE
- [ ] D. UNDERGROUND INJECTION

VII. MODE OF TRANSPORTATION *(transporters only – enter "X" in the appropriate box(es))*

- [ ] A. AIR
- [ ] B. RAIL
- [ ] C. HIGHWAY
- [ ] D. WATER
- [ ] E. OTHER *(specify)*:

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your installation's EPA I.D. Number in the space provided below.

- [X] A. FIRST NOTIFICATION
- [ ] B. SUBSEQUENT NOTIFICATION *(complete item C)*

C. INSTALLATION'S EPA I.D. NO.:

IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information

W

IX. DESCRIPTION OF HAZARDOUS WASTES *(continued from front)*

A. HAZARDOUS WASTES FROM NON–SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.31 for each listed hazardous waste from non–specific sources your installation handles. Use additional sheets if necessary.

1	2	3	4	5	6
7	8	9	10	11	12

B. HAZARDOUS WASTES FROM SPECIFIC SOURCES. Enter the four–digit number from 40 CFR Part 261.32 for each listed hazardous waste fr specific industrial sources your installation handles. Use additional sheets if necessary.

13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

C. COMMERCIAL CHEMICAL PRODUCT HAZARDOUS WASTES. Enter the four–digit number from 40 CFR Part 261.33 for each chemi ub- stance your installation handles which may be a hazardous waste. Use additional sheets if necessary.

31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48

D. LISTED INFECTIOUS WASTES. Enter the four–digit number from 40 CFR Part 261.34 for each listed hazardous waste from hospitals, veterinar hospitals, medical and research laboratories your installation handles. Use additional sheets if necessary.

49	50	51	52	53	54

E. CHARACTERISTICS OF NON–LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non–list hazardous wastes your installation handles. *(See 40 CFR Parts 261.21 – 261.24.)*

- [X] 1. IGNITABLE (D001)
- [X] 2. CORROSIVE (D002)
- [ ] 3. REACTIVE (D003)
- [X] 4. TOXIC (D000)

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE	NAME & OFFICIAL TITLE *(type or print)*	DATE SIGNED
[signature]	PLANT MANAGER	Aug. 14, 199

APPENDIX G.6

U.S.EPA ACKNOWLEDGEMENT OF NOTIFICATION

EPA

ACKNOWLEDGEMENT OF NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

This is to acknowledge that you have filed a Notification of Hazardous Waste Activity for the installation located at the address shown in the box below to comply with Section 3010 of the Resource Conservation and Recovery Act *(RCRA)*. Your EPA Identification Number for that installation appears in the box below. The EPA Identification Number must be included on all shipping manifests for transporting hazardous wastes; on all Annual Reports that generators of hazardous waste, and owners and operators of hazardous waste treatment, storage and disposal facilities must file with EPA; on all applications for a Federal Hazardous Waste Permit; and other hazardous waste management reports and documents required under Subtitle C of RCRA.

EPA I.D. NUMBER ➤ IND006036099

CENTRAL FOUNDRY DIVISION OF GMC
PO BOX 271
BEDFORD IN 47421

INSTALLATION ADDRESS ➤ NORTH JACKSON STREET
BEDFORD IN 47421

EPA Form 8700-12A (4-80)

APPENDIX G.7

RCRA PART A PERMIT APPLICATION

(Fill—in areas are spaced for elite type, i.e., 12 characters/inch)

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F I N D 0 0 6 0 3 6 0 9 9

LABEL ITEMS

I. EPA I.D. NUMBER

II. FACILITY NAME

III. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, af it in the designated space. Review the infor ation carefully; if any of it is incorrect, cr through it and enter the correct data in t appropriate fill—in area below. Also, if any the preprinted data is absent *(the area to left of the label space lists the informati that should appear)*, please provide it in t proper fill—in area*(s)* below. If the label complete and correct, you need not compl Items I, III, V, and VI *(except VI-B wh must be completed regardless)*. Complete items if no label has been provided. Refer the instructions for detailed item descr tions and for the legal authorizations unc which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X		B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X		N/A	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		X	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)			X

III. NAME OF FACILITY

SKIP G M C C E N T R A L F O U N D R Y D I V B E D F O R D P L A N T

IV. FACILITY CONTACT

A. NAME & TITLE *(last, first, & title)*	B. PHONE *(area code & no.)*
2 O H L , G L E N S E N I O R E N G I N E E R	8 1 2 2 7 9 7 3 0 2

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 P O B O X 2 7 1

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 B E D F O R D	I N	4 7 4 2 1

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 N O R T H J A C K S O N S T R E E T

B. COUNTY NAME

L A W R E N C E

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE *(if known)*
6 B E D F O R D	I N	4 7 4 2 1	

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
3361 (specify) Aluminum Foundry	(specify)
C. THIRD	**D. FOURTH**
(specify)	(specify)

VIII. OPERATOR INFORMATION

A. NAME

GMC CENTRAL FOUNDRY DIV BEDFORD PLANT

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL; S = STATE; P = PRIVATE; M = PUBLIC (other than federal or state); O = OTHER (specify)

P (specify)

D. PHONE (area code & no.)

A 812 279 7000

E. STREET OR P.O. BOX

PO BOX 271

F. CITY OR TOWN	G. STATE	H. ZIP CODE
BEDFORD	IN	47421

IX. INDIAN LAND

Is the facility located on Indian lands? [ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
9 N I N 0 0 0 3 5 7 3	9 P NA
B. UIC (Underground Injection of Fluids)	**E. OTHER** (specify)
9 U NA	9 * * * * (specify) (See Attachments) State Air Permits
C. RCRA (Hazardous Wastes)	**E. OTHER** (specify)
9 R NA	9 NA (specify)

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Aluminum Casting Facility

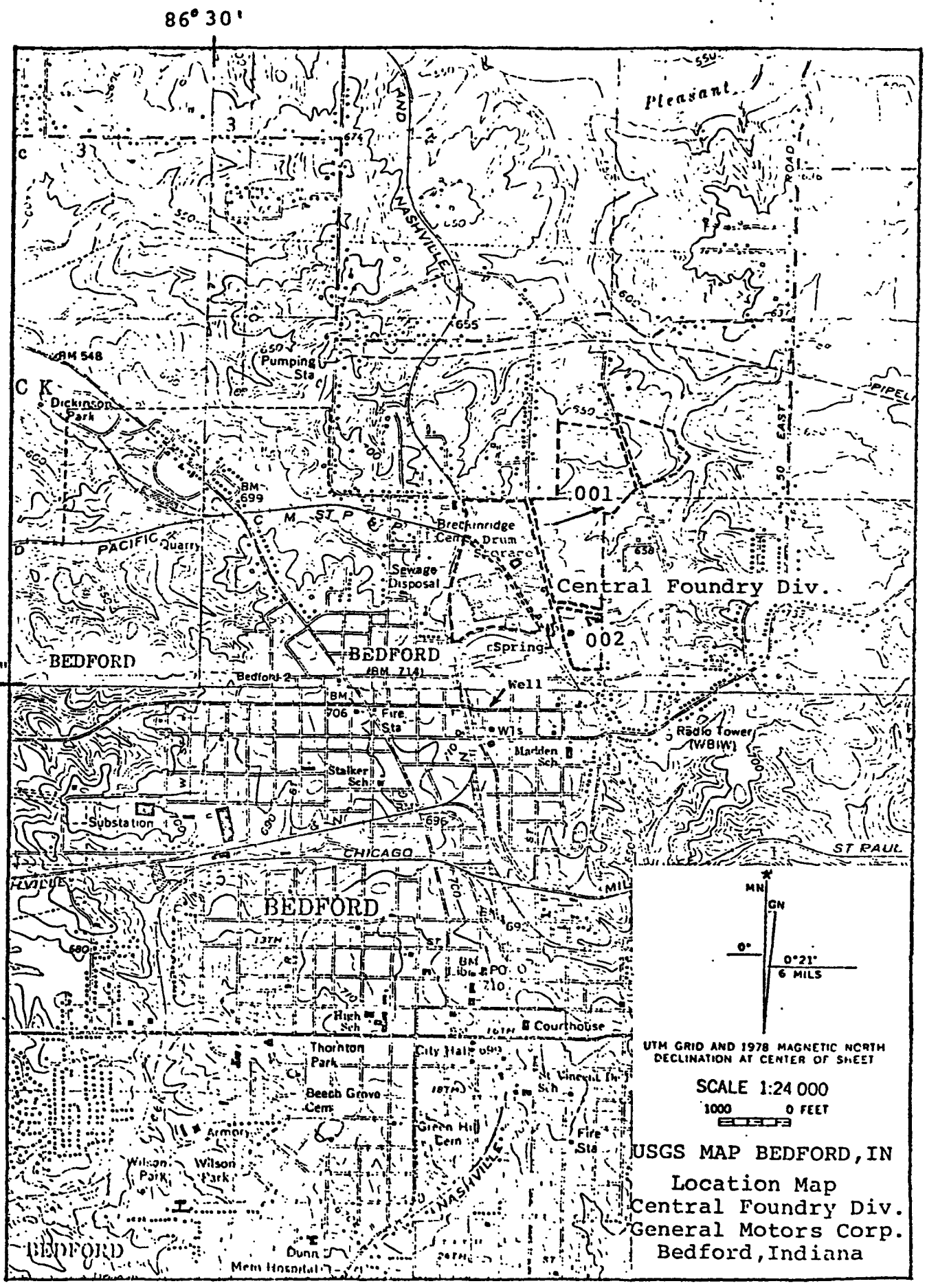
XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
T. R. Wiltse, General Manager	T R Wiltse	11-17-80

COMMENTS FOR OFFICIAL USE ONLY

C


86° 30'
38 '30"
Central Foundry Div.
001
002
BEDFORD
BEDFORD
BEDFORD
BEDFORD
Pleasant
NASHVILLE
EAST
ROAD
Pumping Sta
BM 548
Dickinson Park
BM 699
C M ST P & P
PACIFIC
Quarry
Breckinridge Cem
Drum Storage
Sewage Disposal
Spring
Well
Bedford 2
BM 706
Fire Sta
WTs
Radio Tower (WBIW)
Marden Sch
Stalker Sch
Substation
CHICAGO
ST PAUL
13TH
BM Lib & PO
High Sch
Courthouse
City Hall
Thornton Park
Beech Grove Cem
Armory
Wilson Park
Green Hill Cem
Fire Sta
Dunn Mem Hospital
MN
GN
0°
0°21'
6 MILS
UTM GRID AND 1978 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
SCALE 1:24 000
1000 0 FEET
USGS MAP BEDFORD, IN
Location Map
Central Foundry Div.
General Motors Corp.
Bedford, Indiana

X. Existing Environmental Permits (Continued)

e. Others

PC (47) 1370	State Air Construction Permit
47-07-82-0047	State Air Operation Permit
47-07-82-0055	State Air Operation Permit

FORM 3 RCRA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER: I N D 0 0 6 0 3 6 0 9 9

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

C | YR. 77 | MO. 07 | DAY 22

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR IS EXPECTED TO BEGIN

YR. | MO. | DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

C | DUP | T/A C | 1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY	LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G		5				
X-2	T 0 3	20	E		6				
1	S 0 1	154,000	G		7				
2					8				
3					9				
4					10				

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "104")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   For listed hazardous waste: For each listed hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
X-1	K054	900	P	T03 D80	
X-2	D002	400	P	T03 D80	
X-3	D001	100	P	T03 D80	
X-4	D002				included with above

Continued from page 2.

NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)													T/A	C	FOR OFFICIAL USE ONLY													T/A	C	
W	I	N	D	0	0	6	0	3	6	0	9	9		1	W	D	U	P										2	DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1	D001	1	T	S01				
2	D002	19	T	S01				
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

F	I	N	D	0	0	6	0	3	6	0	9	9		6

V. FACILITY DRAWING

All existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
38 52 43 N	086 29 04 W

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code)*
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

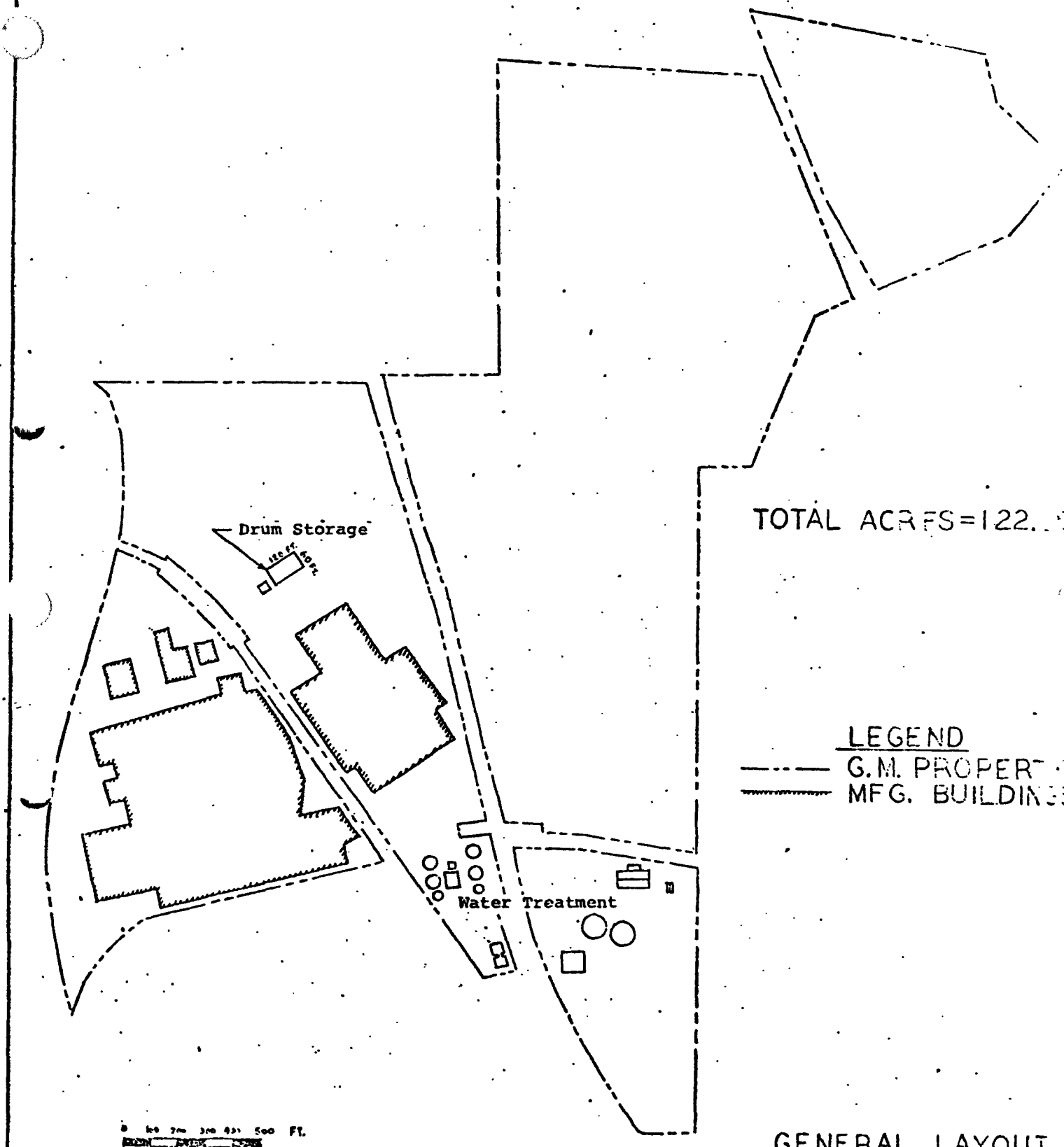
A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
T. R. Wiltse, General Manager	T. R. Wiltse	11-17-80

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment:

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
N/A		

V. FACILITY DRAWING *(see page 4)*



GENERAL LAYOUT

CENTRAL FOUNDRY DIV.
GENERAL MOTORS CORP.
BEDFORD, INDIANA

APPENDIX G.8

U.S.EPA APPROVAL OF PART A PERMIT APPLICATION

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF:

FEB 11 1982

RCRA ACTIVITIES

Mr. Glen Ohl, Sr. Engineer
GMC Central Foundry Div. - Bedford Plant
N. Jackson Street
Bedford, Indiana 47421

RE: Interim Status Acknowledgement USEPA ID No. IND006036099
FACILITY NAME: GMC Central Foundry Div. - Bedford Plant

Dear Mr. Ohl:

This is to acknowledge that the U.S. Environmental Protection Agency (USEPA) has completed processing your Part A Hazardous Waste Permit Application. It is the opinion of this office that the information submitted is complete and that you, as an owner or operator of a hazardous waste management facility, have met the requirements of Section 3005(e) of the Resource Conservation and Recovery Act (RCRA) for Interim Status. However, should USEPA obtain information which indicates that your application was incomplete or inaccurate, you may be requested to provide further documentation of your claim for Interim Status. Our opinion will be reevaluated on the basis of this information.

As an owner or operator of a hazardous waste management facility, you are required to comply with the interim status standards as prescribed in 40 CFR Parts 122 and 265, or with State rules and regulations in those States which have been authorized under Section 3006 of RCRA. In addition, you are reminded that operating under interim status does not relieve you from the need to comply with all applicable State and local requirements.

The printout enclosed with this letter identifies the limit(s) of the process design capacities your facility may use during the interim status period. This information was obtained from your Part A Permit application. If you wish to handle new wastes, to change processes, to increase the design capacity of existing processes, or to change ownership or operational control of the facility, you may do so only as provided in 40 CFR Sections 122.22 and 122.23.

As stated in the first paragraph of this letter, you have met the requirements of 40 CFR Part 122.23; your facility may operate under interim status until such time as a permit is issued or denied. This will be preceded by a request from this office or the State (if authorized) for Part B of your application. Please contact Arthur Kawatachi of my staff at (312) 886-7449, if you have any questions concerning this letter or the enclosure.

Sincerely yours,

Karl J. Klepitsch, Jr., Chief
Waste Management Branch

Enclosure

FACILITY NAME	EPA ID NUMBER
GMC CENTRAL FOUNDRY DIV BEDFORD PLANT	IND006036099

FACILITY OPERATOR

GMC CENTRAL FOUNDRY DIV BEDFORD PLANT

FACILITY OWNER

GMC CENTRAL FOUNDRY DIV BEDFORD PLANT

FACILITY LOCATION

NORTH JACKSON ST.
BEDFORD IN 47421

PROCESS CODE	DESIGN CAPACITY	UNIT OF MEASURE
S01	154,000.00000	G

--------- KEY ----------

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE
STORAGE:		

CONTAINER	S01	G or L
TANK	S02	G or L
WASTE PILE	S03	Y or C
SURFACE IMPOUNDMENT	S04	G or L
DISPOSAL:		

INJECTION WELL	D79	G,L,U, or V
LANDFILL	D80	A or F
LAND APPLICATION	D81	B or Q
OCEAN DISPOSAL	D82	U or V
SURFACE IMPOUNDMENT	D83	G or L
TREATMENT:		

TANK	T01	U or V
SURFACE IMPOUNDMENT	T02	U or V
INCINERATOR	T03	D,W,E, or H
OTHER	T04	U,V,J,R,N, or S

UNIT OF MEASURE	CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS/HOUR	W
GALLONS/HOUR	E
LITERS/HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q
POUNDS/HOUR	J
KILOGRAMS/HOUR	R
TONS PER DAY	N
METRIC TONS/DAY	S

APPENDIX G.9

RCRA PART B PERMIT APPLICATION

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
111 West Jackson Blvd.
CHICAGO, ILLINOIS 60604

FEB 10 1982

REPLY TO ATTENTION OF:
5AHWM

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Glen Ohl
GMC Central Foundry Division
P.O. Box 271
Bedford, Indiana 47421

RE: GMC-Central Foundry Division
North Jackson Street
Bedford, Indiana
IND006036099

Dear Mr. Ohl:

By now you should have received an acknowledgement of our receipt of your Part A permit application material for the above-referenced hazardous waste facility under the Resource Conservation & Recovery Act, as amended (RCRA) permit program. You should also have been apprised of your condition relative to interim status.

Accordingly, this letter constitutes the next step in the formal process leading to issuance or denial of an RCRA permit. Under the authority of 40 CFR 122.22, this is a formal request for submittal of Part B of your application for the above-referenced facility.

Enclosed is a copy of 40 CFR 122.25 which lists the items that constitute Part B for your facility. Your Part B application must be submitted in quadruplicate and postmarked no later than August 18, 1982. Please send your application to the following address:

RCRA ACTIVITIES
Part B Permit Application
USEPA, Region V
P.O. Box A3587
Chicago, Illinois 60690-3587

While your complete application is due no later than the above date, you are encouraged to submit at your earliest opportunity those components which have been completed. Several interim status documents also are used as components of your Part B application. Included are such items as your waste analysis plan, contingency plan, closure plan, etc., each of which may be submitted to this office immediately, to initiate the processing of your Part B application.

Failure to furnish your complete Part B application by the above date, and to provide in full all required information, is grounds for termination of interim status under 40 CFR 122.22.

Information you submit in the Part B application can be disclosed to the public, according to the Freedom of Information Act and U.S.Environmental Protection Agency (USEPA) Freedom of Information regulations. If you wish, however, you may assert a claim of business confidentiality by printing the word "Confidential" on each page of the application which you believe contains confidential business information. USEPA will review business confidentiality claims under regulations at 40 CFR Part 2, and will later request substantiation of any claims. Please review these rules carefully before making a claim.

We have also enclosed a copy of 40 CFR Part 264 which includes technical standards for the operation of treatment and storage facilities. These standards will become applicable upon issuance of a permit to your facility by USEPA.

We will coordinate review of your application with the Indiana State Board of Health and the Hazardous Waste facility Approval Board, and if your application is acceptable, will strive for a simultaneous issuance of Federal and State hazardous waste facility permits. It is possible that during the processing of your application, the State hazardous waste program may become authorized to issue RCRA permits for your type of facility. In that case, direct Federal processing will cease, and the State in lieu of USEPA will make the final determination on your application.

We are committed to conducting the RCRA permitting process as efficiently as possible. Consequently I suggest you contact Y.J. Kim of my staff at (312) 886-7425, as you begin preparing your application. Mr. Kim will be available to discuss specific needs of your application or to meet with you in Chicago. These efforts are intended to generate complete applications, without requiring any information beyond that which is necessary to make RCRA permit decisions.

We look forward to receiving your Part B application.

Sincerely yours,

Karl J. Klepitsch, Jr., Chief
Waste Management Branch

Enclosures: 40 CFR 122.25
40 CFR 264

cc: T.R. Wiltse
David Lamm, ISBH

RCRA - PART B

PERMIT APPLICATION

GMC - CENTRAL FOUNDRY-BEDFORD

AUGUST - 1982

RECEIVED

AUG 1 8 1982

WASTE MANAGEMENT BRANCH
EPA REGION V

TABLE OF CONTENTS

	Page
INTRODUCTION	iii
CERTIFICATION	iv
SECTION 1 - Part A Application Update	1
EPA Form 3510-1	2-3
EPA Form 3510-3	6-10
Photograph - Storage Area	11
SECTION 2 - Part B Permit Application General Information	12
General Description	12
Chemical and Physical Analyses	12-14
Waste Analysis Plan	15
Plant Procedure No. 532-12	16-18
Security Procedures	19
Plant Procedure No. 533-23	20-22
Waiver of Preparedness and Prevention	23
Contingency Plan	23
Plant Procedure No. ECS-14	24-41
Preventive Procedure, Structures and Equipment	42
Prevention of Reaction of Wastes	42
Traffic Patterns	43
Traffic Pattern Diagram	44
Outline of Personnel Training	46-47
Location Information	45
Closure Plan	48
Plant Closure Plan	49-51
Notice In Deed	52
Closure Cost Estimates	52
Post Closure Cost Estimates	52
Financial Assurance Mechanism	52
State Assumption of Responsibility	52
Topographic Map	52
Map	53

Page

SECTION 2 - Part B Permit Application General Infomration (Cont.)

Additional Information 54

SECTION 3 - Part B Permit Application - Specific Information. 55

Container - Storage Facility 55

Drawing of Storage Containment. 56

Appendix A - Financial Responsibility 57-60

INTRODUCTION

The GMC Central Foundry Division, Bedford Plant hereby submits to the United States Environmental Protection Agency, Region V that information requested to satisfy those requirements that constitute the Part B application for a hazardous waste storage permit under the requirements of RCRA.

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Date: 8/16/82 Signature: Robert W. Herr

Robert W. Herr
Plant Manager

Date: 8/16/82 Signature:

T. R. Wiltse
General Manager

SECTION 1

PART A APPLICATION UPDATE

40 CFR 122.24

This section contains information as required by 40 CFR 122.24 provide on forms EPA 3510-1 and EPA 3510-3 including a facility map and photograph of the hazardous waste storage area.

The Part A Application has been updated to reflect the following changes:

1) EPA Form 3510-3, item III, "Process-Codes and Design Capacities" has been modified to show that the plant has the design capacity to store 5500 gallons (100 drums) of hazardous waste. This change is the result of the plant designating a small area within the existing drum storage facility where additional containment was installed for the storage of hazardous waste.

2) A new photograph of the modified hazardous waste storage facility.

(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F I N D 0 0 6 0 3 6 0 9 9

LABEL ITEMS

I. EPA I.D. NUMBER

II. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill—in area(s) below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
A. Is this facility a publicly owned treatment works which results in a discharge to waters of the U.S.? (FORM 2A)		X		B. Does or will this facility *(either existing or proposed)* include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to waters of the U.S.? (FORM 2B)		X	
C. Is this a facility which currently results in discharges to waters of the U.S. other than those described in A or B above? (FORM 2C)	X		N/A	D. Is this a proposed facility *(other than those described in A or B above)* which will result in a discharge to waters of the U.S.? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of hazardous wastes? (FORM 3)	X		X	F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed stationary source which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)		X		J. Is this facility a proposed stationary source which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)			X

III. NAME OF FACILITY

1 GMC CENTRAL FOUNDRY DIV BEDFORD PLANT

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 OHL, GLEN SENIOR ENGINEER	812 279 7302

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 PO BOX 271

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 BEDFORD	IN	47421

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 NORTH JACKSON STREET

B. COUNTY NAME

LAWRENCE

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 BEDFORD	IN	47421	

SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
3361 (specify) Aluminum Foundry	C 7 (specify)
C. THIRD	**D. FOURTH**
(specify)	C 7 (specify)

OPERATOR INFORMATION

A. NAME

GMC CENTRAL FOUNDRY DIV BEDFORD PLANT

B. Is the name listed in Item VIII-A also the owner? ☒ YES ☐ NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL; S = STATE; P = PRIVATE; M = PUBLIC (other than federal or state); O = OTHER (specify)

P (specify)

D. PHONE (area code & no.) C A 812 279 7000

E. STREET OR P.O. BOX

O BOX 271

F. CITY OR TOWN

BEDFORD

G. STATE IN

H. ZIP CODE 47421

IX. INDIAN LAND

Is the facility located on Indian lands? ☐ YES ☒ NO

EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)
N IN 0003573	C 9 P NA
B. UIC (Underground Injection of Fluids)	**E. OTHER** (specify)
U NA	C 9 **** (specify) (See Attachments) State Air Permits
C. RCRA (Hazardous Wastes)	**E. OTHER** (specify)
NA	C 9 NA (specify)

MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

NATURE OF BUSINESS (provide a brief description)

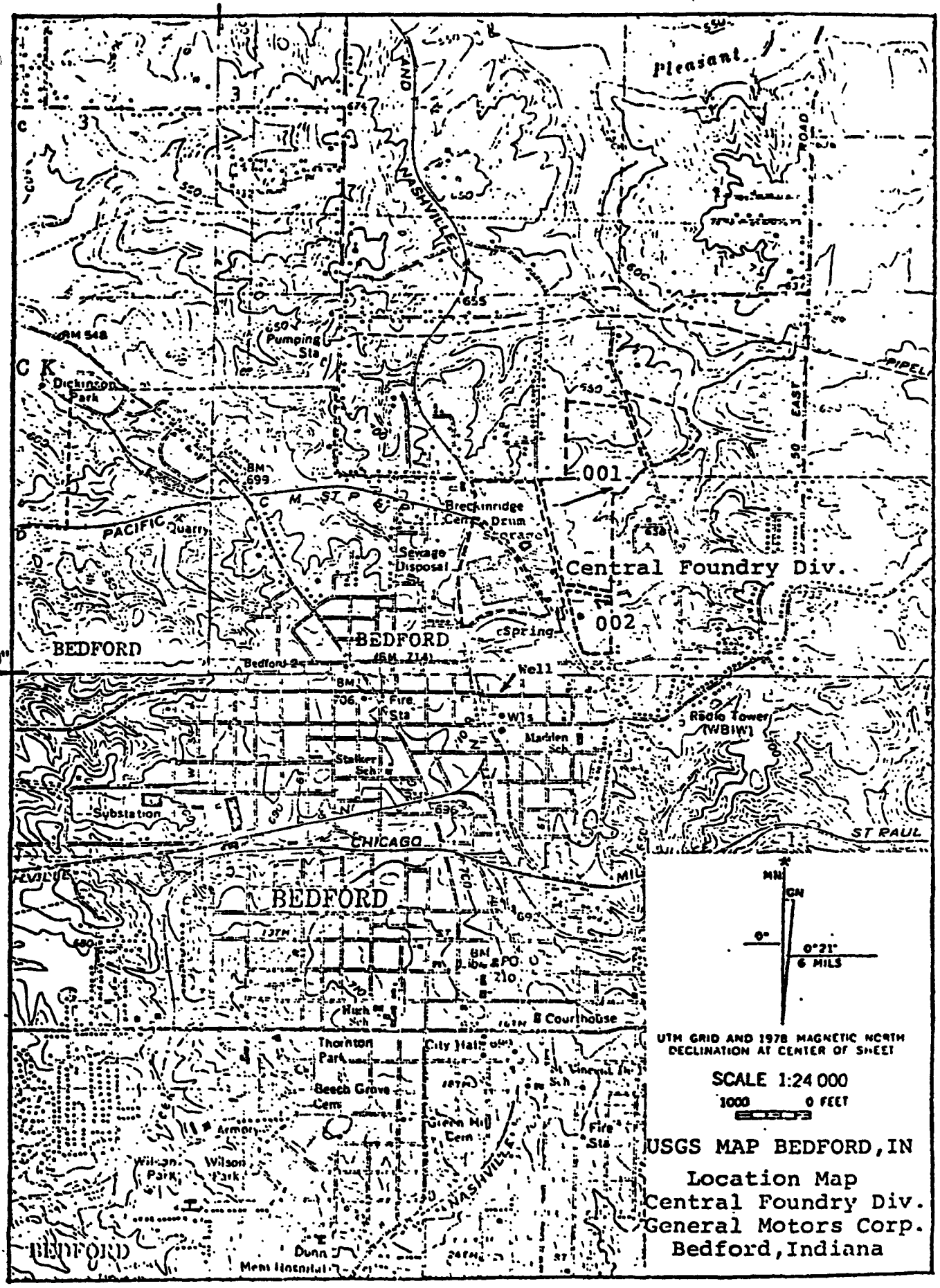
Aluminum Casting Facility

CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
R. Wiltse, General Manager	R Wiltse	11-17-80

COMMENTS FOR OFFICIAL USE ONLY



USGS MAP BEDFORD, IN

Location Map
Central Foundry Div.
General Motors Corp.
Bedford, Indiana

X. Existing Environmental Permits (Continued)

e. Others

PC (47) 1370	State Air Construction Permit
47-07-82-0047	State Air Operation Permit
47-07-82-0055	State Air Operation Permit

FORM 3 RCRA

U.S. ENVIRONMENTAL PROTECTION AGENCY

HAZARDOUS WASTE PERMIT APPLICATION

Consolidated Permits Program

(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER: I N D 0 0 6 0 3 6 0 9 9 1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

I. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility, or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

[X] 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

FOR EXISTING FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

YR.	MO.	DAY
7 7	0 7	2 2

[ ] 2. NEW FACILITY *(Complete item below.)*

FOR NEW FACILITIES, PROVIDE THE DATE (yr., mo., & day) OPERATION BEGAN OR IS EXPECTED TO BEGIN

YR.	MO.	DAY

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

[ ] 1. FACILITY HAS INTERIM STATUS

[ ] 2. FACILITY HAS A RCRA PERMIT

II. PROCESSES – CODES AND DESIGN CAPACITIES

A. PROCESS CODE – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. PROCESS DESIGN CAPACITY – For each code entered in column A enter the capacity of the process.

1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT	B. PROCESS DESIGN CAPACITY 2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
1		~~154,000~~ 5,500	G	
2				
3				
4				
5				
6				
7				
8				
9				
10				

DUP | T/A: C | 1

EPA Form 3510-3 (6-80)

E. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES (code "T04"). FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

V. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number(s) from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
   For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
   For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in Item III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.
   Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (If a code is not entered in D(1))
X1	K 0 5 4	900	P	T 0 3 D 8 0	
	D 0 0 2	400	P	T 0 3 D 8 0	
X3	D 0 0 1	100	P	T 0 3 D 8 0	
X4	D 0 0 2				included with above

tinued from page 2.

TE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S00004

EPA I.D. NUMBER (enter from page 1)			FOR OFFICIAL USE ONLY		
I N D 0 0 6 0 3 6 0 9 9	T/A	C	W	T/A	C
		1	DUP	2	DUP

DESCRIPTION OF HAZARDOUS WASTES (continued)

NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)	D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
	D 0 0 1	1	T	S 0 1	
	D 0 0 2	19	T	S 0 1	

. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

EPA I.D. NO. *(enter from page 1)*

												T/A	C
I	N	D	0	0	6	0	3	6	0	9	9		6

FACILITY DRAWING

existing facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

PHOTOGRAPHS

l existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, atment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
38 52 43 N	086 29 04 W

I. FACILITY OWNER

A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & n*

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
	C G		

OWNER CERTIFICATION

rtify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached uments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the mitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, luding the possibility of fine and imprisonment.

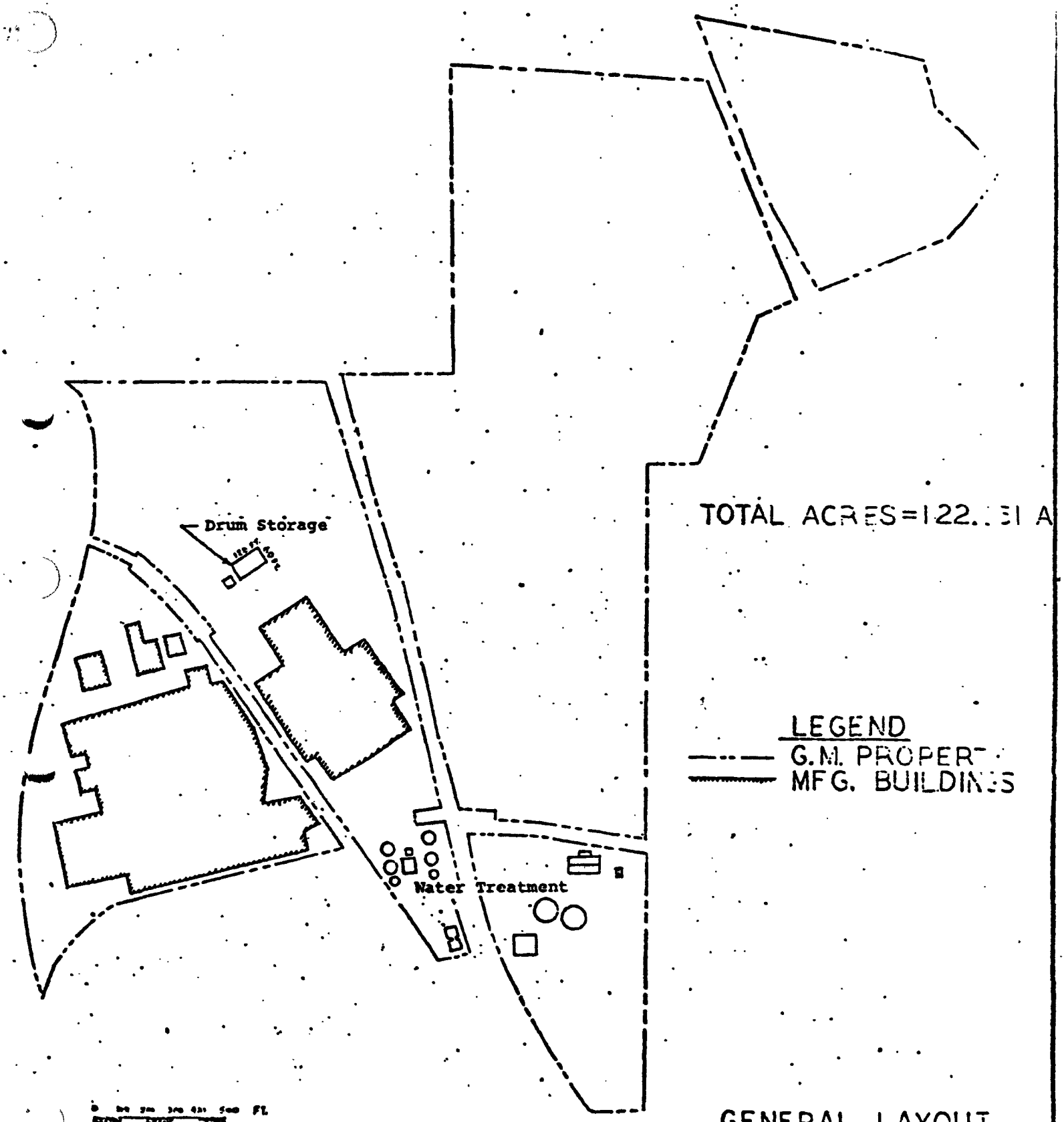
NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
?. R. Wiltse, General Manager	R Wiltse	11-17-80

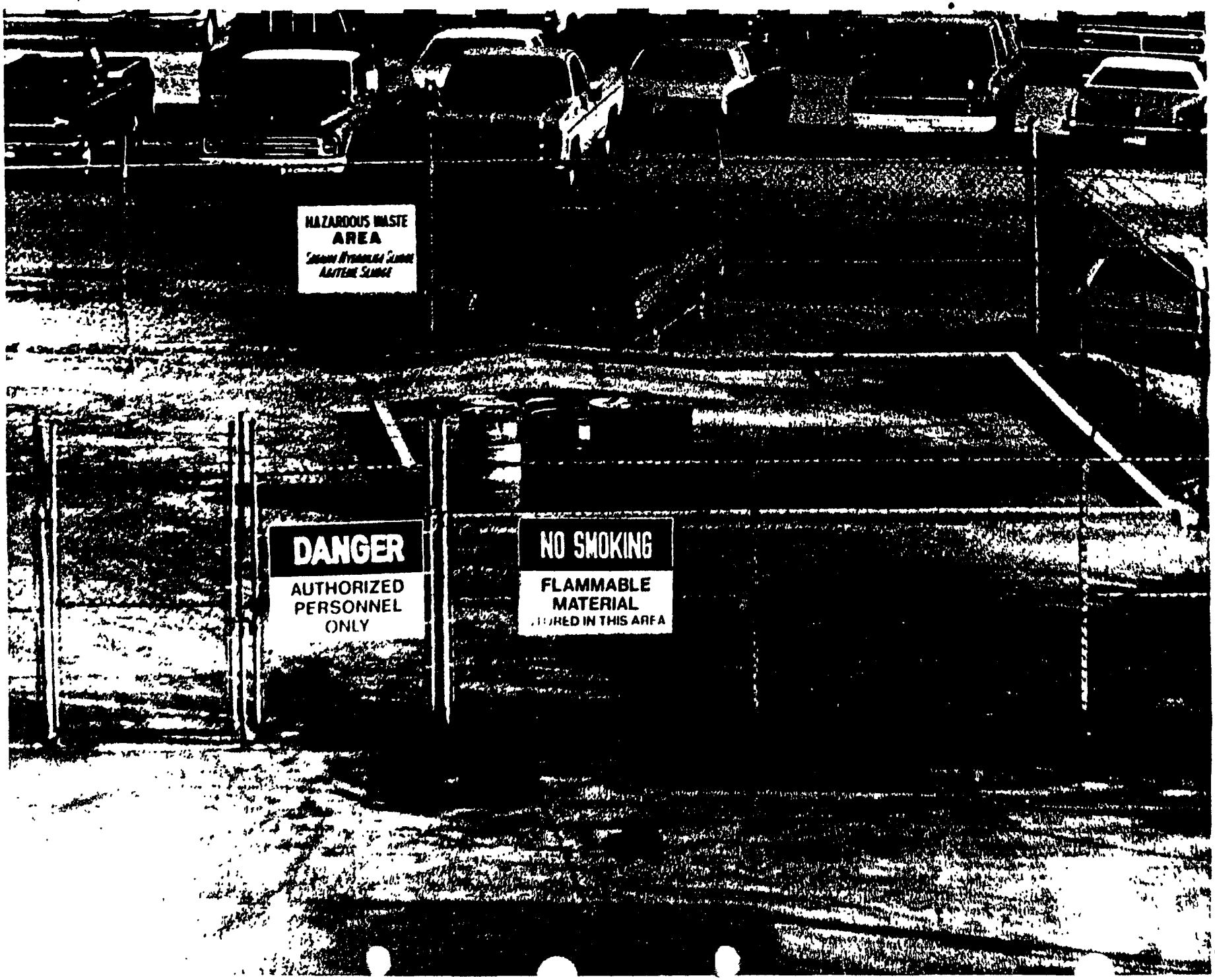
OPERATOR CERTIFICATION

rtify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached uments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the ted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, ..ing the possibility of fine and imprisonment.

NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
N/A		

V. FACILITY DRAWING *(see page 4)*




HAZARDOUS WASTE
AREA
DANGER
AUTHORIZED
PERSONNEL
ONLY
NO SMOKING
FLAMMABLE
MATERIAL

SECTION 2

PART B PERMIT APPLICATION-GENERAL INFORMATION

40 CFR 122.25(a)

General Description (40 CFR 122.5(a)(1))

The GMC-Central Foundry Division, Bedford Plant is a manufacturer of automotive aluminum castings, such as transmission cases, pistons, air condition housings and intake manifolds. The processes used to produce these products include die casting, permanent and semi-permanent molding.

The plant stores two hazardous waste on site which are:

1) Sodium hydroxide sludge (solid) which is hazardous due to its corrosivity (pH).

2) Agitene fluid which is a non-chlorinated petroleum distillate cleaning solvent which is hazardous due to its ignitability.

The above hazardous wastes are stored, prior to shipping off site for disposal, within a designated area (approximately 20' x 30') of the plants drum storage area. This area has additional containment to accomodate the storage of this waste.

Chemical and Physical Analyses (40 CFR 122.5(a)(2))

Analyses of the two hazardous wastes stored at the plants hazardous waste facility, sodium hydroxide sludge and agitene fluid are shown on the following pages. These analyses were conducted in accordance with the plants procedure no. 532-12 "Plan for Analysis of RCRA Hazardous Waste". More detail on the procedure and the plants hazardous waste plan can be obtained from the next section.

DISPLAY G.M. MATERIAL SAFETY DATA SHEET?

- FID : 064587 -

(P) REGULAR AGITENE
AGITENE

MANUFACTURER INFORMATION

(*) MID:#501829
GRAYMILLS CORP
EMERGENCY TELEPHONE #: 312/477-4100
3705 N LINCOLN AVE
CHICAGO, IL 60613

FORMULA INFORMATION

OWNER LAST UPDATE DATE : 112282
FORMULA STATUS : Incomplete
MSDS ON FILE IN CSIS : Yes

SHIPPING INFORMATION

SID #04440 Name: COMBUSTIBLE LIQUID,N.O.S.
Hazard Class: Combustible Liquid
U.N. Code: NA1993
Flash Point : = 110 DEGREES F

INGREDIENTS

CAS#	Formulation	Chemical Name
034590948	= .5%	Propanol, (2-methoxymethylethoxy)-
008002742	= 60%	Hard paraffin
000091203	= 30%	Naphthalene

SECTION 0 -- EFFECTIVE & LAST UPDATE DATES, COMMENTS

1 -->Effective Date : 010177 Last Date Updated : 012981
2 -->Comments :

SECTION 1 -- SHIPPING INFORMATION

1 -->Chemical Family : PETROLEUM NAPTHAS
2 -->Formula :

SECTION 3 -- PHYSICAL DATA

1 -->Boiling Point : 318-388F
2 -->Specific Gravity : .78
3 -->Vapor Pressure : 2.4
4 -->% Volatile by Volume : 98
5 -->Vapor Density : 4.8
6 -->Evaporation Rate : 35 MIN
7 -->Solubility in H2O : NONE
8 -->pH :
9 -->Appearance & Odor : CLEAR BLUE - MILD NAPHA ODOR

SECTION 4 -- FIRE AND EXPLOSION DATA

1 -->Flammable Limits - LEL : 1.0%
2 -->Flammable Limits - UEL : 6.0%
3 -->Extinguishing Media : CO2
4 -->Special Fire Fighting Procedures : NORMAL (LIQUID)
5 -->Unusual Fire & Explosion Hazards : NONE

SECTION 5 -- HEALTH HAZARD DATA

1 -->Effects of Overexposure : MAY CAUSE SKIN AND EYE IRRITATION
2 -->Threshold Limit Value : 500 PPM
3 -->Permissible Exposure Limit :
4 -->Emergency First Aid Procedures : SKIN IF CHAPPED, USE LANOLIN CREAM. EYE CONTACT - FLUSH WITH WATER. INHALATION - GET FRESH AIR. DO NOT INDUCE VOMITING IF SWALLOWED.

SECTION 6 -- REACTIVITY DATA

1 -->Stable : Y
2 -->Conditions to Avoid :
3 -->Incompatible Materials :
4 -->Hazardous Decomposition Products :
5 -->Can Hazardous Polymerization Occur : N
6 -->Conditions to Avoid :

SECTION 7 -- SPILL OR LEAK PROCEDURES

1 -->Steps to be taken in case material is released or spilled : USE OILY DRY
2 -->Waste Disposal Method : REFER TO LOCAL REGULATIONS, SCAVENGER SERVICE RECOMMENDED.

SECTION 8 -- SPECIAL PROTECTION INFORMATION

1 -->Respiratory Protection : NONE
2 -->Local Exhaust : IN SAME ROOM
3 -->Special : NONE
4 -->Mechanical :
5 -->Other :
6 -->Protective Gloves : POLYETHYLENE
7 -->Eye Protection : SAFETY GLASSES
8 -->Other Protective Equipment : GLOVES NOT NEEDED FOR INTERMITTANT USE.

SECTION 9 -- SPECIAL PRECAUTIONS

1 -->Precautions to be taken in Handling & Storage : STORE IN COOL AREA AWAY FROM HEAT OR OPEN FLAME.
2 -->Other Precautions :

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

PLAN FOR ANALYSIS OF RCRA HAZARDOUS WASTES

Proc. No. 532-12
Date Issued 3-20-82
Date Revised 11-30-83
Date Revised
Date Revised

PURPOSE

Provide a procedure for the chemical and physical analysis of the hazardous waste generated by the Bedford Plant as required by Federal and State Regulations (Federal Regulations 40 CFR, Part 265.13, and State Regulation 320 IAC 4-9-2).

SCOPE

Plan for chemical and physical analysis of the sodium hydroxide and agitene sludges which are classified as hazardous under provisions of the Resource Conservation and Recovery Act.

PROCEDURE

1.0 General Waste Analysis Requirements

1.1 All hazardous waste must be analyzed for chemical and physical properties before it is treated, stored or disposed.

1.2 The analysis must contain information that must be known to treat, store or dispose of the waste in accordance with requirements of Federal Regulation 40 CFR, Part 261.

1.3 The analysis may include analysis performed on this waste prior to the effective date of the RCRA regulations or studies conducted on the hazardous waste or wastes from a similar process. Also, may refer to GM safety data sheet for added information.

*1.4 The analysis must be, at a minimum, be repeated annually or when the process generating the waste has been changed.

*2.0 Hazardous Waste Analysis, Rationale and Parameters

*2.1 Sodium Hydroxide Sludge

*2.1.1 This waste has a pH value greater than 12.5 when the material is placed in solution making it a corrosive waste.

*2.1.2 Distilled water is added to the waste until it becomes aqueous. The pH is of the solution is then conducted following the EPA manual SW 846, section 5.

*2.2 Agitene Cleaning Solvent

*2.2.1 This waste is ignitible. The solvent as received has a flash point of 110° F.

*2.2.2 Flash point analysis is to be completed on the material following the quidelines in EPA manual SW 846, Section V using a Pensky-Martens closed cup tester.

3.0 Sampling Method

3.1 Sodium hydroxide sludge. This material is placed in DOT approved drums and stored in the plant approved hazardous waste storage area while awaiting shipment to an approved disposal site.

3.1.1 A good representative sample is to be obtained for analysis.

3.1.2 The sample collector will use a clean trowel or waste pile sampler for removing the sample material from the drum. Collect material from below the top surface. Place samples in a clean stainless steel container and mix in order to obtain a composite sample for laboratory analysis. Place composite samples in clean glass or stainless steel container with cap.

3.1.3 Mark and identify sample with label that lists the following information:

Collector
Sample Number
Place of Collection
Date Samples
Time Sampled
Field Information

3.2 Agitene fluid and sludge waste. This material is placed in an approved DOT drum per the Maintenance Department procedure Number 534-41.

3.2.1 Use a glass tube or a composite liquid waste sampler to obtain a representative sample of material from the drum or drums.

3.2.2 Follow the sampling methodology described in the EPA Manual SW 846, Section 3.0 and Subsections.

3.2.3 Mark and identify sample with label that lists the following information:

Collector
Place of Collection
Date Sampled
Time Sampled
Field Information

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

PLAN FOR ANALYSIS OF RCRA HAZARDOUS WASTES

Proc. No. 532-12
Date Issued 3-20-82
Date Revised 11-30-83
Date Revised
Date Revised

4.0 Other plant wastes are to be added to this procedure if and when the Federal Resource Conservation and Recovery Act (RCRA) and State Regulation is revised to classify those waste materials as being hazardous.

REVISED BY:

Wm S Schoonmaker 12/1/83
W. S. Schoonmaker Date
Environmental Engineer

APPROVED BY:

W. A. Butler 12-1-83
W. A. Butler Date
Superintendent
Plant Engineering

Date

* Indicates Revised Portion

TenEch
Environmental Consultants, Inc.
Mark W. Tenney, Sc.D., P.E.
Joseph L. Pavoni, Ph.D., P.E.

October 3, 1978
Louisville, Kentucky

Central Foundry Division
General Motors Corporation
Bedford Plant
Bedford, Indiana

ATTN: Gary Bowman

Re: Analysis of Sludge Sample

Sample Type - Solid Waste
Date Received - 9-15-78

LABORATORY ANALYSIS RESULTS

Parameter	Results	Date Analyzed	Method of Analyses
...ent solids	99.92%	9-16-78	Gravimetric
pH	13.49	9-16-78	Electrometric
COD	2 mg/l	9-16-78	Dichromate/reflux
Silica (SiO_2)	None detected	9-16-78	Molybdosilicate
Total chromium	0.0009034% by weight	9-21-78	Atomic absorption
Cadmium	0.0001982% by weight	9-25-78	Atomic absorption
Nickel	0.0029921% by weight	9-21-78	Atomic absorption
Zinc	0.0059963% by weight	9-25-78	Atomic absorption
Iron	0.0011553% by weight	9-21-78	Atomic absorption
Copper	0.0000780% by weight	9-25-78	Atomic absorption
Lead	0.0091723% by weight	9-25-78	Atomic absorption
Manganese	0.0001619% by weight	9-21-78	Atomic absorption

CENTRAL FOUNDRY - BEDFORD PLANT LAB ANALYSIS

Sample I.D. RCRA-1 (Kolene Sludge)

Date Received 7-26-82

Date Reported 8-6-82

Corrosivity	pH - 13.7
EP Toxicity	
Arenic	1.42 PPM
Barium	0.22 PPM
Cadmium	Not Detected
Chromium	.016 PPM
Selenium	Not Detected
Silver	Not Detected
Lead	0.48 PPM

Sample I.D. RCRA-2 (Agitene Sludge)

Date Received 7-26-82

Dated Reported 8-6-82

Ignitability	200° F*

*Agitene fluid, when purchased, has a flash point of 105° F. Therefore, waste agitene fluids could have a flash less than 140° F.

Waste Analysis Plan (40 CFR 122.5(a)(3))

The plant has incorporated the requirements of 40 CFR 264.13(b) for a waste analysis plan into a procedure. This procedure numbered 532-12 "Plan for Analysis of RCRA Hazardous Wastes" is shown on the following pages.

PURPOSE

Provide a procedure for the chemical and physical analysis of the hazardous waste generated by the Bedford Plant as required by Federal and State Regulations (Federal Regulations 40 CFR, Part 265.13, and State Regulation 320 IAC 4-9-2).

SCOPE

Plan for chemical and physical analysis of the sodium hydroxide and agitene sludges which are classified as hazardous under provisions of the Resource Conservation and Recovery Act.

PROCEDURE

1.0 General Waste Analysis Requirements

1.1 All hazardous waste must be analyzed for chemical and physical properties before it is treated, stored or disposed.

1.2 The analysis must contain information that must be known to treat, store or dispose of the waste in accordance with requirements of Federal Regulation 40 CFR, Part 261.

1.3 The analysis may include analysis performed on this waste prior to the effective date of the RCRA regulations or studies conducted on the hazardous waste or wastes from a similar process. Also, may refer to GM safety data sheet for added information.

1.4 The analysis must be repeated when the process generating the waste has been changed.

2.0 Hazardous Wastes and Parameters to be Analyzed

2.1 Sodium Hydroxide Sludge

2.1.1 ph as determined by following the EPA Manual SW 846, Section 5 and Subsection guidelines.

2.2 Agitene cleaning solvent waste

2.2.1 Flash point as determined by following the guidelines in EPA Manual SW 846, Section 4 and Subsection guidelines.

3.0 Sampling Method

3.1 Sodium hydroxide sludge. This material is placed in DOT approved drums and stored in the plant approved hazardous waste storage area while awaiting shipment to an approved disposal site.

3.1.1 A good representative sample is to be obtained for analysis.

3.1.2 The sample collector will use a clean trowel or waste pile sampler for removing the sample material from the drum. Collect material from below the top surface. Place samples in a clean stainless steel container and mix in order to obtain a composite sample for laboratory analysis. Place composite samples in clean glass or stainless steel container with cap.

3.1.3 Mark and identify sample with label that lists the following information:

Collector
Sample Number
Place of Collection
Date Sampled
Time Sampled
Field Information

3.2 Agitene fluid and sludge waste. This material is placed in an approved DOT drum per the Maintenance Department procedure Number 534-41.

3.2.1 Use a glass tube or a composite liquid waste sampler to obtain a representative sample of material from the drum or drums.

3.2.2 Follow the sampling methodology described in the EPA Manual SW 846, Section 3.0 and Subsections.

3.2.3 Mark and identify sample with label that lists the following information:

Collector
Place of Collection
Date Sampled
Time Sampled
Field Information

STANDARD PROCEDURE

PLAN FOR ANALYSIS OF RCRA HAZARDOUS WASTES

4.0 Other plant wastes are to be added to this procedure if and when the Federal Resource Conservation and Recovery Act (RCRA) and State Regulation is revised to classify those waste materials as being hazardous.

PREPARED BY: G R. Ahl Date 2-10-82

Approved By: W. A. Butler Date 3/17/82

_____ Date _____

PURPOSE

Provide a procedure for the chemical and physical analysis of the hazardous waste generated by the Bedford Plant as required by Federal and State Regulations (Federal Regulations 40 CFR, Part 265.13, and State Regulation 320 IAC 4-9-2).

SCOPE

Plan for chemical and physical analysis of the sodium hydroxide and agitene sludges which are classified as hazardous under provisions of the Resource Conservation and Recovery Act.

PROCEDURE

1.0 General Waste Analysis Requirements

1.1 All hazardous waste must be analyzed for chemical and physical properties before it is treated, stored or disposed.

1.2 The analysis must contain information that must be known to treat, store or dispose of the waste in accordance with requirements of Federal Regulation 40 CFR, Part 261.

1.3 The analysis may include analysis performed on this waste prior to the effective date of the RCRA regulations or studies conducted on the hazardous waste or wastes from a similar process. Also, may refer to GM safety data sheet for added information.

1.4 The analysis must be repeated when the process generating the waste has been changed.

2.0 Hazardous Wastes and Parameters to be Analyzed

2.1 Sodium Hydroxide Sludge

2.1.1 ph as determined by following the EPA Manual SW 846, Section 5 and Subsection guidelines.

2.2 Agitene cleaning solvent waste

2.2.1 Flash point as determined by following the guidelines in EPA Manual SW 846, Section 4 and Subsection guidelines.

2.3 Chip System Residue

2.3.1 EP toxicity test for lead as determined by following the guidelines in EPA Manual SW 846, Section 4 and Subsection guidelines

*1:

3.0 Sampling Method

3.1 Sodium hydroxide sludge. This material is placed in DOT approved drums and stored in the plant approved hazardous waste storage area while awaiting shipment to an approved disposal site.

3.1.1 A good representative sample is to be obtained for analysis.

3.1.2 The sample collector will use a clean trowel or waste pile sampler for removing the sample material from the drum. Collect material from below the top surface. Place samples in a clean stainless steel container and mix in order to obtain a composite sample for laboratory analysis. Place composite samples in clean glass or stainless steel container with cap.

3.1.3 Mark and identify sample with label that lists the following information:

Collector
Sample Number
Place of Collection
Date Sampled
Time Sampled
Field Information

3.2 Agitene fluid and sludge waste. This material is placed in an approved DOT drum per the Maintenance Department procedure Number 534-41.

3.3 Chip system residue. This material is to be placed into a specially marked container and stored in accordance with the plant procedure No. 533-32

3.3.1 A good representative sample is to be obtained for analysis.

3.3.2 The samle collector shall placed into a clean glass container with a cap for laboratory analysis.

3.3.3 Mark and identify sample with label that list the following information.

Collector
Sample Number
Place of Collection
Date Sampled
Time Sampled
Field Sampled

*Ind (

4.0 Other plant wastes are to be added to this procedure if and when the Federal Resource Conservation and Recovery Act (RCRA) and State Regulation is revised to classify those waste materials as being hazardous.

PREPARED BY: S.R. Ohl Date 2-10-82

Approved By: W.A. Butler Date 3/17/82

_____ Date _____

Security Procedures (40 CFR 122.5(a)(4))

The plant has a 24 hour surveillance which is maintained by security guards. The guards control all entry and exiting of persons to the plant. The plant's perimeter is secured with chain link fence and barb wire.

In addition to the above, the hazardous waste drum storage facility has additional fencing and gates which are monitored by direct line of sight from the guard house, and/or with television monitors.

Signs are also posted on the fence in drum storage areas which state, "Danger - Unauthorized Personnel Keep Out" and "No Smoking - Flammable Fluids". Another sign is posted in the hazardous waste designated storage area which states that hazardous wastes are stored in that area.

Inspection Schedule (40 CFR 122.5(a)(5))

Inspections of the hazardous waste drum storage facility are conducted in accordance with the plants procedure no. 533-23 entitled "Resource Conservation and Recovery Act Inspection Schedule".

This proceudre as shown on the following pages sets forth those requirements established under 40 CFR 264.15 and 274.174. This procedure establishes inspection frequency, observation requirements, corrective actions and recordkeeping.

F GENERAL MOTORS
PLANT
FORD, INDIANA

STANDARD PROCEDURE

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) INSPECTION SCHEDULE

Proc. No. 533-23 20
Date Issued 5-17-81
Date Revised
Date Revised
Date Revised

PURPOSE:

This inspection is being done to comply with requirements of Federal Regulation 40 CFR265-15 and 40 CFR264-15.

SCOPE:

Drum storage area for plant wastes listed per RCRA requirements.

RESPONSIBILITY:

Material Control.

PROCEDURE:

1.0 Area/facilities to be inspected.

1 INSPECTION PLAN Semi-Permanent Mold building for

1.2 Melting metal storage building for the storage of Chip system residue.

2.2 Loading/unloading

3.0 Problems to look for.

3.1 Drums stored/stacked improperly.

3.2 Drums improperly labeled.

3.3 Drums deteriorated or leaking.

3.4 Drums open.

3.5 Drums missing or added without documentation.

4.0 Corresponding corrective action for problems under 3.0 above.

4.1 Restack or relocate drums.

4.2 Affix proper label.

4.3 Transfer contents into another container, clean up spill, put spilled material and clean up material into approved container. Dispose of defective drum in approved disposal facility.

4.4 Affix lid or replace bungs.

4.5 Note drum count, verify count and investigate differences.

5.0 Records.

5.1 Record inspection on log sheet, form 533-23A.

5.3 Keep log sheets on file in Material Control Department at least three (3) years.

PREPARED BY:

G. R. Ohl 5-17-81
G. R. Ohl Date
Environmental Coordinator

APPROVED BY:

RG Simmerman 5/28/81
R. G. Simmerman Date
General Supervisor
Material Control

A. L. Snook 5/29/81
A. L. Snook Date
Superintendent
Industrial Engineering

SODIUM HYDRO SLUDGE AND AGITENG SLUDGE

INSPECTION DATE & TIME	NAME OF INSPECTOR	DAILY INSPECTION: COUNT NO. OF DRUMS	DAILY INSPECTION: STORAGE PROPER? YES	DAILY INSPECTION: STORAGE PROPER? NO	WEEKLY INSPECTION: DRUMS OPEN? YES	WEEKLY INSPECTION: DRUMS OPEN? NO	WEEKLY INSPECTION: DRUM CONDITION OK	WEEKLY INSPECTION: DRUM CONDITION NO	WEEKLY INSPECTION: DRUMS LEAKING? YES	WEEKLY INSPECTION: DRUMS LEAKING? NO	WEEKLY INSPECTION: LABELS OK? YES	WEEKLY INSPECTION: LABELS OK? NO	NATURE OF REPAIRS OR OTHER REMEDIAL ACTION	DA REP ACTI
					SAMPLE									

Waiver of Preparedness and Prevention (40 CFR 122.5(a)(6))

The plant requested a waiver from 40 CFR 264.37 - arrangements with local authorities. The justification for this request follows:

> The plant has all the necessary equipment, facilities and personnel to respond to any emergencies which may involve the two hazardous wastes stored at the plant. The two wastes are (1) sodium hydroxide sludge which is a solid with a pH above 12 and (2) agitene sludge which is ignitable.

Contingency Plan (40 CFR 122.5(a)(7))

The requirements of Subpart D - Contingency Plan and Emergency Procedures have been incorporated into the plants Spill Prevention, Control, and Countermeasures (SPCC) Plan by an amendment to the SPCC plant procedure no. ECS-14. The full procedure with amendment is shown on the following pages.

Waiver of Preparedness and Prevention (40 CFR 122.5(a)(6))

The plant requests a waiver from 40 CFR 264.37 - arrangements with local authorities. The justification for this request follows.

The plant has all the necessary support groups and equipment available to respond to any hazardous waste problems or emergency situation which may arise. The plant has the following support groups:

1. A 32 member fire brigade consisting of maintenance, security and supervisory personnel. These persons under the direction of the plant Security Chief receive monthly training. The training consists of classroom and hands-on training in fighting class A, B, C and D fires.

2. A completely equipped medical department staffed 24 hours per day. The medical department personnel consists of 4 nurses, 1 doctor and the plant Safety Director.

3. A 10 member security force, which maintain 24 hour surveillance of the plant. Security controls all entry and exiting of persons to the plant. The hazardous waste drum storage facility is monitored by direct line of sight from the guardhouse and additionally by television monitors.

Contingency Plan (40 CFR 122.5(a)(7)

The requirements of Subpart D - Contingency Plan and Emergency Procedures have been incorporated into the plants Spill Prevention, Control, and Countermeasures (SPCC) Plan by an amendment to the SPCC plant procedure no. ECS-14. The full procedure with amendment is shown on the following pages.

Central Foundry

ISION OF GENERAL MOTORS
DFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN

Proc. No. ECS-14
Date Issued 6-01-77
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 1 of 15

1. OIL SPILL PREVENTION

1.1 Central Foundry Division
General Motors Corporation
Bedford, IN 47421

1.2 Plant began operation - 1959

1.3 Registered Engineers Certification

JAMES E. HOON REGISTERED NO. 12585 STATE OF INDIANA PROFESSIONAL ENGINEER

Certified By: James E. Hoon Date 3/17/82

Approved By:

R. W. Herr Date 3-18-82
*R. W. Herr
Plant Manager

P. J. Murphy Date 3/18/82
P. J. Murphy
Manager of Plant Engineering & Maintenance

W. A. Butler Date 3/18/82
W. A. Butler
Superintendent of Plant Engineering

* Indicates Revised Portion

Central Foundry
DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN

Proc. No. ECS 14
Date Issued 6-1-74
Date Revised 5-10-78
Date Revised
Date Revised
Page 2 of 15

CERTIFICATION

I have reviewed the Spill Prevention Control and Counter-Measure Plan for (GM Plant) attached. The facility has been examined and being familiar with the provisions of Part 112, Oil Pollution Prevention, Chapter 1, Environmental Protection Agency, Subchapter D, Water Programs, as published in the Federal Register, Vol. 38, No. 237, Tuesday, December 11, 1973, I certify that the SPCC plan has been prepared in accordance with good engineering practices.

2. GENERAL INFORMATION

2.1 Plot Plan attached.

2.2 Existing Containment Facilities:

2.2.1 Fuel Oil Storage System

2.2.1.1 The fuel oil storage facility is a 200,000 gallon, 22 ft. high and 40 ft. in diameter tank. This tank is made from carbon steel and rests on a 42 ft. concrete pad, 15" in depth with reinforced steel bars. This facility is marked (A) on plot plan.

2.2.1.2 A 6 ft. high concrete circular moat surrounds the tank to contain all liquid spillage that might occur in case of tank rupture. This moat can be drained by a sump pump installed in the system.

2.2.1.3 The fuel oil distribution system is composed of 3" supply and 2 1/2" return lines. Any major line leak will create a pressure loss which will de-energize the pump control circuit. In the case of pencil thin leaks when the pressure loss is not sufficient to de-energize the circuit, clearly identified emergency shutoff buttons are placed at four locations in the Melting Department.

2.2.2 Hydraulic Fluid Losses During Production Equipment Operation

2.2.2.1 Hydraulic fluid which mixes with oil is used in the operation of the plant's die casting machines, trim presses, and permanent mold machines. Oil that leaks from this equipment drains into the drainage system located under the machines.

2.2.2.2 This leakage is captured in a series of tunnels and diverted to the plant's primary water treatment system. This is mechanically capable of reclaiming all of the most drastic spill and returning it to plant use. In the event traces of hydraulic fluid get past the primary system there is a backup secondary treatment system, chemically treating the water.

2.2.2.3 After the secondary system, there is a concrete holding basin which holds 300,000 gallons. This basin is divided to allow trapping and retaining a spill.

2.2.3 Miscellaneous Bulk Storage Facilities

2.2.3.1 Marked "D" on plot plan - two 3,000 gallon each steel tanks above grade and containing isocyanide 307 resins (isocure). Specific gravity is heavier than water, and the material is toxic and flammable.

2.2.3.2 Deleted

2.2.3.3 Marked "E" on plot plan - one 2,000 gallon steel tank containing no lead gasoline. Tank is located below grade.

2.2.3.4 Marked "F" on plot plan - one 10,000 gallon steel storage tank below grade containing regular gasoline.

2.2.3.5 Marked "J" on plot plan - one 5,000 gallon steel tank above grade and used as storage for water glycol hydraulic fluid.

2.2.3.6 Marked "K" on plot plan - one 10,000 gallon steel tank above grade, used as storage for mineral base die lube.

*2.2.3.7 Marked "L" on plot plan - one 10,000 gallon steel tank above grade. Storage for light oils from clarithickners.

*2.2.3.8 Marked "M" on plot plan - water treatment plant consisting of two 100,000 gallon concrete submerged clarithickners. Four

central foundry

ISION OF GENERAL MOTORS
FORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN
(SPCC)

Proc. No. ECS-14
Date Issued 6-01-74
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 5 of 15

2.2.3.8 (Continued)

100,000 gallon concrete submerged clarifier Two 40,000 gallon concrete submerged sludge thickner. One 130,000 gallon steel tank above grade used as filter press effluent surge tank. One 20,000 gallon concrete tank for oil and sludge separation

2.2.3.9 Marked "N" on plot plan - one 300,000 gallon concrete holding basin below grade. This basin holds treated water to final filtration.

*2.2.3.10 Marked "P" on plot plan - 7 steel storage tanks with total capacity of 150,000 gallons storing used phosphate ester hydraulic fluid. All tanks are surrounded by earthen dike.

*2.2.3.11 Marked "Q" on plot plan - 14 steel storag tanks with total capacity of 157,500 gallons storing used phosphate ester hydraulic fluid. All tanks are surrounded by earthen dike.

2.2.3.12 Marked "R" on plot plan - one 2,000,000 gallon sludge holding lagoon. Dormant at time time awaiting final disposition of sludge.

2.2.3.13 Marked "S" on plot plan - two 5,000 gallon steel tanks, storing new phosphate ester hydraulic fluid.

2.2.3.14 Marked "U" on plot plan - one 10,000 gallon fiberglass tank storing brine used for water softener regeneration.

2.2.3.15 Marked "V" on plot plan - one 2,000 gallon tank and one 500 gallon tank holding mineral electrolytic fluid used for EDM machining.

2.2.3.16 90,000 gallons of phosphate ester hydraulic fluid is contained in power units throughc the plant.

*2.2.3.17 Marked "T" on plot plan - eight steel storage tanks with total capacity of 32,000 gallons storing used phosphate ester hydraulic fluid. All tanks are surrounded by earthen dike.

2.2.3.18 Marked "W" on plot plan - two 1,000,000 gallon steel storage tanks to store phosphate ester hydraulic fluids and waste water sludges. Tanks are surrounded by earthen dike.

*2.2.3.19 Marked "X" on plot plan - three 20,000 gallc tanks for hydraulic fluid. Tanks are surrounded by concrete dike.

*2.2.4 Containment Facilities

2.2.4.1 Tanks marked "A", "D", "I", "J", "K", "L", "P", "Q", "S", "T", "U" "V" and "W" are located above ground. Tanks "A", "K", "J", "L" and "X" are surrounded with a concrete wall. Tanks "P", "Q", "T" and "W" are surrounded by earthen dikes. Leaks in these tanks would be contained by existing dikes. Tanks "D", "I", "K", "J", "L", "S", "V" and "X" are visible and in event of leaks, the fluid leaking would be diked using sand or absorbing material and the diked fluid would be disposed of by standard methods. Tank "U contains salt and water, as such is not a serious pollutant, however, a spill from thi tank would be contained inside the building that houses it (Shipping Building).

2.2.4.2 Tanks "E", "F", "H" "M" and "N" are located below ground level. Tanks "E" and "F" have fluid levels periodically checked to determine subterain leaks, should leaks develop. Tanks in areas "H" and "M" are monitored to protect against overflow. Tank "N" contains treated water.

2.2.4.3 Electrical Sub-Station Containment

All overhead electrical substations (Sub "A" and Sub "L") with transformers containing fluid have a curbed slab under the substatio

*2.2.5 Hazardous Waste Management Facilities (See Attachment 1; "Amendment to Procedure Number ECS-14".

2.3 Inspection, Testing and Maintenance Procedures:

2.3.1 Bulk Storage Above Ground

2.3.1.1 The Bedford plant has a 200,000 gallon fuel oil storage tank surrounded by a retention wall. The fluid level is checked each time material is added to the tank. The tank, retaining walls, and distribution system are inspected twice a year. The preventive maintenance program also included changing the oil filters yearly.

2.3.1.2 The tank is made from carbon steel and complies with ARI Specifications #650, UL Bul. #142, NEPA Bul. #30 and OSHA. It has also been given additional corrosion resistance with a double primer and a metallic overcoat.

2.3.1.3 One 10,000 gallon vertical hydraulic fluid storage tank shown on included Bedford Plant layout would leak toward the water treatment plant if a leak accidently developed. In this area, the spread of fluid can be controlled on plant property. These tanks are observed and used daily and are inspected twice a year.

2.3.3 Underground Systems

2.3.3.1 In the fuel oil distribution system, all piping 2 1/2" and above is schedule 40 black welded piping, wrapped with plastic for underground use and corrosion protection. In the case of a major line leak, the pressure loss will de-energize the circuit pump. Emergency shutoff buttons are placed at four locations in the plant if a smaller leak develops which is not sufficient to de-energize the system.

2.3.3.2 Hydraulic fluid, used in the operation of the plant's die casting machines and trim presses, leak into a series of tunnels and is directed to a water treatment system. There is a continuing leak detection and prevention program in the Maintenance Department for all of this equipment.

Central Foundry

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN
(SPCC)

Proc. No. ECS-14
Date Issued 6-1-74
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 8 of 15

*2.4 Spill Definition

2.4.1 The definition is to conform to the Environmental Protection Agency regulations on discharge of oil (40 CFR 110 36 FR 22487, November 25, 1971), and specifically to section 110.3, "Discharge into Navigable Waters Harmful." Generally described as - Discharges of such quantities of oil and other hazardous materials into or upon the navigable waters of the United States of adjoining shore lines determined to be harmful to the public health or welfare of the United States, at all times and locations and under all circumstances and conditions, include discharges which:

a) Violate applicable water quality standards, or;
b) Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines, or;
c) Exceed reportable quantities of the hazardous materials in Table 117.3, EPA 40 CFR, Part 11), FR 50766 August 29, 1979. (Reference GM WPC 79-2 US).

2.5 Cleanup Procedures

2.5.1 Spill Initial Action

2.5.1.1 First action in the event of any kind of pollutant spill is to prevent the pollutant from entering a sewer, sluice system, or plant settling pond, the river water inlet or the river directly. Take immediate action to confine the spill and prevent further spills. In-plant spills are the responsibility of the operating department where found. Out-plant spills are the responsibility of the Material Control Department.

2.5.1.1.1 Any spill on the floor in the plant can be contained using sand, dirt, or oil-dry, as dam material or absorbent. In extreme

central foundry
ISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN
(SPCC)

Proc. No. ECS-14
Date Issued 6-1-74
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 9 of 15

emergencies, oil can be contained with productive powered materials, such as sand, clays, cement, etc., although the use of these is not recommended for this purpose.

2.5.1.1.2 Spills which occur on paved surface in plant perimeters can be treated as above. However, if the spill occurs on dirt, near a sewer or waterway, care must be taken that it does not eventually seep through the dirt into that facility. It may be necessary to ultimately excavate the polluted dirt and have it disposed of by a licensed contractor.

2.5.1.1.3 Spills which result in direct contamination of the settling pond, settling basin or Salt Cre must be contained by any availab means;

2.5.1.1.3.1 Oil or other floating materials - use hay, straw or a boom arrangement.

2.5.1.1.3.2 Soluable material attempt to contain within plant owned facilities and not allow to reach the river.

2.5.2 Internal Notification

2.5.2.1 Immediately upon discovery and initial action regarding a pollutant spill, certain persons in the plant must be notified. Information to be supplied these persons is:

2.5.2.1.1 Location of spillage.

2.5.2.1.2 Type of material spilled.

2.5.2.1.3 Estimated quantity and extent.

2.5.2.1.4 A run down of measures taken thus far to confine the spillage and prevent further spillage.

2.5.2.2 This information will be passed immediately to Plant Protection, extension, 7360. The guard receiving the call will notify the following as soon as possible: (Before each home number, dial 8-812 then the number).

	Plt. Ext.	Home Phone
*Plant Manager	7222	279-2117
Mgr. Plt. Engr. & Maint.	7357	275-7857
*Supt. Plant Engr.	7303	824-4111
Supt. of Maintenance	7328	
*Personnel Director	7334	332-2099

2.5.3 Notifying Regulatory Agencies

2.5.3.1 In the event of an accidental spill reaching State Streams, the appropriate State agency must be notified immediately. The Plant Manager is sole authority for reporting; in his absence, the Plant Engineer will act for him and in his absence the Maintenance Superintendent will act for the Plant Manager. The actual reporting will be done by the Plant Engineer or Maintenance Supt.

2.5.3.2 A spill that enters sanitary sewer lines may affect city sewage treatment facilities. Such a spill must be reported to the city.

City Sewage Service - 275-6292

Sewage Disposal Plant - 275-4901

2.5.3.3 A spill that reaches State Streams will be reported immediately to:

U. S. Coast Guard
National Response Center
400 Seventh St., S. W.
Washington, D. C. 20590
Phone: 800-424-8802

Central Foundry

'ISION OF GENERAL MOTORS
)FORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN
(SPCC)

Proc. No. ECS-14
Date Issued 6- 1-74
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 11 of 15

Emergency Center
Indiana Stream Pollution Control Board
Phone: 317-633-0144

2.5.3.4 Spill Notification within normal working hours

Division Works Engineer

Mr. Wm. C. Cheek
Central Foundry Div., GMC
77 West Center Street
Saginaw, MI 48605
Office Phone: 517-776-3377
Centrex Phone: 8-386-3377
Home Phone: 517-793-0089

Division Administration Environmental Activitie

Mr. J. B. Medved, P. E.
Central Foundry Div., GMC
77 West Center Street
Saginaw, MI 48605
Office Phone: 517-766-3387
Centrex Phone: 8-386- 3376
Home Phone: 313-793-2464

State Agency

Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, IN 46206
Phone: 317-633-0713
(Mr. Joe Stallsmith)

Local Sanitarian

Health Department Court House
Mr. Paul McBride
Phone: 275-3234

2.5.4 External Notification

2.5.4.1 An outside call regarding a spill can come from any source to any receiver, and may have nothing to do with the plant. It is important that the proper information be obtained from the caller, so the proper action can be initiated. When such a notification is received, request the following:

2.5.4.1.1 Where is the spill?

2.5.4.1.2 Can you identify the material? What does it look like?

2.5.4.1.3 When did you observe it?

2.5.4.1.4 Will you identify yourself, (name and address) so that we can report on results of our investigation?

2.5.4.1.5 Can we contact you for further assistance if we cannot locate the spill?

2.5.4.2 The person taking spill information from outside the plant will follow the "Internal Notification" procedure.

2.5.5 Spill Confinement

2.5.5.1 In the event the spill cannot be contained within the confines of our plant boundaries, we must take immediate action to procure all necessary materials and equipment to confine and clean up the spill. It remains our reponsibility until properly disposed of.

*2.5.6 Manpower Assignments

2.5.6.1 The person designated to be responsible for spill cleanup is Mr. Joseph Choate, Maintenance Superintendent.

Phone Extension: 7328
Home Phone:
Home Address:

*2.5.6.1.1 Mr. Choate will designate alternates in the event of his absence.

Mr. Choate's first alternate is:

Jim Burch
West Rocky Creek, Bedford
PHONE: 812-275-2639

2.5.4.1.1 Were is the spill?

2.5.4.1.2 Can you identify the material? What does it look like?

2.5.4.1.3 When did you observe it?

2.5.4.1.4 Will you identify yourself, (name and address) so that we can report on results of our investigation?

2.5.4.1.5 Can we contact you for further assistance if we cannot locate the spill?

2.5.4.2 The person taking spill information from outside the plant will follow the "Internal Notification" procedure.

2.5.5 Spill Confinement

2.5.5.1 In the event the spill cannot be contained within the confines of our plant boundaries, we must take immediate action to procure all necessary materials and equipment to confine and clean up the spill. It remains our responsibility until properly disposed of.

*2.5.6 Manpower Assignments and Responsibilities

In the event of a spill, the Maintenance Superintendent, Mr. Joseph Choate will be acting Emergency Coordinator.

Plant Phone Extension	7328
Home Phone	279-0106
Home Address	1302 Crawford Drive, Bedford

*2.5.6.1 Mr. Choate will designate alternates in the event of his absence. Mr. Choate's first alternate is:

Jim Burch
West Rocky Creek, Bedford
PHONE: 812-275-2639

*2.5.6.2 Mr. Burch is responsible for:
Dispatching cleanup crews
Coordinating cleanup

Mr. Butler is responsible for:
Notifying in-plant management
Notifying proper regulatory agencies
Notifying proper corporate offices

*2.5.6a The Emergency Coordinator, (Maintenance Superintendent or designated alternate) shall provide all necessary resources including, but not limited to, manpower, materials, equipment, and funds to carryout this contingency plan.

*2.5.6b The Emergency Coordinator shall be responsible to immediately identify the character, exact source, amount, and area extent of the release. The emergency coordinator will access possible hazards, both indirect and direct, to human health and environment.

*2.5.6c The Emergency Coordinator will insure the wastes which may be uncompatible with the released material are treated, stored, or disposed of until cleanup procedures are completed.

2.5.6.3 The following spill control and cleanup equipment is available at the plant:

2.5.6.3.1 Sump pumps are installed at the fuel oil storage tank and in the die cast tunnel system.

2.5.6.3.2 A mobile 300 gallon fluid collection system and a caterpillar tractor with a backhoe are parked at the Maintenance Area.

2.5.6.3.3 Oil absorption material is available from a storage crib which is located in the southwest section of the large manufacturing building.

2.4.6.4 Cleanup contractors available:

2.5.6.4.1 McIntyre Brother Construction
1020 7th Street, Bedford, IN
Phone: 279-9637

2.5.6.4.2 Stone City Construction Company
910 R Street, Bedford, IN
Phone: 275-7541

2.5.6.4.3 Cunningham Construction Company
1000 Lincoln Avenue, Bedford, IN
Phone: 275-4469

*2.5.6.1.2 Mr. Burch is responsible for:
Dispatching cleanup crews
Coordinating cleanup
Mr. Butler is responsbile for:
Notifying in-plant management
Notifying proper regulatory agencies
Notifying proper corporate offices

2.5.6.2 The Maintenance Department will supply necessary manpower for spill cleanup.

2.5.6.3 The following spill control and cleanup equipment is available at the plant:

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central foundry

DIVISION OF GENERAL MOTORS
OFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

OIL SPILL PREVENTION
AND COUNTER MEASURE PLAN

(SPCC)

Proc. No. ECS-14
Date Issued 6-1-74
Date Revised 4-25-77
Date Revised 2-27-80
Date Revised 3-19-82
Page 14 of 15

2.5.7 Written Report

2.5.7.1 A spill designated as harmful quantities of mineral oil will require a written report, giving detailed information of the causes of the spill. The report must be sumbitted to the E.P.A. within 60 days of a spill; prior to the E.P.A. report submitting. G.M. Environ Activities Staff and Legal Department shall review the report within 30 days of a spill.

2.5.7.2 Any spill that violates the Plant NPDES Permit Limitations will require a submission of a detailed written report with the E.P.A. Regional Administrator and the State of Indiana within five (5) days after becoming aware of such condition. See plant NPDES permit for reporting requirements. Divisional Works Engineer and GM legal Department must approve all written reports before submitta

*2.5.7.3 Activation of the RCRA Contingency Plan requires a writt report. See amendment to this procedure.

2.5.8 Spill Cleanup Procedures:

2.5.8.1 Training program is continuous for Maintenance Water Treatment, and Power House personnel.

2.5.8.2 Off hour spill detection and notification is accomplished with standby Maintenance personnel and by Plant Protection.

2.5.8.3 Procedures and developments will be reviewed in departmental meetings as required.

3.0 HISTORY OF OIL SPILLS

3.1 Spills occuring since June 10, 1973; November 12, 1976 - black material discharged at 002.
February 22, 1977, approximately 5 gallons of used flushing spilled at west side of plant.
November 18, 1977, a non-compliance with NPDES permit report was filed as a result for excessive suspended soilids and grease and oils in 001 and 002 outfalls.

3.2 Description of Incident

3.2.1 On 11-12-76 black material was observed flowing from 002 outfall, this condition lasted approximately one half hour. Tests indicated this material contained ± 160 PPM PCB's. No source of contamination was found. Removing settling lagoon connection to the sewers, and by passing areas that once contained lagoons.

3.2.2 On 2-22-77, approximately five gallons of used hydraulic flushing fluid siphoned from it's storage tank and reached a storm drain discharging into a ditch west of CFD property. The siphoned flow was stopped and the fluid dammed with sand, then cleaned up and disposed of. The ditch was dredged and dredged material disposed of. The storm drain and sewer were abandoned and plugged. The storage tank was moved to a diked area.

3.2.3 On 11-18-77, a non-compliance with NPDES permit report was filed. Test results at 001 and 002 outfall indicated suspended solids and grease and oils content exceeded allowable limits. Reasons were excessive influent flow of water to the treatment plant resulting from a break in an underground city water line and a reservoir level control malfunction. Both faults were corrected and effluent water quality returned to allowable quality.

3.3 Spill Potential

3.3.1 Fuel oil distribution equipment failure would result in less than 100 gallons spillage. This spill would follow the paths previously described.

3.3.2 Fuel oil tank rupture would spill 200,000 gallons maximum and would be contained within a concrete dike area.

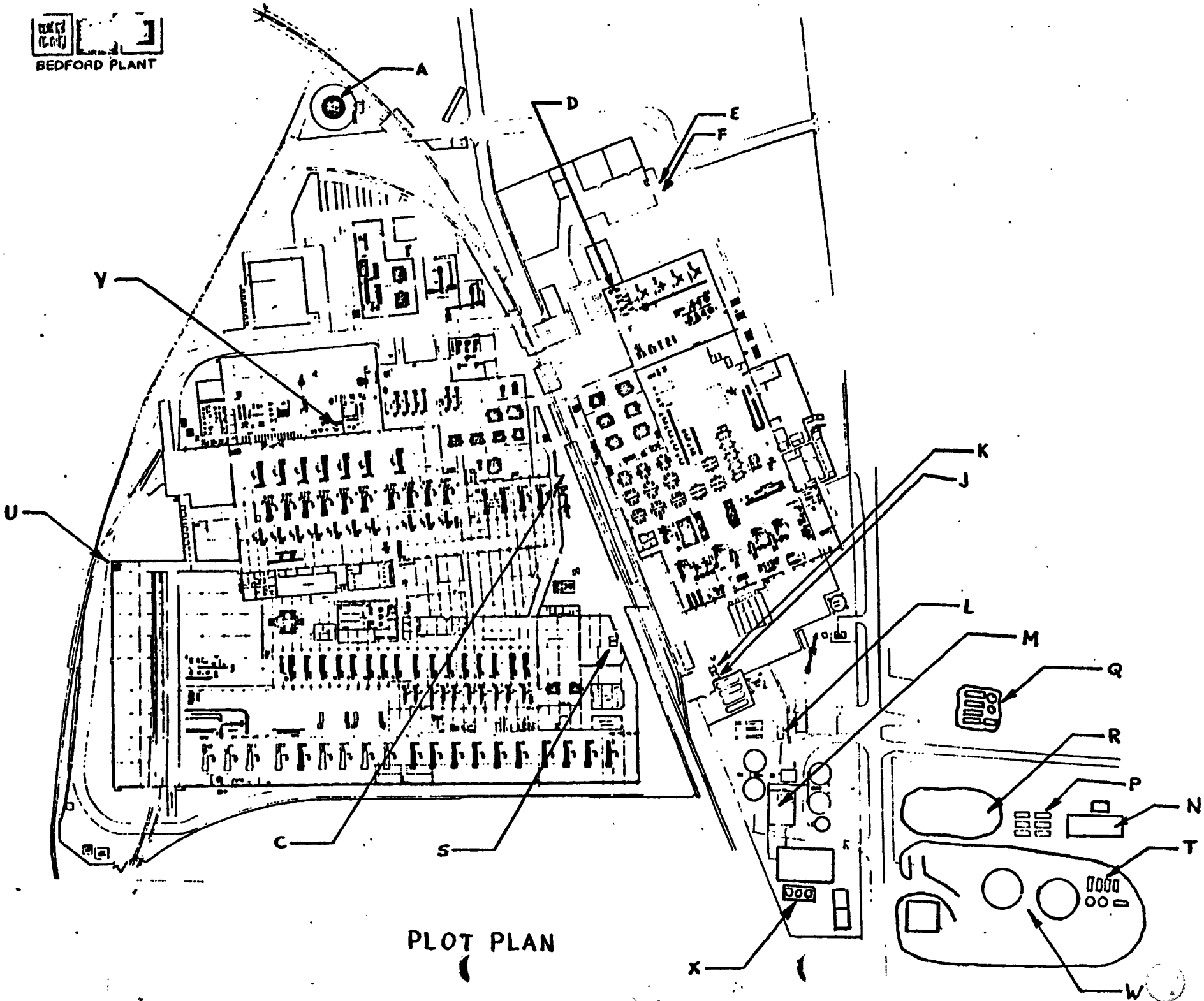
3.4 Containment Facilities Planned

3.4.1 No additional containment facilities are planned at this time.

3.5 Bulk Loading and Unloading Procedures

3.5.1 Bulk oil loading and unloading procedures are given in the operating procedures.

3.6 This procedure is to be updated and/or revised at least once every three years.



PLOT PLAN

central foundry

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

AMENDMENT TO SPILL
PREVENTION AND COUNTER MEASURE
PLAN (SPCC)

"Hazardous Waste Contingency Plan"

Proc. No. ECS-14
Date Issued 5-19-81
Date Revised 3-12-82
Date Revised
Date Revised

PURPOSE:

Provide for a contingency plan and emergency procedure for the RCRA hazardous waste facility as required by Federal EPA regulations 40 CFR Part 265.50.

SCOPE:

Cover the EPA permitted hazardous waste facility at the Bedford Plant, which is the drum storage area for the sodium hydroxide and agitene cleaning solvent sludges.

PROCEDURE:

1.0 The Bedford SPCC and this amendment to that plan are to be followed by plant personnel whenever there is an unplanned sudden or non-sudden release of the hazardous wastes to air, soil, or surface water of the facility which may cause personal injury or may leave the plant property.

2.0 Plant Protection and the Plant Medical Staff are available 24 hours a day to respond to any emergencies requiring their services. In case of fire, Plant Protection will call the Plant Fire Brigade per standard operating procedure.

3.0 See item 2.5.6 of the SPCC plan, page 13, for the emergency coordinator assignment and responsibilities.

4.0 See item 2.5.6.3 of the SPCC plan, page 14, for list of emergency equipment. The Plant Protection gatehouse is located approximately 300 feet from the hazardous waste storage area. The plant guards are on duty at all times in this gatehouse and have radio and telephone for communication both in and out of the plant.

5.0 The characteristics and quantity of these hazardous waste materials are such that no evacuation plan is required. Also, the storage area is located outside and clear of occupied buildings and work areas.

6.0 The emergency coordinator will notify the Superintendent of Plant Engineering and the Plant Environmental Coordinator of any incident involving hazardous wastes that requires implementing this contingency plan. The Plant Environmental Coordinator will record the time, date and details of the incident. The environmental coordinator will prepare a report for submittal to the EPA Reginal Administrator within 15 days after the incident. The report must include:

- Name, address and telephone number of the owner or operator
- Facility location
- Date, time and type of incident.
- Name and quantity of materials involved.
- Extent of injury, if any.
- Assessment of actual or potential hazards to human health or environment, if applicable.
- Estimated quantity and disposition of recovered material that resulted from the incident.

6.0 Continued

This report is to be reviewed and approved by the Division and Corporate Environmental Staff and signed by the Bedford Plant Manager.

7.0 This contingency plan must be reviewed and immediately amended, if necessary, whenever:

- Applicable regulations are revised.
- The plan fails in an emergency.
- The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.
- The list of emergency coordinators changes.
- The list of emergency equipment changes.

PREPARED BY:

G. R. Ohl 5-19-81

G. R. Ohl — Date
Environmental Coordinator

Preventive Procedures, Structure, and Equipment (40 CFR 122.5(a)(8))

To help prevent spills of hazardous waste when unloading and loading these materials, all hazardous waste drums are transported by forktrucks on wooden pallets. The storage area has a ramp which allows smooth entrance of forktrucks in and out of the hazardous waste storage area. Curbing is also provided on the ramp to prevent the forktrucks from accidentially running off the sides of the ramps.

The hazardous waste drum storage area contains any runoff of hazardous waste materials by a six inch curb around the storage area. The curbed storage area has a sump pit which allows removal of any contained materials which is determined to be hazardous. Non-hazardous fluids collected within the curbing is drained to the plants waste water treatment through a process sewer line.

Hazardous waste materials at the plant are handled and stored on concrete surfaces eliminating the possibility of these materials entering the ground and contaminating the ground water. In the event of spills, materials will be contained and cleaned up in accordance with the plants SPCC Plan.

The hazardous waste drum storage area is completely independent of electrical power other than for lighting purposes during non-daylight hours. In the event of a power outage during dark hours, all hazardous waste activities will be ceased.

All hazardous wastes are stored and sealed in drums minimizing possible human contact. All persons handling hazardous wastes are trained and informed on protective equipment and clothing needed to safely handle the hazardous waste, sodium hydroxide sludge and agitene fluids.

Prevention of Reaction of Wastes (40 CFR 122.5(a)(9))

The two hazardous wastes stored at the plant are placed within a 6" curb area segregating these materials from the remaining materials stored within the plants drum storage area. All hazardous waste drums are stored on wooden pallets to keep any contaminated fluid within the curbing from coming into contact with the drums.

Signs are placed on the fence to the storage area which clearly state that unauthorized persons are to keep out and that no smoking is allowed due to ignitable fluids stored at the location.

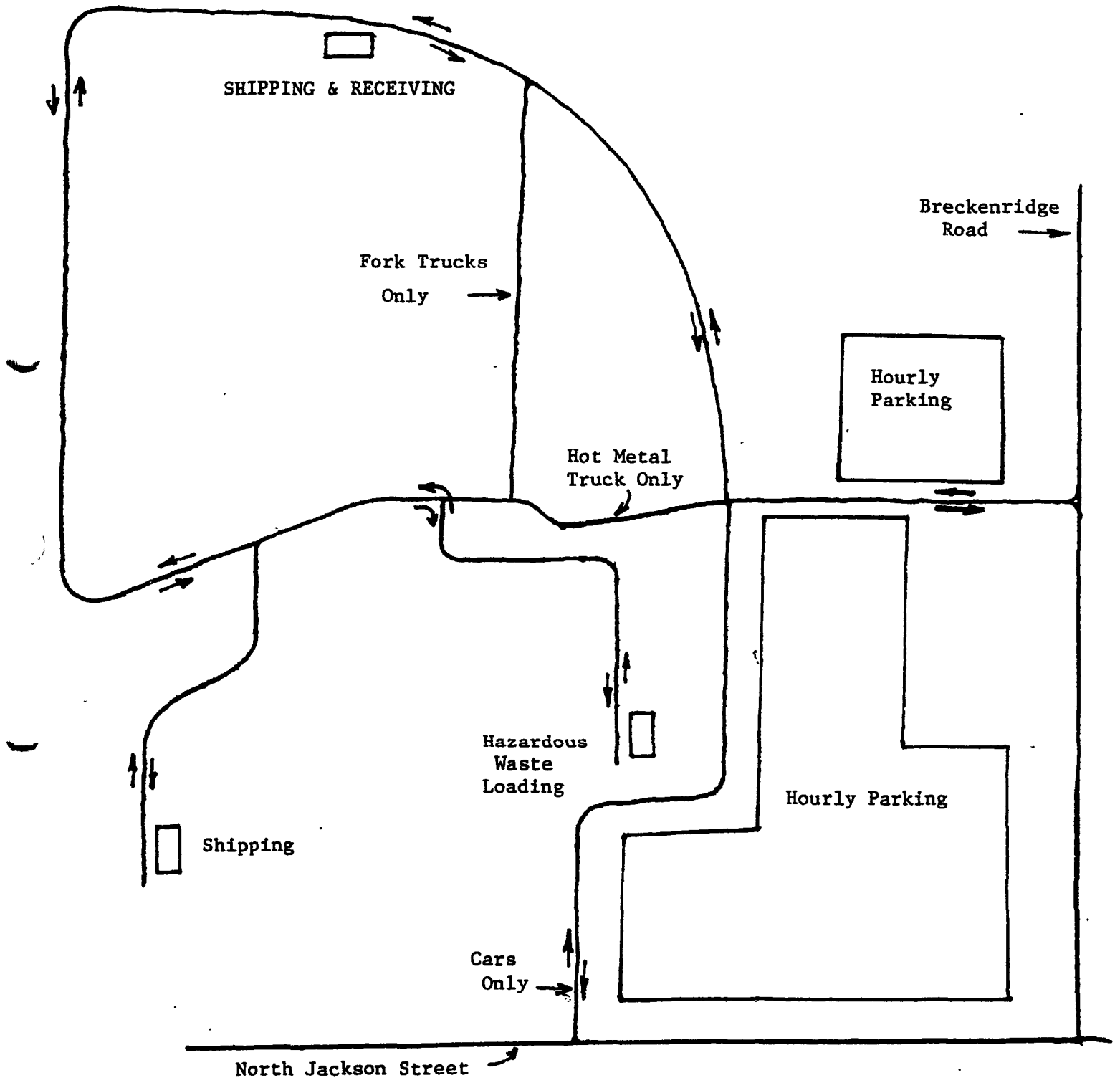
The drum storage area is located approximately 200' from the plants closest property line which meets the requirements of regulations.

Traffic Patterns (40 CFR 122.25(a)(10))

Access to the plant is obtained by turning off of Indiana State Road 58 north onto North Jackson Street. Approximately 1/2 miles north on North Jackson Street is the entrance to the plant offices and lobby. Truck entrance is found by continuing north and turing west onto Breckenridge Road. Approximately 1/8 miles on Breckenridge Road turn south into the plants access road to the gatehouse. Approximately 24 semi-tractor trailers and 8 van type trucks enter the plant each day.

Traffic is routed around the perimeter of the plant to the receiving areas. Stop signs and speed limit signs are posted throughout the plant.

All access roads within the plant are bituminous or concrete surfaces. These roads have the load bearing of at least 40,000 lbs. per axle.



Traffic Flow (Not to Scale)

Location Information (40 CFR 122.25(a)(11))

This plant is an existing facility and therefore requirements of 122.25 (a)(11)(i) and (ii) do not apply.

In respect to requirements of section 122.25(a)(11)(iii) this plant is located outside of any flood area. This statement is based on information obtained off of the U.S. Geological Survey Maps for the Bedford area and from the U.S. Department of Agriculture, Soil Conservation Office. The U.S. G.S. maps show the plants hazardous waste drum storage area to be located at an elevation of 720 feet above sea level, which is well above the 100 year flood level for the White River and Pleasant Run Creek areas flood levels of 510 feet.

Subsections 122.5(a)(11)(iv) and (v) do not apply since the plant is not located in a flood plain.

Outline of Personnel Training (40 CFR 122.25(a)(12))

The personnel training program for this plant is incorporated in the overall plant program for the training of all employes to perform their assignments in a safe manner and in accordance with all plant policies, regulations and procedures.

The Plant Departments are responsible for preparing the job procedures and insuring that their employes are trained properly to perform their job assignments. Technical advice is furnished to the operating departments by the Plant Environmental Coordinator, Environmental Engineer, Safety Director and other specialists, as required. The Environmental Coordinator directs the training program on Hazardous Wastes Management in accordance with plant procedures. The Environmental Coordinator and the Environmental Engineer have attended General Motors Corporation training meetings on hazardous wastes and the Environmental Coordinator obtained training at the General Motors Hazardous Waste Management Seminar.

Personal Resume

Mr. Glen R. Ohl, the Plant Environmental Coordinator. Mr. Ohl has been with the G.M. Central Foundry Division for 30 years and worked in the environmental area at the Bedford Plant for the past 10 years. He received his engineering degree from General Motors Institute in 1958.

Mr. William Schoonmaker, Environmental Plant Engineer, gives technical advice and recommendations on the Hazardous Waste Management Program to plant personnel. Mr. Schoonmaker has a degree in chemical engineering and is a Registered Professional Engineer. He has been employed by the Bedford Plant the past 4 years working on engineering projects in the environmental areas. Mr. Schoonmaker was previously employed by the Indiana State Board of Health.

The General Motors Corporate Environmental Activities Staff issues information bulletins concerning all environmental areas including Hazardous Waste Management to plants in the Corporation. This information is reviewed by the Plant Engineer and Environmental Coordinator and if applicable reviewed with personnel that handle hazardous waste and incorporate any new requirements into job procedures.

The job and safety procedures explain to the employe the procedures and steps to be followed while performing his or her job. Attention is given to the proper wearing of personal protective equipment, correct use of tools, clean up of spills, emergency procedures, and emergency equipment. Particular emphasis is placed on the job training to be sure the employes understand their job responsibilities and demonstrate the ability to perform their job assignments in a satis-

factory manner. The date of the employe's training and job procedure instructions are recorded and filed in the Personnel Department. All employes have their job procedures and duties explained to them on the first 3 consecutive days of employment and every 6 months thereafter. Employes that are transferred to new job assignments receive job training before they are allowed to work alone without immediate supervision.

The plant SPCC plan provides detailed instructions and information on the Bedford Plant's emergency procedures for responding to emergencies.

The plant has the following support groups available to respond to any hazardous waste problem or emergencies:

1. Fire brigade consisting of trained personnel under the direction of Plant Security and the Chief of Security.

2. Complete medical department staffed with nurses 24 hours per day, a plant doctor, and a plant Safety Director.

3. Plant Security force that patrols the plant property and controls access to the property. A two-way radio system is provided for immediate communication in case of emergencies.

All employes are required to review job and safety procedures semi-annually. Records documenting these reviews, employes names, job classification are filed in the Personnel Department.

Closure Plan (40 CFR 122.25(a)(13))

The plant's closure plan consists of a three page document as shown on the following pages. This plan sets forth the procedure; action, and cost estimate required to close the plant's hazardous waste drum storage area for sodium hydroxide sludges and agitene waste fluids.

GENERAL MOTORS CORPORATION

CENTRAL FOUNDRY DIVISION

BEDFORD PLANT

CLOSURE PLAN FOR RCRA HAZARDOUS WASTE DRUM STORAGE AREA

I. Introduction

Under the U.S. EPA regulations, 40 CFR Part 265, Subpart G, Sections 265.110 thru 265-120 each facility which stores, treats, or disposes of hazardous wastes must have a Closure Plan on file. This Closure Plan has been prepared to cover the following facility:

1. EPA I.D. Number - IND006036099

2. Owner's Name: General Motors Corporation
   Central Foundry Division
   Bedford Plant
   North Jackson Street
   Bedford, IN 47421

3. This plan has been prepared by: Glen R. Ohl
   Environmental Coordinator
   Date - July 15, 1982

4. The attached chart shows the drum storage area for storage of hazardous wastes.

II. Maximum Waste Inventory

The following table shows the maximum quantity of wastes on hand at any one time:

Sodium Hydroxide Sludge	50 drums
Agitene Sludge	50 drums

III. Schedule for Closing

This facility does not have a definite closure date. The following schedule is open-ended. It lists the timetable for closure in terms of elapsed time subsequent to the time that EPA, or an EPA authorized state agency, has approved this Closure Plan. This Closure Plan must be submitted to the EPA agency for approval at least 180 days before closure is expected to start. The Plant Engineer will submit the closure plans. (See Section 265.112 (c) of the EPA regulation in 40 CFR.)

Day 1 - Plant termination of hazardous waste activity.

Day 15 - Drums of hazardous wastes prepared for shipment to disposal site.

Day 20 - Obtain necessary approvals for shipment of hazardous wastes to approved disposal site.

Day 30 - Clean concrete storage area that was used for storing wastes by sweeping. After sweeping use a detergent cleaner solution to wash the concrete area. The area will then be rinsed with clean water.

Day 32 - Examine trench around hazardous waste storage area. Any hazardous waste residue will be removed and packaged in DOT approved drums for shipment to approved disposal area.

Day 35 - Ship hazardous wastes sludges in approved containers to disposal site.

Day 40 - Use plant power vacuum scrubber to wash and rinse vacated drum storage area for hazardous wastes. Wash liquid shall be discharged to the plant wastewater treatment facilities.

Day 45 - Closure should be complete.

Day 50 - Certification of closure by independent registered professional engineer.

IV. Decontamination of Facility

1. All hazardous waste sodium hydroxide and agitene sludges will be placed in approved DOT drums and marked for shipment to an approved chemical waste landfill.

2. Storage Area: The storage area will be sweep clean. The area will then be scrubbed with a mild detergent with the plant power scrubber. The area will be rinsed with clean water. These cleaning liquids will be collected by the plant vacuum pickup truck and treated via the plant wastewater treatment facilities. The concrete trench around the concrete storage area will be cleaned and any hazardous waste residue will be placed in an approved DOT drum and disposed of in an approved chemical waste landfill as specified by the plant environmental coordinator. Potential firms are:

Cecos	- Williamsburg, Ohio
Adams Center	- Ft. Wayne, Indiana

3. Testing: To verify the completeness of the decontamination process, the ph of the rinse water solutions will be measured by the Plant Water Treatment Department. The Plant Environmental Coordinator will inspect the cleaned area to confirm that all hazardous waste has been removed.

V. Cost Estimates for Closure (to be updated annually on July 1)

Prepared by: G. R. Ohl, Senior Engineer

Approved by: Gary C. Southern
Resident Comptroller

Area	Total Cost	
Sodium Hydroxide Sludge	~~$3,000~~ 2,000	0
Agitene Sludge	1,000	0
Drum Storage	~~7,200~~ 8,200	$ 9,000
Inspection, Approval, Testing and Report	~~3,000~~ 3,500	$ 4,000
TOTAL	~~$14,200~~ $ 14,700 G. Ohl 7-1-84	$ 13,000 W. Schoonmaker 6/20/85

Notice In Deed (40 CFR 122.25(a)(14))

This plant is only a hazardous waste storage facility and does not dispose of any hazardous waste, therefore, section 122.25(a)(14) does not apply.

Closure Cost Estimates (40 CFR 122.25(a)(15))

The closure cost information for this plant's hazardous waste storage area is included in the closure plan which was shown in a previous subsection containing the requirements of 40 CFR 122.25(a)(13).

Information pertinent to the plant's financial responsibility for liability coverage and closure care can be found in appendix A. Appendix A includes information which has been previously submitted to Mr. Valdas Adamkus, Regional Administrator of Region V on July 2, 1982.

Post-Closure Cost Estimate (40 CFR 122.25(a)(16))

This plant does not dispose of any hazardous waste on-site, therefore, this section does not apply.

Financial Assurance Mechanism (40 CFR 122.25(a)(17))

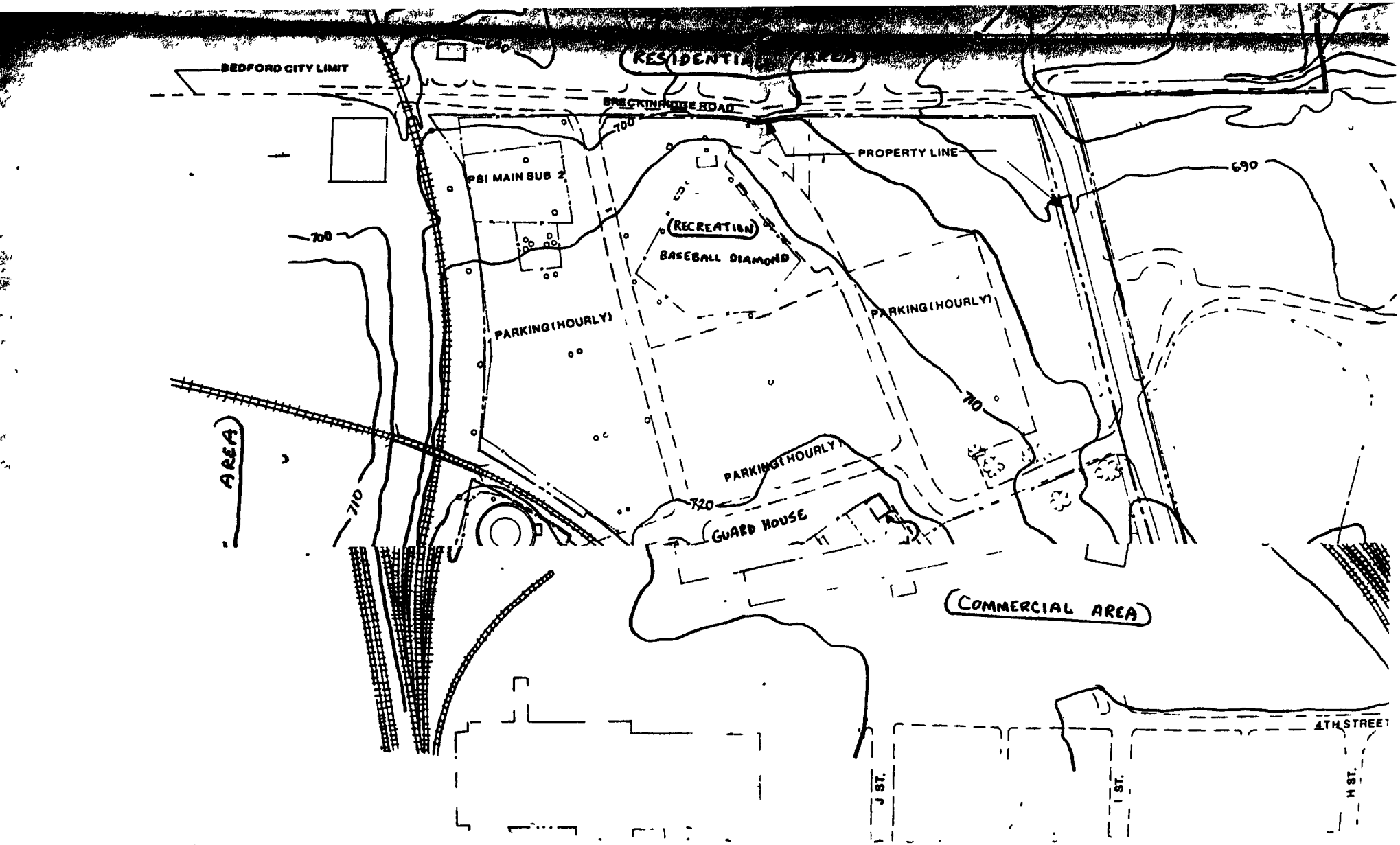
The requirements of this section has been demonstrated in the information and documentation submitted in a letter from F. A. Smith, Executive Vice President of General Motors Corporation on July 2, 1982 to Region 5 Administrator, Mr. Valdas Adamkus. A copy of this letter is shown in Appendix A including exerts from attachment A of that letter.

State Assumption of Responsibility (40 CFR 122.25(a)(18))

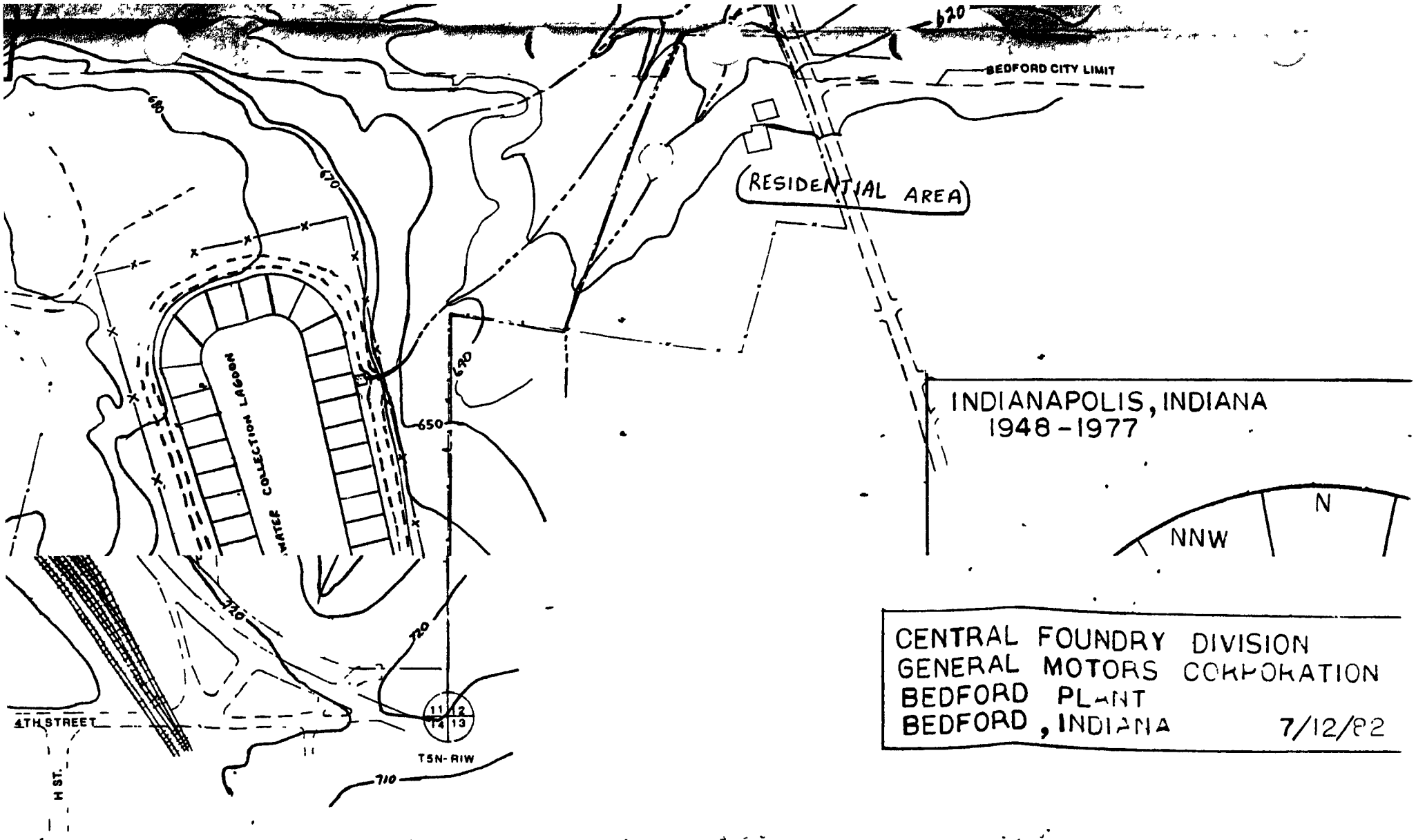
This plant will not request state assumption of legal and financial responsibilities.

Topographic Map (40 CFR 122.25(a)(19))

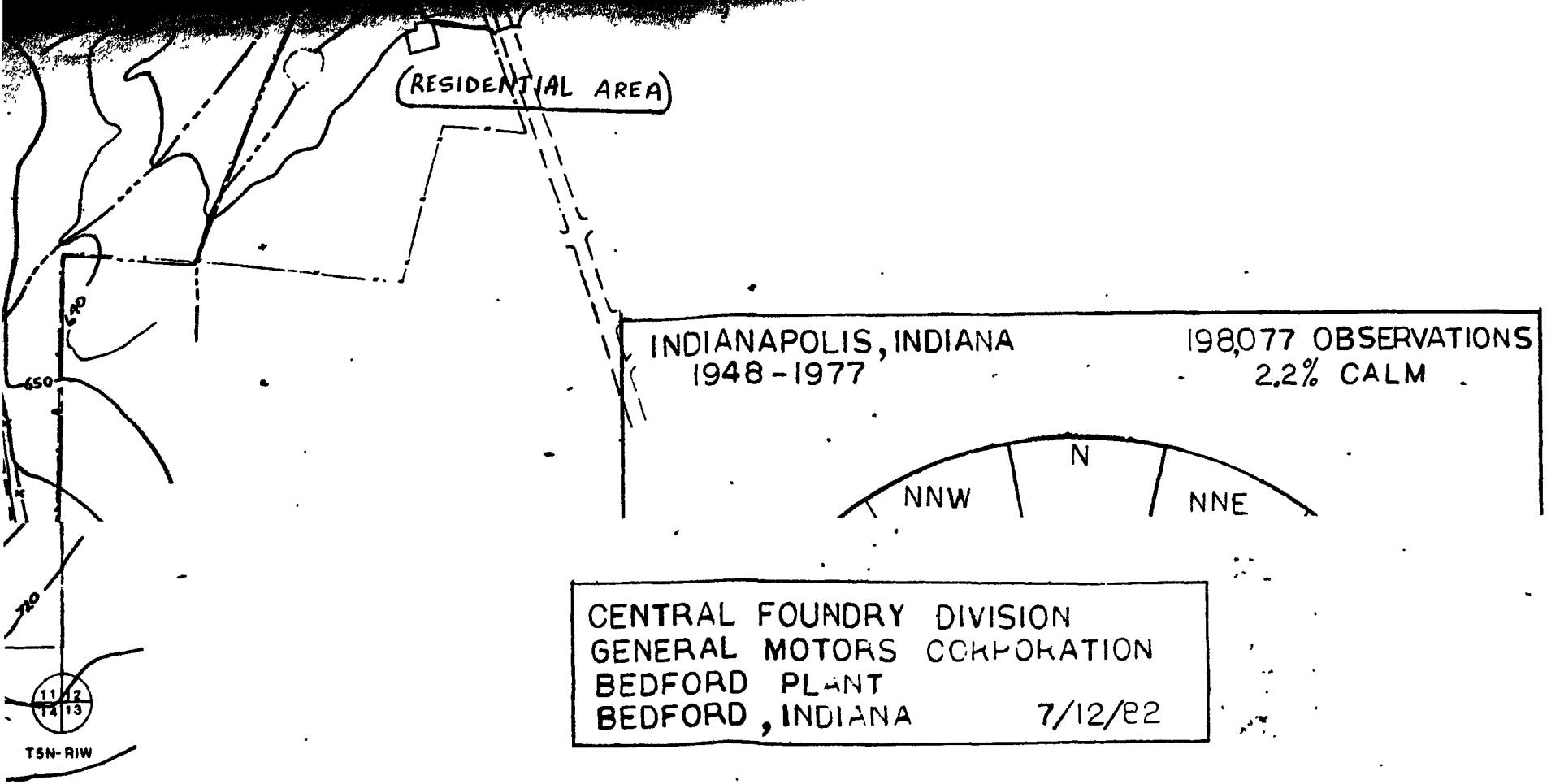
All the information section 122.25(a)(19) is shown on the topographic map located in the protective folder on the following page.



NOTE: THIS FACILITY IS NOT WITHIN THE 100 YEAR FLOOD F
BASED UPON THE U.S.G.S. MAPS, THE 100 YEAR FLOOD
AREA IS AT ELEVATION 510.



.OOD PLAIN AREA.
FLOOD PLAIN


RESIDENTIAL AREA
650
T5N-R1W
INDIANAPOLIS, INDIANA
1948-1977
198,077 OBSERVATIONS
2.2% CALM
N
NNW
NNE
CENTRAL FOUNDRY DIVISION
GENERAL MOTORS CORPORATION
BEDFORD PLANT
BEDFORD, INDIANA
7/12/82

Additional Information (40 CFR 122.25(a)(20))

Additional information will be provided in accordance with the requirements of 40 CFR 122.25(a)(20) at the request of the EPA Region V Administrator.

SECTION 3

PART B PERMIT APPLICATION - SPECIFIC INFORMATION

40 CFR 122.25(b)

Container - Storage Facility

The Plant's hazardous waste drum storage area consists of a 8" concrete slab, approximately 660 sq. feet (22' x 30') area surrounded with a 6" high curbing. This area has a ramp which allows easy fork truck access. See the drawing on the following page for more detail.

The concrete slab slopes to the southeast corner of the containment to a sump. All containers stored in this area are placed on wooden pallets which eliminates the storage container coming in contact with any accumulated liquids within the containment.

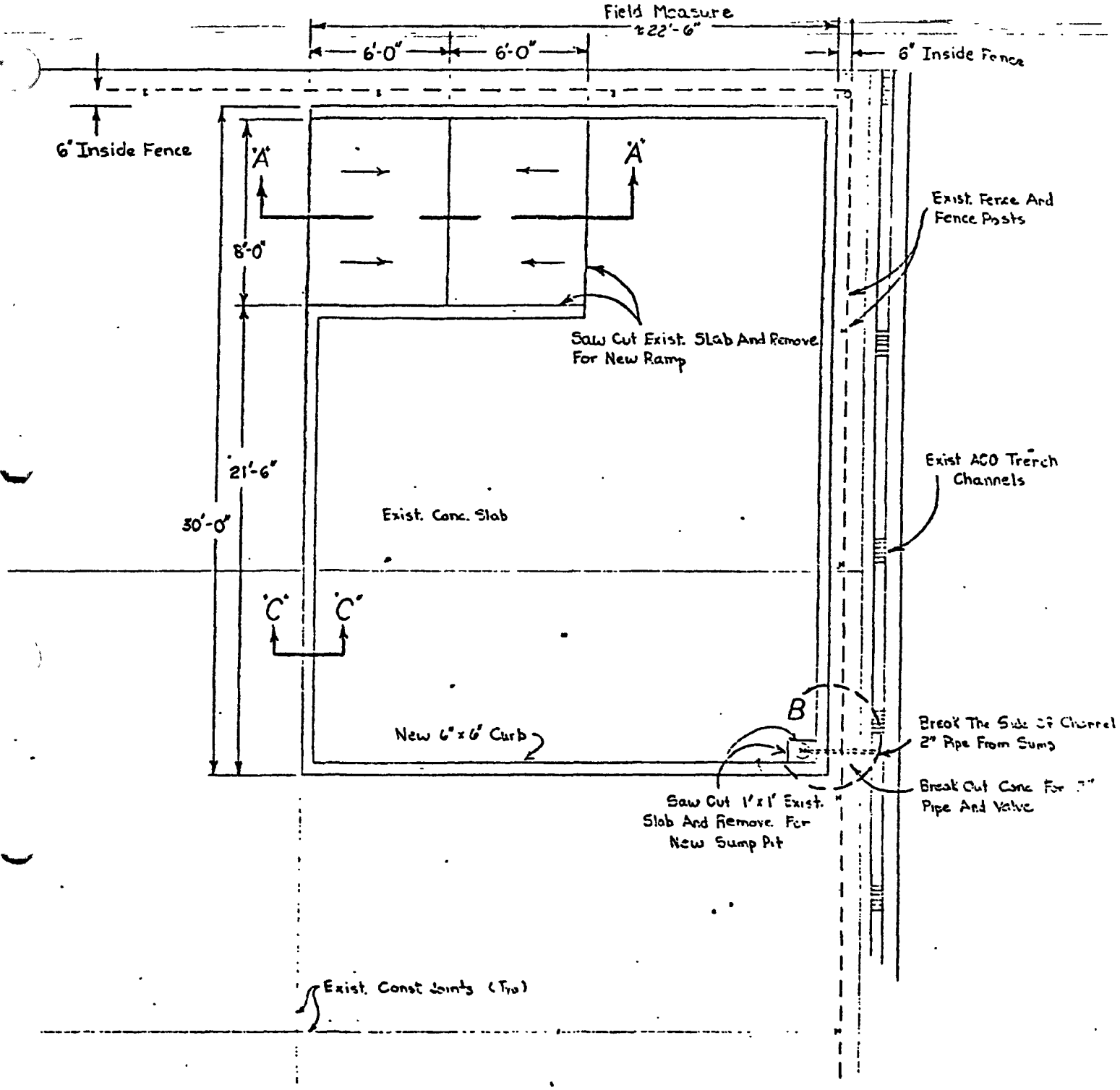
The hazardous waste storage containment has a liquid retaining capacity of 275 ft^3 or 2,060 gallons. This constitutes more than 30% of the maximum amount (100 drums or 5500 gallons) of hazardous waste to be stored in the area.

The containment is completely surrounded with a 6 inch curbing which prevents any liquid run-on into the hazardous waste storage area.

Of the two hazardous wastes stored at the hazardous waste facility, only the agitene waste is a liquid. This waste can be detected by observation and if present in the waste containment area will be removed with plant vacuum truck and placed into drums and restored. Non-hazardous liquids are drained to the plants waste water treatment plant through a process sewer line.

The plant does store ignitable waste in its hazardous waste drum storage area. See the topographical map in the previous section which shows the location of the storage area in relationship to the plants property lines. The nearest property line is approximately 200 feet away.

The plant does not, at this time, store any incompatible waste within the hazardous waste drum storage area.



PLAN VIEW - HAZARDOUS WASTE STORAGE CONTAINMENT

(Scale 1/4" = 1'-0")

APPENDIX A

Financial Responsibility

GENERAL MOTORS CORPORATION

Mr. Valdas Adamkus
Regional Administrator
U.S. EPA Region 5
230 S Dearborn
Chicago, IL 60604

Dear Mr. Adamkus:

I am the chief financial officer of General Motors Corporation, 3044 West Grand Boulevard, Detroit, Michigan 48202. This letter is in support of the use of the financial test to demonstrate financial responsibility for liability coverage and closure and/or post-closure care as specified in Subpart H of 40 CFR Parts 264 and 265.

The owner or operator identified above is the owner or operator of the following facilities for which liability coverage is being demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. See Attachment A.

1. The owner or operator identified above owns or operates the following facilities for which financial assurance for closure or post-closure care is demonstrated through the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by the test are shown for each facility. See Attachment A.

2. The owner or operator identified above guarantees, through the corporate guarantee specified in Subpart H of 40 CFR Parts 264 and 265, the closure and post-closure care of the following facilities owned or operated by its subsidiaries. The current cost estimates for the closure or post-closure care so guaranteed are shown for each facility. None.

3. In States where EPA is not administering the financial requirements of Subpart H of 40 CFR Parts 264 and 265, this owner or operator is demonstrating financial assurance for the closure or post-closure care of the following facilities through the use of a test equivalent or substantially equivalent to the financial test specified in Subpart H of 40 CFR Parts 264 and 265. The current closure and/or post-closure cost estimates covered by such a test are shown for each facility. None.

4. The owner or operator identified above owns or operates the following hazardous waste management facilities for which financial assurance for closure or, if a disposal facility, post-closure care, is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in Subpart H of 40 CFR Parts 264 and 265 or equivalent or substantially equivalent State mechanisms. The current closure and/or post-closure cost estimates not covered by such financial assurance are shown for each facility. See Attachment B.

This owner or operator is required to file a Form 10-K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The figures for the following items marked with an asterisk are derived from this owner's or operator's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 1981.

Alternative I
($ in millions)

1.	Sum of current closure and post-closure cost estimates (total of all cost estimates listed above)	$ 33.5
2.	Amount of annual aggregate liability coverage to be demonstrated	$ 2.0
3.	Sum of lines 1 and 2	$ 35.5
*4.	Total liabilities (if any portion of your closure or post-closure cost estimates is included in your total liabilities, you may deduct that portion from this line and add that amount to lines 5 and 6)	$ 21,270.1
*5.	Tangible net worth	$ 17,716.9
*6.	Net worth	$ 17,721.1
*7.	Current assets	$ 13,716.1
*8.	Current liabilities	$ 12,555.1
9.	Net working capital (line 7 minus line 8)	$ 1,161.0
*10.	The sum of net income plus depreciation, depletion, and amortization	$ 4,739.6
*11.	Total assets in U.S. (required only if less than 90% of assets are located in the U.S.)	$ 27,510.8

		Yes	No
12.	Is line 5 at least $10 million?	X	___
13.	Is line 5 at least 6 times line 3?	X	___
14.	Is line 9 at least 6 times line 3?	X	___
*15.	Are at least 90% of assets located in the U.S.? If not, complete line 16.	___	X
16.	Is line 11 at least 6 times line 3?	X	___
17.	Is line 4 divided by line 6 less than 2.0?	X	___
18.	Is line 10 divided by line 4 greater than 0.1?	X	___
19.	Is line 7 divided by line 8 greater than 1.5?	___	X

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 264.151(g) as such regulations were constituted on the date shown immediately below.

F. A. Smith
Executive Vice President
7/2/82

MID005356704
Facility EPA I.D. Number

GMC CADILLAC MOTOR CAR DIVISION CLARK PLANT
Name of Facility

2860 CLARK ST
Facility Mailing Address (Street or P.O. Box)

DETROIT	MI	48232
City or Town	State	Zip Code

SAME AS ABOVE
Facility Location (Street, Route No. or other specific identifier)

	WAYNE		
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 31,430.00

IND006036099
Facility EPA I.D. Number

GMC CENTRAL FOUNDRY DIVISION BEDFORD PLANT
Name of Facility

PO BOX 271
Facility Mailing Address (Street or P.O. Box)

BEDFORD	IN	47421
City or Town	State	Zip Code

NORTH JACKSON ST
Facility Location (Street, Route No. or other specific identifier)

BEDFORD	LAWRENCE	IN	47421
City or Town	County	State	Zip Code

CURRENT CLOSURE COST ESTIMATE OF FACILITY $ 14,200.00

37PMZ/0629j
6/29/82

APPENDIX G.10

U.S.EPA PART B PERMIT

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

R. Hoar
P. Murphy
W. Butler
W. Cheek
} cover letter only

J. Medvid
J. Chu-CAS

REPLY TO ATTENTION OF
5HW

10-3-83

SEP 27 1983

T. R. Wiltse, General Manager
GMC Central Foundry
P.O. Box 271
Bedford, Indiana 47421

Re: GMC Central Foundry Bedford Plant
IND 006036099

Dear Mr. Wiltse:

Enclosed is a copy of the final Resource Conservation and Recovery Act (RCRA) Permit for your hazardous waste storage area at the above referenced facility. The failure of your company to meet any portion of the Permit could result in civil and/or criminal penalties. The United States Environmental Protection Agency is ready and willing to assist you in interpreting any of the conditions of the Permit as they relate specifically to your facility.

The Permit as issued is effective as of the date indicated on the cover page of the Permit. You have the right to appeal any condition of the Permit pursuant to 40 Code of Federal Regulations (CFR) Section 124.19.

Sincerely yours,

Basil G. Constantelos, Director
Waste Management Division

Enclosures

cc: Guinn Doyle, ISBH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
HAZARDOUS WASTE MANAGEMENT PERMIT

Name of Permittee: GMC Central Foundry Bedford Plant

Facility Location: North Bedford Street, Bedford, IN

EPA Identification Number: IND 006036099

Effective Date: September 23 , 1983

Expiration Date: September 23 , 1993

Authorized Activities

In reference to GMC Central Foundry's application for a hazardous waste management permit under the Solid Waste Disposal Act, Subtitle C, as amended (42 U.S.C., Section 6901, e.t. seq., commonly known as the Resource Conservation and Recovery Act or RCRA) and the administrative record, you are authorized to conduct at the above-named facility the following hazardous waste management activities:

X Storage	Treatment	Disposal
X Container	Tank	Injection Well
Tank	Surface Impoundment	Landfill
Waste Pile	Incinerator	Land Application
Surface Impoundment	Other	Ocean Disposal
		Surface Impoundment

Applicable Regulations:

The conditions of this permit were developed in accordance with the applicable provisions of 40 CFR Part:

X 261	X 264, Subpart G	264, Subpart K
X 262	X 264, Subpart H	264, Subpart L
X 264, Subpart A-E	X 264, Subpart I	264, Subpart O
	264, Subpart J	X 270

That are effective as of September , 1983. You must operate in accordance with the terms and conditions (attachments I to VII) to this permit.

Permit Approval:

This permit approval is based upon the administrative record which is maintained at the United States Environmental Protection Agency (U.S. EPA) Region V Office.

Issued this 23rd day of September, 1983

by Basil G. Constantelos
Basil G. Constantelos, Director
Waste Management Division

TABLE OF CONTENTS

	PAGE
PERMIT FORM	1
TABLE OF CONTENTS	2
ATTACHMENTS	
I. Permit Conditions	
1. General Permit	1
2. General Facility	7
3. Container	11
II. Waste Analysis Plan	
III. Contingency Plan	
IV. Inspection Plan	
V. Closure Plan	
VI. Training Plan	
VII. Container Storage System Plan	

IND006036099

ATTACHMENT I

PERMIT CONDITIONS

I. GENERAL PERMIT

A. EFFECT OF PERMIT

The Permittee is allowed to store hazardous waste in accordance with the conditions of this permit. Any storage of hazardous waste not authorized in this permit is prohibited. Compliance with this permit constitutes compliance, for purposes of enforcement, with Subtitle C of RCRA. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Section 3013 or Section 7003 of RCRA, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9606 (a), commonly known as CERCLA), or any other law providing for protection of public health or the environment.

B. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 CFR 270.41, 270.42, and 270.43. The filing of a request for a permit modification, revocation and reissuance, or termination or the notification of planned changes or anticipated noncompliance on the part of the Permittee does not stay the applicability or enforceability of any permit condition.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. DUTIES AND REQUIREMENTS

1. Duty to Comply. The Permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued pursuant to 40 CFR 270.61(a). Any permit noncompliance, other than non-compliance authorized by an emergency permit, constitutes a violation of RCRA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

2. Duty to Reapply. If the Permittee wishes to continue an activity allowed by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least 180 days before this permit expires.

3. Permit Expiration. This permit and all conditions herein will remain in effect beyond the permit's expiration date if the Permittee has submitted a timely, complete application and through no fault of the Permittee the Regional Administrator has not issued a new permit as set forth in 40 CFR 270.51.

4. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. Duty to Mitigate. The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

6. Proper Operation and Maintenance. The Permittee shall at all times properly operate and maintain all facilities and systems of control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. Duty to Provide Information. The Permittee shall furnish to the Regional Administrator, within a reasonable time, any relevant information which the Regional Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Regional Administrator, upon request, copies of records required to be kept by this permit.

8. Inspection and Entry. The Permittee shall allow the Regional Administrator, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

   (a) Enter at reasonable times upon the Permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of this permit;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

(c) Inspect at reasonable times any facilities, equipment practices, or operations regulated or required under this permit; and

(d) Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by RCRA, any substances or parameters at any location.

9. Monitoring and Records.

(a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846 June 19, 1982, Standard Methods of Wastewater Analysis; Fifteenth Edition, 1980, and 1981 Supplement; or an equivalent method as specified in the attached Waste Analysis Plan

(b) The Permittee shall retain copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report or record. These periods may be extended by request of the Regional Administrator at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility.

(c) Records of monitoring information shall specify:

(i) The dates, exact place, method, and times of sampling or measurements;

(ii) The individuals who performed the sampling or measurements;

(iii) The dates analyses were performed;

(iv) The individuals who performed the analyses;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

10. Reporting Planned Changes. The Permittee shall give notice to the Regional Administrator as soon as possible of any planned physical alterations or additions to the permitted facility.

11. Anticipated Noncompliance. The Permittee shall give advance notice to the Regional Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. Such notification does not waive permittee's duty to comply set out in I.D.1.

12. Transfer of Permits. This permit may be transferred to a new owner or operator only if it is modified or revoked and reissued pursuant to 40 CFR 270.41(b)(2) or 270.42(d). Before transferring ownership or operation of the facility during its operating life, the Permittee shall notify the new owner or operator in writing of the requirements of 40 CFR Parts 264 and 270.

13. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

14. Twenty-four Hour Reporting. The Permittee shall report to the Regional Administrator any noncompliance with the permit which may endanger health or the environment. Any such information shall be reported orally within 24 hours from the time the Permittee becomes aware of the circumstances. This report shall include the following:

    (a) Information concerning the release of any hazardous waste which may endanger public drinking water supplies.

    (b) Information concerning the release or discharge of any hazardous waste, or of a fire or explosion at the facility, which could threaten the environment or human health outside the facility. The description of the occurrence and its cause shall include:

        (i) Name, address, and telephone number of the owner or operator;

        (ii) Name, address, and telephone number of the facility;

(iii) Date, time, and type of incident;

(iv) Name and quantity of materials involved;

(v) The extent of injuries, if any;

(vi) An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

(vii) Estimated quantity and disposition of recovered material that resulted from the incident.

A written submission shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the periods of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Permittee need not comply with the five day written notice requirement if the Regional Administrator waives the requirement and the Permittee submits a written report within fifteen days of the time the Permittee becomes aware of the circumstances.

15. Other Noncompliance. The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time monitoring reports, as required by this permit are submitted. The reports shall contain the information listed in condition I.D.14.

16. Other Information. Whenever the Permittee becomes aware that he or she failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Regional Administrator, the Permittee shall promptly submit such facts or information.

E. Signatory Requirement. All reports or other information requested by the Regional Administrator shall be signed and certified as required by 40 CFR 270.11.

F. Confidential Information. The Permittee may claim confidential any information required to be submitted by this permit in accordance with 40 CFR §270.12.

G. Documents To Be Maintained at Facility Site. The Permittee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments, revisions and modifications to these documents:

(1) Waste analysis plan as required by 40 CFR 264.13 and this permit. (Attachment II)

(2) Personnel training documents and records as required by 40 CFR 264.16(d) and this permit. (Attachment VI)

(3) Contingency plan as required by 40 CFR 264.53(a) and this permit. (Attachment III)

(4) Closure plan as required by 40 CFR 264.112(a) and this permit. (Attachment V)

(5) Cost estimate for facility closure as required by 40 CFR 264.142(d) and this permit. (Attachment V)

(6) Operating record as required by 40 CFR 264.73 and this permit.

(7) Inspection schedules as required by 40 CFR 264.15(b) and this permit. (Attachment IV)

All amendments, revisions and modifications to any plan or cost estimates required by this permit shall be submitted to the Regional Administrator for approval and permit modification.

2. GENERAL FACILITY CONDITIONS

A. Authorized Waste. The permittee is authorized to store, up to 5,500 gallons, the following hazardous waste(s) or categories of hazardous waste in accordance with the conditions specified in this permit:

1) Agitene waste fluid which is a non-chlorinated petroleum cleaning solvent, U.S. EPA #D001.

2) Kolene sludge which is solidified sodium hydroxide waste, U.S. EPA #D002.

B. Design and Operation of Facility. The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.

C. General Waste Analysis. The Permittee shall follow the procedures described in the attached waste analysis plan, Attachment II.

The permittee shall verify its waste analysis as part of the quality assurance program. The quality assurance program will be in accordance with current U.S. EPA practices (Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846 June 1982 and at a minimum insure that the permittee maintains proper functional instruments, uses approved sampling and analytical methods, assures the validity of sampling and analytical procedures, and permforms correct calculations.

D. Security. The Permittee shall comply with the security provisions of 40 CFR 264.14(b) and (c).

The permittee shall maintain and operate the following:

1) A 24 hour surveillance system by guards which controls entry onto the active facility portion; and

2) A fence which completely surrounds the the active facility portion.

E. General Inspection Requirements. The Permittee shall follow the inspection schedule, Attachment IV. The Permittee shall remedy any deterioration or malfunction discovered by an inspection as required by 40 CFR 264.15(c). Records of inspections shall be kept as required by 40 CFR 264.15(d).

F. Personnel Training. The Permittee shall conduct personnel training as required by 40 CFR 264.16. This training program

shall follow the attached outline, Attachment VI. The Permittee shall maintain training documents and records as required by 40 CFR 264.16(d) and (e).

G. General Requirements for Ignitable, Reactive, or Incompatible Waste. The Permittee shall comply with the requirements of 40 CFR 264.17(a).

H. Prepardnesss and Prevention

1. Required Equipment. At a minimum, the Permittee shall furnish equip the facility with the equipment set forth in the contingency plan, Attachment 3 as required by 40 CFR 264.32.

2. Testing and Maintenance of Equipment. The Permittee shall test and maintain the equipment specified in the previous permit condition as necessary to assure its proper operation in time of emergency.

3. Access to Communications or Alarm System. The Permittee shall maintain access to the communications or alarm system as required by 40 CFR 264.34.

4. Required Aisle Space. At a minimum, the Permittee shall maintain aisle space as required by 40 CFR 264.35.

5. Arrangements with Local Authorities. The Permittee shall attempt to make arrangements with State and local authorities as required by 40 CFR 264.37. If State or local officials refuse to enter into preparedness and prevention arrangements with the Permittee, the Permittee must document this refusal in the operating record.

I. Contingency Plan.

1. Implementation of Plan. The Permittee shall immediately carry out the provisions of the contingency plan, Attachment III, and follow the emergency procedures described by 40 CFR 264.56 whenever there is a fire, explosion, or release of hazardous waste or constituents which threatens or could threaten human health or the environment.

2. Copies of Plan. The Permittee shall comply with the requirements of 40 CFR 264.53.

3. Amendments to Plan. The Permittee shall review and immediately amend, if necessary, the contingency plan, as required by 40 CFR 264.54.

4. Emergency Coordinator. The Permittee shall comply with the requirements of 40 CFR 264.55, concerning the emergency coordinator.

J. Recordkeeping and Reporting.

1. Operating Record. The Permittee shall maintain a written operating record at the facility in accordance with 40 CFR 264.73(a), (b)(1), (2), (3), (4), (5), (6), and (8).

2. Annual Report. The Permittee shall comply with the biennial report requirements of 40 CFR 264.75.

K. Closure.

1. Performance Standard. The Permittee shall close the facility as required by 40 CFR 264.111 and in accordance with the closure plan, Attachment V.

2. Amendment to Closure Plan. The Permittee shall amend the closure plan in accordance with 40 CFR 264.112(b) whenever necessary.

3. Notification of Closure. The Permittee shall notify the Regional Administrator at least 180 days prior to the date he expects to begin closure.

4. Time Allowed For Closure. After receiving the final volume of hazardous waste, the Permittee shall treat or remove from the site all hazardous waste in accordance with the schedule specified in the closure plan, Attachment 5. After receiving the final volume of hazardous waste, the Permittee shall complete closure activities in accordance with the schedule specified in the closure plan, Attachment V.

5. Disposal or Decontamination of Equipment. The Permittee shall decontaminate and/or dispose of all facility equipment as required by 40 CFR 264.114.

6. Certification of Closure. The Permittee shall certify that the facility has been closed in accordance with the specifications in the closure plan as required by 40 CFR 264.115.

L. Cost Estimate for Facility Closure. The Permittee's original closure cost estimate, prepared in accordance with 40 CFR 264.142(a), is specified in Attachment V.

1. The Permittee must adjust the closure cost estimate for inflation within 30 days after each anniversary of the date on which the first closure cost estimate was prepared, as required by 40 CFR 264.142(b).

2. The Permittee must revise the closure cost estimate whenever there is a change in the facility's closure plan as required by 40 CFR 264.142(c).

3. The Permittee must keep at the facility the latest closure cost estimate as required by 40 CFR 264.142(d).

M. Financial Assurance for Facility Closure. The Permittee shall demonstrate continuous compliance with 40 CFR 264.143 by providing documentation of financial assurance, as required by 40 CFR 264.151, in at least the amount of the cost estimates required by permit condition II.L. Changes in financial assurance mechanisms must be approved by the Regional Administrator pursuant to 40 CFR 264.143.

N. Liability Requirements. The Permittee shall demonstrate continuous compliance with the requirements of 40 CFR 264.147 and the documentation requirements of 40 CFR 264.151, including the requirements to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million, exclusive of legal defense costs.

O. Incapacity of Owners or Operators, Guarantors, or Financial Institutions.

The Permittee shall comply with 40 CFR 264.148 whenever necessary.

3. STORAGE IN CONTAINERS

A. Waste Identification. The Permittee may store the following wastes in containers at the facility, subject to the terms of this permit: D001 and D002. The maximum design capacity of the storage area is 5,500 gallons.

B. Condition of Containers. If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the Permittee shall transfer the hazardous waste from such container to a container that is in good condition or otherwise manage the waste in compliance with the the conditions of this permit.

C. Compatibility of Waste with Containers. The Permittee shall assure that the ability of the container to contain the waste is not impaired as required by 40 CFR §264.172.

D. Management of Containers. The Permittee shall manage containers as required by 40 CFR §264.173.

E. Containment. The Permittee shall maintain the containment system in accordance with the requirements of 40 CFR 264.175 as specified in the attached plans and specifications, Attachment VII.

F. Special Requirements for Ignitable or Reactive Waste. The Permittee shall not locate containers holding ignitable or reactive waste within 15 meters (50 feet) of the facility's property line.

G. Special Requirements for Incompatible Wastes.

1. Prior to placing incompatible wastes or incompatible wastes and materials in the same container, the Permittee shall comply with 40 CFR 264.17(b).

2. The Permittee shall not place hazardous waste in an unwashed container that previously held an incompatible waste or material.

3. The Permittee must document compliance with III. G. (1) and (2) as required by 40 CFR 264.17(c) and place this documentation in the operating record (condition II.J.1).

IND006036099

ATTACHMENT II

WASTE ANALYSIS PLAN

ISION OF GENERAL MOTORS
PLANT
D, INDIANA

PURPOSE

Provide a procedure for the chemical and physical analysis of the hazardous waste generated by the Bedford Plant as required by Federal and State Regulations (Federal Regulations 40 CFR, Part 265.13, and State Regulation 320 IAC 4-9-2).

SCOPE

Plan for chemical and physical analysis of the sodium hydroxide and agitene sludges which are classified as hazardous under provisions of the Resource Conservation and Recovery Act.

PROCEDURE

1.0 General Waste Analysis Requirements

1.1 All hazardous waste must be analyzed for chemical and physical properties before it is treated, stored or disposed.

1.2 The analysis must contain information that must be known to treat, store or dispose of the waste in accordance with requirements of Federal Regulation 40 CFR, Part 261.

1.3 The analysis may include analysis performed on this waste prior to the effective date of the RCRA regulations or studies conducted on the hazardous waste or wastes from a similar process. Also, may refer to GM safety data sheet for added information.

1.4 The analysis must be repeated when the process generating the waste has been changed.

2.0 Hazardous Wastes and Parameters to be Analyzed

2.1 Sodium Hydroxide Sludge

2.1.1 ph as determined by following the EPA Manual SW 846, Section 5 and Subsection guidelines.

2.2 Agitene cleaning solvent waste

2.2.1 Flash point as determined by following the guidelines in EPA Manual SW 846, Section 4 and Subsection guidelines.

3.0 Sampling Method

3.1 Sodium hydroxide sludge. This material is placed in DOT approved drums and stored in the plant approved hazardous waste storage area while awaiting shipment to an approved disposal site.

3.1.1 A good representative sample is to be obtained for analysis.

3.1.2 The sample collector will use a clean trowel or waste pile sampler for removing the sample material from the drum. Collect material from below the top surface. Place samples in a clean stainless steel container and mix in order to obtain a composite sample for laboratory analysis. Place composite samples in clean glass or stainless steel container with cap.

3.1.3 Mark and identify sample with label that lists the following information:

Collector
Sample Number
Place of Collection
Date Sampled
Time Sampled
Field Information

3.2 Agitene fluid and sludge waste. This material is placed in an approved DOT drum per the Maintenance Department procedure Number 534-41.

3.2.1 Use a glass tube or a composite liquid waste sampler to obtain a representative sample of material from the drum or drums.

3.2.2 Follow the sampling methodology described in the EPA Manual SW 846, Section 3.0 and Subsections.

3.2.3 Mark and identify sample with label that lists the following information:

Collector
Place of Collection
Date Sampled
Time Sampled
Field Information

4.0 Other plant wastes are to be added to this procedure if and when the Federal Resource Conservation and Recovery Act (RCRA) and State Regulation is revised to classify those waste materials as being hazardous.

PREPARED BY: S.R. Old Date 2-10-82

Approved By: W.A. Butler Date 3/17/82

_____ Date _____

IND006036099

ATTACHMENT III

CONTINGENCY PLAN

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

AMENDMENT TO SPILL PREVENTION AND COUNTER MEASURE PLAN (SPCC)

"Hazardous Waste Contingency Plan"

Proc. No. ECS-14
Date Issued 5-19-81
Date Revised 3-12-82
Date Revised
Date Revised
Page 1 of 2

PURPOSE:

Provide for a contingency plan and emergency procedure for the RCRA hazardous waste facility as required by Federal EPA regulations 40 CFR Part 265.50.

SCOPE:

Cover the EPA permitted hazardous waste facility at the Bedford Plant, which is the drum storage area for the sodium hydroxide and agitene cleaning solvent sludges.

PROCEDURE:

1.0 The Bedford SPCC and this amendment to that plan are to be followed by plant personnel whenever there is an unplanned sudden or non-sudden release of the hazardous wastes to air, soil, or surface water of the facility which may cause personal injury or may leave the plant property.

2.0 Plant Protection and the Plant Medical Staff are available 24 hours a day to respond to any emergencies requiring their services. In case of fire, Plant Protection will call the Plant Fire Brigade per standard operating procedure.

3.0 See item 2.5.6 of the SPCC plan, page 13, for the emergency coordinator assignment and responsibilities.

4.0 See item 2.5.6.3 of the SPCC plan, page 14, for list of emergency equipment. The Plant Protection gatehouse is located approximately 300 feet from the hazardous waste storage area. The plant guards are on duty at all times in this gatehouse and have radio and telephone for communication both in and out of the plant.

5.0 The characteristics and quantity of these hazardous waste materials are such that no evacuation plan is required. Also, the storage area is located outside and clear of occupied buildings and work areas.

6.0 The emergency coordinator will notify the Superintendent of Plant Engineering and the Plant Environmental Coordinator of any incident involving hazardous wastes that requires implementing this contingency plan. The Plant Environmental Coordinator will record the time, date and details of the incident. The environmental coordinator will prepare a report for submittal to the EPA Reginal Administrator within 15 days after the incident. The report must include:

- Name, address and telephone number of the owner or operator
- Facility location
- Date, time and type of incident.
- Name and quantity of materials involved.
- Extent of injury, if any.
- Assessment of actual or potential hazards to human health or environment, if applicable.
- Estimated quantity and disposition of recovered material that resulted from the incident.

6.0 Continued

This report is to be reviewed and approved by the Division and Corporate Environmental Staff and signed by the Bedford Plant Manager.

7.0 This contingency plan must be reviewed and immediately amended, if necessary, whenever:

- Applicable regulations are revised.
- The plan fails in an emergency.
- The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.
- The list of emergency coordinators changes.
- The list of emergency equipment changes.

PREPARED BY:

G.R. Ohl 5-19-81

G. R. Ohl — Date
Environmental Coordinator

"A description of emergency response procedures for fires and explosions."

The GMC-Central Foundry Division, Bedford Plant has an established procedure for responding to emergency fires and explosions.

When a fire or an explosion occurs, an emergency call is made to the Maintenance dispatcher. The dispatcher then sounds a coded alarm throughout the plant to designate the area where the emergency has occurred. The plants trained fire brigade responds to the alarm with the plant fire fighting equipment to extinguish the fire. If additional fire fighting equipment is needed, the Bedford City Fire Department is called to the scene.

The plant fire brigade consists of maintenance, security and supervisory personnel who have had classroom training and hands on experience in fighting Class A, B, C and D fires.

1. OIL SPILL PREVENTION

1.1 Central Foundry Division
General Motors Corporation
Bedford, IN 47421

1.2 Plant began operation - 1959

1.3 Registered Engineers Certification

JAMES E. HOON REGISTERED NO. 12535 STATE OF INDIANA PROFESSIONAL ENGINEER

Certified By: James E. Hoon Date 3/17/82

Approved By:

R. W. Herr Date 3-18-82
*R. W. Herr
Plant Manager

P. J. Murphy Date 3/18/82
P. J. Murphy
Manager of Plant Engineering & Maintenance

W. A. Butler Date 3/18/82
W. A. Butler
Superintendent of Plant Engineering

CERTIFICATION

I have reviewed the Spill Prevention Control and Counter-Measure Plan for (GM Plant) attached. The facility has been examined and being familiar with the provisions of Part 112, Oil Pollution Prevention, Chapter 1, Environmental Protection Agency, Subchapter D, Water Programs, as published in the Federal Register, Vol. 38, No. 237, Tuesday, December 11, 1973, I certify that the SPCC plan has been prepared in accordance with good engineering practices.

2. GENERAL INFORMATION

2.1 Plot Plan attached.

2.2 Existing Containment Facilities:

2.2.1 Fuel Oil Storage System

2.2.1.1 The fuel oil storage facility is a 200,000 gallon, 22 ft. high and 40 ft. in diameter tank. This tank is made from carbon steel and rests on a 42 ft. concrete pad, 15" in depth with reinforced steel bars. This facility is marked (A) on plot plan.

2.2.1.2 A 6 ft. high concrete circular moat surrounds the tank to contain all liquid spillage that might occur in case of tank rupture. This moat can be drained by a sump pump installed in the system.

2.2.1.3 The fuel oil distribution system is composed of 3" supply and 2 1/2" return lines. Any major line leak will create a pressure loss which will de-energize the pump control circuit. In the case of pencil thin leaks when the pressure loss is not sufficient to de-energize the circuit, clearly identified emergency shutoff buttons are placed at four locations in the Melting Department.

2.2.2 Hydraulic Fluid Losses During Production Equipment Operation

2.2.2.1 Hydraulic fluid which mixes with oil is used in the operation of the plant's die casting machines, trim presses, and permanent mold machines. Oil that leaks from this equipment drains into the drainage system located under the machines.

2.2.2.2 This leakage is captured in a series of tunnels and diverted to the plant's primary water treatment system. This is mechanically capable of reclaiming all of the most drastic spill and returning it to plant use. In the event traces of hydraul fluid get past the primary system there is a backup secondary treatment system, chemically treating the water.

2.2.2.3 After the secondary system, there is a concrete holding basin which holds 300,000 gallons. This basin is divided to allo trapping and retaining a spill.

2.2.3 Miscellaneous Bulk Storage Facilities

2.2.3.1 Marked "D" on plot plan - two 3,000 gallon each steel tanks above grade and containing isocyanide 307 resins (isocure) Specific gravity is heavier than water, the material is toxic and flammable.

2.2.3.2 Deleted

2.2.3.3 Marked "E" on plot plan - one 2,000 gallon steel tank containing no lead gasoline. Tank is located below grade.

2.2.3.4 Marked "F" on plot plan - one 10,000 gallo steel storage tank below grade containing regular gasoline.

2.2.3.5 Marked "J" on plot plan - one 5,000 gallon steel tank above grade and used as storage for water glycol hydraulic fluid.

2.2.3.6 Marked "K" on plot plan - one 10,000 gallo steel tank above grade, used as storage fo mineral base die lube.

*2.2.3.7 Marked "L" on plot plan - one 10,000 gallo steel tank above grade. Storage for lig oils from clarithickners.

*2.2.3.8 Marked "M" on plot plan - water treatment plant consisting of two 100,000 gallon concrete submerged clarithickners. Four

2.2.3.8 (Continued)

100,000 gallon concrete submerged clarifier Two 40,000 gallon concrete submerged sludge thickner. One 130,000 gallon steel tank above grade used as filter press effluent surge tank. One 20,000 gallon concrete tank for oil and sludge separation

2.2.3.9 Marked "N" on plot plan - one 300,000 gallon concrete holding basin below grade. This basin holds treated water to final filtration.

*2.2.3.10 Marked "P" on plot plan - 7 steel storage tanks with total capacity of 150,000 gallons storing used phosphate ester hydraulic fluid. All tanks are surrounded by earthen dike.

*2.2.3.11 Marked "Q" on plot plan - 14 steel storage tanks with total capacity of 157,500 gallons storing used phosphate ester hydraulic fluid. All tanks are surrounded by earthen dike.

2.2.3.12 Marked "R" on plot plan - one 2,000,000 gallon sludge holding lagoon. Dormant at time time awaiting final disposition of sludge.

2.2.3.13 Marked "S" on plot plan - two 5,000 gallon steel tanks, storing new phosphate ester hydraulic fluid.

2.2.3.14 Marked "U" on plot plan - one 10,000 gallon fiberglass tank storing brine used for water softener regeneration.

2.2.3.15 Marked "V" on plot plan - one 2,000 gallon tank and one 500 gallon tank holding mineral electrolytic fluid used for EDM machining.

2.2.3.16 90,000 gallons of phosphate ester hydraulic fluid is contained in power units throughout the plant.

2.3.1.1 The Bedford plant has a 200,000 gallon fuel oil storage tank surrounded by a retention wall. The fluid level is checked each time material is added to the tank. The tank, retaining walls, and distribution system are inspected twice a year. The preventive maintenance program also included changing the oil filters yearly.

2.3.1.2 The tank is made from carbon steel and complies with ARI Specifications #650, UL Bul. #142, NEPA Bul. #30 and OSHA. It has also been given additional corrosion resistance with a double primer and a metallic overcoat.

2.3.1.3 One 10,000 gallon vertical hydraulic fluid storage tank shown on included Bedford Plan layout would leak toward the water treatmen plant if a leak accidently developed. In this area, the spread of fluid can be controlled on plant property. These tank observed and used daily and are inspected twice a year.

2.3.3 Underground Systems

2.3.3.1 In the fuel oil distribution system, all piping 2 1/2" and above is schedule 40 black welded piping, wrapped with plastic for underground use and corrosion protectio In the case of a major line leak, the pressure loss will de-energize the circuit pump. Emergency shutoff buttons are placed at four locations in the plant if a smaller leak develops which is not sufficient to de-energize the system.

2.3.3.2 Hydraulic fluid, used in the operation of the plant's die casting machines and tri presses, leak into a series of tunnels and is directed to a water treatment system There is a continuing leak detection and prevention program in the Maintenance Department for all of this equipment.

*2.4 Spill Definition

2.4.1 The definition is to conform to the Environmental Protection Agency regulations on discharge of oil (40 CFR 110 36 FR 22487, November 25, 1971), and specifically to section 110.3, "Discharge into Navigable Waters Harmful." Generally described as Discharges of such quantities of oil and other haza materials into or upon the navigable waters of the United States of adjoining shore lines determin to be harmful to the public health or welfare of th United States, at all times and locations and under all circumstances and conditions, include discharge which:

a) Violate applicable water quality standards, or;
b) Cause a film or sheen upon or discoloration of the surface of the water or adjoining shoreline or cause sludge or emulsion to be deposited beneath the surface of the water or upon adjoin shorelines, or;
c) Exceed reportable quantities of the hazardous materials in Table 117.3, EPA 40 CFR, Part 11), FR 50766 August 29, 1979. (Reference GM WPC 79-2 US).

2.5 Cleanup Procedures

2.5.1 Spill Initial Action

2.5.1.1 First action in the event of any kind of pollutant spill is to prevent the pollutant from entering a sewer, sluice system, or plant settling pond, the river water inlet or the river directly. Take immediate acti to confine the spill and prevent further spills. In-plant spills are the responsibility of the operating department where found. Out-plant spills are the responsibility of the Material Control Department.

2.5.1.1.1 Any spill on the floor in the plant can be contained using san dirt, or oil-dry, as dam materia or absorbent. In extreme

emergencies, oil can be contain with productive powered materia such as sand, clays, cement, et although the use of these is no recommended for this purpose.

2.5.1.1.2 Spills which occur on paved sur in plant perimeters can be trea as above. However, if the spill occurs on dirt, near a sewer or waterway, care must be taken that it does not eventual seep through the dirt into that facility. It may be necessa ultimately excavate the pollute dirt and have it disposed of by licensed contractor.

2.5.1.1.3 Spills which result in direct contamination of the settling pond, settling basin or Salt Cr must be contained by any ava means;

2.5.1.1.3.1 Oil or other float materials - use ha straw or a boom arrangement.

2.5.1.1.3.2 Soluable mater attempt to contain within plant owned facilities and not allow to reach the river.

2.5.2 Internal Notification

2.5.2.1 Immediately upon discovery and initial action regarding a pollutant spill, certain persons in the plant must be notified. Information to be supplied these persons is:

2.5.2.1.1 Location of spillage.

2.5.2.1.2 Type of material spilled.

2.5.2.1.3 Estimated quantity and extent.

2.5.2.1.4 A run down of measures taken thus far to confine the spillage and prevent further spillage.

2.5.2.2 This information will be passed immediately to Plant Protection, extension, 7360. The guard receiving the call will notify the following as soon as possible: (Before each home number, dial 8-812 then the number).

	Plt. Ext.	Home Phone
*Plant Manager	7222	279-2117
Mgr. Plt. Engr. & Maint.	7357	275-7857
*Supt. Plant Engr.	7303	824-4111
Supt. of Maintenance	7328	
*Personnel Director	7334	332-2099

2.5.3 Notifying Regulatory Agencies

2.5.3.1 In the event of an accidental spill reaching State Streams, the appropriate State agency must be notified immediately. The Plant Manager is sole authority for reporting; in his absence, the Plant Engineer will act for him and in his absence the Maintenance Superintendent will act for the Plant Manager. The actual reporting will be done by the Plant Engineer or Maintenance Supt.

2.5.3.2 A spill that enters sanitary sewer lines may affect city sewage treatment facilities. Such a spill must be reported to the city.

City Sewage Service - 275-6292

Sewage Disposal Plant - 275-4901

2.5.3.3 A spill that reaches State Streams will be reported immediately to:

U. S. Coast Guard
National Response Center
400 Seventh St., S. W.
Washington, D. C. 20590
Phone: 800-424-8802

Emergency Center
Indiana Stream Pollution Control Board
Phone: 317-633-0144

2.5.3.4 Spill Notification within normal working ho

Division Works Engineer

Mr. Wm. C. Cheek
Central Foundry Div., GMC
77 West Center Street
Saginaw, MI 48605
Office Phone: 517-776-3377
Centrex Phone: 8-386-3377
Home Phone: 517-793-0089

Division Administration Environmental Activi

Mr. J. B. Medved, P. E.
Central Foundry Div., GMC
77 West Center Street
Saginaw, MI 48605
Office Phone: 517-766-3387
Centrex Phone: 8-386- 3376
Home Phone: 313-793-2464

State Agency

Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, IN 46206
Phone: 317-633-0713
(Mr. Joe Stallsmith)

Local Sanitarian

Health Department Court House
Mr. Paul McBride
Phone: 275-3234

2.5.4 External Notification

2.5.4.1 An outside call regarding a spill can come from any source to any receiver, and may ha nothing to do with the plant. It is important that the proper information be obtained from the caller, so the proper action can be initiated. When such a notification is received, request the following:

2.5.4.1.1 Where is the spill?

2.5.4.1.2 Can you identify the material? What does it look like?

2.5.4.1.3 When did you observe it?

2.5.4.1.4 Will you identify yourself, (nam and address) so that we can repc on results of our investigation?

2.5.4.1.5 Can we contact you for further assistance if we cannot locate the spill?

2.5.4.2 The person taking spill information from outside the plant will follow the "Internal Notification" procedure.

2.5.5 Spill Confinement

2.5.5.1 In the event the spill cannot be contained within the confines of our plant boundaries, we must take immediate action to procure all necessary materials and equipment to confine and clean up the spill. It remains our reponsibility until properly disposed of.

*2.5.6 Manpower Assignments

2.5.6.1 The person designated to be responsible for spill cleanup is Mr. Joseph Choate, Maintenance Superintendent.

Phone Extension: 7328
Home Phone:
Home Address:

*2.5.6.1.1 Mr. Choate will designate alternates in the event of his absence.

Mr. Choate's first alternate is:

Jim Burch
West Rocky Creek, Bedford
PHONE: 812-275-2639

*2.5.6.1.2 Mr. Burch is responsible for:
Dispatching cleanup crews
Coordinating cleanup
Mr. Butler is responsbile for:
Notifying in-plant management
Notifying proper regulatory agencies
Notifying proper corporate offices

2.5.6.2 The Maintenance Department will supply necessary manpower for spill cleanup.

2.5.6.3 The following spill control and cleanup equipment is available at the plant:

2.5.6.3.1 Sump pumps are installed at the fuel oil storage tank and in the die cast tunnel system.

*2.5.6.3.2 A mobile 300 gallon fluid collec system and a caterpillar trac with a backhoe are parked at the Maintenance Area.

2.5.6.3.3 Oil absorption material is available from a storage crib which is located in the southwest section of the lar manufacturing building.

2.5.6.4 Cleanup contractors available:

*2.5.6.4.1 McIntyre Brothers Const.
1020 7th St., Bedford, IN
Phone: 279-9637

2.5.6.4.2 Stone City Construction Company
910 R Street, Bedford, IN
Phone: 275-7541

*2.5.6.4.3 Cunningham Construction Company
1000 Lincoln Ave., Bedford, IN
Phone: 275-4469

2.5.7 Written Report

2.5.7.1 A spill designated as harmful quantities of mineral oil will require a written report, giving detailed information of the causes of the spill. The report must be sumbitted to the E.P.A. within 60 days of a spill; prior to the E.P.A. report submitting. G.M. Envir Activities Staff and Legal Department shall review the report within 30 days of a spill.

2.5.7.2 Any spill that violates the Plant NPDES Permit Limitations will require a submission of a detailed written report with the E.P.A. Regional Administrator and the State of Indiana within five (5) days after becoming aware of such condition. See plant NPDES permit for reporting requirements. Division Works Engineer and GM legal Department must approve all written reports before submittal

*2.5.7.3 Activation of the RCRA Contingency Plan requires a wr report. See amendment to this procedure.

2.5.8 Spill Cleanup Procedures:

2.5.8.1 Training program is continuous for Maintenan Water Treatment, and Power House personnel.

2.5.8.2 Off hour spill detection and notification is accomplished with standby Maintenance personnel and by Plant Protection.

2.5.8.3 Procedures and developments will be reviewed in departmental meetings as required.

3.0 HISTORY OF OIL SPILLS

3.1 Spills occuring since June 10, 1973; November 12, 1976 - black material discharged at 002.
February 22, 1977, approximately 5 gallons of used flushing spilled at west side of plant.
November 18, 1977, a non-compliance with NPDES permit repor was filed as a result for excessive suspended soilids and grease and oils in 001 and 002 outfalls.

3.2 Description of Incident

3.2.1 On 11-12-76 black material was observed flowing fr 002 outfall, this condition lasted approximately one half hour. Tests indicated this material cont ± 160 PPM PCB's. No source of contamination was found. Removing settling lagoon connection to the sewers, and by passing areas that once contained lagoons.

3.2.2 On 2-22-77, approximately five gallons of used hydraulic flushing fluid siphoned from it's storage tank and reached a storm drain discharging into a ditch west of CFD property. The siphoned flow was stopped and the fluid dammed with sand, then cleaned up and disposed of. The ditch was dredged and dredged material disposed of. The storm drain sewer were abandoned and plugged. The storage tank was moved to a diked area.

3.2.3 On 11-18-77, a non-compliance with NPDES permit report was filed. Test results at 001 and 002 o indicated suspended solids and grease and oils content exceeded allowable limits. Reasons were excessive influent flow of water to the treatment plant resulting from a break in an underground city water line and a reservoir level control malfunctic Both faults were corrected and effluent water quali returned to allowable quality.

3.3 Spill Potential

3.3.1 Fuel oil distribution equipment failure would result in less than 100 gallons spillage. This spill would follow the paths previously described.

3.3.2 Fuel o i l tank rupture would spill 200,000 gallons maximum and would be contained within a concrete dike area.

3.4 Containment Facilities Planned

3.4.1 No additional containment facilities are planned at this time.

3.5 Bulk Loading and Unloading Procedures

3.5.1 Bulk oil loading and unloading procedures are given in the operating procedures.

3.6 This procedure is to be updated and/or revised at least once every three years.

ATTACHMENT IV

INSPECTION PLAN

STANDARD PROCEDURE

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) INSPECTION SCHEDULE

Date Issued
Date Revised
Date Revised
Date Revised

ON GENERAL MOTORS
D PLANT
D, INDIANA

PURPOSE:

This inspection is being done to comply with requirements of Federal Regulation 40 CFR265-15 and 40 CFR264-15.

SCOPE:

Drum storage area for plant wastes listed per RCRA requirements.

RESPONSIBILITY:

Material Control.

PROCEDURE:

1.0 Area/facilities to be inspected.

1.1 Drum storage north of Semi-Permanent Mold building for storage of sodium hydroxide and agitene sludges.

2.0 Inspection frequency.

2.1 Storage area - weekly.

2.2 Loading/unloading - daily.

3.0 Problems to look for.

3.1 Drums stored/stacked improperly.

3.2 Drums improperly labeled.

3.3 Drums deteriorated or leaking.

3.4 Drums open.

3.5 Drums missing or added without documentation.

4.0 Corresponding corrective action for problems under 3.0 above.

4.1 Restack or relocate drums.

4.2 Affix proper label.

4.3 Transfer contents into another container; clean up spill, put spilled material and clean up material into approved container. Dispose of defective drum in approved disposal facility.

4.4 Affix lid or replace bungs.

4.5 Note drum count, verify count and investigate differences.

5.0 Records.

5.1 Record inspection on log sheet, form 533-23A.

5.3 Keep log sheets on file in Material Control Department at least three (3) years.

EPARED BY:

G. R. Ohl 5-27-81
G. R. Ohl — Date
Environmental Coordinator

APPROVED BY:

RG Simmerman 5/28/81
R. G. Simmerman — Date
General Supervisor
Material Control

A. L. Snook 5/25/81
A. L. Snook — Date
Superintendent
Industrial Engineering

Solvent Handling "SLUDGE" AND HAZARDOUS SLUDGE

INSPECTION DATE & TIME	NAME OF INSPECTOR	DAILY INSPECTIONS: COUNT NO. OF DRUMS	DAILY INSPECTIONS: STORAGE PROPER? YES	DAILY INSPECTIONS: STORAGE PROPER? NO	WEEKLY INSPECTIONS: DRUMS OPEN? YES	WEEKLY INSPECTIONS: DRUMS OPEN? NO	WEEKLY INSPECTIONS: DRUM CONDITION OK	WEEKLY INSPECTIONS: DRUM CONDITION NO	WEEKLY INSPECTIONS: DRUMS LEAKING? YES	WEEKLY INSPECTIONS: DRUMS LEAKING? NO	WEEKLY INSPECTIONS: LABELS OK? YES	WEEKLY INSPECTIONS: LABELS OK? NO	NATURE OF REPAIRS OR OTHER REMEDIAL ACTION	DA RE ACTI

IND006036099

ATTACHMENT V

CLOSURE PLAN

GENERAL MOTORS CORPORATION

CENTRAL FOUNDRY DIVISION

BEDFORD PLANT

CLOSURE PLAN FOR RCRA HAZARDOUS WASTE DRUM STORAGE AREA

I. Introduction

Under the U.S. EPA regulations, 40 CFR Part 265, Subpart G, Sections 265.110 thru 265-120 each facility which stores, treats, or disposes of hazardous wastes must have a Closure Plan on file. This Closure Plan has been prepared to cover the following facility:

1. EPA I.D. Number - IND006036099

2. Owner's Name: General Motors Corporation
   Central Foundry Division
   Bedford Plant
   North Jackson Street
   Bedford, IN 47421

3. This plan has been prepared by: Glen R. Ohl
   Environmental Coordinator
   Date - July 15, 1982

4. The attached chart shows the drum storage area for storage of hazardous wastes.

II. Maximum Waste Inventory

The following table shows the maximum quantity of wastes on hand at any one time:

Sodium Hydroxide Sludge	50 drums
Agitene Sludge	50 drums

III. Schedule for Closing

This facility does not have a definite closure date. The following schedule is open-ended. It lists the timetable for closure in terms of elapsed time subsequent to the time that EPA, or an EPA authorized state agency, has approved this Closure Plan. This Closure Plan must be submitted to the EPA agency for approval at least 180 days before closure is expected to start. The Plant Engineer will submit the closure plans. (See Section 265.112 (c) of the EPA regulation in 40 CFR.)

Day 1 - Plant termination of hazardous waste activity.

Day 15 - Drums of hazardous wastes prepared for shipment to disposal site.

Day 20 - Obtain necessary approvals for shipment of hazardous wastes to approved disposal site.

Day 30 - Clean concrete storage area that was used for storing wastes by sweeping. After sweeping use a detergent cleaner solution to wash the concrete area. The area will then be rinsed with clean water.

Day 32 - Examine trench around hazardous waste storage area. Any hazardous waste residue will be removed and packaged in DOT approved drums for shipment to approved disposal area.

Day 35 - Ship hazardous wastes sludges in approved containers to disposal site.

Day 40 - Use plant power vacuum scrubber to wash and rinse vacated drum storage area for hazardous wastes. Wash liquid shall be discharged to the plant wastewater treatment facilities.

Day 45 - Closure should be complete.

Day 50 - Certification of closure by independent registered professional engineer.

IV. Decontamination of Facility

1. All hazardous waste sodium hydroxide and agitene sludges will be placed in approved DOT drums and marked for shipment to an approved chemical waste landfill.

2. Storage Area: The storage area will be sweep clean. The area will then be scrubbed with a mild detergent with the plant power scrubber. The area will be rinsed with clean water. These cleaning liquids will be collected by the plant vacuum pickup truck and treated via the plant wastewater treatment facilities. The concrete trench around the concrete storage area will be cleaned and any hazardous waste residue will be placed in an approved DOT drum and disposed of in an approved chemical waste landfill as specified by the plant environmental coordinator. Potential firms are:

Cecos	- Williamsburg, Ohio
Adams Center	- Ft. Wayne, Indiana

3. Testing: To verify the completeness of the decontamination process, the ph of the rinse water solutions will be measured by the Plant Water Treatment Department. The Plant Environmental Coordinator will inspect the cleaned area to confirm that all hazardous waste has been removed.

V. Cost Estimates for Closure (to be updated annually on July 1)

Prepared by: G. R. Ohl, Senior Engineer

Approved by: Gary C. Southern
Resident Comptroller

Area	Total Cost
Sodium Hydroxide Sludge	$ 3,000
Agitene Sludge	1,000
Drum Storage	7,200
Inspection, Approval, Testing and Report	3,000
TOTAL	$14,200

IND006036099

ATTACHMENT VI

TRAINING PLAN

"The content of your personnel training program should be presented."

As described in the GMC, Central Foundry Division-Bedford Plant RCRA Part B, Permit Application, Section 2, "Outline of Personnel Training", pages 46 and 47. The facility training program consists of job and safety procedures which explain to the employe the procedures and steps to be followed while performing his or her job. Attached are two procedures which establish those requirements for the handling, storage and disposal of the two hazardous wastes at this facility. These procedures are reviewed with the employe twice a year and for new or transferred employes on the first three consecutive days of employment in that area.

"Training for emergency response."

Members of the plant's fire brigade undergo classroom and hands-on training. Classroom training consists of slides, films, and discussion. In the field, members are exposed to various types of fires to extinguish.

Members of the brigade undergo training on a monthly schedule.

"Provisions for implementing the training program."

The Bedford Plant has developed job safety and operating procedures for various classifications of employment throughout the plant. These procedures are reviewed with appropriate employes twice a year. These procedures are also reviewed with all new employes that are assigned to the job classifications on the first three consecutive days of their employment.

Outline of Personnel Training (40 CFR 122.25(a)(12))

The personnel training program for this plant is incorporated in the overall plant program for the training of all employes to perform their assignments in a safe manner and in accordance with all plant policies, regulations and procedures.

The Plant Departments are responsible for preparing the job procedures and insuring that their employes are trained properly to perform their job assignments. Technical advice is furnished to the operating departments by the Plant Environmental Coordinator, Environmental Engineer, Safety Director and other specialists, as required. The Environmental Coordinator directs the training program on Hazardous Wastes Management in accordance with plant procedures. The Environmental Coordinator and the Environmental Engineer have attended General Motors Corporation training meetings on hazardous wastes and the Environmental Coordinator obtained training at the General Motors Hazardous Waste Management Seminar.

Personal Resume

Mr. Glen R. Ohl, the Plant Environmental Coordinator. Mr. Ohl has been with the G.M. Central Foundry Division for 30 years and worked in the environmental area at the Bedford Plant for the past 10 years. He received his engineering degree from General Motors Institute in 1958.

Mr. William Schoonmaker, Environmental Plant Engineer, gives technical advice and recommendations on the Hazardous Waste Management Program to plant personnel. Mr. Schoonmaker has a degree in chemical engineering and is a Registered Professional Engineer. He has been employed by the Bedford Plant the past 4 years working on engineering projects in the environmental areas. Mr. Schoonmaker was previously employed by the Indiana State Board of Health.

The General Motors Corporate Environmental Activities Staff issues information bulletins concerning all environmental areas including Hazardous Waste Management to plants in the Corporation. This information is reviewed by the Plant Engineer and Environmental Coordinator and if applicable reviewed with personnel that handle hazardous waste and incorporate any new requirements into job procedures.

The job and safety procedures explain to the employe the procedures and steps to be followed while performing his or her job. Attention is given to the proper wearing of personal protective equipment, correct use of tools, clean up of spills, emergency procedures, and emergency equipment. Particular emphasis is placed on the job training to be sure the employes understand their job responsibilities and demonstrate the ability to perform their job assignments in a satis-

factory manner. The date of the employe's training and job procedure instructions are recorded and filed in the Personnel Department. All employes have their job procedures and duties explained to them on the first 3 consecutive days of employment and every 6 months thereafter. Employes that are transferred to new job assignments receive job training before they are allowed to work alone without immediate supervision.

The plant SPCC plan provides detailed instructions and information on the Bedford Plant's emergency procedures for responding to emergencies.

The plant has the following support groups available to respond to any hazardous waste problem or emergencies:

1. Fire brigade consisting of trained personnel under the direction of Plant Security and the Chief of Security.

2. Complete medical department staffed with nurses 24 hours per day, a plant doctor, and a plant Safety Director.

3. Plant Security force that patrols the plant property and controls access to the property. A two-way radio system is provided for immediate communication in case of emergencies.

All employes are required to review job and safety procedures semi-annually. Records documenting these reviews, employes names, job classification are filed in the Personnel Department.

"Job titles, duties, and names of each employe receiving training."

The following is a list of persons who are directly or indirectly involved with hazardous waste management and or activities at the Bedford Plant.

Environmental Coordinator - Glen Ohl

Supervisor of the plant's environmental engineers and is responsible for the plant's environmental activities.

Environmental Engineer - Wm. Schoonmaker, P.E.

Responsibilities include providing technical advice, assistances, and recommendations on environmental activities and projects.

Material Control General Supervisor - Ronald Simmerman

Supervisor of the plants material control department. Responsibilities include the transferring and handling of materials throughout the plant. The material control department is directly responsible for the hazardous

Material Control Supervisor - Roger Porter

Supervisor of the hourly workers in the material control department. This position has the responsibilities of the truck drivers and material handlers. Duties also include maintaining, inspecting and shipping of hazardous waste.

Material Control Truck Drivers - Bill Mapes
- Paul Porter
- Paul Phipps

Duties include moving materials throughout the plant as required. Truck drivers are responsible for placing hazardous waste into the hazardous waste designated storage area.

Material Control Material Handler - Jim Langley

Responsibilities include making inspections of the storage and handling of waste materials.

Maintenance General Supervisor - Jim Burch

Supervisor of maintenance supervisors. This position is responsible to respond and supervise any emergency spill cleanup in accordance with the SPCC-Plan.

Maintenance Machine Repairman - Bob Owens
Fred Pritchett

These men in their job duties use agitene fluid. This position requires the draining of agitene tanks periodically into drums, which are labeled and sent to the hazardous waste storage area.

Production Supervisor - Sheila Scherschel

Supervisor of the production floor and is responsible for production workers. This position is responsible to insure that job duties are conducted in accordance with job and safety procedures.

Kolene Operator - Lee Ray

Duties of the position include the placing of waste sludge into drums. It is the responsibility of the operator to seal and label the drums of hazardous waste.

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

DISPOSAL OF USED AGITENE AND USED AGITENE SLUDGE

Proc. No. S534-42
Date Issued 12-14-82
Date Revised 11-10-82
Date Revised
Date Revised

Mag card

PURPOSE:

Provide a procedure for the storage, handling and disposal of spent agitene.

SCOPE:

This procedure covers all Maintenance work area agitene tanks located in the following areas:

1. Garage
2. Motor Shop
3. Cylinder and Pump Rebuild Area (2 Tanks)
4. Spindle Room
5. M/R Manifold Shop
6. M/W Hill Area
7. M/R Shop Located in Tool Room
8. Piston N/W Area
9. Power House

RESPONSIBILITY:

Maintenance Department.

PROCEDURE:

1.0 All spent agitene is to be drained from the tank and placed in an approved DOT 55 gallon drum.

1.1 The following drums are non-returnable and should be used:

1.1.1 Agitene
1.1.2 Kemseal B - Detrex
1.1.3 Foamaster - Diamond Shamrock
1.1.4 Surfacant Rinse - Houghton
1.1.5 Lacquer Thinner

2.0 It is the responsibility of the individual draining the tank to see that the barrel is properly sealed before transporting.

3.0 The individual responsible for draining out and cleaning the tank will make sure that the barrel is properly labeled.

3.1 Labels (see attached example) will be kept at the Maintenance SCALE office.

DIVISION OF GENERAL MOTORS
BEDFORD PLANT
BEDFORD, INDIANA

STANDARD PROCEDURE

DISPOSAL OF USED AGITENE AND USED AGITENE SLUDGE

Proc. No. S534-42
Date Issued 12-14-82
Date Revised 11-10-82
Date Revised
Date Revised

3.2 All pertinent information must be recorded on the label.

3.3 Labels (hazardous waste liquid) must also be attached per example 2.

4.0 Barrel will then be transported by truck to the "Maintenance Waste Material" storage area.

4.1 No more than four (4) barrels of spent agitene are to be stored in this area at one time.

4.2 Only one type of fluid in any one barrel.

4.3 Barrels placed in Maintenance Waste Oil Area must be on skids.

5.0 It is the responsibility of the Material Control Department to transport waste fluid from Maintenance Waste Area to the Hazardous Waste Storage Area.

5.1 Do not take any fluid to the Oil House Area without notifying Material Control General Supervisor.

5.2 The Material Control truck driver must be familiar with "Oil Spill Prevention and Counter Measure Plan" (SPCC).

5.3 "NO SMOKING" or open flames in Hazardous Waste Storage area, or while transporting material.

5.4 In the event of an accidental spill, the truck driver must take the following steps:

5.4.1 Contain the spill with oil dri, sand or other absorbant material. This material must then be picked up and put in a drum and stored in the Hazardous Material Storage Area.

5.4.2 Safety equipment and spill clean up equipment are available in plant crib.

5.4.3 Notify supervisor as soon as practical of the spill, action taken, and results.

Revised by:
RG Zimmerman 11/10/82
Date

Approved by:
R.R. Ohl 11-17-82
Environmental Coordinator Date

Approved by:
M C Smith 11/18/82
Supt., Maintenance Date

RG Zimmerman 11/15/82
Gen. Supv., Mat'l Control Date

W.A. Connell USF 11/18/82
Safety Supervisor Date

* Indicates Revised Portion

..ISION OF GENERAL MOTORS
EDFORD PLANT
EDFORD, INDIANA

STANDARD PROCEDURE

STORAGE, HANDLING AND DISPOSAL OF SODIUM HYDROXIDE ~~SLUDGE~~ (KOLENE)

Proc. No. 5533-17
Date Issued 12-1-78
Date Revised 11-10-82
Date Revised
Date Revised
Page 1 of 2

Mag cards

PURPOSE:

Sodium hydroxide waste is a hazardous material and therefore must be subject to control procedures. This procedure identifies the method for proper storage, handling, and disposal of sodium hydroxide sludge.

SCOPE:

This procedure applies to the storage, handling, and disposal of sodium hydroxide sludge which result from any operation at the Bedford plant.

RESPONSIBILITY:

Material Control - 5533
Permanent Mold - 5400
Purchasing

PROCEDURE:

1.0 Drums of sodium hydroxide sludge must be closed before transporting.

2.0 The source department must label each barrel with following information:

2.1 The type of material - "Sodium Hydroxide Sludge" or "Kolene Salts", etc.

2.2 The department which produced the sludge.

2.3 The date and shift the sludge started accumulating in the department.

2.4 The ORM-E hazardous waste label properly completed (see Fig. 1).

3.0 The barrels of sludge must be loaded two per pallet and hauled by the production department to a designated area in the Permanent Mold Department.

4.0 The Material Control Department will transfer the material from the Permanent Mold Department to the hazardous material waste storage area.

4.1 At ~~no time~~ are containers of sodium hydroxide sludge to be dumped into unlabeled containers for storage or disposal.

DIVISION OF GENERAL MOTORS
EDFORD PLANT
EDFORD, INDIANA

STANDARD PROCEDURE

STORAGE, HANDLING AND DISPOSAL OF SODIUM HYDROXIDE SLUDGE (KOLENE)

Proc. No. 5533-17
Date Issued 12-1-78
Date Revised 11-10-82
Date Revised
Date Revised
Page 2 of 2

5.0 When sufficient numbers of barrels have been accumulated, the Material Control Department will request that purchasing obtain the services of a carrier who is licensed to transport this hazardous material to an approved disposal site. This waste must be hauled in accordance with Regulation State 330IAC 4-10 federal RCRA regulations.

6.0 The shipment of this material must be in compliance with material Control procedure 5533-14 which includes requirements of the Hazardous Materials Shipping Act and CFR Title 49.

7.0 In the event of an accidental spill, the following action must be taken:

7.1 Contain the spill.

7.2 Personal protective equipment, including rubber gloves and face mask are required.

7.3 Place material back into an approved container and place in hazardous waste area.

7.4 Notify supervisor as soon as practical of the spill, action taken, and results.

Revised by:

RG Sommerman 11/10/82
Date

Approved by:

[signature] 11/16/82
Supt., Perm. Mold Dept. Date

[signature] 11-16-82
Environmental Coordinator Date

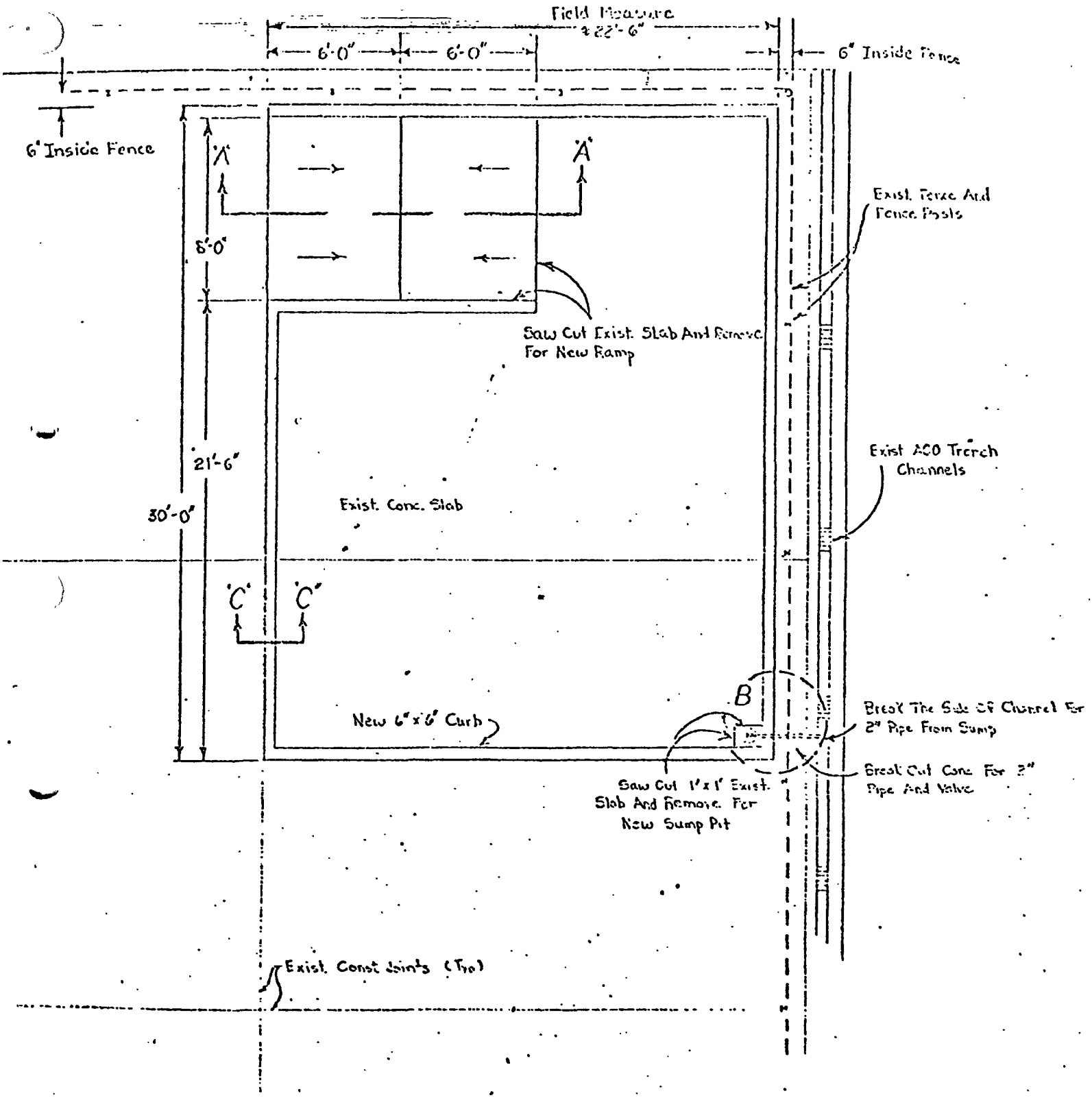
W.A. Correll [illegible] 11/18/82
Safety Supervisor Date

RG Sommerman 11/15/82
Gen. Supv., Material Ctrl. Date

*Indicates Revised Portion

ATTACHMENT VII

CONTAINMENT SYSTEM PLAN



PLAN VIEW - HAZARDOUS WASTE STORAGE CONTAINMENT

(Scale 1/4" = 1'-0")

APPENDIX G.11

ISBH LETTER DATED FEBRUARY 21, 1984

STATE of INDIANA

ENVIRONMENTAL MANAGEMENT BOARD

INDIANAPOLIS 46206-1964

1330 West Michigan Street
P. O. Box 1964

February 21, 1984

VIA CERTIFIED MAIL

Mr. Glen Ohl
GMC Central Foundry
P.O. Box 271
Bedford, IN 47421

Dear Mr. Ohl:

Re: GMC Central Foundry
Bedford Plant
Bedford, Indiana
IND 006036099

Please find enclosed a copy of the Indiana Hazardous Waste Management Permit for your hazardous waste storage facility at the above-referenced location.

If you find the terms and conditions of this permit are objectionable, you may petition for a hearing before the Environmental Management Board within 15 days after the date of receipt of this permit in accordance with IC 13-7-10-4(a).

If you have any questions regarding this matter, please contact Mr. Bruce Palin of the Division of Land Pollution Control at AC 317/633-0203.

Very truly yours,

Ralph C. Pickard
Technical Secretary

BHP/tr
Enclosure
cc: Mr. Rich Shandross, U.S. EPA
Lawrence County Health Department

INDIANA ENVIRONMENTAL MANAGEMENT BOARD
HAZARDOUS WASTE MANAGEMENT (HWM) PERMIT

EPA Identification No.:	IND 006036099
Name of Permittee:	GMC Central Foundry Bedford Plant P.O. Box 271 Bedford, IN 47421
Facility Location:	North Jackson Street Bedford, Indiana
Latitude:	38° 52' 43" N
Longitude:	86° 29' 04" W

In accordance with the provisions of the Indiana Environmental Management Act (IC 13-7, as amended, hereinafter referred to as "the Act"), you are authorized by the Indiana Environmental Management Board (hereinafter referred to as the "Board") to conduct the hazardous waste management activity of container storage at the listed facility location in accordance with the applicable provisions of 320 IAC 4 and with the provisions and conditions attached to this permit. Federal Register (40 CFR) requirements, equivalent to State regulation citations, are in parentheses throughout the permit.

320 IAC 4-3 (Part 261)
320 IAC 4-4 (Part 262)
320 IAC 4-6 (Part 265, Subparts A-E & I)
320 IAC 4-7 (Part 265, Subparts G & H)

This permit is based on the assumption that the information submitted in the permit application dated August 16, 1982 as modified by subsequent amendments dated November 15, 1982, March 10, 1983, and November 30, 1983 (hereafter referred to as the application), is accurate and that the facility is constructed and will be operated as specified in the application. Any inaccuracies found in this information may be grounds for the termination or modification of this permit (see IC 13-7-10-5(a)) and potential enforcement action. The Permittee must inform the Board of any deviation from or changes in the information in the application which would affect the permittee's ability to comply with the applicable regulations or permit conditions.

This permit is effective as of the date of signature and shall remain in effect until March 1, 1989, unless revoked and reissued, or terminated or continued in accordance with IC 13-7-10-2(f).

For the Indiana Environmental Management Board

Ralph C. Pickard

Ralph C. Pickard, Technical Secretary

Date: February 20, 1984

I - STANDARD CONDITIONS

A. EFFECT OF PERMIT

The Permittee is allowed to store hazardous waste in accordance with the conditions of this permit. Any storage of hazardous waste not authorized in this permit is prohibited. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Section 3013 or Section 7003 of RCRA, Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9606(a), commonly known as CERCLA), or any other law providing for protection of public health or the environment.

B. PERMIT ACTIONS

This permit may be modified, revoked, and reissued, or terminated for cause as specified in 320 IAC 4-8-5. The filing of a request for a permit modification, revocation, and reissuance, or termination or the notification of planned changes or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. DUTIES AND REQUIREMENTS

1. Duty to Comply. The Permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued pursuant to 40 CFR 270.61(a). Any permit noncompliance, other than noncompliance authorized by an emergency permit, constitutes a violation of RCRA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

2. Duty to Reapply. If the Permittee wishes to continue an activity allowed by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least 120 days before this permit expires.

3. Permit Expiration. This permit and all conditions herein will remain in effect beyond the permit's expiration date if the Permittee has submitted a timely, complete application (see IC 13-7-10-2(f)) and through no fault of the Permittee, the Board has not issued a new permit.

4. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

5. Duty to Mitigate. The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

6. Proper Operation and Maintenance. The Permittee shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facility or similar systems only when necessary to achieve compliance with the conditions of the permit.

7. Duty to Provide Information. The Permittee shall furnish to the Board, within a reasonable time, any relevant information which the Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also furnish to the Board, upon request, copies of records required to be kept by this permit.

8. Inspection and Entry. The Permittee shall allow the Board, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

   a. Enter at reasonable times upon the Permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of this permit;

   b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

   c. Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by 320 IAC 4, any substances or parameters at any location.

9. Monitoring and Records.

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, July 1982, or an equivalent method as specified in the Waste Analysis Plan.

b. The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this permit, and records of all data used to complete the application for this permit for a period of at least three years from the date of the sample, measurement, report, or record. These periods may be extended by request of the Board at any time and are automatically extended during the course of any unresolved enforcement action regarding this facility.

c. Records of monitoring information shall specify:

i. The dates, exact place, and times of sampling or measurements;

ii. The individuals who performed the sampling or measurements;

iii. The dates analyses were performed;

iv. The individuals who performed the analyses;

v. The analytical techniques or methods used; and

vi. The results of such analyses.

10. Reporting Planned Changes. The Permittee shall give notice to the Board as soon as possible of any planned physical alterations or additions to the permitted facility.

11. Anticipated Noncompliance. The Permittee shall give advance notice to the Board of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. Such notification does not waive Permitte's duty to comply as set out in I.D.1.

12. Transfer of Permits. This permit may be transferred to a new owner or operator only if it is modified or revoked and reissued pursuant to 320 IAC 4-9-6. Before transferring ownership or operation of the facility during its operating life, the Permittee shall notify the new owner or operator, in writing, of the requirements of 320 IAC 4 and all applicable Federal requirements.

13. Twenty-four Hour Reporting. The Permittee shall report to the Board any noncompliance with the permit which may endanger health or the environment. Any such information shall be reported orally within 24 hours from the time the Permittee becomes aware of the circumstances. This report shall include the following:

    a. Information concerning the release of any hazardous waste which may endanger public drinking water supplies.

    b. Information concerning the release or discharge of any hazardous waste, or of a fire or explosion at the facility, which could threaten the environment or human health outside the facility. The description of the occurrence and its cause shall include:

        i. Name, address, and telephone number of the owner or operator;

        ii. Name, address, and telephone number of the facility;

        iii. Date, time, and type of incident;

        iv. Name and quantity of materials involved;

        v. The extent of injuries, if any;

        vi. An assessment of actual or potential hazard to the environment and human health outside the facility, where this is applicable; and

        vii. Estimated quantity and disposition of recovered material that resulted from the incident.

    A written submission shall also be provided within five days of the time the Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the periods of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Permittee need

not comply with the five-day written notice requirement if the Board waives the requirement and the Permittee submits a written report within 15 days of the time the Permittee becomes aware of the circumstances.

14. Other Noncompliance. The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time monitoring reports, as required by this permit, are submitted. The reports shall contain the information listed in condition D.13.

15. Other Information. Whenever the Permittee becomes aware that he failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Board, the Permittee shall promptly submit such facts or information.

E. SIGNATORY REQUIREMENT

All reports or other information requested by the Board shall be signed by a responsible corporate officer or principal executive officer of at least the level of vice-president and certified.

F. CONFIDENTIAL INFORMATION

The Permittee may claim confidential any information required to be submitted by this permit in accordance with 320 IAC 4-11-3.

G. DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The Permittee shall maintain at the facility, until closure is completed and certified by an independent registered professional engineer, the following documents and amendments, revisions, and modifications to these documents:

1. Waste analysis plan as required by 320 IAC 4-6-1 (265.13) and this permit.

2. Personnel training documents and records as required by 320 IAC 4-6-1 (265.16(d)) and this permit.

3. Contingency plan as required by 320 IAC 4-6-1 (265.53(a)) and this permit.

4. Closure plan as required by 320 IAC 4-6-1 (265.112(a)) and this permit.

5. Cost estimate for facility closure as required by 320 IAC 4-6-1 (265.142(d)) and this permit.

6. Operating record as required by 320 IAC 4-6-1 (265.73) and this permit.

7. Inspection schedules as required by 320 IAC 4-6-1 (265.15(b)) and this permit.

II - GENERAL FACILITY CONDITIONS

A. AUTHORIZED WASTE

The Permittee is authorized to store up to 5,500 gallons of the following hazardous waste(s) or categories of hazardous waste in containers and in accordance with the conditions specified in this permit:

1. Agitene waste fluid which is a non-chlorinated petroleum cleaning solvent, U.S. EPA Waste Code #D001.

2. Kolene sludge which is solidified sodium hydroxide waste, U.S. EPA Waste Code #D002

B. DESIGN AND OPERATION OF FACILITY

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment.

C. GENERAL WASTE ANALYSIS

The Permittee shall follow the procedures described in the waste analysis plan required by 320 IAC 4-6-1 (265.13).

The Permittee shall verify its waste analysis as part of the quality assurance program. The quality assurance program will be in accordance with current U.S. EPA practices (Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, July 1982) and at a minimum insure that the Permittee maintains proper functional instruments, uses approved sampling and analytical methods, assures the validity of sampling and analytical procedures, and performs correct calculations.

D. SECURITY

The Permittee shall comply with the security provisions of 320 IAC 4-6-1 (265.14(b)(2) and (c)).

The Permittee shall maintain and operate the following:

1. A 24 hour surveillance system by guards which control entry onto the active facility portion; and

2. A fence which completely surrounds the active facility portion.

E. GENERAL INSPECTION REQUIREMENTS

The Permittee shall follow the inspection schedule, required by 320 IAC 4-6-1 (265.15). The Permittee shall remedy any deterioration or malfunction discovered by an inspection as required by 320 IAC 4-6-1 (265.15(c)). Records of inspections shall be kept as required by 320 IAC 4-6-1 (265.15(d)).

F. PERSONNEL TRAINING

The Permittee shall conduct personnel training as required by 320 IAC 4-6-1 (265.16). The Permittee shall maintain training documents and records as required by 320 IAC 4-6-1 (265.16(d) and (e)).

G. GENERAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

The Permittee shall comply with the requirements of 320 IAC 4-6-1 (265.17(a)).

H. PREPAREDNESS AND PREVENTION

1. Required Equipment. At a minimum, the Permittee shall equip the facility with the equipment set forth in the contingency plan, as required by 320 IAC 4-6-1 (265.32).

2. Testing and Maintenance of Equipment. The Permittee shall test and maintain the equipment specified in the previous permit condition as necessary to assure its proper operation in time of emergency.

3. Access to Communications or Alarm System. The Permittee shall maintain access to the communications or alarm systems as required by 320 IAC 4-6-1 (265.34).

4. Required Aisle Space. At a minimum, the Permittee shall maintain aisle space as required by 320 IAC 4-6-1 (265.35).

5. Arrangements With Local Authorities. The Permittee shall attempt to make arrangements with State and local authorities as required by 320 IAC 4-6-1 (265.37). Due to the nature and quantity of your waste, a copy of the contingency plan sent certified mail to the appropriate State and local authorities will satisfy this condition.

I. CONTINGENCY PLAN

1. Implementation of Plan. The Permittee shall immediately carry out the provisions of the contingency plan, and follow the emergency procedures described by 320 IAC 4-6-1 (265.56)

whenever there is a fire, explosion, or release of hazardous waste or constituents which threatens or could threaten human health or the environment.

2. Copies of Plan. The Permittee shall comply with the requirements of 320 IAC 4-6-1 (265.53).

3. Amendments to Plan. The Permittee shall review and immediately amend, if necessary, the contingency plan, as required by 320 IAC 4-6-1 (265.54).

4. Emergency Coordinator. The Permittee shall comply with the requirements of 320 IAC 4-6-1 (265.55), concerning the emergency coordinator.

J. RECORDKEEPING AND REPORTING

1. Operating Record. The Permittee shall maintain a written operating record at the facility in accordance with 320 IAC 4-6-1 (265.73(a), (b)(1), (2), (3), (4), (5), (6), and (8)).

2. Annual Report. The Permittee shall comply with the annual report requirements of 320 IAC 4-6-1.

K. CLOSURE

1. Performance Standard. The Permittee shall close the facility as required by 320 IAC 4-7-1 (265.111) and in accordance with the closure plan, required by 320 IAC 4-7-1 (265.112).

2. Amendment to Closure Plan. The Permittee shall amend the closure plan in accordance with 320 IAC 4-7-1 (265.112(b)) whenever necessary.

3. Notification of Closure. The Permittee shall notify the Board at least 180 days prior to the date he expects to begin closure.

4. Time Allowed for Closure. After receiving the final volume of hazardous waste, the Permittee shall treat or remove from the site all hazardous waste in accordance with the schedule specified in the closure plan. After receiving the final volume of hazardous waste, the Permittee shall complete closure activities in accordance with the schedule specified in the closure plan.

5. Disposal or Decontamination of Equipment. The Permittee shall decontaminate and/or dispose of all facility equipment as required by 320 IAC 4-7-1 (265.114) and the closure plan.

6. Certification of Closure. The Permittee shall certify that the facility has been closed in accordance with the specifications in the closure plan as required by 320 IAC 4-7-1 (265.115).

L. COST ESTIMATE FOR FACILITY CLOSURE

1. The Permittee must adjust the closure cost estimate for inflation within 30 days after each anniversary of the date on which the first closure cost estimate was prepared, as required by 320 IAC 4-7-5(b) (265.142(b)).

2. The Permittee must revise the closure cost estimate whenever there is a change in the facility's closure plan as required by 320 IAC 4-7-5(c) (265.142(c)).

3. The Permittee must keep at the facility the latest closure cost estimate as required by 320 IAC 4-7-5(d) (265.142(d)).

M. FINANCIAL ASSURANCE FOR FACILITY CLOSURE

The Permittee shall demonstrate continuous compliance with 320 IAC 4-7-6 (265.143) by providing documentation of financial assurance, as required by 320 IAC 4-7-28 (264.151), in at least the amount of the cost estimates required by permit condition II.K. Changes in financial assurance mechanisms must be approved by the Board pursuant to 320 IAC 4-7 (265.143).

N. LIABILITY REQUIREMENTS

The Permittee shall demonstrate continuous compliance with the requirements of 320 IAC 4-7-26 (264.147) and the documentation requirements of 320 IAC 4-7-28 (264.151), including the requirements to have and maintain liability coverage for sudden and accidental occurrences in the amount of at least $1 million per occurrence with an annual aggregate of at least $2 million, exclusive of legal defense costs.

O. INCAPACITY OF OWNERS OR OPERATORS, GUARANTORS, OR FINANCIAL INSTITUTIONS

The Permittee shall comply with 320 IAC 4-7-27 (265.148) whenever necessary.

III STORAGE IN CONTAINERS

A. WASTE IDENTIFICATION

The Permittee may not store more than a total of 100 55-gallon drums of the wastes listed in II A. All storage must occur within the areas designated for storage in the permit application.

B. CONDITION OF CONTAINERS

If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the Permittee shall transfer the hazardous waste from such container to a container that is in good condition or otherwise manage the waste in compliance with the conditions of this permit.

C. COMPATIBILITY OF WASTE WITH CONTAINERS

The Permittee shall assure that the ability of the container to contain the waste is not impaired as required by 320 IAC 4-6-1 (265.172).

D. MANAGEMENT OF CONTAINERS

The Permittee shall manage containers as required by 320 IAC 4-6-1 (265.173).

E. INSPECTION

The Permittee shall inspect areas where containers are stored as required by 320 IAC 4-6-1 (265.174).

F. SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTE

The Permittee shall not locate containers holding ignitable or reactive waste within 15 meters (50 feet) of the facility's property line.

G. SPECIAL REQUIREMENTS FOR INCOMPATIBLE WASTE

1. Prior to placing incompatible wastes or incompatible wastes and materials in the same container, the Permittee shall comply with 320 IAC 4-6-1 (265.17(b)).

2. The Permittee shall not place hazardous waste in an unwashed container that previously held an incompatible waste or material.

3. The Permittee shall separate containers of incompatible wastes, as required by 320 IAC 4-6-1 (265.177(c)).

4. The Permittee must document compliance with III.G.1 and 2 as required by 320 IAC 4-6-1 (265.17(c)) and place this documentation in the operating record.

APPENDIX G.12

U.S.EPA PRELIMINARY SITE ASSESSMENT

BARNES & THORNBURG

1313 Merchants Bank Building
11 South Meridian Street
Indianapolis, Indiana 46204
(317) 638-1313

TWX 810-341-3427 B&T LAW IND
Telecopier (317) 231-7433

August 24, 1987

Gary P. Toth, Esquire
Senior Counsel
General Motors Corporation
Legal Staff
New Center One Building
3031 West Grand Boulevard
Post Office Box 33122
Detroit, Michigan 48232

Re: Central Foundry - Bedford; State RCRA Permit

Dear Gary:

I enclose a copy of EPA's preliminary site assessment of the GMC Central Foundry - Bedford for your review. I am including copies of five of the six referenced letters/memos:

October 22, 1979
April 8, 1981
April 13, 1981
January 25, 1984
March 28, 1984

We are still seeking the document dated April 8, 1984. I also enclose a copy of a recent article which appeared in the Bloomington, Indiana newspaper regarding cleanup of the north lagoon at the Bedford site.

Very truly yours,

Joan M. Heinz

JMH:ja
Enclosure
cc: William S. Schoonmaker

7876j

COPY

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
IND	006036099

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
GMC Central Foundry	North Jackson St., P.O. Box 271

03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
Bedford	IN	47421	Lawrence	093	8

09 COORDINATES LATITUDE	LONGITUDE	
38° 52' 55"	86° 28' 55"	Bartlettsville Quadrangle 7.5 minute series (1:24,000)

10 DIRECTIONS TO SITE (Starting from nearest public road) (See map) SE¼, SE¼, SECT. 11, T5N, R1W
IN Hwy 37 south from Indianapolis to Bedford, turn left onto Gillen Post Dr. (5th St), continue east on 5th St. to "H" Street. Turn left onto "H" St. and go one block to 4th St. Turn right on 4th St., drive one block and turn left on Jackson St. The plant is less than 1/2 mile from this intersection.

III. RESPONSIBLE PARTIES

01 OWNER (If known)	02 STREET (Business, mailing, residential)		
Central Foundry Div. GMC	N. Jackson St., P.O. Box 271		
03 CITY	**04 STATE**	**05 ZIP CODE**	**06 TELEPHONE NUMBER**
Bedford	IN	47421	(812) 279-7302
07 OPERATOR (If known and different from owner)	**08 STREET (Business, mailing, residential)**		
Central Foundry, Glenn Ohl	same		
09 CITY	**10 STATE**	**11 ZIP CODE**	**12 TELEPHONE NUMBER**
same	----	----------	(812) 279-7302

13 TYPE OF OWNERSHIP (Check one)
☐ A. PRIVATE ☐ B. FEDERAL: _____ (Agency name) ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☒ F. OTHER: Owned by General Motors Corporation (Specify) ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)
☒ A. RCRA 3001 DATE RECEIVED: 8/22/80 (Month Day Year) Form 8700-12 ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: / / (Month Day Year) ☐ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION
☒ YES ☐ NO DATE 1/28/85 (Month Day Year)

BY (Check all that apply)
☐ A. EPA ☐ B. EPA CONTRACTOR ☒ C. STATE ☐ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: _____ (Specify)
CONTRACTOR NAME(S): _____

02 SITE STATUS (Check one)	03 YEARS OF OPERATION		
☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN	1959 (Beginning Year)	Present (Ending Year)	☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED
Polychlorinated Biphenyls (Cas #227.1336-36-3) [Toxic, Persistent]
Phenols(Cas #212.108-95-2) [Toxic, Persistent, Ignitable]

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION
Groundwater (population/environment)
Surface water (population/environment)
Direct contact (population/environment)

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)
☐ A. HIGH (Inspection required promptly) ☒ B. MEDIUM (Inspection required) ☐ C. LOW (Inspect on time available basis) ☐ D. NONE (No further action needed, complete current disposition form)

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
Harry Atkinson HA	Indiana State Board of Health--LPC	(317) 243-5132

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
Sherry Evans-Carmichael	ISBH	LPC	(317) 243-5058	4/30/85 (Month Day Year)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
IND	006036099

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- A SOLID
- B POWDER, FINES
- X C SLUDGE
- E SLURRY
- X F LIQUID
- G GAS
- D OTHER _____ (Specify)

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

- TONS 786
- CUBIC YARDS _____
- NO OF DRUMS _____

03 WASTE CHARACTERISTICS (Check all that apply)

- X A TOXIC
- B CORROSIVE
- C RADIOACTIVE
- X D PERSISTENT
- X E SOLUBLE
- F INFECTIOUS
- G FLAMMABLE
- X H IGNITABLE
- I HIGHLY VOLATILE
- J EXPLOSIVE
- K REACTIVE
- L INCOMPATIBLE
- M NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			
OLW	OILY WASTE	539	tons--PCB	contaminated oil-est.
SOL	SOLVENTS	Unknown		Aquitene waste cleaning solvent
PES	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS			
IOC	INORGANIC CHEMICALS	2.25	ton/yr.	Potassium Cyanide-est. (1983)
ACD	ACIDS			
BAS	BASES	4.5	ton/yr	Sodium Hydroxide-est. (1983)
MES	HEAVY METALS	240	ton/yr	Aluminum Chip Drying Waste Contaminated with lead-est. (1983)

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e g , state files, sample analysis, reports)

GM Letter-LPC Files
Liquid Industrial Waste Hauler Reports (Oil)--LPC Files

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
IND	006036099

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 14,000
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [X] ALLEGED
04 NARRATIVE DESCRIPTION
The Bedford Water Company also sells water to the North Lawrence Water Company and the East Lawrence Water Company.

01 [X] B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: unk
02 [X] OBSERVED (DATE: unk) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION
Table 9 - pg. 16 of the Indiana Stream Pollution Control Board 1982-83 305(b) Report.

01 [X] C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED: unk
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [X] ALLEGED
04 NARRATIVE DESCRIPTION
No data available to date.

01 [ ] D. FIRE/EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED: _____
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION
Unknown

01 [X] E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED: _____
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [X] ALLEGED
04 NARRATIVE DESCRIPTION
No data available to date.

01 [X] F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: unk (Acres)
02 [X] OBSERVED (DATE: 4/6/81) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION
Memo dated April 8, 1981.

01 [X] G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 182.4
02 [ ] OBSERVED (DATE: _____) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION
Located 48 wells x 3.8 people/household - estimate.
In LPC files.

01 [X] H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: unk
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [X] ALLEGED
04 NARRATIVE DESCRIPTION
Workers in the plant.

01 [ ] I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: _____
02 [ ] OBSERVED (DATE: _____) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION
Unknown.

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 3—DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
IND	006036099

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 ☐ J. DAMAGE TO FLORA — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

No information at this time.

01 ☒ K. DAMAGE TO FAUNA — 02 ☒ OBSERVED (DATE: 10/26/83) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

Letter dated 3/28/84 and it has been reported that 83 dairy cattle were purchased by GM, destroyed and buried on GM property due to PCB contamination. This will be researched.

01 ☒ L. CONTAMINATION OF FOOD CHAIN — 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Letter dated 1/25/84, PCB contamination of fish and a health advisory against eating fish from Pleasant Run, Salt Creek and the East Fork of the White River. (305b Report)

01 ☒ M. UNSTABLE CONTAINMENT OF WASTES (Spills/runoff/standing liquids/leaking drums) — 02 ☒ OBSERVED (DATE: 4/6/81) ☐ POTENTIAL ☐ ALLEGED
03 POPULATION POTENTIALLY AFFECTED: unknown — 04 NARRATIVE DESCRIPTION

See memo dated 4/8/81.

01 ☒ N. DAMAGE TO OFFSITE PROPERTY — 02 ☐ OBSERVED (DATE: _____) ☐ POTENTIAL ☒ ALLEGED
04 NARRATIVE DESCRIPTION

Reportedly the family that owned the 83 dairy cattle that had to be destroyed, never resumed the dairy business because the stream that crossed their property was heavily contaminated with PCBs.

01 ☒ O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 ☐ OBSERVED (DATE: _____) ☒ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

Letter from EPA dated 10/22/79.

01 ☒ P. ILLEGAL/UNAUTHORIZED DUMPING — 02 ☒ OBSERVED (DATE: 4/13/81) ☐ POTENTIAL ☐ ALLEGED
04 NARRATIVE DESCRIPTION

See memo dated 4/13/81.

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: 14182.4 est.

IV. COMMENTS

Additional information will be sent, as it is compiled.

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Div. of Land Pollution Control Files - ISBH
EPA - Surface Impoundment Assessment Information System
Data on IN Public Water Supplies (Revised 1984) ISBH
Camp, Dresser & McKee Environmental Study Report for GM
Indiana Stream Pollution Control Board (1982-83), 305(b) Report.

EPA FORM 2070-12 (7-81)

ERRIS EXECUTIVE SUMMARY

Wang Sequence # _____ WINDSHIELD SURVEY _X_ YES ___ NO
EPA ID# IND006036099
Original Company Name: GM Bedford

Revised Company Name: GMC Central Foundry

Alias Names: Central Foundry Div. of GMC

Original _X_ Address: North Jackson St., PO Box 271
Corrected ___ Bedford, IN 47421
Lawrence County

___ Landfill ___ Generator ___ Treatment, Storage, Disposal (TSD)
___ Transporter _X_ Other: Surface Impoundment.

PRIORITY ASSESSMENT: ___HIGH _X_MEDIUM ___LOW ___NO FURTHER ACTION (NONE)

CLASS:
___I-STATE LEAD _X_II-REM/FIT LEAD State Accompanies FIT ___III-REM/FIT LEAD Limited On-site State Involvement ___IV OTHER: _____

Priority Justification and State Comments Regarding:
_X_PA ___SI ___Follow-up SI ___RPS ___HRS

This site has had several surface impoundments which have been closed. Much more research needs to be conducted on this site. The analyses that are available suggest unusually high levels of PCBs in aquatic life, as well as surface water and sediments. Several enforcement actions have been directed at this facility by the Indiana Stream Pollution Control Board of the Indiana State Board of Health. At one point, the company conducted a "cleanup" of the facility (mainly an equipment and process cleanup).

The State will complete an HRS on this site, as soon as all information has been compiled.

STATE INVOLVEMENT

_C_ Preliminary Assessments _R_ Site Inspection ___ Follow-up Site Inspection
___ Responsible Party Search _C_ Hazard Ranking System (HRS)

* COMPLETE DOCUMENTS (C) REVIEW DOCUMENTS (R)

Prepared by: Sherry Evans-Carmichael Phone: (317) 243-5058 Date: 4/30/85
Activity Time: 42 Hours

APPENDIX G.13

RCRA CLOSURE NOTIFICATION

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

September 18, 1987

Mr. Valdas V. Adamkus
Regional Administrator
United States Environmental
Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Re: General Motors Corporation, Central Foundry Division/Bedford,
Indiana Plant RCRA Permit IND 006036099

Dear Mr. Adamkus:

Pursuant to Section 2(K)(3) of General Motors Corporation ("GMC") Central Foundry Division/Bedford Plant's EPA Final Resource Conservation and Recovery Act ("RCRA") Permit #IND 006036099, this letter notifies you that GMC intends to close its RCRA storage facility in accordance with the Closure Plan previously approved by EPA. Upon completion of closure, and upon certification of closure by an independent registered professional engineer, the GMC Central Foundry Division/Bedford Plant will no longer operate a treatment, storage or disposal facility requiring a RCRA permit.

Please call Mr. Bill Schoonmaker, our plant Environmental Coordinator, if you have any questions.

Sincerely,

Robert W. Herr

Robert W. Herr
Plant Manager

Lets Get It Together
SAFETY BELTS SAVE LIVES

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

September 18, 1987

Nancy A. Maloley, Commissioner
Indiana Department of
Environmental Management
105 South Meridian Street
P. O. Box 6015
Indianapolis, Indiana 46206-6015

RE: General Motors Corporation, Central Foundry Division/Bedford, Indiana Plant, Indiana Hazardous Waste Permit IND 006036099

Dear Ms. Maloley:

Pursuant to Section II(K)(3) of General Motors Corporation ("GMC") Central Foundry Division/Bedford Plant's Indiana Hazardous Waste Management Permit #IND 006036099, this letter notifies you that GMC intends to close its hazardous waste storage facility in accordance with the Closure Plan previously approved by the State. Upon completion of closure, and upon certification of closure by an independent registered professional engineer, the GMC Central Foundry Division/Bedford Plant will no longer operate a treatment, storage or disposal facility requiring a hazardous waste management facility permit under Indiana law.

Please call Mr. Bill Schoonmaker, our plant Environmental Coordinator, if you have any questions.

Sincerely,

Robert W. Herr

Robert W. Herr
Plant Manager

Lets Get It Together
SAFETY BELTS SAVE LIVES

APPENDIX G.14

RCRA NOTICE TO CLOSE ACKNOWLEDGEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

REPLY TO THE ATTENTION OF:
5HS-13

OCT 28 1987

Mr. Bill Schoonmaker
General Motors Corporation
Central Foundry Division
North Jackson Street
Bedford, Indiana 47421

Re: Closure Plan Implementation
IND 006036099

Dear Mr. Schoonmaker:

Your letter dated September 18, 1987, notifying the U.S. Environmental Protection Agency (EPA) Region V of your intent to close the permitted 'drum storage facility' was received on September 28, 1987. As discussed during our telephone conversation of October 19, 1987, General Motors Corporation (GMC), Central Foundry Division will follow the approved closure plan included in the Resource Conservation and Recovery Act Permit, IND 006036099.

The approved closure plan requires that GMC notify the U.S. EPA at least 180 days prior to implementation. Therefore, you may begin closure after March 27, 1988, in accordance with the approved closure plan. GMC Central Foundry Division will, upon completion of closure, certify closure by an independent registered Professional engineer.

If you have any questions, please call me at (312) 886-0997.

Sincerely

Herbert Levine

Herbert Levine, Geologist
Indiana Unit, TPS

cc: Thomas Russel, Chief
Hazardous Waste Management Branch
Indiana Department of Environmental Management

APPENDIX G.15

RCRA CLOSURE CERTIFICATION

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

January 17, 1989

Thomas W. Rarick, Acting Commissioner
Indiana Department of Environmental
Management
105 South Meridian Street
P.O. Box 6015
Indianapolis, Indiana 46206

Dear Mr. Rarick:

Pursuant to Section II(K)(6) of General Motors Corporation ("GMC") Central Foundry Division/Bedford Plant's Indiana Hazardous Waste Management Permit #IND 006036099, this letter notifies you that GMC hereby certifies that its hazardous waste storage facility has been closed according to the closure plan approved by the Indiana Department of Environmental Management on February 21, 1984. Enclosed is the Certification of Closure by an independent Indiana Registered Professional Engineer. The GMC Central Foundry Division/Bedford Plant will no longer operate a hazardous waste storage facility requiring a permit under Indiana law. Any RCRA hazardous wastes will be stored on site for less than 90 days.

If you have any questions regarding these matters please contact Mr. Gregory Etzel, our plant Environmental Engineer at AC 812/279-7310.

Sincerely,

R. W. Herr
Plant Manager

c: Herbert Levine, USEPA

bc: J. Medved, CFD
D. Schiemann, GM Legal
W. Collinson, EAS
J. Kyle, B & T

Lets Get It Together
SAFETY BELTS SAVE LIVES

WOODARD & CURRAN INC.
CONSULTING ENGINEERS

January 24, 1989

Mr. Greg Etzel
Central Foundry
Division of General Motors
No. Jackson Street, PO Box 271
Bedford, IN 47421

Re: Closure Certification for RCRA Hazardous Waste Drum Storage Area

Dear Mr. Etzel:

This report is to certify that the RCRA Hazardous Waste Drum Storage Area at the Central Foundry Division of GMC, Bedford plant, has been closed in accordance with the specifications in the closure plan approved on February 21, 1984.

I personally observed that all drums of material have been removed from the area, and that all loose material has been mechanically removed from the concrete storage pad. The concrete pad was cleaned with a pressure washer using detergent. Then the pad was rinsed using the pressure washer (Hotsy) and fresh potable water from the plant supply. At the end of the rinse period, a sample of the fresh water coming out of the pressure washer wand was taken (Hotsy washer), and a sample of the rinse water running off the pad into the concrete drain sump (pit washwater) was also taken. The sample analysis results are summarized in the attached table.

This sampling indicates that no organics characteristic of the Agitene previously stored on this pad are present. Low levels of barium, cadmium, and lead were present.

The rinse water runoff from the storage pad was collected in a small pit in one corner of the pad. The rinse water was conveyed by gravity drain pipe to the plant process sewer and hence to the plant wastewater treatment facility for treatment. The treatment process includes primary clarification, activated sludge treatment, sand filtration, and final GAC (granular activated carbon) treatment prior to discharge. In the future, rainwater falling on the concrete pad will be collected and receive treatment as did the rinse water.

In summary, the waste drum storage area has been closed by removal of stored drums and the cleaning of the concrete pad by sweeping and washing. Stormwater runoff from the pad will continue to be treated along with the plant process wastewater.

Very truly yours,

WOODARD & CURRAN INC.

Michael R. Alberi

Michael R. Alberi, P.E.
Vice President

Indiana License ENE8605288

Attachment

MRA:tal
88080.01

ATTACHMENT 1

RCRA PAD WASHWATER SAMPLE ANALYSIS

Parameter	Hotsy Washer	Pit Washwater
pH		
- Lab	7.63	8.17
TDS - ug/l (ppb)	1070	1692
Arsenic - ug/l (ppb)	< 50	< 50
Barium - ug/l (ppb)	21	23
Cadmium - ug/l (ppb)	< 5	5
Chromium, Total - ug/l (ppb)	< 20	< 20
Lead, total - ug/l (ppb)	< 50	370
Mercury, Total - ug/l (ppb)	< 0.2	< 0.2
Selenium, Total - ug/l (ppb)	< 50	< 50
Silver, Total - ug/l (ppb)	< 10	< 10
Polyunclear Aromatics		
Napthalene	ND at 5 ppb	ND at 5 ppb
Acenaphythylene	ND at 5 ppb	ND at 5 ppb
Acenaphthane	ND at 5 ppb	ND at 5 ppb
Flourene	ND at 5 ppb	ND at 5 ppb
Phenathrene	ND at 5 ppb	ND at 5 ppb
Anthracene	ND at 5 ppb	ND at 5 ppb
Flouranthene	ND at 5 ppb	ND at 5 ppb
Pyrene	ND at 5 ppb	ND at 5 ppb
Benzo(k)flouranthene	ND at 5 ppb	ND at 5 ppb
Benzo(a)pyrene	ND at 5 ppb	ND at 5 ppb
Indeno(1,2,3-cd)pyrene	ND at 5 ppb	ND at 5 ppb
Dibenzo(a,h)anthracene	ND at 5 ppb	ND at 5 ppb
Benzo(ghi)perylene	ND at 5 ppb	ND at 5 ppb
Benso(a)anthracene	ND at 5 ppb	ND at 5 ppb

ND = None Detected < = less than

CERTIFICATE OF ANALYSIS

CORRESPOND TO

EMS Laboratories, Inc.
7901 West Morris Street
Indianapolis, Indiana 46231
(317) 243-8304

RECEIVED
NOV 14 1988
Woodard & Curran Inc.

SAMPLE

EMS SAMPLE : 110342
REPORT DATE : 11/09/88
DATE RECEIVED : 09/13/88
DATE COMPLETE : 11/08/88

REPORT TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

BILL TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

DESCRIPTION

RCRA #1
WATER SAMPLE
P.O. NUMBER : VERBAL

DATE :
TIME :

TEST DESCRIPTION / ANALYTE	RESULT	METHOD	DATE / DET. LIMIT	ANALYST / UNITS
AL DISSOLVED SOLIDS DRIED AT 180 C		EPA 160.1	09/24/88	MRW
SOLIDS, DISSOLVED	350		10	MG/L
pH		EPA 150.1	09/16/88	DAT
PH	8.3		0.1	STD. UNITS
ARSENIC, TOTAL		EPA 206.2	09/18/88	RLB
ARSENIC, TOTAL	ND		0.010	MG/L
INSTRUMENT	PE 3030 GFAA			
BARIUM, TOTAL		EPA 200.7	09/21/88	MYJ
BARIUM, TOTAL	0.04		0.01	MG/L
INSTRUMENT	ICAP 61			
CADMIUM, TOTAL		EPA 200.7	09/21/88	MYJ
CADMIUM, TOTAL	ND		0.005	MG/L
INSTRUMENT	ICAP 61			
CHROMIUM, TOTAL		EPA 200.7	09/21/88	MYJ
CHROMIUM, TOTAL	ND		0.01	MG/L
INSTRUMENT	ICAP 61			
LEAD, TOTAL		EPA 200.7	09/21/88	MYJ
LEAD, TOTAL	ND		0.05	MG/L
INSTRUMENT	ICAP 61			
MERCURY, TOTAL		EPA 245.1	09/21/88	RLB

EMS SAMPLE : 110342

TEST DESCRIPTION / ANALYTE	RESULT	METHOD / DET. LIMIT	DATE / UNITS	ANALYST
MERCURY, TOTAL	: ND	0.00020	MG/L	
INSTRUMENT	: PE 403 CVAA			
SELENIUM, TOTAL		EPA 270.2	09/20/88	SON
SELENIUM, TOTAL	: ND	0.0050	MG/L	
INSTRUMENT	: PE 5100 GFAA			
SILVER, TOTAL		EPA 200.7	09/27/88	MYJ
SILVER, TOTAL	: ND	0.01	MG/L	
INSTRUMENT	: ICAP 61			
POLYNUCLEAR AROMATIC HYDROCARBONS		SW846-8100	10/31/88	JLM
SURROGATE LIST (spike conc)	: uG/L	NA	NA	
Nitrobenzene-d5	: 42	(25)	% Rec	
2-Fluorobiphenyl	: 26	(25)	% Rec	
Terphenyl-d14	: 61	(25)	% Rec	
TARGET COMPOUND LIST	:			
Naphthalene	: ND	10.	uG/L	
Acenaphthylene	: ND	10.	uG/L	
Acenaphthene	: ND	10.	uG/L	
Fluorene	: ND	10.	uG/L	
Phenanthrene	: ND	10.	uG/L	
Anthracene	: ND	10.	uG/L	
Fluoranthene	: ND	10.	uG/L	
Pyrene	: ND	10.	uG/L	
Benz(a)anthracene	: ND	10.	uG/L	
Chrysene	: ND	10.	uG/L	
Benzo(b)fluoranthene	: ND	10.	uG/L	
Benzo(k)fluoranthene	: ND	10.	uG/L	
Benzo(a)pyrene	: ND	10.	uG/L	
Indeno(1,2,3-cd)pyrene	: ND	10.	uG/L	
Dibenz(a,h)anthracene	: ND	10.	uG/L	
Benzo(ghi)perylene	: ND	20.	uG/L	
Dilution Factor 1				
ACID DIGESTION FOR FAA OR ICP		EPA 200.0	09/19/88	MSK
METALS, DIGEST	: COMPLETE	NA	NA	
INITIAL WT OR VOL	: NA			
FINAL WT OR VOL	: NA			
ACID DIGESTION FOR GFAA		EPA 200.0	09/16/88	SON
METALS, DIGEST	: COMPLETE	NA	NA	
INITIAL WT OR VOL	: NA			
FINAL WT OR VOL	: NA			
ORGANIC EXTRACTION AND SAMPLE PREPARATION		SW846-3500	09/15/88	BJW
ORG. EXT. AND PREP	: COMPLETE			
INITIAL WT OR VOL	: 100 ML			
FINAL VOLUME, ML	: 1 ML			

EMS SAMPLE : 110342

TEST DESCRIPTION ANALYTE	RESULT	METHOD	DATE DET. LIMIT	ANALYST UNITS

ND - Not Detected
NA - Not Applicable
Sample was not received in the proper container for the analytes requested.
Sample was not received properly chemically preserved for analysis requested.

proved by : D Peterson

CERTIFICATE OF ANALYSIS

CORRESPOND TO

EMS Laboratories, Inc.
7901 West Morris Street
Indianapolis, Indiana 46231
(317) 243-8304

SAMPLE

EMS SAMPLE : 110343
REPORT DATE : 11/09/88
DATE RECEIVED : 09/13/88
DATE COMPLETE : 11/08/88

REPORT TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

BILL TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

DESCRIPTION

RCRA #2
WATER SAMPLE
P.O. NUMBER : VERBAL

DATE :
TIME :

TEST DESCRIPTION / ANALYTE	RESULT	METHOD	DATE / DET. LIMIT	ANALYST / UNITS
TOTAL DISSOLVED SOLIDS DRIED AT 180 C		EPA 160.1	09/24/88	MRW
SOLIDS, DISSOLVED	: 650		10	MG/L
pH		EPA 150.1	09/16/88	DAT
PH	: 7.5		0.1	STD. UNITS
ARSENIC, TOTAL		EPA 206.2	09/18/88	RLB
ARSENIC, TOTAL	: ND		0.010	MG/L
INSTRUMENT	: PE 3030 GFAA			
BARIUM, TOTAL		EPA 200.7	09/21/88	MYJ
BARIUM, TOTAL	: 0.13		0.01	MG/L
INSTRUMENT	: ICAP 61			
CADMIUM, TOTAL		EPA 200.7	09/21/88	MYJ
CADMIUM, TOTAL	: ND		0.005	MG/L
INSTRUMENT	: ICAP 61			
CHROMIUM, TOTAL		EPA 200.7	09/21/88	MYJ
CHROMIUM, TOTAL	: 0.24		0.01	MG/L
INSTRUMENT	: ICAP 61			
LEAD, TOTAL		EPA 200.7	09/21/88	MYJ
LEAD, TOTAL	: 0.66		0.05	MG/L
INSTRUMENT	: ICAP 61			
MERCURY, TOTAL		EPA 245.1	09/21/88	RLB

EMS SAMPLE : 110343

TEST DESCRIPTION / ANALYTE	RESULT	METHOD / DET. LIMIT	DATE / UNITS
MERCURY, TOTAL	: ND	0.00020	MG/L
INSTRUMENT	: PE 403 CVAA		
SELENIUM, TOTAL		EPA 270.2	09/20/88 SON
SELENIUM, TOTAL	: ND	0.0050	MG/L
INSTRUMENT	: PE 5100 GFAA		
SILVER, TOTAL		EPA 200.7	09/27/88 MYJ
SILVER, TOTAL	: ND	0.01	MG/L
INSTRUMENT	: ICAP 61		
POLYNUCLEAR AROMATIC HYDROCARBONS		SW846-8100	10/31/88 JLM
SURROGATE LIST (spike conc)	: uG/L	NA	NA
Nitrobenzene-d5	: ND	(25)	% Rec
2-Fluorobiphenyl	: ND	(25)	% Rec
Terphenyl-d14	: ND	(25)	% Rec
NOTE: SURROGATES DILUTED OUT			
TARGET COMPOUND LIST	:		
Naphthalene	: ND	100.	uG/L
Acenaphthylene	: ND	100.	uG/L
Acenaphthene	: ND	100.	uG/L
Fluorene	: ND	100.	uG/L
Phenanthrene	: ND	100.	uG/L
Anthracene	: ND	100.	uG/L
Fluoranthene	: ND	100.	uG/L
Pyrene	: ND	100.	uG/L
Benz(a)anthracene	: ND	100.	uG/L
Chrysene	: ND	100.	uG/L
Benzo(b)fluoranthene	: ND	100.	uG/L
Benzo(k)fluoranthene	: ND	100.	uG/L
Benzo(a)pyrene	: ND	100.	uG/L
Indeno(1,2,3-cd)pyrene	: ND	100.	uG/L
Dibenz(a,h)anthracene	: ND	100.	uG/L
Benzo(ghi)perylene	: ND	200.	uG/L
Dilution Factor 10			
ACID DIGESTION FOR FAA OR ICP		EPA 200.0	09/19/88 MSK
METALS, DIGEST	: COMPLETE	NA	NA
INITIAL WT OR VOL	: NA		
FINAL WT OR VOL	: NA		
ACID DIGESTION FOR GFAA		EPA 200.0	09/16/88 SON
METALS, DIGEST	: COMPLETE	NA	NA
INITIAL WT OR VOL	: NA		
FINAL WT OR VOL	: NA		
ORGANIC EXTRACTION AND SAMPLE PREPARATION		SW846-3500	09/15/88 BJW
ORG. EXT. AND PREP	: COMPLETE		
INITIAL WT OR VOL	: 100 ML		
FINAL VOLUME, ML	: 1 ML		

EMS SAMPLE : 110343

TEST DESCRIPTION ANALYTE	RESULT	METHOD	DATE DET. LIMIT	ANALYST UNITS

ID - Not Detected
NA - Not Applicable
Sample was not received in the proper container for the analytes requested.
Sample was not received properly chemically preserved for analysis requested.

Approved by : D L Peterson

CERTIFICATE OF ANALYSIS

CORRESPOND TO

EMS Laboratories, Inc.
7901 West Morris Street
Indianapolis, Indiana 46231
(317) 243-8304

SAMPLE

EMS SAMPLE : 110344
REPORT DATE : 11/09/88
DATE RECEIVED : 09/13/88
DATE COMPLETE : 11/08/88

REPORT TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

BILL TO

BOB SEVERANCE
WOODARD AND CURRAN, INC.
41 HUTCHINS DRIVE
PORTLAND ME 04102

DESCRIPTION

RCRA #3
SOLID SAMPLE
P.O. NUMBER : VERBAL

DATE :
TIME :

TEST DESCRIPTION / ANALYTE	RESULT	METHOD	DATE / DET. LIMIT	ANALYST / UNITS
		EPA 150.1	09/15/88	DAT
PH	: 10.1		0.1	STD. UNITS
20% SLURRY				
METALS SCAN #1 BY ICP		EPA 200.7	09/21/88	MYJ
METAL SCAN #1 BY ICP	: COMPLETE		25	MG/KG
SILVER	: ND			
ALUMINUM	: 11000			
BORON	: 30			
BARIUM	: 32			
BERYLLIUM	: ND			
BISMUTH	: ND			
CALCIUM	: 82000			
CADMIUM	: ND			
COBALT	: ND			
CHROMIUM	: 280			
COPPER	: 320			
IRON	: 22000			
POTASSIUM	: 2700			
LITHIUM	: ND			
MAGNESIUM	: 8700			
MANGANESE	: 200			
MOLYBDENUM	: 58			
SODIUM	: 1200			
NICKEL	: 40			
LEAD	: 150			
ANTIMONY	: ND			

EMS SAMPLE : 110344

TEST DESCRIPTION / ANALYTE	RESULT	METHOD	DATE / DET. LIMIT	ANALYST / UNITS
SILICON	: 140			
TIN	: ND			
STRONTIUM	: 130			
TITANIUM	: 140			
THALLIUM	: ND			
VANADIUM	: 60			
ZINC	: 300			
ZIRCONIUM	: ND			
PCB, GAS CHROMATOGRAPHY:ECD		SW846-8080	09/22/88	EMW
AROCLOR 1016	: ND		1.0	MG/KG
AROCLOR 1221	: ND			
AROCLOR 1232	: ND			
AROCLOR 1242	: ND			
AROCLOR 1248	: ND			
AROCLOR 1254	: ND			
AROCLOR 1260	: ND			
POLYNUCLEAR AROMATIC HYDROCARBONS		SW846-8100	10/31/88	JLM
SURROGATE LIST (spike conc)	: MG/KG		NA	NA
Nitrobenzene-d5	: ND		(25)	% Rec
2-Fluorobiphenyl	: ND		(25)	% Rec
Terphenyl-d14	: ND		(25)	% Rec
NOTE: SURROGATES DILUTED OUT				
TARGET COMPOUND LIST	:			
Naphthalene	: ND		100.	MG/KG
Acenaphthylene	: ND		100.	MG/KG
Acenaphthene	: ND		100.	MG/KG
Fluorene	: ND		100.	MG/KG
Phenanthrene	: ND		100.	MG/KG
Anthracene	: ND		100.	MG/KG
Fluoranthene	: ND		100.	MG/KG
Pyrene	: ND		100.	MG/KG
Benz(a)anthracene	: ND		100.	MG/KG
Chrysene	: ND		100.	MG/KG
Benzo(b)fluoranthene	: ND		100.	MG/KG
Benzo(k)fluoranthene	: ND		100.	MG/KG
Benzo(a)pyrene	: ND		100.	MG/KG
Indeno(1,2,3-cd)pyrene	: ND		100.	MG/KG
Dibenz(a,h)anthracene	: ND		100.	MG/KG
Benzo(ghi)perylene	: ND		200.	MG/KG
Dilution Factor 100				
ACID DIGESTION IN S/S/S FOR ANALYSIS BY FAA OR ICP		SW846-3050	09/19/88	MSK
METALS, DIGEST	: COMPLETE		NA	G
INITIAL WT OR VOL	: 1			
FINAL WT OR VOL	: 25			
PCB EXTRACTION, SLUDGE/SOIL/SEDIMENT		SW846-3550	09/20/88	JLM
PCB EXT., SOIL	: COMPLETE		NA	NA

EMS SAMPLE #: 110344

TEST DESCRIPTION / ANALYTE	RESULT	METHOD	DATE / DET. LIMIT	ANALYST / UNITS
ORGANIC EXTRACTION AND SAMPLE PREPARATION		SW846-3500	10/16/88	BJW
ORG. EXT. AND PREP..... :	COMPLETE		NA	NA
INITIAL WT OR VOL ..... :	2.0 G			
FINAL VOLUME, ML ..... :	2 ML			

ND - Not Detected
NA - Not Applicable
Sample was not received in the proper container for the analytes requested.
Sample was not received properly chemically preserved for analysis requested.

Approved by : D. Peterson

APPENDIX G.16

IDEM LETTER DATED APRIL 23, 1990

FOR YOUR INFORMATION

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

105 South Meridian Stree
P.O. Box 601
Indianapolis 46206-601
Telephone 317/232-8603

VIA CERTIFIED MAIL - P124-437-400

April 23, 1990

Mr. R.W. Herr
Central Foundry Division
General Motors Corporation
North Jackson Street
Bedford, Indiana 47421-0271

Re: Closure Certification
General Motors Corporation
Bedford, Indiana
IND 006036099

Dear Mr. Herr:

The Indiana Department of Environmental Management (IDEM) has received your certification, dated January 17, 1989, that total closure has been completed as outlined in the approved closure plan dated September 23, 1988, for the container storage area (SO1). With the receipt of this certification, total closure is complete as required by 329 IAC 3-21.

General Motors Corporation, Bedford, Indiana, originally notified the U.S. Environmental Protection Agency (U.S. EPA), Region V, as a hazardous waste storage facility with the following hazardous waste activity: container storage (SO1). With the completion of closure, that activity has been eliminated. The approved closure plan indicated that General Motors Corporation's new status is generator. The container storage area will continue to be used for less than ninety (90)-day storage.

This is also to notify you that your facility is no longer required by 329 IAC 3-22-4 to maintain financial assurance for the closure of your facility.

If you have any questions about this letter, please contact Mr. Mitch Mosier at AC 317/232-3221.

Sincerely,

Bruce H Palin

Bruce H. Palin
Acting Assistant Commissioner
Solid and Hazardous Waste Management

MJM/ssh
cc: Lawrence County Health Department
Ms. Fayola Wright, U.S. EPA, Region V
Mr. Hak Cho, U.S. EPA, Region V
Mr. Jeff Stevens
Ms. Jenny Ranck Dooley
Mr. James Hunt

An Equal Opportunity Employer

APPENDIX G.17

NRC LETTER DATED JUNE 6, 1990

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

June 6, 1990

Duty Officer, U.S. Coast Guard
National Response Center, Room 2611
2100 Second Street, S.W.
Washington, D.C. 20593

Subject: Sulfuric Acid Spill - May 24, 1990

The purpose of this letter is to confirm in writing the reporting by Wm. S. Schoonmaker, Plant Environmental Coordinator, of GMC, Central Foundry Division, Bedford Plant, located on N. Jackson Street, Bedford, Indiana 47421, of a spill on May 24, 1990, at approximately 8:30 P.M., to Mr. Dave Benson, Duty Officer. The spill consisted of an approximate 20 gallons of 66% sulfuric acid in an contained area at the plant's drum storage area. No evacuation of the area was required during this incident.

The spill was the result of a 55 gallon plastic drum developing a small leak from which the sulfuric acid leaked onto a curbed concrete storage pad. The sulfuric acid ran into a grated perimeter drain tough which runs around the inside of the curbed area. The acid ran for approximately 10 feet into a 2' x 2' x 3' pump collection box where the material was contained.

The City of Bedford's fire department emergency response team was called in to assist in the monitoring of the spill. Remediation of the spill area was completed at approximately 11:45 P.M. by Spill Recovery Of Indiana, Indianapolis, who was brought in to clean up the spilled materials.

If you have any questions or need additional information, please contact Mr. Wm. S. Schoonmaker at (812) 279-7308.

Sincerely

R. W. Herr

Robert. W. Herr
Plant Manager

cc: John Kassis, IDEM
Paul McBride, County Health Department
Wm. S. Schoonmaker, CFBedford

bcc: Keith West, CFDivision
Industrial Waste and Toxic Substance Control, GM-EAS
Environmental Law - Stationary, GM-Legal

Lets Get It Together
SAFETY BELTS SAVE LIVES

ADDRESSES FOR LETTER OF RESPONSE FOR SPILL REPORTING.

Duty Officer, U.S. Coast Guard
National Response Center, Room 2611
2100 Second Street, S.W.
Washington, D.C. 20593

Industrial Waste and Toxic Substances Control
Environmental Activities Building - Plant Environment
30400 Mound Road
Warren, MI 48090-9015

Environmental Activities Staff
General Motors Corporation
General Motors Technical Center
30400 Mound Road
Warren, MI 48090-9015

Environmental Law - Stationary
General Motors Corporation
New Center One Building
3031 West Grand Boulevard
P.O. Box 33121
Detroit, MI 48232

Indiana Department of Environmental Management
P.O. Box 6015
Indianapolis, IN 46206-6015

Environmental Response
Attn: John Kassis

Lawrence County Health Department
1410 I Street
Bedford, IN 47421

Attn: Paul McBride

Keith West
Central Foundry Division
General Motors Corporation
77 West Center Street
Saginaw, MI 48605-1629

MATERIAL USED

QUAN.	NO	DESCRIPTION	PRICE
		TOTAL	

EQUIPMENT USED

INVOICE 2952

SPILL RECOVERY OF INDIANA, INC.

PO BOX 34337 • INDIANAPOLIS, INDIANA 46234 • (317) 291 3972 • FAX (317) 298 3845

NAME General Motors Corporation

ADDRESS P.O. Box #791 N. Jackson St.

CITY Bedford, Indiana 47421

DATE 24 May 1990

PHONE 812-279-7308

Bill Schoonmaker | CUSTOMER'S ORDER NO

Respond to Central Foundry to Sulphuric Acid Release. Repack Compromised Drum and Neutralize Residuals.

This invoice is for clean-up only.
Disposal & related charges will be
billed on Environmental Services
of Indiana Invoice No. _____

DUE UPON RECEIPT

CUSTOMER'S AUTHORIZATION AND AGREEMENT

I, the owner or person having authority to act for the owner do hereby authorize and request the work and material covered by this order. Said work and material to be furnished at your regular prices. Payment will be made for same in cash or on other terms satisfactory to you and same shall constitute a lien until fully satisfied. If suit is required in order to secure payment I agree to pay all collection cost, reasonable attorney fees and waive all rights to claim exemption under the state laws. A service charge is charged on all invoices over 30 days delinquent. You will not be held responsible for articles left in case of loss by fire or theft, or any other means beyond your control.

CUSTOMER'S SIGNATURE Wm Schoonmaker

TOTAL FOR LABOR	
TOTAL FOR MATERIAL	
TOTAL FOR EQUIP	
SALES TAX	
TOTAL AMOUNT	

PAY FROM THIS INVOICE—NO STATEMENT WILL BE SENT

DUE UPON RECEIPT

APPENDIX G.18

U.S.EPA INSPECTION REPORT DATED MAY 18 AND 19, 1982

Special Handling

Mogel

REPORT ON INSPECTION TO DETERMINE COMPLIANCE WITH THE FEDERAL PCB DISPOSAL AND MARKING REGULATIONS

GENERAL MOTORS CORPORATION
CENTRAL FOUNDRY DIVISION
NORTH JACKSON STREET
BEDFORD, INDIANA 47421

MAY 18-19, 1982

PERFORMED FOR:

U.S. ENVIRONMENTAL PROTECTION AGENCY
TOXIC SUBSTANCES SECTION
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

PERFORMED BY:

VERSAR INC.
6621 ELECTRONIC DRIVE
SPRINGFIELD, VIRGINIA 22151

Objective

The purpose of this inspection was to document and verify the compliance of General Motors Corporation-Central Foundry Division with Federal PCB Disposal and Marking Regulations (40 CFR 761) published in Part VI of the Federal Register on May 31, 1979. The specific objective of this inspection was to document and verify the extent of PCB contamination in the die casting sumps, the water treatment plant, the surface ponds and lagoons, around PCB storage tanks, and at NPDES outfalls 001 and 002. This was a reinspection of the Central Foundry Division resulting from the high PCB concentrations detected during the previous PCB inspection conducted on September 16, 1980.

I. Facility and Responsible Official

General Motors Corporation
Central Foundry Division
North Jackson Street
Bedford, Indiana 47421

William A. Butler, Superintendent, Plant Engineering
Phone: (812) 279-7303

II. Inspection Dates and Participants

May 18-19, 1982

General Motors Corporation -
William A. Butler, Superintendent, Plant Engineering
Glen R. Ohl, Senior Engineer
Bill Schoomaker, Project Engineer
Paul Breidenback, Electrical Engineer
Ronald W. Remmers, Environmental Project Engineer
Joseph B. Medved, P.E., Administrator - Environmental Activities
Gerry Brent, Laboratory Supervisor

U.S. Environmental Protection Agency -
David H. Homer, Ph.D., Enviornmental Scientist

Indiana State Board of Health -
Jim Trailor, Chief, Technical Support Branch

Versar Inc. -

Robert F. Murphy, Compliance Auditor Robert F. Murphy

Michael C. Calhoun, Compliance Auditor Michael C. Calhoun

William M. Moran, Compliance Auditor William M. Moran

III. Facility Description

The Central Foundry Division of General Motors Corporation is located on approximately 132 acres of land and presently employs about 1,200 people. The facility has been owned and operated by General Motors Corporation since 1947; it was formerly a stone mill before 1946. A plant layout including the surrounding portion of the City of Bedford is shown as Figure 1.

The Central Foundry Division is presently operating at 60 to 70 percent production capacity. The plant manufactures aluminum automotive components including piston heads, intake manifolds, and transmission housings, as well as turbine blades composed of various heat resistant alloys (See PCB Report dated September 16, 1980). The manufactured products are then incorporated into General Motors Corporation vehicles, with a small number of transmission housings being sold to the Ford Motor Company.

IV. Inspection Findings

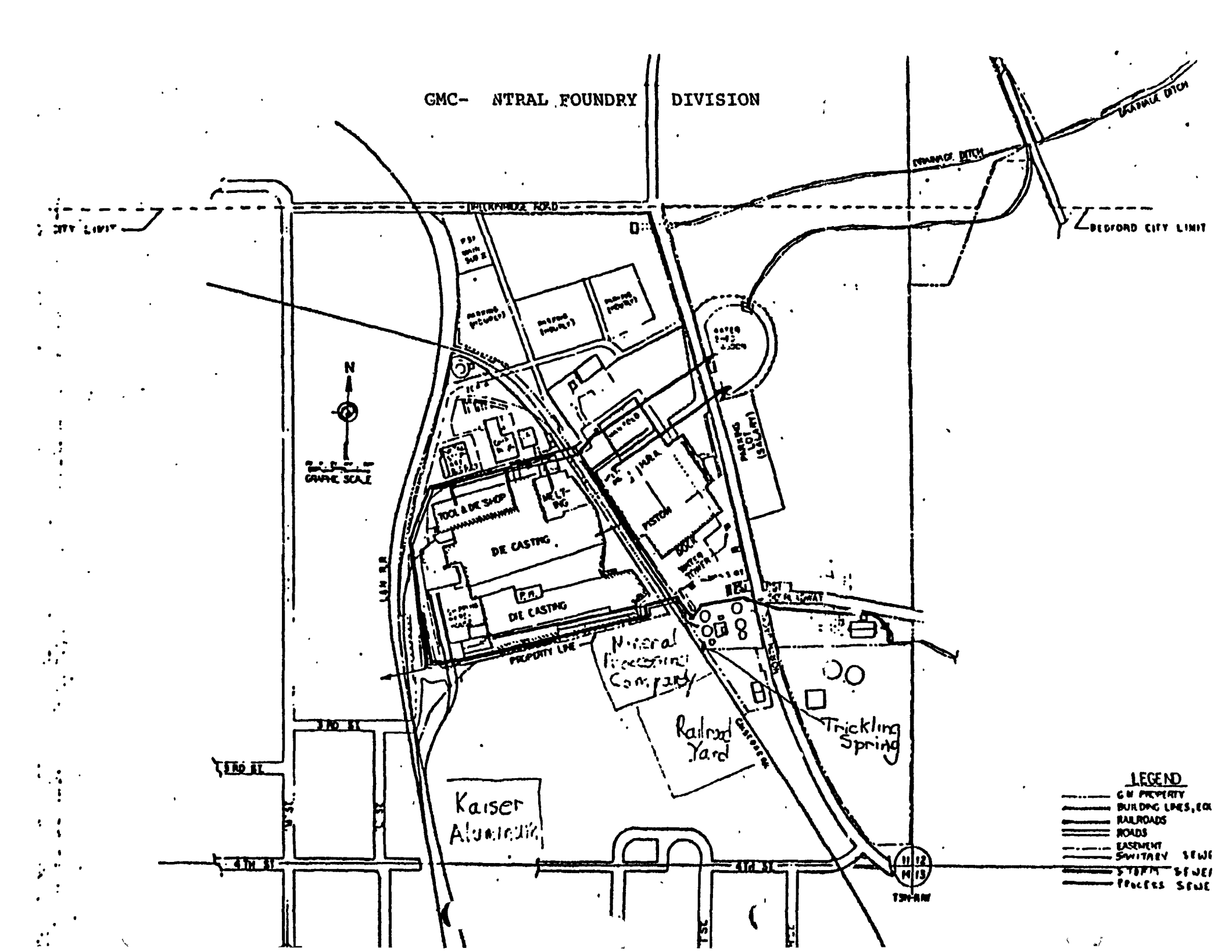
The following areas of non-compliance were noted during the PCB inspection of the General Motors Corporation - Central Foundry Division conducted May 18-19, 1982.

1. Improper storage and disposal of PCBs as defined by 40 CFR 761.65(b) and 761.60(d).

   - The south storage lagoon contains an estimated 6,810,000 kilograms of PCB mixtures (oil, water, and sludge). Sludge and oil/water PCB samples collected from the surface of the lagoon showed 16,000 ppm and 24,000 ppm Aroclor 1242, respectively (Table 1).

   - Two sediment samples were collected on two separate banks of the old watershed lagoon from areas (several square feet each) which were visibly oil-impregnated. PCB concentrations of 600,000 ppm and 91,000 ppm Aroclor 1242 were detected in these two samples (Figure 2, Table 1).

   - Seven large, leaking, and predominantly empty PCB storage tanks were stored for disposal east of the south storage lagoon. An oil-impregnated area of approximately 40 feet by


GMC- NTRAL FOUNDRY DIVISION
DIE CASTING
DIE CASTING
PISTON
PROPERTY LINE
Railroad Yard
Trickling Spring
Kaiser
LEGEND
RAILROADS
ROADS

60 feet surrounded the storage tanks. Four PCB sediment samples collected from the oil-impregnated area showed 1,900 ppm to 100,000 ppm Aroclor 1242. A PCB sediment sample collected adjacent to the stained area (Sample Number 19) showed 420 ppm, Aroclor 1242.

- An area composite sediment sample was collected from the bank of a pond covering an area of about 1,260 square feet (40 feet diameter), and a PCB concentration of 97 ppm mixed Aroclors was detected (Figure 2, CDF-13).

- A sediment sample was collected from NPDES outfall 002 at the headwaters of Bailey's Branch, and a PCB concentration of 1,000 ppm Aroclor 1242 was detected. The extent of the PCB contamination could not be determined because the Central Foundry Division chain link property fence bordered the sampling location.

- A sludge sample was collected from the North Make 1 South Make 1 drainage sump, and a PCB concentration of 1,200 ppm Aroclor 1242 was detected. The sump contained roughly 40 cubic feet of sludge at the time of the inspection. Hydraulic and cooling fluids from die cast machines drain into this sump, then are pumped to the head of the Central Foundry Division wastewater treatment plant.

- A sediment sample was collected from the grit chamber at the head of the wastewater treatment plant, and a PCB concentration of 1,600 ppm Aroclor 1242 was detected. Grit was also noticed in an adjacent wheelbarrow. Neither the grit chamber nor the wheelbarrow was a totally enclosed device.

2. Improper use of two PCB transformers as defined by the Interim Measures Program, Appendix B (III)(B) and (C).

   - The facility did not keep written inspection records for their two PCB transformers between May 11, 1981, and April 28, 1982 (they missed three quarterly inspections).

   - The inspectors observed minor leakage on the bottom of a PCB transformer stored for reuse in the Electrical Storage Room. No mention of this leakage was indicated on the Central Foundry Division "Inspection of Electrical Transformers Containing PCB's" for the April 29, 1982 inspection (Attachment 7, page 3).

3. Improper marking as defined by 40 CFR 761.40(a)(10).

   Several areas where PCBs stored for disposal were not marked with M_L or M_S PCB labels were viewed by the inspectors.

- The grit chamber and a wheelbarrow filled with grit at the wastewater treatment plant.
- The old watershed lagoon.
- The North Make 1 South Make 1 sump.
- The north pond (Figure 2, CDF-13).
- The south storage lagoon and pumphouse.

4. Insufficient recordkeeping as defined by 40 CFR 761.80 (a), (a)(1).

   - The annual documents were prepared on a July 1 - June 30 reporting year basis and not on a calendar year basis.
   - The July 1, 1980 - June 30, 1981 and the July 1, 1979 - June 30, 1980, annual documents do not list the dates and quantities of PCB sludge transported for disposal to CECOS International Inc. for each individual shipment (Attachments 2 and 3).

5. Possible improper storage and disposal of PCBs as defined by 40 CFR 761.65(b) and 761.60(d).

   - The extent of the PCB contamination around NPDES outfall 001 could not be determined. A PCB core sediment sample collected adjacent to the discharge pipe showed 38 ppm, Aroclor 1242.
   - The extent of the PCB contamination below the water level in the old watershed lagoon could not be determined. The exposed banks of the lagoon showed PCB concentrations of up to 600,000 ppm Aroclor 1242.

According to the "PCB Inventory Performed by GM in 1976" which was obtained at the time of the previous PCB inspection conducted on September 16, 1980, the Central Foundry Division purchased 911,845 pounds of PCB hydraulic fluids in 1971 and 1972 (Attachment J). It has already been established that these PCB fluids were used in the die cast and trim press hydraulic systems at the Central Foundry Division. Decontamination of these systems commenced in 1976, and by the November 20, 1979 testing date, all of the hydraulic systems had PCB concentrations below 50 ppm. The "Die Cast Machines and Trim Presses Most Recent Checks" is shown as Attachment 1.

All hydraulic and cooling fluids that leak from the die cast and trim press machines drain into a series of trenches and collection sumps. The fluids are pumped from the collection sumps to the head of the wastewater treatment plant. The hydraulic fluids settle to the bottom of two clari-thickeners (the predominant hydralic fluid presently used at the Central Foundry Division is a phosphate ester, Houghton 1120, which has a specific gravity of 1.05). They are then pumped to the facility's east million gallon capacity PCB storage tank. Prior to 1978, this waste hydraulic fluid (it contained a higher concentration of PCBs at that time) was pumped to the south storage lagoon, which resulted in its contamination.

Besides the known PCB contamination of the south storage lagoon, the inspectors found other significant areas of improper PCB storage and disposal. These areas include the old watershed lagoon, the area around seven leaky PCB storage tanks, and the area near NPDES outfall 002 at the headwaters to Bailey's Branch. A schematic of the "GM Central Foundry Division Layout Depicting Sampling Points" is shown as Figure 2.

The inspectors viewed the south storage lagoon and noted that the fluid level had dropped a few feet since the September 16, 1980 PCB Inspection (Photograph 1). A sludge and an oil/water sample were collected from this lagoon, and PCB concentrations of 16,000 ppm and 24,000 ppm Arolcor 1242 were detected in these two samples, respectively (Table 1). Sludge from the south storage lagoon is dewatered, then placed into an approximately 20 cubic yard capacity steel dumpster lined with plastic. The dumpster was marked with an M_L PCB label at the time of the inspection (Photograph 2). The inspectors collected a sample of the filter cake from the dumpster, and a PCB concentration of 1,500 ppm Aroclor 1242 was detected (Table 1).

According to Mr. Ohl, Senior Engineer, sludge from the thickeners at the wastewater treatment plant is pumped through the dewatering operation and stored for disposal in the dumpster. This sludge is considered a PCB solid because of the prior flushing of PCBs through the wastewater treatment plant. According to Mr. Ohl, during the winter, all of the PCB

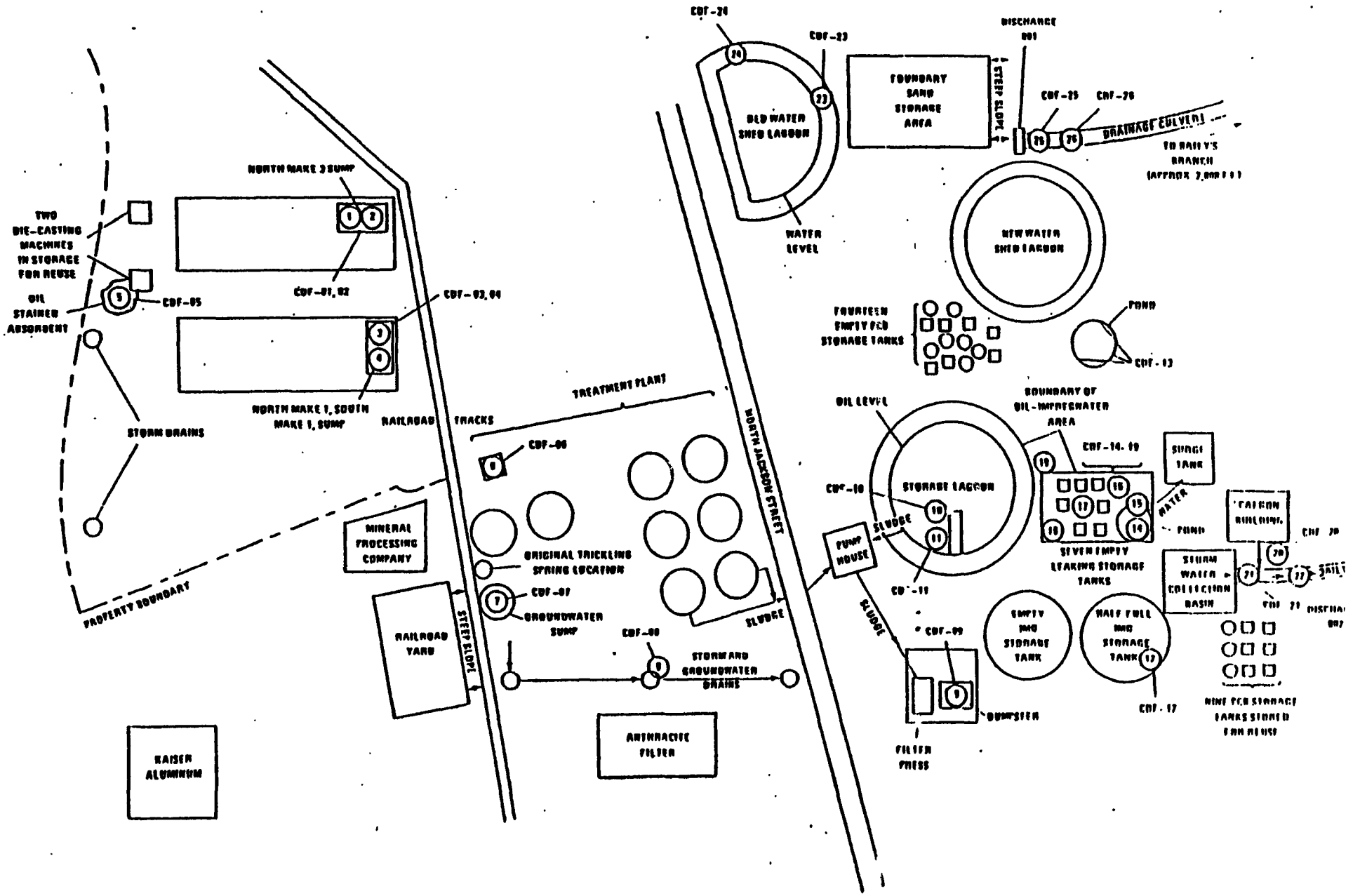


FIGURE 2: RM CENTRAL FOUNDRY DIVISION LAYOUT SHOWING SAMPLING POINTS
(NOT TO SCALE)

TABLE 1. PCB ANALYTICAL RESULTS FOR SAMPLES COLLECTED AT THE CENTRAL FOUNDRY DIVISION ON MAY 19, 1982*

Sample Number	Description	PCB Concentration (ppm)**	Aroclor Type
1	Water: North Make 3 Sump	400 ppb	1242
2	Sludge: North Make 3 Sump	24	1242
3	Water: North and South Make 1 Sump	87 ppb	1242
4	Sludge: North and South Make 1 Sump	1,200	1242
5	Solids: Die Cast Machine at West Storage Yard	4	1242
6	Solids: Grit Chamber at Treatment Plant	1,600	1242
7	Water: Groundwater Sump	ND+	—
8	Water: Storm Sewer by Treatment Plant	4 ppb	1242
9	Solids: Filter Cake in the Dumpster	1,500	1242
10	Oil/Water: From Storage Lagoon	24,000	1242
11	Solids: Cake from Storage Lagoon	16,000	1242
12	Oil: East Million Gallon Storage Tank	580	1242
13	Sediment: Space Composite by North Pond	97	Mix
14	Oil/Water: From South Pond	33,000	1242
15	Sediment: SE Side of Seven Leaking Storage Tanks	1,900	1242
16	Sediment: NE Side of Seven Leaking Storage Tanks	2,100	1242
17	Sediment: Center of Seven Leaking Storage Tanks	23,000	1242
18	Sediment: SW Side of Seven Leaking Storage Tanks	100,000	1242
19	Sediment: NW Side of Seven Leaking Storage Tanks	420	1242
20	Water: Discharge 002	ND+	—
21	Water: Stormwater Runoff into Bailey's Branch	7 ppb	1242
22	Sediment: Discharge 002 into Bailey's Branch	1,000	1242
23	Sediment: NE Corner of Old Watershed Lagoon, 10 feet above water level	91,000	1242
24	Sediment: North Side of Old Watershed Lagoon near water surface	600,000	1242
25	Water: Discharge 001	6 ppb	1242
26	Sediment: Base of Discharge 001 (Core sample)	38	1242

* The facility collected two duplicates for each of the eight water samples and two splits on the remaining samples. One duplicate/split was collected in a bottle supplied by Versar personnel, the second duplicate/split was collected in a bottle supplied by the Central Foundry Division. All samples were collected by Versar inspectors.

** All water samples are reported in parts per billion.

\+ Not detected at 1 part per billion.

filter cake disposed of through the dumpster originates from the thickeners. During the rest of the year, the filter cake is approximately 65 percent thickened sludge and 35 percent south storage lagoon sludge. According to the "CFD Bedford PCB Recordkeeping Inventoried 7-1-81," the Central Foundry Division shipped 1,103,776 kilograms of dewatered PCB sludge to CECOS International Inc. in Williamson, Ohio, during the period from July 1, 1980, to June 30, 1981 (Attachment 2). Attachment 2 also indicates that the south storage lagoon contained 6,810,000 kilograms of PCB mixtures as of July 1, 1981. According to the "CFD Bedford PCB Recordkeeping Inventoried 7-1-80," the Central Foundry Division shipped 58,778 kilograms of PCB sludge to Cecos International Inc. during June 1980 (Attachment 3). No PCB sludge was disposed of by the Central Foundry Division prior to June 1980. A recent "Hazardous Waste Manifest" for the disposal of 12,636 kilograms of PCB filter cake to CECOS International Inc. dated May 12, 1982, is shown as Attachment 4.

The inspectors observed that the wall and floor adjacent to the dewatering operation in the PCB sludge processing building were splattered with sludge. The PCB content of the splattered sludge is probably similar to the 1,500 ppm Aroclor 1242 found in the dumpster.

As mentioned earlier, the Central Foundry Division decontaminated all of the hydraulic systems that used PCB fluids. The inspectors viewed the two main sumps in the die casting area where the PCB hydraulic fluids are collected before being pumped to the wastewater treatment plant (Photograph 3). The inspectors collected a sludge and a water sample from the North Make 3 sump, and PCB concentrations of 24 ppm and 400 ppb Aroclor 1242 were detected in the two samples, respectively (Table 1). The inspectors estimated that there were approximately 25 cubic feet of sludge in this sump at the time of the inspection. A sludge and a water sample were collected at the North Make 1 South Make 1 sump, and PCB concentrations of 1,200 ppm and 87 ppb Aroclor 1242 were detected, respectively (Table 1). Approximately 40 cubic feet of sludge were contained in this sump at the time of the inspection.

The inspectors toured the wastewater treatment plant and noted the additional treatment capabilities which were constructed since the previous PCB inspection dated September 16, 1980. A schematic of the "GM-Central Foundry Division Treatment Plant" is shown as Figure 3. A sample of solids was collected from the recently installed grit chamber (less than two years old) (Photograph 4). A PCB concentration of 1,600 ppm Aroclor 1242 was detected in this sample (Table 1). Mr. Ohl stated that not more than a few cubic yards of grit accumulate per year, and all is disposed of through CECOS International Inc. via the dumpster. A total of several cubic feet of sludge were observed in the grit chamber and in an adjacent wheelbarrow, and neither item was marked with the M_L or M_S PCB label.

The Central Foundry Division has an old watershed lagoon which was previously used to collect plant stormwater for discharge through NPDES outfall 001 (Photograph 5). Mr. Remmers, Environmental Project Engineer, stated that this lagoon was about 30 years old. In August 1981, a new watershed lagoon became operational (Photograph 6). This new lagoon collects stormwater from the plant then pumps it to the wastewater treatment plant. Since this new lagoon became operational, the old lagoon and NPDES outfall 001 have become obsolete.

The inspectors observed numerous areas of oil-impregnated soil along the banks of the old watershed lagoon (Photographs 7 and 8). Sediment samples were collected on the northeast bank about ten feet above the water level, and on the north bank at the water surface (Photographs 9 and 10). PCB concentrations of 91,000 ppm and 600,000 ppm Aroclor 1242 were detected in these two samples, respectively (Table 1). The total extent of the PCB contamination below the water surface could not be determined.

According to Mr. Trailer of the Indiana State Board of Health and EPA officials, the Central Foundry Division cut a breach in this lagoon several months prior to the inspection and drained out most of the water. The breach had been retrofilled by the time of the inspection. Sample Number 23 (91,000 ppm PCBs) was collected near the point where the breach was cut (Figure 2).

The outfall pipe for discharge 001 empties into a drainage culvert which meanders towards Bailey's Branch (Figure 2). This pipe is located several hundred yards to the east of the old watershed lagoon separated by a foundry sand storage area. The facility officials stated that the foundry sand was never used as cleanup material for PCB spillage.. According to Mr. Ohl and Mr. Schoomaker, Project Engineer, the NPDES outfall 001 previously discharged approximately 75,000 gpd. At the time of the inspection, a small trickle of water was discharging from this pipe, but the flow was probably due to groundwater seepage from the foundry sand storage area (Photograph 11). The inspectors collected a water sample from NPDES outfall 001 and a sediment core sample from the drainage culvert; PCB concentrations of 6 ppb and 38 ppm Aroclor 1242 were detected, respectively (Table 1). The extent of PCB contamination in and around the drainage culvert cannot be determined without more detailed sampling (Photographs 12 and 13).

Besides the stormwater drainage which collects in the watershed lagoon, much of the stormwater and some groundwater drain through a series of pipes to a stormwater collection basin adjacent to NPDES outfall 002. The water passes through a screen and then empties into Bailey's Branch. According to Mr. Remmers, the facility is planning to redirect this runoff to the wastewater treatment plant in the near future. The inspectors collected water samples at a storm sewer adjacent to the wastewater treatment plant and at the discharge point into Bailey's Branch (Photographs 14 and 15). PCB concentrations of 4 ppb and 7 ppb were detected in the storm sewer and at the discharge point, respectively (Table 1).

The inspectors viewed NPDES outfall 002 which discharges treated effluent that passes through the wastewater treatment plan. This outfall provides the source for the headwaters of Bailey's Branch (Photograph 15). According to Messrs. Ohl and Schoomaker, the flowrate through NPDES outfall 002 is about 300,000 gpd. The inspectors collected a water sample at outfall 002 and a sediment sample from the headwaters of Bailey's Branch; a PCB concentration of 1,000 ppm Aroclor 1242 was

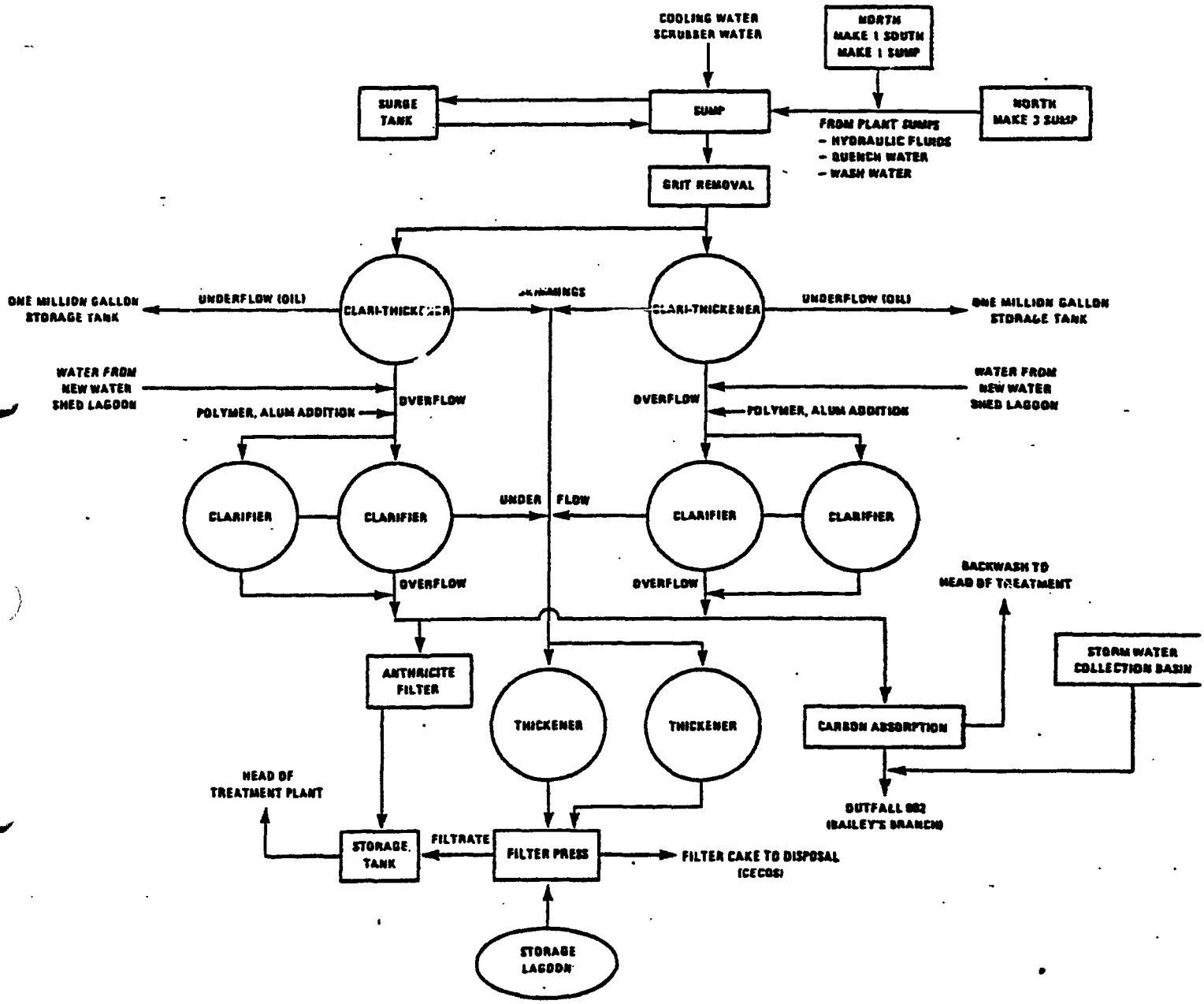


FIGURE 1. GM – CENTRAL FOUNDRY TREATMENT PLANT
(NOT TO SCALE)

detected in the sediment (Photograph 16). No PCBs were detected in the water sample (Table 1).

According to the "Oil Spill Prevention and Counter Measure Plan" for the Central Foundry Division, a spill of black material was observed flowing from NPDES outfall 002 on November 12, 1976 (Attachment 5, page 15). The facility tested this material and found ± 160 ppm PCBs. The inspectors noticed black discoloration in the sediment sample they collected (1,000 ppm, Aroclor 1242). The extent of the PCB contamination in Bailey's Branch could not be determined because the facility's chain link property fence was located adjacent to NPDES outfall 002 (Photograph 17).

Three separate outdoor areas of PCB storage tanks were observed by the inspectors (Figure 2). The northernmost storage area consisted of 14 empty 6,000 to 17,500-gallon capacity steel tanks all marked with M_L PCB labels (Photographs 18 and 19). According to Mr. Ohl, all fourteen tanks were stored for disposal. One tank had slight leakage around a drain valve while the rest showed no evidence of leakage. According to the PCB report dated September 16, 1980, these tanks previously contained oil with a PCB concentration of about 900 ppm. The tanks were then emptied into the east million gallon capacity PCB storage tank during the summer of 1980 (Attachment 2).

Adjacent and to the east of these PCB storage tanks was a shallow pond roughly 40 feet in diameter (Photograph 20). Mr. Calhoun of Versar stated that he believed that several PCB storage tanks had been at that location during the PCB inspection dated September 16, 1980. An area composite sediment sample was collected from the banks of this pond, and a PCB concentration of 97 ppm mixed Aroclors was detected. (Table 1).

The second area of PCB storage tanks consists of seven predominantly empty 15,000 and 20,000 gallon capacity steel tanks located east of the south storage lagoon (Attachments 2 and 3). These seven PCB tanks showed evidence of moderate leakage, and all were marked with M_L PCB labels (Photograph 21). Several of these tanks were open on top

(Photograph 22). According to Mr. Ohl, the contents of these tanks were emptied and placed into the east million gallon capacity PCB storage tank, and all seven tanks were stored for disposal. An area of approximately 40 feet by 60 feet encompassing the tanks was found to be heavily oil-impregnated (Photographs 23 and 24). The inspectors collected a grid of five sediment samples in this area in the shape of an "X" (Figure 2). PCB concentrations of 100,000 ppm, 23,000 ppm, 2,100 ppm, 1,900 ppm, and 420 ppm Aroclor 1242 were detected in these five samples (Figure 2 and Table 1). Sample Number 19 (420 ppm Aroclor 1242) was actually collected outside the oil-impregnated area. This may indicate lateral PCB migration during times of excessive precipitation.

A small pond (approximately ten feet in diameter) was located in the southeastern portion of the oil-impregnated area (Photograph 25). At the time of the inspection, water was being pumped from the pond into the surge basin to the east (Photographs 26 and 27). An oil/water sample collected from the pond showed 33,000 ppm Arolcor 1242 (Table 1).

The facility officials stated that no cleanup of this contaminated soil is planned until the south storage lagoon is decontaminated. The existence and/or extent of groundwater contamination resulting from this PCB storage area and/or the south storage lagoon is unknown. It is known that this geographical area is one of karst topography (highly permeable bedrock).

The third area of PCB storage tanks is located to the southeast of the south storage lagoon. It consists of nine 8,000 to 15,000-gallon capacity storage tanks, and two one-million gallon capacity storage tanks. According to Mr. Ohl and Attachment 2, the nine smaller tanks consist of five PCB tanks with various amounts of fluid, three empty PCB tanks, and one empty non-PCB tank. All nine tanks were stored for reuse. The inspectors viewed these PCB storage tanks and found all to be structurally sound with no leakage evident; all were marked with M_L PCB labels (Photograph 28).

According to facility officials, the west million gallon capacity storage tank was empty and had never been used. Mr. Ohl and the inspectors estimated that the east million gallon capacity PCB storage tank was about half full at the time of the inspection. According to facility officials, the fluid in this tank originated from fluid drained from the tanks in the three outdoor PCB tank storage areas, and from fluid which is periodically pumped from the underflow of the two clari-thickeners at the wastewater treatment plant (Figure 3). They further stated that the PCB fluid in this tank was stored for reuse. This PCB storage tank was marked with the M_L PCB label and showed no evidence of leakage (Photograph 29). The inspectors collected an oil sample from this tank, and a PCB concentration of 580 ppm Aroclor 1242 was detected (Table 1).

Concern was raised about the presence of a groundwater fed trickling spring located near the wastewater treatment plant being a source of PCB contamination. According to Mr. Remmers, the Central Foundry Division recently installed a concrete sump to collect this groundwater because it presented a serious contamination problem to NPDES outfall 002 (chlorides in this water average about 15,000 ppm). At the time of the inspection, the water level in the sump was static due to the constant groundwater pressure (Photographs 30 and 31). The inspectors collected a water sample from the sump, and no PCBs were detected (Table 1).

The inspectors viewed the west yard at the Central Foundry Division and observed two die cast machines stored for reuse. Mr. Ohl stated that these machines were decontaminated with the rest of the PCB hydraulic systems. Both units were covered with plastic, both were stored outdoors above asphalt, and one machine showed evidence of leakage (Photographs 32 and 33). A sample of oil-impregnated absorbent material was collected around the leaky machine, and a PCB concentration of 4 ppm Aroclor 1242 was detected (Table 1). Two storm sewers were located within 100 yards of these die cast machines in storage. Mr. Ohl stated that he believes that these storm sewers drain toward the stormwater collection basin and through NPDES outfall 002.

According to Mr. Trailor of the Indiana State Board of Health, the Central Foundry Division previously stored die cast fluid in a large tank at the west yard, and back-siphoned some of this fluid into drainage ditches near the western boundary of their property. At the time of the inspection, the drainage ditches were not observed and no evidence of their existence was apparent.

The Central Foundry Division prepared a "CFD Bedford PCB Recordkeeping Inventoried June 1, 1979" (Attachment 6). According to Mr. Ohl, Attachments 2, 3, and 6 are the Central Foundry Division annual documents for the reporting years ending July 1, 1981, July 1, 1980, and July 1, 1979, respectively. These three annual documents meet all the PCB recordkeeping requirements with the following exceptions:

1. Attachments 2 and 3 do not list the dates and quantities of PCB sludge transported for disposal to CECOS International Inc. for each individual shipment.

2. The annual documents were prepared on a July 1 - June 30 reporting year basis and not on a calendar year basis.

According to Messrs. Ohl and Schoomaker, the Central Foundry Division owned two PCB transformers at the time of the inspection. Both were viewed and found to be marked with M_L PCB labels (Photograph 34). An Allis-Chalmers PCB transformer stored for reuse showed evidence of minor leakage around its drain spout. This 397-gallon capacity PCB transformer was enclosed within a steel containment structure of approximate dimensions of six feet by seven feet by ten inches (capacity equal to about 66 percent of the PCB transformer fluid volume). A description of both PCB transformers viewed is presented in Table 2.

Messrs. Ohl and Schoomaker stated that the Central Foundry Division had not owned any other PCB transformers for at least the last five years and that they never serviced their PCB transformers. No Askarel fluid for topping-off these PCB transformers is retained by the Central Foundry Division.

TABLE 2. TRANSFORMERS AND CAPACITORS INSPECTED AT THE CENTRAL FOUNDRY DIVISION

A. Transformers

Manufacturer	Location	Quantity	kVA Rating	Fluid Capacity Gallons	Fluid Type	Label	Leakage*	Status
Westinghouse	Substation A	1	2,000	472	Inerteen	M_L	None	In-Service
Westinghouse	Substation A	1	2,000	-	Dry	None	N/A	In-Service
Allis-Chalmers	Electrical Storage Room	1	1,000	397	Chlorextol	M_L	Minor	Stored/Reuse
Westinghouse	Induction Melting	3	2,100	225	Mineral	None	None	In-Service
Ferranti-Packard	Induction Melting	2	2,100	300	Mineral	None	**	In-Service

B. Capacitors

Manufacturer	Location	Quantity	Size	Voltage	Fluid Type	Label	Status
General Electric	Treatment Plant Sub	40	Large	4,160	Pyranol	M_S	In-Service
Westinghouse	Die Casting	2	Large	480	Inerteen	None	In-Service
Westinghouse	Permanent Mold Machining	2	Large	480	Inerteen	None	In-Service

*As per Interim Measures Program definition
**One transformer (SN7-10121-01) showed evidence of moderate leakage and the second transformer had no leakage.

According to Mr. Ohl, the Central Foundry Division conducted periodic visual inspections of their PCB transformers since the inception of the Interim Measures Program. No written inspection record was kept for the first three 90-day periods after the May 11, 1981 effective date of these regulations. An "Inspection of Electrical Transformers Containing PCBs" was conducted April 29, 1982 (Attachment 7, page 3). Attachment 7 did not mention any leakage from the Allis-Chalmers PCB transformer stored for reuse. Three weeks after the Interim Measures Program inspection, minor leakage was noticed around the drain spout of this PCB transformer. The Central Foundry Division developed guidance procedures dated May 7, 1981, to comply with the Interim Measures Program (Attachment 7, pages 1 and 2). This document lists all the requirements of the Interim Measures Program, but it was not adhered to by plant personnel.

According to Mr. Breidenback, Electrical Engineer, the Central Foundry Division owns approximately ten mineral oil transformers, and all were purchased new since 1977. General Electric performs all servicing of these mineral oil transformers. Five of these transformers were viewed by the inspectors in the Induction Melting Substation, and they are described in Table 2. All five mineral oil transformers viewed were contained within concrete curbing. One of these transformers showed a small amount of moderate leakage (Westinghouse SN7-10121-01).

According to Attachment 2, the Central Foundry Division had 40 large, high voltage PCB capacitors and 280 large, low voltage PCB capacitors in service containing a total of 1,812.8 kilograms of PCB fluid. Mr. Ohl stated that no large PCB capacitors were stored for disposal at the time of the inspection. The 40 large, high voltage PCB capacitors were viewed at the treatment plant substation (Photograph 35). Each was marked with an M_S PCB label. Four large, low voltage PCB capacitors were viewed, and none were marked with M_L or M_S PCB labels. According to facility officials, all low voltage PCB capacitors are marked with M_S PCB labels when they are taken out of service. A description of the PCB capacitors viewed by the inspectors is shown in Table 2.

According to Attachment 1, one large, high voltage PCB capacitor containing 1.6 kilograms of PCB fluid was shipped to CECOS International Inc. on September 25, 1980. No other large PCB capacitors were disposed of by the Central Foundry Division since 1978. On April 26, 1982, the facility disposed of eight drums filled with small PCB capacitors (less than three pounds of PCBs each) to CECOS International Inc. The "Hazardous Waste Manifest" for this shipment is shown as Attachment 8.

The inspectors viewed the designated PCB storage area in the sludge processing building. The storage area was approximately 27 feet by 20 feet in area, had a concrete floor, and was contained within a three-foot high concrete dike which was marked with an M_L PCB label (Photograph 36). The storage area contained no PCB items at the time of the inspection, but it did contain a 5,750-gallon capacity ferric chloride tank. A small self-contained sump was located in the southeast corner of the storage area to capture any spillage from this tank (Photograph 37).

According to a "General Motors - Central Foundry Division (PCB Inventory performed by GM in 1976)," the Central Foundry Division purchased 6,670 pounds of pattern, utility, and shim wax (impregnated with PCBs) between 1971 and 1975 (Attachment J). When questioned, the facility officials demonstrated little knowledge about the disposition of these PCB products. In a letter from Mr. Butler, Superintendent of Plant Engineering, dated July 7, 1982, he stated that the use and disposal of PCB impregnated waxes at the Central Foundry Division "deals with items and events prior to the effective date of the Toxic Substances Control Act (TSCA)" (Attachment 9). The General Motors' Legal Staff has requested that Versar/EPA provide General Motors with the legal basis and authority on which the above requested information should be made available.

The following additional information was obtained from Messrs. Ohl and Schoemaker:

- No oil based heat transfer fluids or quench oils were used at the Central Foundry Division.
- Mineral Processing Company located south of the facility (Figure 1), recovers aluminum dross and sells it back to the Central Foundry Division.

- No other PCBs were used at the Central Foundry Division to the best of their knowledge.

V. Inspection Summary

On the morning of May 18, 1982, the inspectors, accompanied by Mr. David Homer of the U.S. Environmental Protection Agency, met with the receptionist for the Central Foundry Division. They were presented with a liability waiver which they signed to gain admittance to the facility. They then met with Messrs. Butler and Ohl of General Motors Corporation. The inspectors presented the EPA-authorized credentials, a "Notice of Inspection" and a "Confidentiality Notice" to the gentlemen. Mr. Butler signed the "Notice of Inspection" and returned it to the inspectors. He kept the "Confidentiality Notice" for further viewing. The inspectors summarized the intent and the scope of their inspection, then proceeded to a conference room to begin their audit.

The inspectors were joined in the conference room by Messrs. Ohl, Schoomaker, and Breidenback. Relevant information regarding PCB transformers, PCB capacitors, PCB storage areas, and the use of PCBs in hydraulic systems were discussed, and the PCB Annual Documents were reviewed. Information regarding the water treatment plant, the water and sludge storage lagoons, and NPDES outfalls 001 and 002 was discussed in detail.

The inspectors toured the Central Foundry Division accompanied by Mr. Homer, Mr. Trailor of the Indiana State board of Health, and Messrs. Ohl and Remmers of General Motors Corporation. The gentlemen viewed the die casting area, the west storage yard, two electrical substations, the water treatment facility, the area of groundwater seepage (old trickling spring), the PCB storage tanks, the watershed and storage lagoons, and NPDES outfalls 001 and 002. Photographs were taken as needed. At the conclusion of the tour, the inspectors developed a site sampling plan and left the facility.

The inspectors, accompanied by Mr. Homer, returned to the Central Foundry Division on the morning of May 19, 1982, to conduct their site

sampling. The General Motors Corporation personnel who accompanied the inspectors during the day were Messrs. Butler, Ohl, Remmers, Schoomaker, and Medved. The inspectors viewed two additional electrical substations but concentrated most of the day on site sampling. Numerous samples including several quality control samples were collected by the inspectors as shown in Figure 2. Photographs were collected, throughout the day of sampling locations, the electrical substations, and offsite locations as needed.

The inspectors returned to Mr. Butler's office for the closing conference and handed him a "Receipt for Samples and Documents." Mr. Butler signed the receipt, as well as the "Confidentiality Notice," and returned them to the inspectors. At this point, the inspectors left seven rolls of film and a list of Central Foundry Division documents, which they requested, with the facility officials. Mr. Butler asked the inspectors to submit a written request to him for the above information. On May 25, 1982, Mr. Murphy submitted the formal request to Mr. Butler (Attachment H). On July 13, 1982, the inspectors received all of the information they requested with the exception of the information related to PCB impregnated waxes. The facility believes that this information is not covered by TSCA (Attachment 9).

The inspectors summarized their findings and left Mr. Butler's office. The inspectors met Mr. Gerry Brent, Laboratory Supervisor for the Central Foundry Division, who requested information regarding the Versar Analytical Procedures. On June 4, 1982, Mr. Murphy sent Mr. Brent a copy of the "Standard Versar Quality Control Program" (Attachment G).

LIST OF ATTACHMENTS

GENERAL MOTORS CORPORATION
CENTRAL FOUNDRY DIVISION
NORTH JACKSON STREET
BEDFORD, INDIANA 47421

MAY 18-19, 1982

ATTACHMENTS

A. PCB Analytical Report
B. List of Photographs
C. Notice of Inspection
D. Confidentiality Notice
E. Receipts for Samples and Documents
F. Chain of Custody Records
G. PCB Inspection Checklist
H. Letter to Mr. Butler requesting documents and photographs dated May 25, 1982.
I. Letter to Mr. Brent enclosing the Standard Versar Quality Control Program dated June 4, 1982 (7 pages)
J. General Motors - Central Foundry Division (PCB Inventory performed by GM in 1976) (2 pages)

ATTACHMENTS OBTAINED FROM FACILITY

1. Die Cast Machines and Trim Presses Most Recent Checks, Dated November 20, 1979. (1 page)
2. CFD Bedford PCB Recordkeeping, Inventoried 7-1-81. (3 pages)
3. CFD Bedford PCB Recordkeeping, Inventoried 7-1-80. (3 pages)
4. Hazardous Waste Manifest, Dated May 12, 1982. (2 pages)
5. Oil Spill Prevention and Counter Measure Plan. (16 pages)
6. CFD Bedford PCB Recordkeeping, Inventoried 7-1-79. (3 pages)
7. Inspection of Electrical Transformers Containing PCBs. (3 pages)
8. Hazardous Waste Manifest, Dated April 26, 1982. (2 pages)
9. Letter from Mr. Butler, Dated July 7, 1982. (3 pages)

Versar Inc.

PCB ANALYTICAL REPORT

PREPARED FOR: Mr. Jon Byroade

REF. # 717.55

Facility Inspected GENERAL MOTORS CORPORATION

SAMPLE No.	LAB No.	CONCENTRATION PARTS/MILLION	AROCLOR	COMMENTS
CDF - 01	1693	400 ppb*	1242	Water
CDF - 02	1694	24	1242	Soil
CDF - 03	1695	87 ppb	1242	Water
CDF - 04	1697	1200	1242	Soil
CDF - 05	1698	4	1242	Soil
CDF - 06	1699	1600	1242	Soil
CDF - 07	1700	<1	——	Water
CDF - 08	1701	4 ppb	1242	Water
CDF - 09	1702	1500	1242	Soil
CDF - 10	1703	24,000	1242	Oil
CDF - 11	1704	16,000	1242	Soil
CDF - 12	1705	580	1242	Oil
CDF - 13	1707	97	1242 + 1254	Soil
CDF - 14	1708	33,000	1242	Oil
CDF - 15	1709	1900	1242	Soil
CDF - 16	1710	2100	1242	Soil
CDF - 17	1711	23,000	1242	Soil
CDF - 18	1712	100,000	1242	Soil
CDF - 19	1713	420	1242	Soil
CDF - 20	1714	<1 ppb	——	Water
CDF - 21	1715	7 ppb	1242	Water
CDF - 22	1716	1000	1242	Soil
CDF - 23	1717	91,000	1242	Soil
CDF - 24	1718	600,000	1242	Soil

*Water concentrations reported in parts per billion

Date: July 1, 1982

Mark T. Carkhuff

MARK T. CARKHUFF, CHIEF
APPLIED GC SECTION
APPLIED CHEMISTRY DIVISION

6621 ELECTRONIC DRIVE, SPRINGFIELD, VIRGINIA 22151 TELEPHONE: (703) 750-3000

PCB ANALYTICAL REPORT

PREPARED FOR: Mr. Jon Byroade

REF. # 717.55

Facility Inspected

SAMPLE NO.	LAB NO.	CONCENTRATION PARTS/MILLION	AROCLOR	COMMENTS
CDF - 25	1719	6 ppb	1242	Water
CDF - 26	1720	38	1242	Soil

July 1, 1982

Mark T. Carkhuff

MARK T. CARKHUFF, CHIEF
APPLIED GC SECTION
APPLIED CHEMISTRY DIVISION

5621 ELECTRONIC DRIVE, SPRINGFIELD, VIRGINIA 22151 TELEPHONE: (703) 750-3000

ATTACHMENT B

LIST OF PHOTOGRAPHS

GENERAL MOTORS CORPORATION
CENTRAL FOUNDRY DIVISION
NORTH JACKSON STREET
BEDFORD, INDIANA 47421

MAY 18-19, 1982

1. A view of the south storage lagoon. (Moran)
2. A view of the PCB filter cake dumpster. (Moran)
3. A view of a trench leading into the North Make 3 sump. (Murphy)
4. A view of the grit chamber at the wastewater treatment plant. (Murphy)
5. A view of the old watershed lagoon. (Moran)
6. A view of the new watershed lagoon. (Murphy)
7. A view of the northeast bank of the old watershed lagoon. Notice the oil impregnation along the top of the bank. (Murphy)
8. Oil impregnation along a bank of the old watershed lagoon. (Moran)
9. PCB sediment sample (number 23) location on the northeast bank of the old watershed lagoon. (Murphy)
10. A PCB sediment sample (number 24) location near the water surface on the north bank of the old watershed lagoon. (Murphy)
11. A view of the discharge pipe for NPDES outfall 001. (Murphy)
12. A view of the culvert near NPDES outfall 001. (Murphy)
13. A side view of the foundry sand storage area looking from NPDES outfall 001. (Murphy)
14. A view of the storm sewer at the water treatment plant. (Murphy)
15. A view of the headwaters of Bailey's Branch. The stormwater discharge is on the left, and NPDES outfall 002 is on the right. (Murphy)

LIST OF PHOTOGRAPHS (Continued)

16. The location where a PCB sediment sample was collected at the headwaters of Bailey's Branch. (Homer)

17. A view of Bailey's Branch looking downstream from NPDES outfall 002. (Murphy)

18. A view of 14 empty PCB storage tanks. (Murphy)

19. A view of 14 empty PCB storage tanks. (Moran)

20. A view of the pond adjacent to the 14 empty PCB storage tanks. (Moran)

21. A view of a pond adjacent to the seven leaky PCB storage tanks. (Murphy)

22. A view of seven leaky PCB storage tanks. Notice that several tanks have openings on top. (Moran)

23. Oil impregnation on the northeast side of the seven leaky PCB storage tanks. (Murphy)

24. Oil impregnation through the center of the seven leaky PCB storage tanks. (Homer)

25. Oil impregnation on the southeast side of the seven leaky PCB storage tanks. (Murphy)

26. A view of the hose which was draining water from the pond around the seven leaky PCB storage tanks into the surge basin. (Murphy)

27. A view of the surge basin. (Moran)

28. A view of several of the PCB storage tanks stored for reuse. (Murphy)

29. A view of the east million gallon capacity PCB storage tank. (Murphy)

30. A view of the recently installed groundwater sump near the water treatment plant. (Moran)

31. A view of the steep slope behind the old "trickling spring". (Murphy)

32. A view of a die cast machine in the west yard at the Central Foundry Division. (Murphy)

33. Absorbent material under a die cast machine stored for reuse in the west yard which was sampled for PCBs. (Murphy)

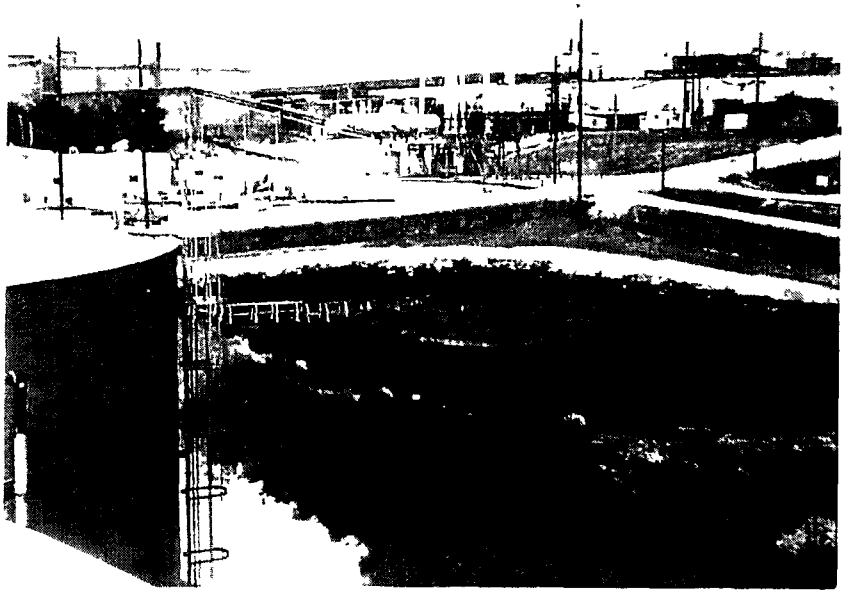
34. A view of a Westinghouse PCB transformer in Substation A. (Murphy)

35. A view of 40 large PCB capacitors at the treatment plant substation. (Murphy)

36. A view of the designated PCB storage area in the sludge processing building. (Murphy)

37. A view of a self-contained sump in the designated PCB storage area. (Murphy)

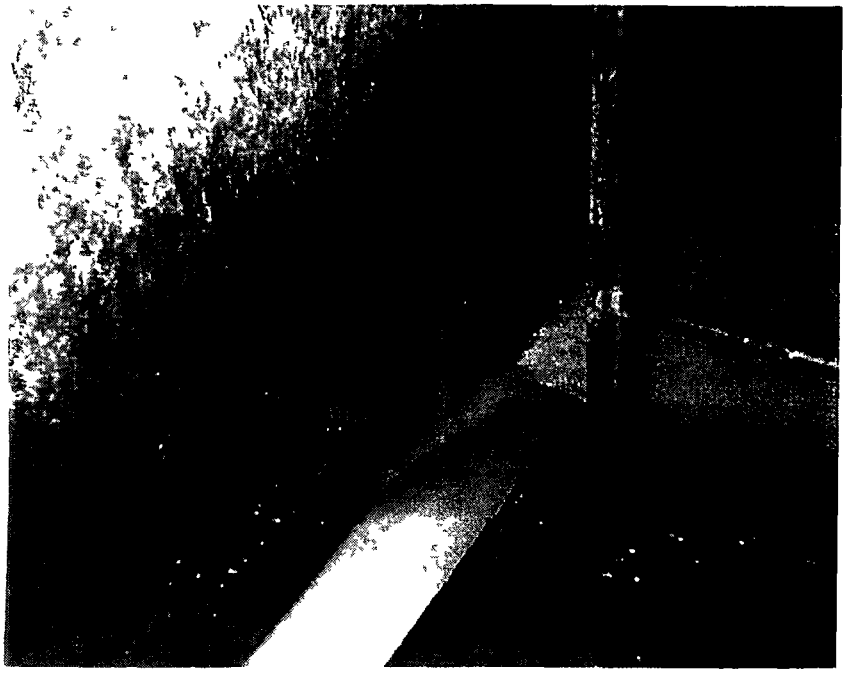
PHOTOGRAPHS
MAY 18-19, 1982



1. A view of the south storage lagoon. (Moran)

2. A view of the PCB filter cake dumster. (Moran)

PHOTOGRAPHS
MAY 18-19, 1982

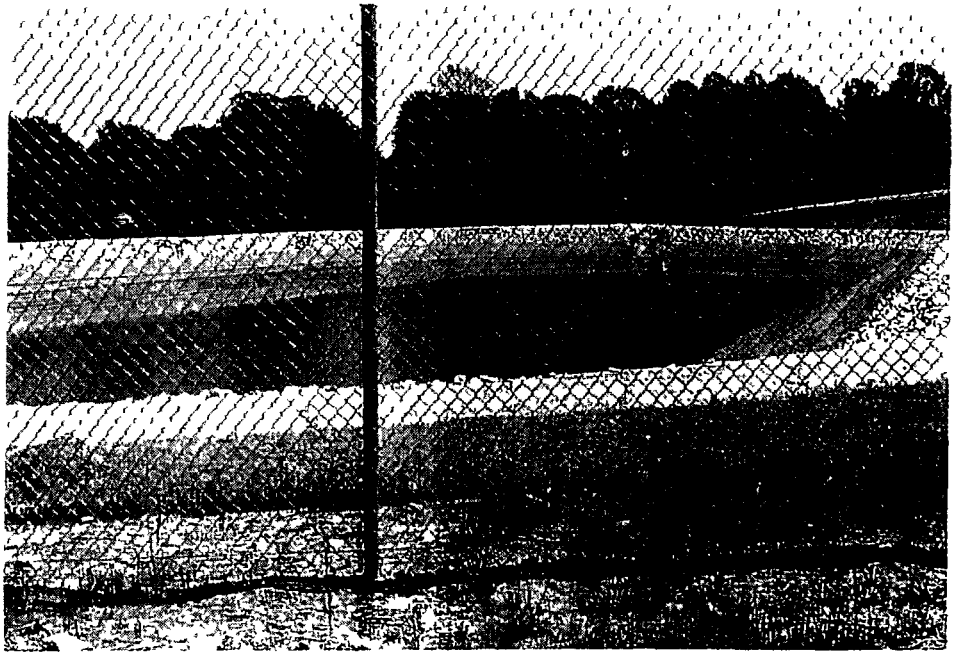


3. A view of a trench leading into the North Make 3 sump. (Murphy)

4. A view of the grit chamber at the wastewater treatment plant. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

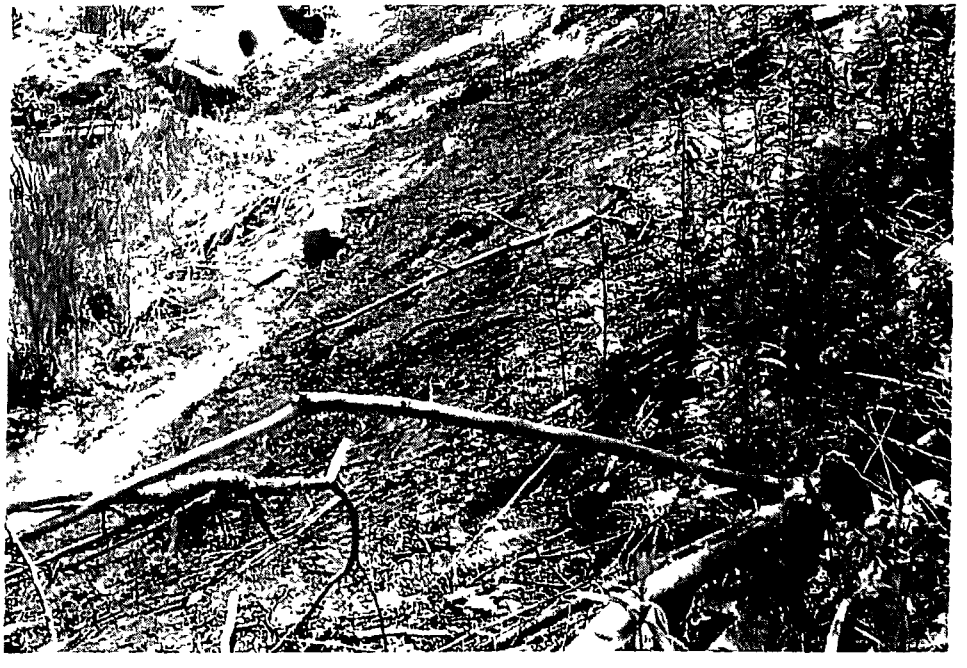
5. A view of the old watershed lagoon. (Moran)



6. A view of the new watershed lagoon. (Murphy)

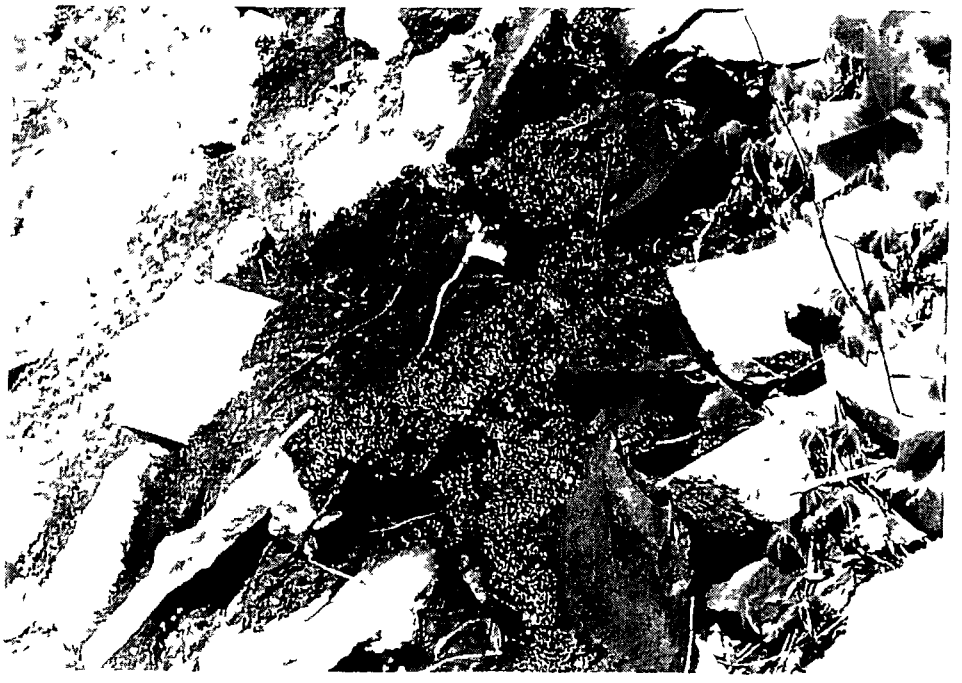
PHOTOGRAPHS
MAY 18-19, 1982

7. A view of the northeast bank of the old watershed lagoon. Notice the oil impregnation along the top of the bank. (Murphy)



8. Oil impregnation along a bank of the old watershed lagoon. (Moran)

PHOTOGRAPHS
MAY 18-19, 1982



9. PCB sediment sample (number 23) location on the northeast bank of the old watershed lagoon. (Murphy)

10. PCB sediment sample (number 24) location near the water surface on the north bank of the old watershed lagoon. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

11. A view of the culvert near NPDES outfall 001. (Murphy)

12. A view of the culvert near NPDES outfall 001. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

13. A side view of the foundry sand storage area looking from NPDES outfall 001. (Murphy)

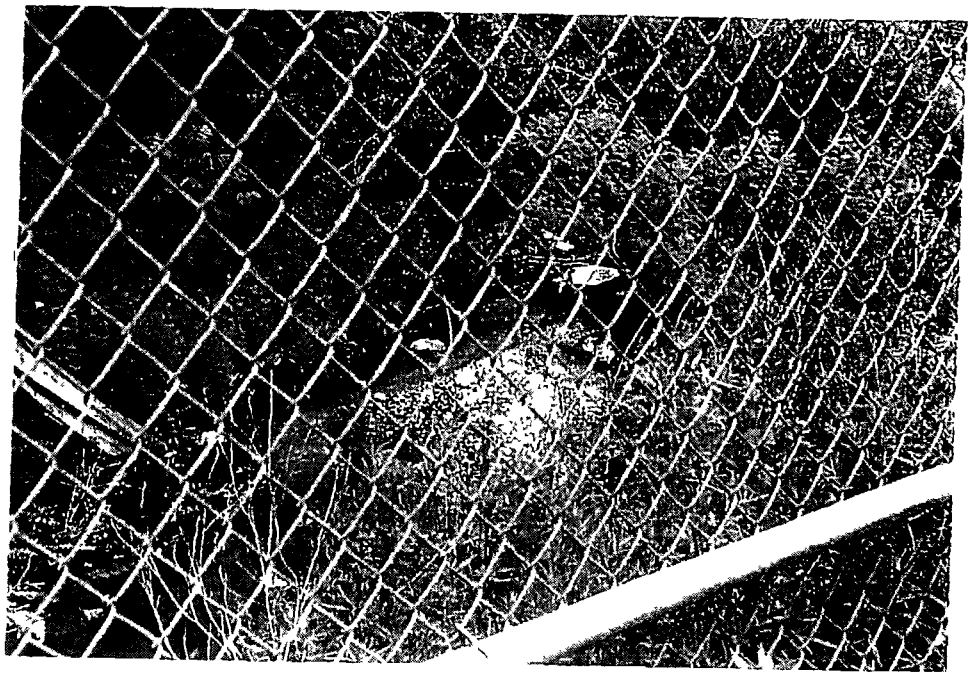
14. A view of the storm sewer at the water treatment plant. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

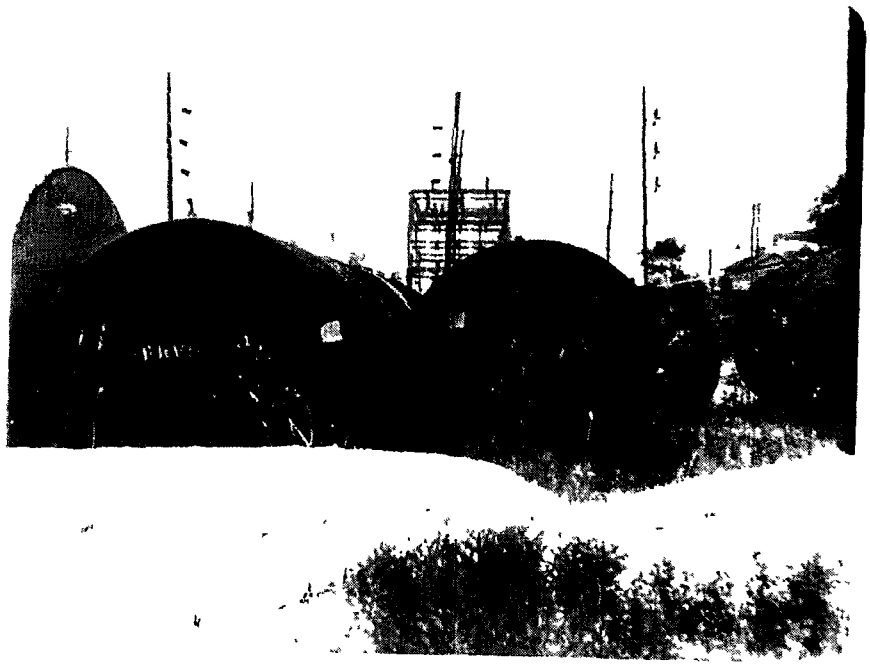
15. A view of the headwaters of Bailey's Branch. The stormwater discharge is on the left, and NPDES outfall 002 is on the right. (Murphy)

16. The location where a PCB sediment sample was collected at the headwaters of Bailey's Branch. (Homer)

PHOTOGRAPHS
MAY 18-19, 1982



17. A view of Bailey's Branch looking downstream from NPDES outfall 002. (Murphy)



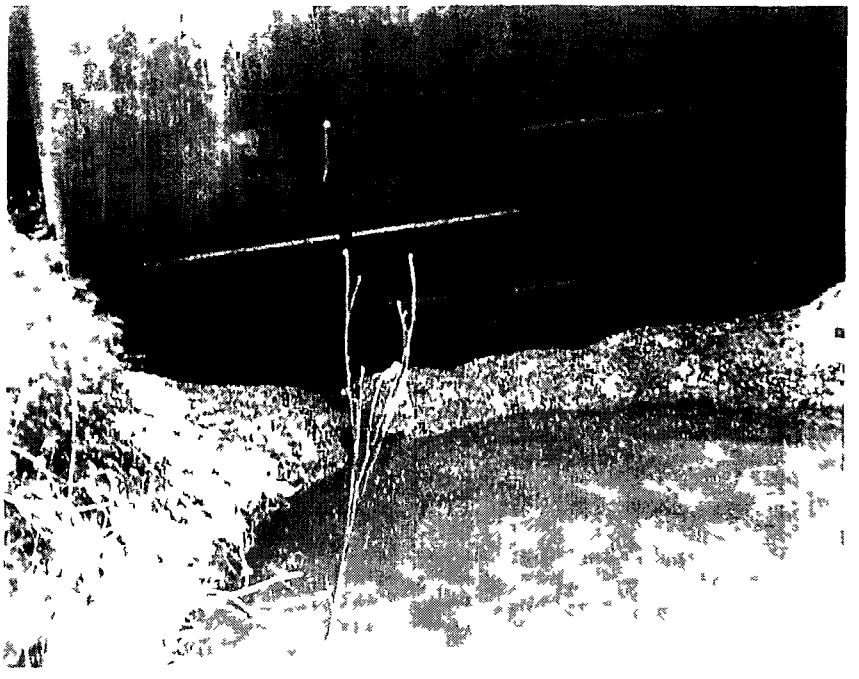
18. A view of 14 empty PCB storage tanks. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

19. A view of 14 empty PCB storage tanks. (Moran)

20. A view of the pond adjacent to the 14 empty PCB storage tanks. (Moran)

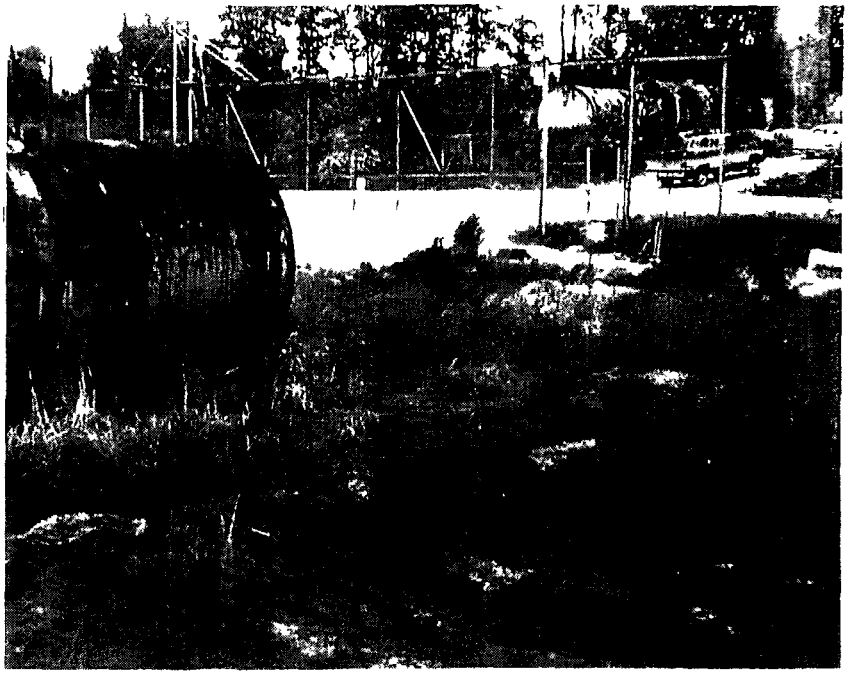
PHOTOGRAPHS
MAY 18-19, 1982



21. A view of a pond adjacent to seven leaky PCB storage tanks. (Murphy)

22. A view of seven leaky PCB storage tanks. Notice that several tanks have openings on top. (Moran)

PHOTOGRAPHS
MAY 18-19, 1982

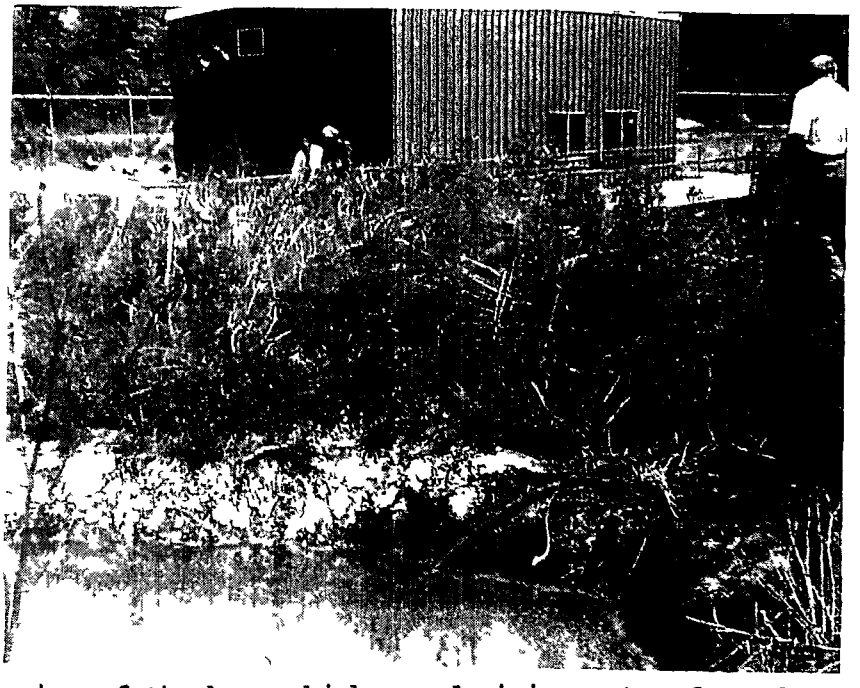


23. Oil impregnation on the northeast side of the seven leaky storage tanks. (Murphy)

24. Oil impregnation through the center of the seven leaky PCB storage tanks. (Homer)

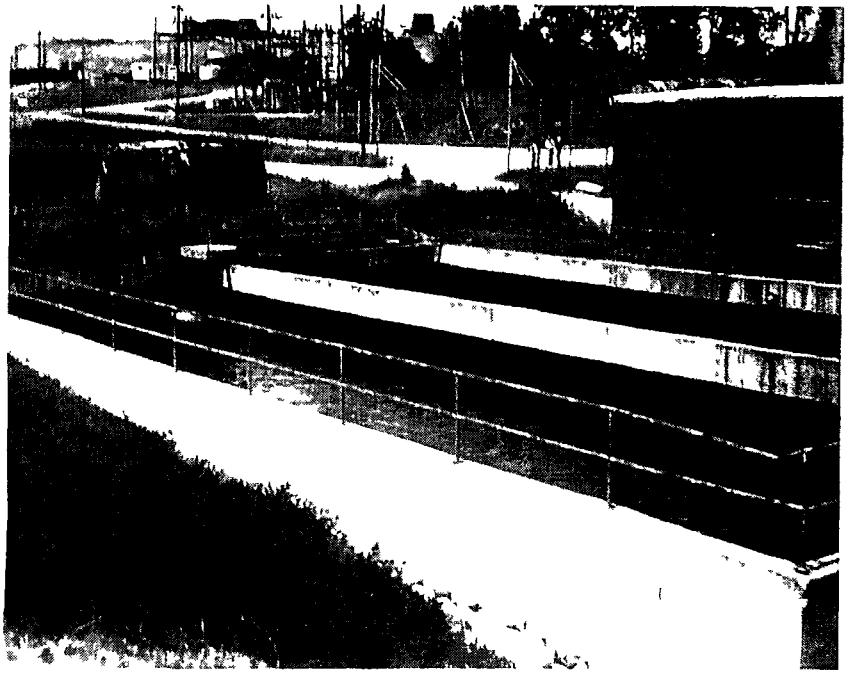
PHOTOGRAPHS
MAY 18-19, 1982

25. Oil impregnation on the southeast side of the seven leaky PCB storage tanks. (Murphy)

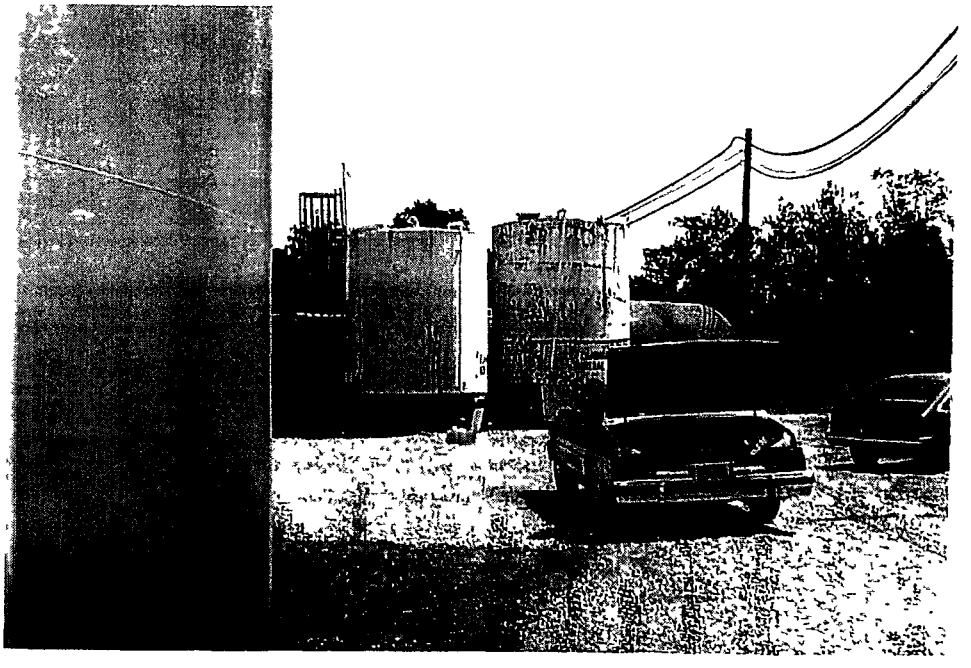


26. A view of the hose which was draining water from the pond around the seven leaky PCB storage tanks into the surge basin. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

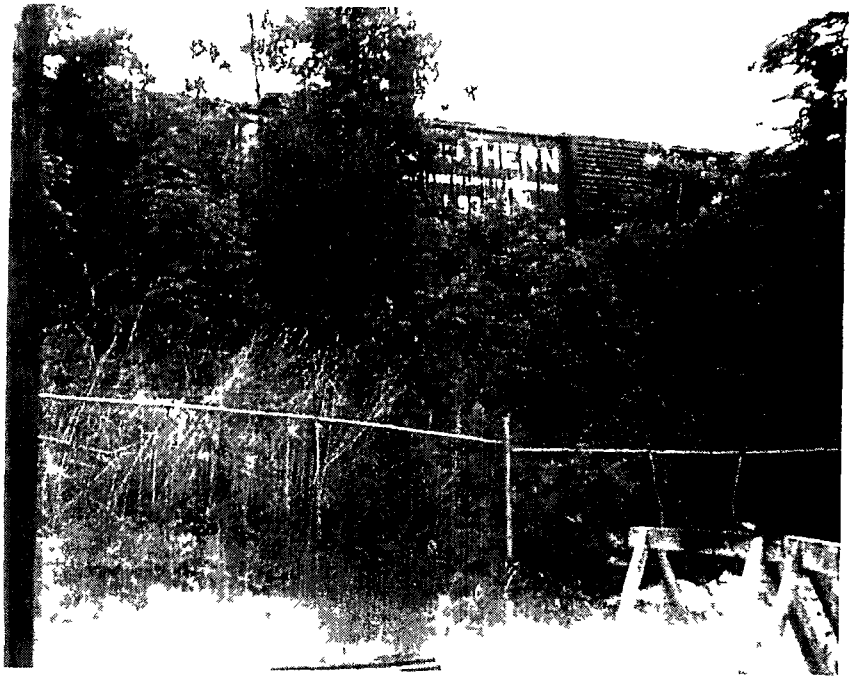


27. A view of the surge basin. (Moran)



28. A view of several of the PCB storage tanks stored for reuse. (Murphy)

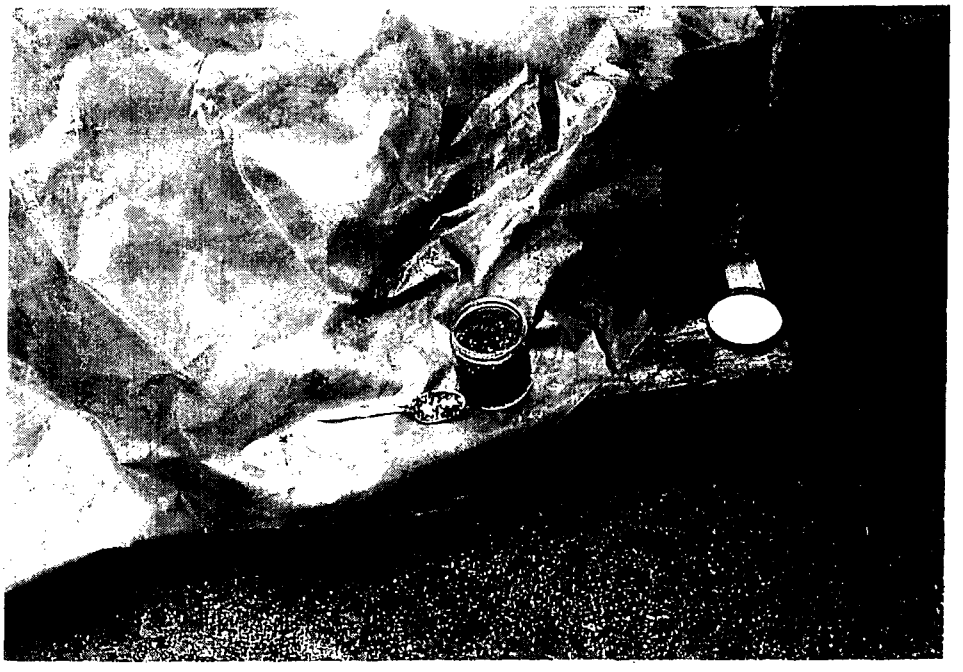
PHOTOGRAPHS
MAY 18-19, 1982



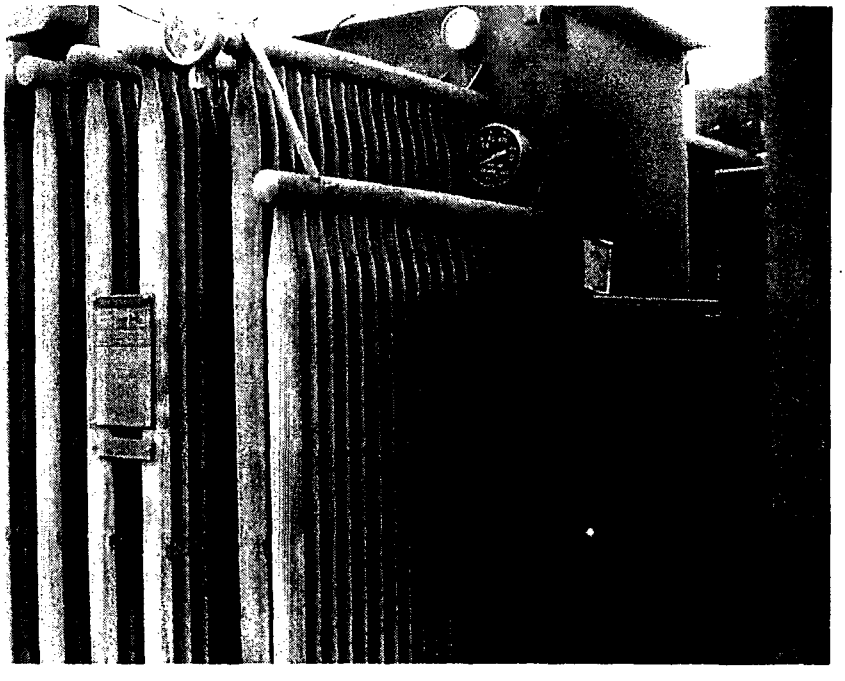
31. A view of the steep slope behind the old "trickling spring". (Murphy)

32. A view of a die cast machine in the west yard at the Central Foundry Division. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

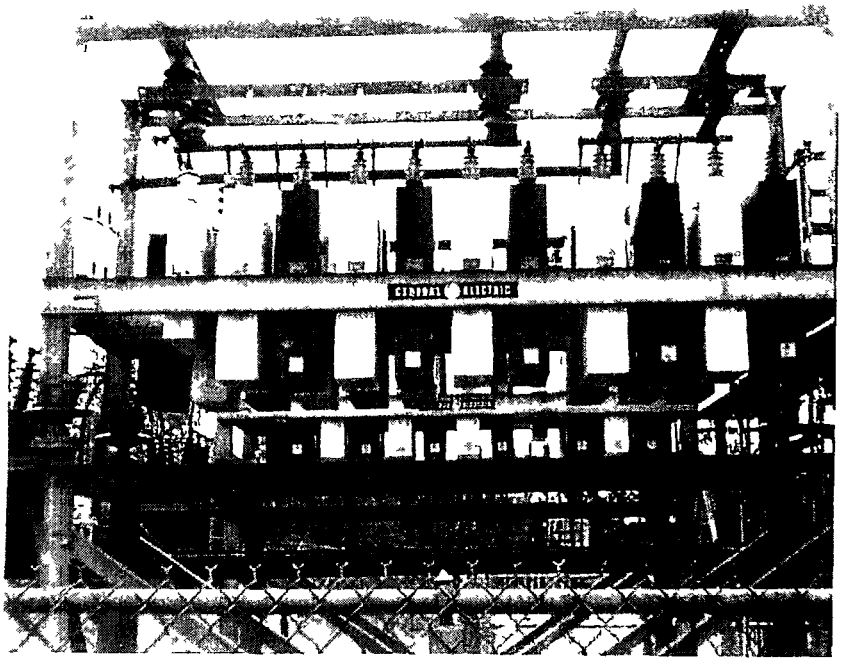


33. Absorbent material under a die cast machine stored for reuse in the west yard which was sampled for PCBs. (Murphy)

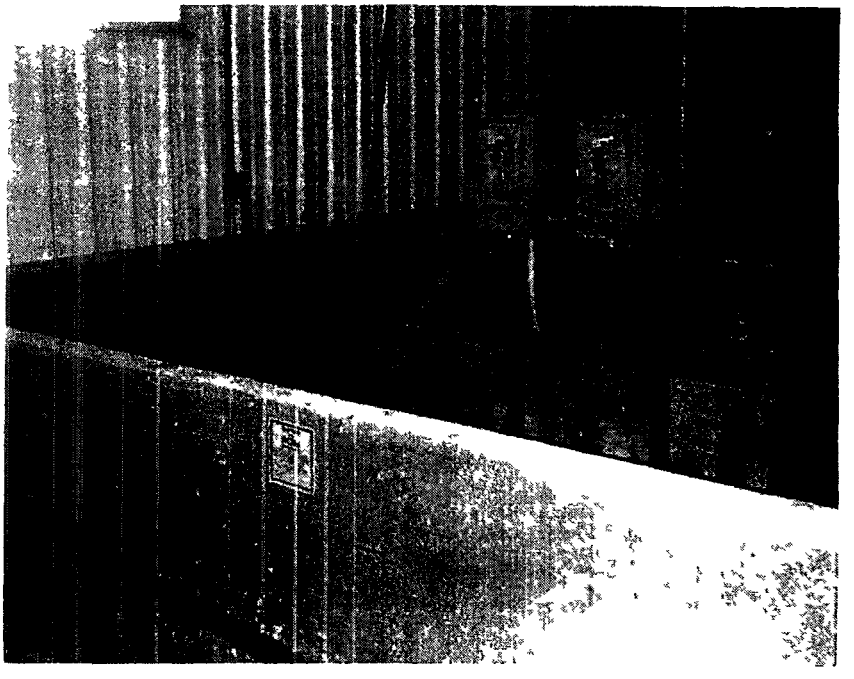


34. A view of a Westinghouse PCB transformer in substation A. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982

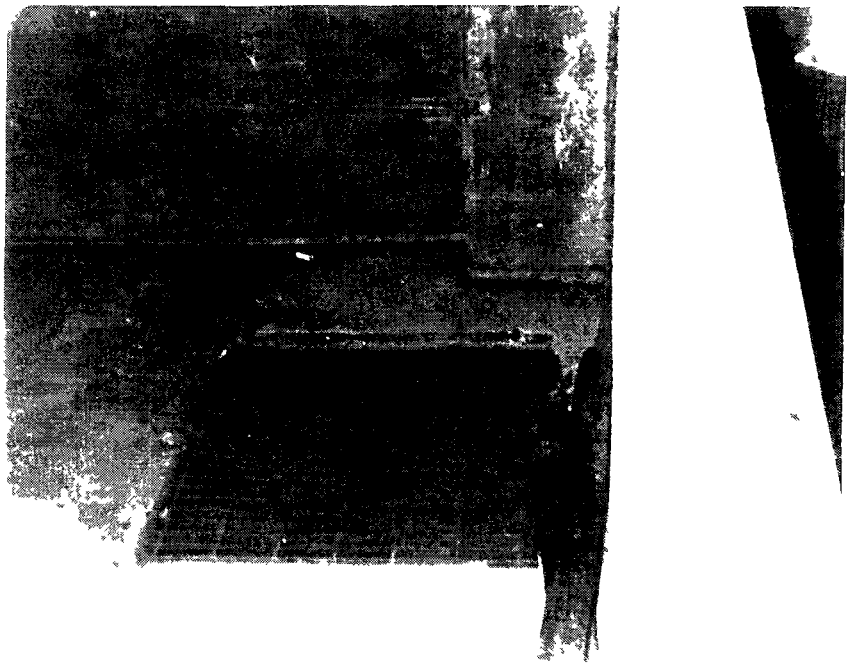


35. A view of 40 large PCB capacitors at the treatment plant substation. (Murphy)



36. A view of the designated PCB storage area in the sludge processing building. (Murphy)

PHOTOGRAPHS
MAY 18-19, 1982



37. A view of a self-contained sump in the designated PCB storage area. (Murphy)

APPENDIX G.19

ISBH LETTER DATED SEPTEMBER 22, 1971

STATE OF INDIANA

INDIANAPOLIS

STATE BOARD OF HEALTH

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, Indiana 46206

(317) 633-4273

September 22, 1971

Mr. Raymond Jarrard
Personnel Manager
Central Foundry Division
General Motors Corporation
Bedford, Indiana 47421

Dear Mr. Jarrard:

Re: Air Pollution Emissions, Central Foundry

This is to confirm the visit of our staff representatives and the Lawrence County Sanitarian, Paul McBride, to your operations on September 9. At that time they discussed process emissions from the foundry and violations at the Company's open dump. Also observed was a problem of liquid wastes leaching from the dump into a drainage ditch which feeds a nearby stream. You were informed that the stream pollution, open burning and dumping observed by our staff are in violation of State Laws, Regulation APC 2, and the Refuse Disposal Act.

Open burning must be terminated immediately and the contracts you are presently discussing for refuse hauling should be consummated as soon as possible. As the County Sanitarian advised you, the dumping of combustible material such as cardboard, paper, and liquid wastes must be terminated immediately, as well as the dumping of garbage and trash from the cafeteria. We concur with Mr. McBride that a trench be dug as soon as possible to halt stream pollution as an interim step (a representative from the Water Pollution Control Division will contact you regarding this matter).

As far as process operations in the foundry are concerned, it appears that you are well on the way to controlling the chip handling processes as well as the dross handling operation. However, as was discussed, consideration must be given to the numerous melting furnaces, particularly during the fluxing periods. We request that you evaluate all your furnaces for particulate and fluoride emissions, particularly during fluxing and submit appropriate plans for air pollution emission controls to this office.

We understand you plan to dispose of dross in a new facility to be constructed by others. As you were advised, it must be approved before it will be allowed to go into operation.

We thank you for your cooperation and request that you contact us at your convenience should you require further information or assistance.

Very truly yours,

Harry D. Williams

Harry D. Williams, Director
Division of Air Pollution Control

GLE/fht
cc: Paul McBride, Lawrence County Health Department
O. H. Hert, Water Pollution Control

APPENDIX G.20

CAUSE NO. B-802

STATE OF INDIANA

STREAM POLLUTION CONTROL BOARD

INDIANAPOLIS

1330 West Michigan
P. O. Box 1964

March 16, 1983

VIA CERTIFIED MAIL

Mr. Robert W. Herr, Plant Manager
General Motors Corporation
Central Foundry Division
Bedford Plant
P.O. Box 271
Bedford, IN 47421

Dear Mr. Herr:

Re: Adoption of Consent Decree and
Issuance of Final Order
Stream Pollution Control Board
of the State of Indiana
vs.
General Motors Corporation
Central Foundry Division
Bedford, Indiana
Cause No. B-802

This is to inform you that the Indiana Stream Pollution Control Board, at its regularly scheduled meeting of March 15, 1983, approved the Consent Decree negotiated between you or your representatives and members of our staff and has issued same as its own Final Order. A copy of the executed Final Order is enclosed.

As to civil penalties provided for in the document, please forward a check made payable to the Indiana Environmental Management Special Fund to this office within thirty (30) days of receipt of this correspondence. You are no doubt familiar with the other terms of the Consent Decree necessary to ensure future compliance.

Very truly yours,

Earl A. Bohner
Technical Secretary

Enclosure
cc: Hearing Officer
Mr. Ron Mustard, Region V, U.S. EPA
Office of the Attorney General
Attention: Mrs. Debra Albright
Mr. Otis M. Smith, General Counsel
Attention: Mr. Paul Zavala, Attorney
Ronald G. Blankenbaker, M.D.
Mr. Ralph C. Pickard
Lawrence County Health Department

STATE OF INDIANA)
) SS.
COUNTY OF MARION)

BEFORE THE STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA

IN THE MATTER OF THE:

STREAM POLLUTION CONTROL BOARD OF THE STATE OF INDIANA,

Petitioner,

v.

CENTRAL FOUNDRY DIVISION, GENERAL MOTORS CORPORATION, BEDFORD, INDIANA,

Respondent.

CAUSE NO. B-802

STIPULATED FINDINGS AND CONSENT ORDER

A Notice of Hearing having been filed herein on July 7, 1981, and Petitioner and Respondent being desirous of settling and compromising this action and having consented, without hearing or adjudication of any issue of fact or law herein, to the entry of this Stipulated Findings and Consent Order, and without this Stipulated Findings and Consent Order constituting any evidence or admission by either party with respect to any issue of fact or law herein, the parties do hereby stipulate as follows:

STIPULATED FINDINGS

1. The Stream Pollution Control Board of the State of Indiana ("Board") is an agency of the State of Indiana, duly empowered to hold administrative hearings to

determine whether there are possible violations of the Environmental Management Act (I.C. 13-7), the Stream Pollution Control Law (I.C. 13-1-3), and the regulations duly promulgated thereunder, and to enter an order requiring the taking of such action as is indicated by the circumstances to cause the abatement of such condition.

2. Respondent owns and operates a foundry in Bedford, Lawrence County, Indiana.

3. The Board has jurisdiction over both the subject matter and the parties to the action.

4. Pursuant to the provisions of I.C. 13-7 and I.C. 4-22-1, Notice of Hearing was issued and served upon Respondent.

5. Respondent has on its property a lagoon containing storm water and non-contact cooling water, hereafter referred to as the "north lagoon." Said north lagoon was used prior to the construction of a new lagoon and wastewater treatment system. The overflow from the north lagoon was discharged (through Outfall 001) to Pleasant Run Creek. In 1974, Respondent was issued a National Pollutant Discharge Elimination System (NPDES) permit which authorized it to discharge water in the north lagoon through Outfall 001. The permit did not address allowable PCB concentrations in the discharge. In 1976 the Board served notice on Respondent that the NPDES permit would be modified to include a limitation for PCB's. The Board's efforts to modify the permit culminated in an Agreed Order in Cause #B-416. In said Order, Respondent was to eliminate dry-weather discharge from Outfall 001 by October 21, 1981, and to thereafter discharge only when necessary due to storm water conditions, in which case the storm water and non-contact overflow could be drained as long as its PCB concentration was at or less than 50 ppb. The Order also provided for the construction of a new storm water lagoon, and final treatment of the discharge from the new lagoon was to be instituted if needed by December 31,

1983, so that it would contain no more than 1 ppb of PCB's. Previous sampling of the discharge from the north lagoon had a reported PCB level under 50 ppb.

6. On March 26, 1981, a complaint call from the Lawrence County sanitarian notified the Board of a water discharge which was ongoing at Respondent's facility. Board staff responding to the call on March 26, 1981 discovered that the contents of the north lagoon were being allowed to drain through a cut which had been opened in the north lagoon approximately 25 feet south of the overflow pipe. Earth-moving equipment used for the construction of the new lagoon was bringing dug material from the area of the new lagoon into the north lagoon basin. A bulldozer hastened the drainage process by pushing the material into what was left of the liquid in the north lagoon. The action of the construction equipment had stirred up the sludges and residues at the bottom of the north lagoon and mixed them with the discharging water. The water itself traveled down a trench to a depression where it was allowed to soak into the ground and then out Outfall 001. The trench and depression were constructed in a foundry sand storage area approximately two acres in size consisting largely of aluminum casting sand.

Upon contacting Company officials, Board staff was informed that the cut had been made to allow the release of the contents of the north lagoon in order to provide a site for placing dug material from the construction of the new State-approved lagoon. Visual observation of the north lagoon contents revealed it to be of poor quality. Staff requested that the filling operation be discontinued and the trench opening be closed, and this was done.

7. Pictures as well as soil and water samples were taken on March 26, 1981 and during a second investigation conducted on March 31, 1981. The follow-up investigation showed no visible surface flow from the location of the trench cut into the north lagoon. Sampling results showed that the north lagoon water had a PCB level of 660 ppb on the inside of the north lagoon and 190 ppb in the

depression to which it had discharged. A water seep from the toe of the foundry sand area of Outfall 001 was also tested and was found to contain PCB's at a concentration of 7 ppb.

8. Respondent was complying with the terms and conditions of the Agreed Order in Cause No. B-416 which called for the building of a new storm water lagoon when the discharge was discovered. In order to construct the new storm water lagoon it was discussed with the staff that drainage and closure of the north lagoon was necessary. However, Respondent did not formally request nor explicitly receive permission from the Board to modify the operation of its north lagoon, to change the strength or quality of its discharge therefrom, nor to change its point of discharge, prior to the events described above.

9. During the course of negotiating this Order, Respondent proposed to Board staff that it be allowed to pump the remaining water from the north lagoon and treat it in Respondent's water treatment system. Respondent also proposed to continue filling the drained north lagoon with construction spoil from the nearby construction area and, when the north lagoon is completely filled, cap the area of the north lagoon with clay of a specified degree of impermeability to prevent any potential leaching of PCB's from the north lagoon area. This proposal is being reviewed by U.S. EPA, Region V, to determine if Federal regulations governing the disposal of PCB's apply.

10. It is the contention of the Board that Respondent is in violation of the Environmental Management Act at I.C. 13-7-4-1(c) for the actions described in (6), (7) and (8) above. It is the Respondent's contention that no violation of the Environmental Management Act occurred because the Board's staff was informed of such action and Respondent was acting pursuant to the terms and conditions of the Agreed Order in Cause B-416.

CONSENT ORDER

NOW, THEREFORE, upon the consent of the parties hereto, it is hereby ORDERED, ADJUDGED AND DECREED as follows:

1. The provisions of this Order shall apply to the Respondent, its directors, officers, agents, servants, employees, successors, and assigns, and to all persons, firms, and corporations acting through or for them.

2. Respondent shall monitor the PCB concentrations in the water seeping from the northeast toe of its foundry sand storage area by taking two (2) grab samples per month for six months from the date of acceptance by the Board of this Order. Samples shall be taken at the northeast toe of the foundry sand storage area. The results shall be reported to the Board on a monthly basis, separately from Respondent's regular monitoring reports. Within 60 days of the last monthly report, Respondent shall submit to the Board an analysis of its data, together with a proposal for treating the seepage, if necessary, which is technologically feasible, economically reasonable and ecologically sound if the data shows that there is a significant level of PCB concentration in the discharge.

3. The foundry sand storage area shall not be a subject of this Order. Any permits, approvals, variances, or other requirements for the continued operation of this area shall be obtained from the Environmental Management Board.

4. Respondent shall pay a civil penalty of $2,500.00 in settlement of this cause. Said penalty shall be paid to the Environmental Management Special Fund within 30 days of notice of Board approval of this Order.

5. Full and timely compliance with the terms of this Order shall constitute a final adjudication of this action.

6. This Consent Order shall not be effective unless and until it is approved by the Board. Provided Respondent complies herewith the Board shall not initiate any further administrative or civil judicial action arising from the alleged incident which is the basis of this cause.

CENTRAL FOUNDRY DIVISION
GENERAL MOTORS CORPORATION

By: Robert W. Herr

Title: Plant Manager

Date: January 25, 1983

STREAM POLLUTION CONTROL BOARD
OF THE STATE OF INDIANA

By: [signature]

Title: Technical Secretary

Date: March 15, 1983

Recommended by:

[signature]
Earl A. Bohner, Director
Division of Water
Pollution Control

Approved as to form
and legality:
Linley E. Pearson
Attorney General of Indiana
by:

[signature]
Deborah E. Albright
Deputy Attorney General

RECOMMENDATION FOR ADOPTION

[signature]
Wayne E. Penrod
Hearing Officer

DATE: February 7, 1983

APPENDIX G.21

IDEM LETTER DATED JUNE 22, 1987

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
NANCY A. MALOLEY, Commissioner

June 22, 1987

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317-232-8603

VIA CERTIFIED MAIL P 395 653 280

Mr. William Schoonmaker, Senior Engineer
GMC - Central Foundry Division
P.O. Box 271
Bedford, IN 47421

Re: Open Dumping of Foundry Sand
GMC - Central Foundry Division Property
North Jackson Street
Lawrence County

Dear Mr. Schoonmaker:

On June 2, 1987, staff of this office inspected the above-referenced site. The inspection revealed that open dumping of foundry sand is taking place on this property, which is in violation of the Indiana Solid Waste Permit Rule, 330 IAC 4, and the Environmental Management Act, IC 13-7. The site also is in violation of federal criteria promulgated under the Resource Conservation and Recovery Act (RCRA) of 1976.

Efforts must begin immediately to obtain approval for the proper disposal of this foundry sand. An outline of the special waste approval procedures is enclosed. Pending staff review of the analytical data, you are permitted to stock pile the foundry sand on the property. Furthermore, depending on the analytical results, the foundry sand presently on-site shall be:

1. Collected and approved to an approved sanitary landfill; or

2. Compacted and covered with a minimum of two feet of suitable cover soil, graded to prevent ponding of water, and seeded to provide vegetation.

A follow-up inspection will be made in approximately 30 days to monitor compliance. A final compliance period of 60 days is set for completion. Failure to comply with the provisions of this notice will subject you to legal action by the State of Indiana.

If you have any questions about this action or about your obligation concerning this matter, please contact Mr. Hotz or me at AC 317/243-5086.

Very truly yours,

C. Steven Poe, Chief
Facility Inspection Section-South
Solid Waste Management Branch
Solid and Hazardous Waste Management

TH/rmw
Enclosures
cc: Lawrence County Health Department
Mr. George Oliver

APPENDIX G.22

IDEM LETTER DATED APRIL 27, 1988

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

April 27, 1988

Mr. Tim Hotz, Environmental Scientist
Facility Inspection Section
Solid Waste Management Branch
Indiana Department of Environmental Management
P.O. Box 6015
Indianapolis, IN 46206

Dear Mr. Hotz:

In response to your request to discontinue dumping of foundry sand at the Bedford Plant and begin closure of the existing fill area, the Bedford Plant has been complying with these terms since June, 1987. The foundry sand has been analyzed and found to contain no hazardous constituents and is presently being disposed of at Rumpke Landfill in Jackson County as a special waste.

Due to a major construction project at the Bedford Plant, excavated soils and solid fill have been placed in this area for the past year. Due to the completion of the construction, the fill area has been scheduled for closure within the next two months.

The closure of the fill area will entail grading all side slopes to a minimum of 3:1, cover entire site with two feet of clean clay and top soil, sloping to prevent ponding of water and seeding to provide vegetation.

As we discussed in our telephone conversation of April 26, 1988, I will notify you upon completion of this project to schedule a site visit for your final inspection of the site. If any questions arise regarding these matters, please contact me at AC812/279-7310.

Sincerely,

Gregory Etzel, P.E.
Environmental Engineer

Lets Get It Together
SAFETY BELTS SAVE LIVES

APPENDIX G.23

IDEM LETTER DATED NOVEMBER 18, 1988

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
NANCY A. MALOLEY, Commissioner

November 18, 1988

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317-232-8603

Mr. Greg Etzel
GMC - Central Foundry Division
P.O. Box 271
Bedford, Indiana 47421

Re: Notice of Compliance
Closure of Open Dump
Lawrence County

Dear Mr. Etzel:

Previously, a Violation Letter was mailed to Mr. William Schoonmaker concerning the open dumping of solid waste on General Motors' property, located on North Jackson Street, Bedford, Indiana.

This open dump violation required your efforts to have the site brought into compliance with State statutes.

This open dump was inspected by a member of our staff on October 24, 1988, and was found to have been corrected. Thank you for your attention in having this matter resolved.

Very truly yours,

C. Steven Poe, Chief
Facility Inspection Section-South
Solid Waste Management Branch
Solid and Hazardous Waste Management

TH/rmw

cc: Lawrence County Health Department
Mr. Steven H. Poe, Special Projects Section

APPENDIX G.24

U.S.EPA INSPECTION REPORT SEPTEMBER 16, 1980

REPORT ON INSPECTION TO DETERMINE COMPLIANCE WITH THE PCB DISPOSAL AND MARKING REGULATIONS

GENERAL MOTORS CORPORATION - CENTRAL FOUNDRY DIVISION
NORTH JACKSON STREET
BEDFORD, INDIANA 47421

September 16, 1980

OCT 4 11 35 AM '85
DIVISION OF LAND POLLUTION CONTROL
STATE BOARD OF HEALTH

Performed for:

U.S. ENVIRONMENTAL PROTECTION AGENCY
TOXICS SUBSTANCES OFFICE
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

Performed by:

VERSAR INC.
6621 ELECTRONIC DRIVE
SPRINGFIELD, VIRGINIA 22151

Objective

The objective of this inspection was to inspect and document General Motors Corporations, Central Foundry Division's compliance with Federal PCB Disposal and Marking Regulations (30 CFR 761) published in Part VI of the Federal Register on May 31, 1979.

The Central Foundry Division of General Motors uses a vast number of hydraulic casting and trim press machines in the production of various automotive components. The primary objective of this inspection was to ascertain the quantities of PCBs contained within these hydraulic systems and in transformers and capacitors owned by General Motors. Also an evaluation of the management, documentation, storage, and disposal of such PCB fluids was a secondary objective.

I. Facility and Responsible Official Identification

General Motors Corporation - Central Foundry Division
North Jackson Street
Bedford, Indiana 47421

Glen R. Ohl,
Senior Engineer

(812) 279-7000

II. Inspection Date and Participants

September 16, 1980

General Motors - Glen R. Ohl, Senior Engineer, Central Foundry Division
William J. Collinson, Environmental Engineer, Detroit, Michigan
Richard W. Shuman, Central Foundry, Saginaw, Michigan
Gary L. Bowman, Plant Engineer, Central Foundry Division

Versar Inc. - Michael C. Calhoun, Environmental Scientist
Eric D. Juergens, Environmental Scientist

U.S. EPA, Region V - Sheldon Simon, Chemical Engineer

III. *Findings and Conclusions*

General Motors Corporation - Central Foundry Division, Bedford, Indiana Plant, was found to be in non-compliance with the PCB regulations and requirements listed below.

1. The storage of PCB contaminated waste oils and solids in an old process waste lagoon that does not comply with storage for disposal requirements in Section 761.42.

2. The improper storage and disposal of spilled PCB contaminated hydraulic fluid from oil storage tanks just east of the old process waste lagoon as stated in Sections 761.42 and 761.10.

Handling and storage practices of waste oils and sludges generated by the Bedford Plant have undergone several changes. Prior to the establishment of the Federal PCB regulations, sludges were either buried on GM property or hauled to a landfill (location of neither the sludge burial site nor landfill site was determined). Additional waste oil from clari-thickeners' underflow was placed in a storage lagoon. Contents of this lagoon are currently being dewatered and disposed of by CECOS International, Williamsburg, Ohio, an Annex II landfill.

Sampling and analysis of bank sediment from the old process waste lagoon showed a PCB concentration of 3100 ppm (see Figure 1 and attached lagoon photograph). The lagoon was properly marked but it does not meet the storage for disposal requirements of Section 761.42 (rainfall protection and floor and curbing) intended to prevent PCB environmental contamination.

Upon finalization of the Federal PCB regulations, GM began obtaining tanks, now totalling 29, for temporary storage until 2 one-million gallon storage tanks could be constructed. Transfer of the oils from the 29 smaller storage tanks to the one-million gallon tanks took place from August 22, 1980 to September 12, 1980, just prior to the inspection. Based on GM's calculations of volumes of the 29 temporary storage tanks, the one-million gallon tank that was filled currently contains 385,000 gallons of oil with an estimated PCB concentration of 900 ppm. This estimate was based on random sampling and analysis by GM of the 29 tanks prior to

transfer of the oil to the one-million gallon tanks. All 29 temporary storage tanks and the partially filled one-million gallon tank were properly marked.

Visual inspection of the temporary tank storage areas (See Figure 1 and attached lagoon photograph) indicated that some leakage or spillage has occurred from some of the 29 tanks as indicated by discolored soil to a depth of two inches in the vicinity of eight tanks just east of the old process waste lagoon. Versar's sampling and analysis of surface soil between two of the temporary storage tanks (located within the above mentioned area) revealed a PCB concentration of 11,000 ppm. This constitutes improper storage and disposal because, as stated in Sections 761.42 and 761.10, "spills and other uncontrolled discharges of PCBs constitute the disposal of PCBs." Results of PCB analysis of areas of non-compliance are detailed in Table 1.

IV. Facility Description

The Central Foundry Division of General Motors produces various aluminum automotive components including piston heads, transmission housings and intake manifolds as well as turbine blades made of various heat resistant alloys. This facility uses 48 large (2,000-3,000 ton) and 21 small (800 ton) casting machines, with a trim press associated with each.

Cooling water from heat exchangers, wash water, scrubber water, quench water, and hydraulic fluid leakage from casting and trim press machines all enter a common sump at the head of the treatment system as shown in Figure 2. The wastewaters and captured hydraulic fluids enter two parallel clari-thickeners followed by two parallel clarifiers (alum and polymer addition). Both clarifier overflows go to a concrete basin and through a carbon adsorption system (Calgon Unit) prior to discharge at NPDES permitted outfall 002. A portion of the clarifier overflow is filereed and reused by the plant. The clari-thickeners' underflow, which is primarily an oil/sludge generated from hydraulic fluid, is pumped to one of two 1.0 million gallon storage tanks. Versar sampling and analysis of a clari-thickener underflow revealed a PCB concentration of 790 ppm (see Table 2). Clari-thickener skimmings and clarifier underflow (settled and precipitated

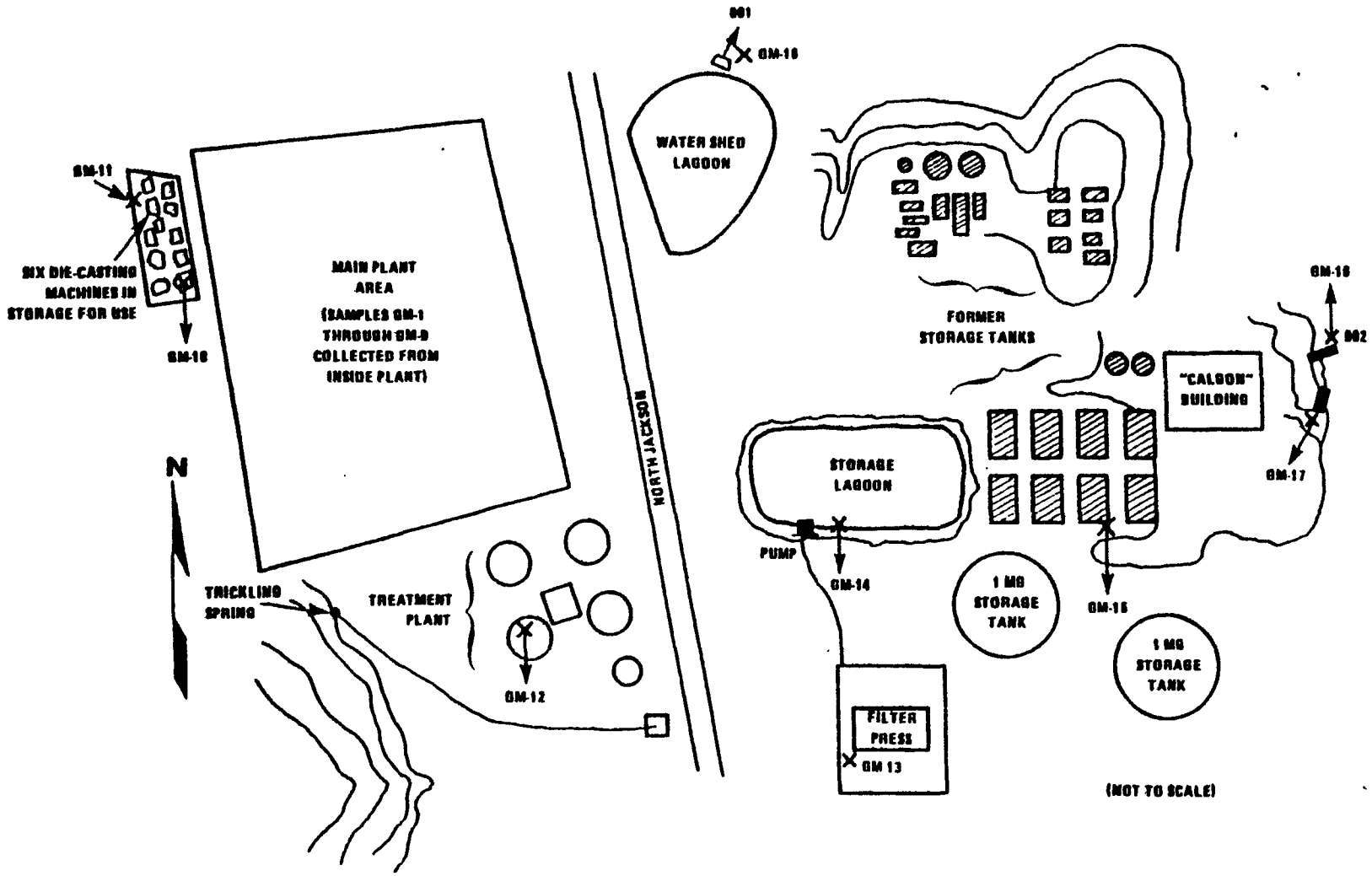


FIGURE 1 GM CENTRAL FOUNDRY PLANT LAYOUT DEPICTING SAMPLING POINTS

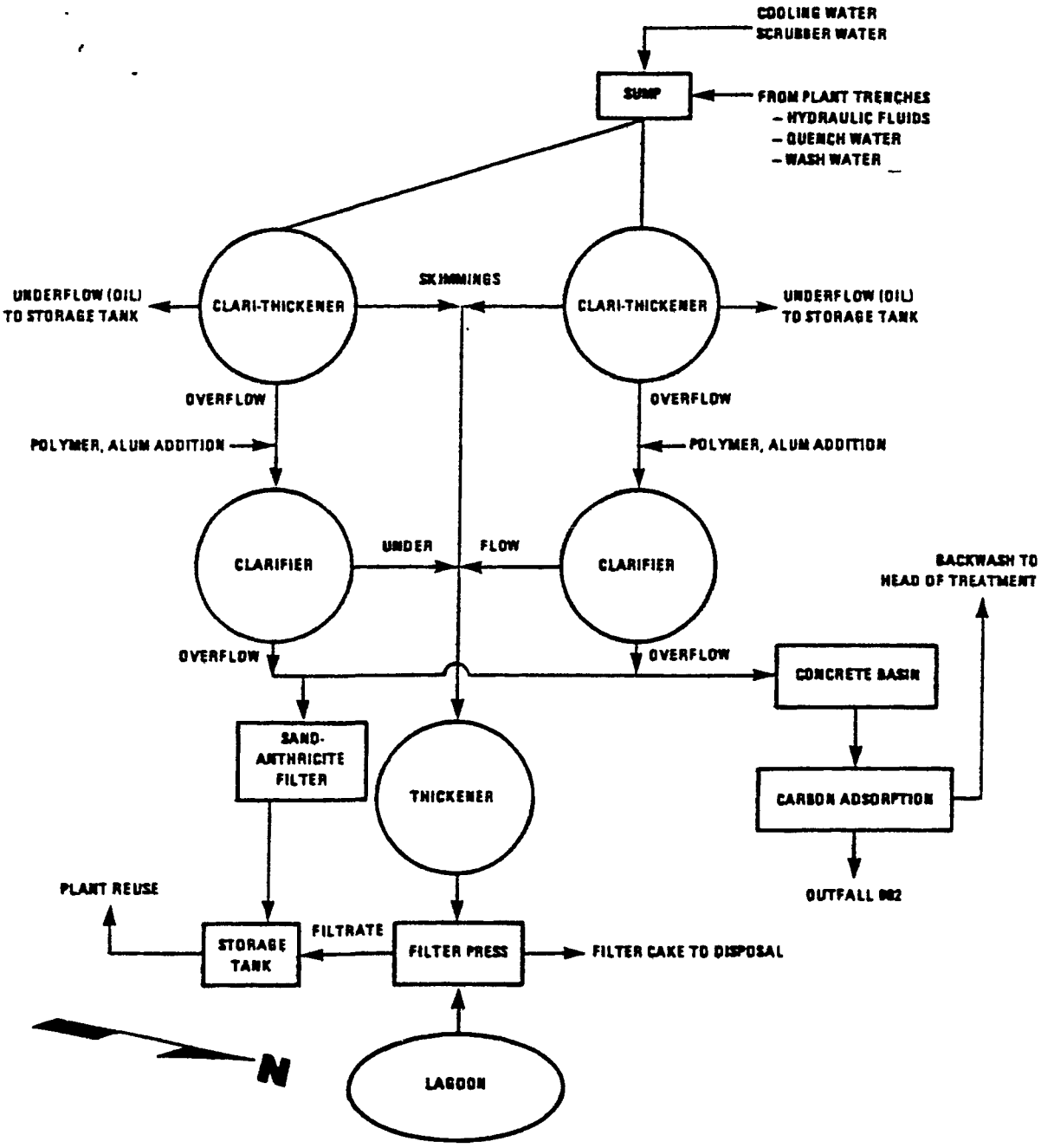


FIGURE 2 GM – CENTRAL FOUNDRY TREATMENT PLANT

TABLE 1. PCB SAMPLE RESULTS ASSOCIATED WITH AREAS OF NON-COMPLIANCE, NPDES PERMITTED DISCHARGES, AND GM AREA RUNOFF

Sample Number	Description	PCB Concentration ppm (1242)
14	Solid material from bank of old process lagoon	3,100
15	Surface soil sample taken from between 2 (old) temporary storage tanks	11,000
16	NPDES Discharge 002	<0.5 **
17	GM and non-GM runoff oil sample from culvert near NPDES Discharge Point 002	300,000
18	NPDES Discharge 001	<0.5 **

** Water Samples report in ppb

TABLE 2. PCB SAMPLE RESULTS ASSOCIATED WITH THE TREATMENT PROCESS

Sample Number	Description	PCB Concentration ppm (1242)
5	Solid sample from floor trench between die cast machines #1 and #2	270
6	Oil/solid sample from floor collection system located at die cast machine #142	<1
9	Oil/water sample from die cast machine area prior to entering main collection sump	<0.5 **
12	Oil sample from bottom of one clari-thickener	790
13	Solid sample of filter cake being sent to CECOS International	1,000

** Water Samples Reported in ppb

material) is settled in a thickener and dewatered to a filter cake which goes to CECOS International, Williamsburg, Ohio landfill. The filtrate is stored and reused by the plant. Versar's sampling and analysis of this filter cake revealed a PCB concentration of 1,000 ppm. Additional water inputs to outfall 002 include runoff from the west and south end of the treatment plant, a natural spring originating from the hillside just west of the treatment plant, and runoff from the adjacent railroad yard (not GM property). This runoff is directed under North Jackson Street via a corregated steel culvert and joins the 002 discharge just prior to GM's self-monitoring NPDES station.

Versar's sampling and analysis of a small pocket of oil observed at the end of this culvert revealed a PCB concentration of 300,000 ppm. It must be repeated that this sample consists of runoff from GM and non-GM property.

Runoff from the north side of the plant is diverted to a pond referred to as the water shed lagoon and subsequently discharged through an underflow weir designated as NPDES outfall 001.

GM facility representatives indicated that GM has made plans which will significantly alter the current situation to include:

- Diversion of all storm runoff for reuse or treatment thus eliminating NPDES outfall 001 (water shed lagoon or pond).
- Continued pumping out of the old lagoon for disposal of its contents and subsequently dispose of discolored soil around the lagoon.
- Disposal of 29 temporary storage tanks.
- Employment of a private contractor (Battelle) to optimize a process which will be used to remove PCBs from waste oil. If successful, this "cleaned" oil will be stored in the second one-million gallon storage tank and subsequently reused.
- Employement of a private contractor (Battelle) to determine the source of persistent PCBs in recovered oil in light of extensive clean-up of die casting and trim press machines and collection trenches.

V. Inspection Summary

The inspectors met with Glen R. Ohl, William J. Collinson, Richard W. Shuman, and Gary L. Bowman on the morning of September 16, 1980. Glen R. Ohl was presented the "Notice of Inspection" which he signed and the "Confidentiality Notice" which he noted as received.

General Motors initiated a draining and flushing program of hydraulic die casting machines, trim press machines, and collection trenches in 1976. A phosphate ester hydraulic fluid (Houghton 1120) was chosen as the replacement fluid for PCB containing Pydrauls and is now used exclusively throughout the Bedford Plant. A periodic sampling and analysis program was also initiated at that time. The most recent sampling and analysis occurred in November of 1979 and indicated PCB concentrations in all hydraulic systems to be under 50 ppm. Versar's sampling and analysis also confirmed this point (see Versar Table 3 for die casting and trim press hydraulic fluid analytical results).

This facility has two PCB transformers containing a total of 6,303 kilograms of PCB dielectric fluid. All other plant transformers are gas-filled. In addition, 40 large high voltage and 280 large low voltage PCB containing capacitors are in service. These were observed to be properly marked.

Five 55-gallon drums containing capacitors ready for disposal were observed on the loading dock area. Inspection of GM records indicated that they were awaiting pick-up by CECOS International for disposal. Both the annual report entry and shipping manifest showed proper documentation of this disposal.

TABLE 3. PCB SAMPLE RESULTS OF DIE CAST MACHINE AND TRIM PRESS HYDRAULIC FLUID

Sample Number	Description	PCB Concentration ppm (1242)
1	Die Cast Machine #2	1
2	Trim Press Machine #2	1
3	Die Cast Machine #8	11
4	Trim Press #8	17
7	Die Cast Machine #102	1
8	Die Cast Machine #107	1
10	Die Cast Machine in storage (west end of plant)	7
11	Adsorbent material near sample point #10	8

* Unable to determine

Versar Inc

PCB ANALYTICAL REPORT

PREPARED FOR: Sheldon Simon
etc.

REF. # 701

Facility Inspected: General Motors Redford Township

SAMPLE NO.	LAB NO.	CONCENTRATION PARTS/MILLION	AROCLOR	COMMENTS
GM-1	5980	<1	—	Hydraulic Fluid
GM-2	5981	<1	—	Hydraulic Fluid
GM-3	5982	11	1242	Hydraulic Fluid
GM-4	5983	17	1242	Sludge-Floor Drain
GM-5	5984	270	1242	Sludge Collection Sump
GM-6	5985	<1	—	Hydraulic Fluid
GM-7	5986	<1	—	Hydraulic Fluid
GM-8	5987	<1	—	Hydraulic Fluid

DATE: _____

MARK T. CARKHUFF, CHEMIST
APPLIED CHEMISTRY DIVISION

WESTON Inc

PCB ANALYTICAL REPORT

PREPARED FOR: Sheldon Simon

REF. # 701

US EPA

230 So. Dearborn

Chicago, Illinois 60604

Facility Investigation Gould Industries Belvidere Illinois

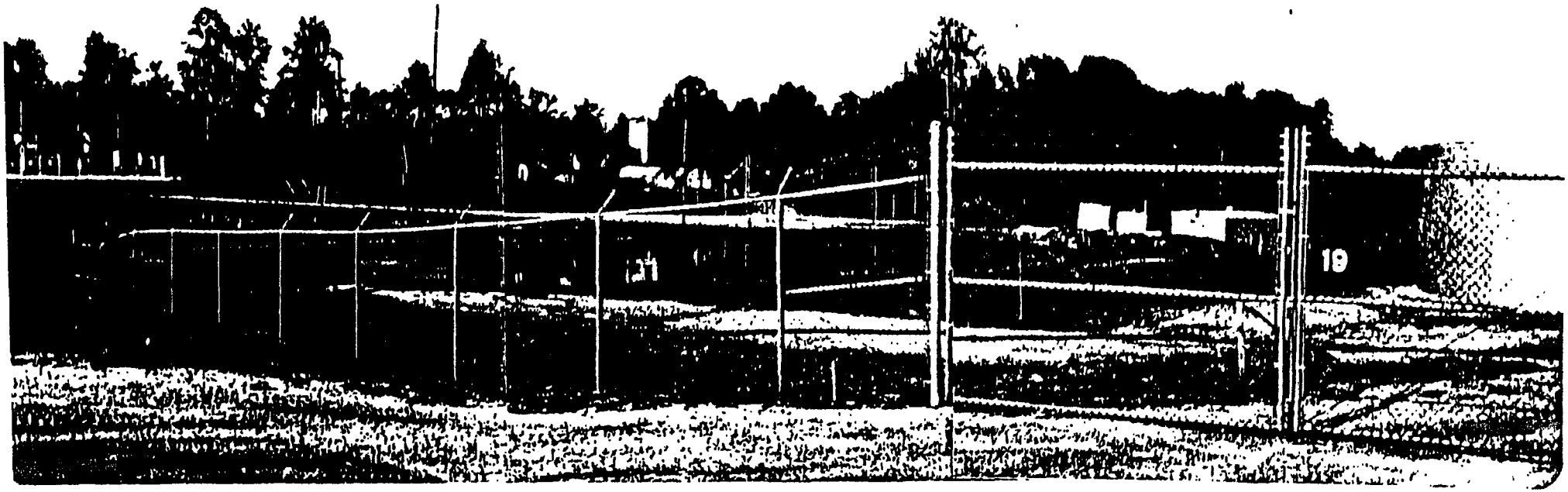
SAMPLE No.	LAB No.	CONCENTRATION PARTS/MILLION	AROCLOR	COMMENTS
GM - 9	5988	*<0.5		Oil water mixture
GM - 10	5989	7	1242	Hydraulic Fluid Absorbent Mat
GM - 11	5990	**Could not Quantitate		Oil from Hyd. Fl.
GM - 12	5991	790	1242	Filter Cake
GM - 13	5992	1,000	1242	Soil Storage Area
GM - 14	5993	3,100	1242	Soil from between Storage Tanks
GM - 15	5994	11,000	1242	Water Discharge
GM - 16	5995	*<0.5	—	Oil water mixture
GM - 17	5996	**30,000	1242	Water Discharge
GM - 18	5997	*<0.5		

DATE: * Water Samples reported in ppb

** Halogenated Interference, *** oil Emulsified water

MARK T. CARKHUFF, CHEMIST
APPLIED CHEMISTRY DIVISION

GENERAL MOTORS CORPORATION - CENTRAL FOUNDRY DIVISION - BEDFORD, INDIANA PLANT 9/16/80



OLD PCB WASTE LAGOON AND PCB STORAGE TANKS IN THE BACKGROUND.

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Die Casting Machine Number 2 - 400 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-1	<1	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Traim Press Number 2 - 90 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-2	<1	1242

COMMENTS:

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Die Casting Machine Number 8 - 500-550 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM- 3	11	1242

COMMENTS:

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Trim Press Number 8 - 90 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-4	17	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT X SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Floor trench perpendicular from main trench located between die casting machine numbers 1 and 2

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: scoop

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-5	270	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT X SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Trench convergence in basement collection system nearest die casting machine number 142

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: scoop

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-6	<1	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Backend of Die Casting Machine Number 102 - 500 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM- 7	<1	1242

COMMENTS: Duplicate samples taken

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Backend of Die Casting Machine Number 107 - 500 gallon capacity

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-8	<1	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL _____

OTHER X Water-Oil Mixture

SAMPLE DESCRIPTION: Co-mingled waste stream from basement collection system just prior to entering main sump basket

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: direct grab

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-9	<0.5 *	1242

COMMENTS: *ppb

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL X WATER _____ SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Die Casting Machine (one of six) in storage for use at west end of building

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: pinch tube

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-10	7	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL _____

OTHER X Sorbent material

SAMPLE DESCRIPTION: Sorbent material from spill area near Die Casting Machines in storage at west end of building

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: scoop

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-11	32	1242

COMMENTS:

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT X SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Thickened oil from bottom of one of two clari-thickeners.

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: GM's grab sampler

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-12	790	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL _____

OTHER X Filter Cake

SAMPLE DESCRIPTION: Filter Cake in "Dumpster" dewatered sludge from treatment system.

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: Direct Grab

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-13	1,000	1242

COMMENTS:

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL X

OTHER _____

SAMPLE DESCRIPTION: Four-inch core from perimeter of old storage lagoon

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: direct grab

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-14	3,100	1242

COMMENTS:

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL X

OTHER _____

SAMPLE DESCRIPTION: From between two of eight tanks on south side of tank storage area.

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: scoop

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-15	11,000	1242

COMMENTS: _____

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER X SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Permitted Discharge 002

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: _____

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-16	<0.5 *	1242

COMMENTS: *ppb

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Sisco, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER _____ SEDIMENT _____ SOIL _____

OTHER X Oil-water Mix

SAMPLE DESCRIPTION: 48-inch pipe diverting GM and non-GM runoff to point after 002 discharge

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: direct grab

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-17	300,000	1242

COMMENTS: Advisory sample - water contained by pipe includes spring water and runoff from GM and non-GM property

INDIVIDUAL SAMPLE ANALYSIS REPORT

VERSAR ANALYTICAL REPORT NUMBER: 701

TO: Sheldon Simon, EPA Region V

FACILITY: General Motors Corporation - Central Foundry Division, Bedford, Indiana

SAMPLE DATE: September 16, 1980

SAMPLE TYPE: OIL _____ WATER X SEDIMENT _____ SOIL _____

OTHER _____

SAMPLE DESCRIPTION: Permitted Discharge 001

COLLECTED BY: Michael C. Calhoun - Environmental Scientist

COLLECTION METHOD: direct grab

SAMPLE CODE	PCB CONCENTRATION (ppm)	AROCLOR TYPE
GM-18	<0.5 *	1242

COMMENTS: *ppb

Runoff pond containing runoff from north and east sides of plant

U.S. Environmental Protection Agency

NOTICE OF INSPECTION

Name of Firm	
Firm Address	
Inspector Name and Address: M. L. CALHOUN & ERIC JEFFERS	Date 9/16/80 Time 8:20
Inspector's Signature: Michael Calhoun	Name of Recipient: B. F. Ohl
Title: Field Engineer	Title: Senior Engineer

REASON FOR INSPECTION

Under the authority of Section 11 of the Toxic Substances Control Act

☑ For the purpose of inspecting (including taking samples, photographs, statements, and other inspection activities) an establishment, facility, or other premises in which chemical substances or mixtures or articles containing same are manufactured, processed or stored, or held before or after their distribution in commerce (including records, files, papers, processes, controls, and facilities) and any conveyance being used to transport chemical substances, mixtures, or articles containing same in connection with their distribution in commerce (including records, files, papers, processes, controls and facilities) bearing on whether the requirements of the Act applicable to the chemical substances, mixtures, or articles within or associated with such premises or conveyance have been complied with.

☐ In addition, this inspection extends to (circle appropriate letters):

(A) Financial data
(B) Sales data
(C) Pricing data
(D) Personnel data
(E) Research data

The nature and extent of inspection of such data specified in A through E above is as follows:

U.S. Environmental Protection Agency TSCA INSPECTION CONFIDENTIALITY NOTICE	Facility GENERAL MOTORS. Facility Address
Inspector Name MIKE CALHOUN/ERIC TURGEON	Chief Executive Officer of Firm
Inspector Address VERSAR INC 6621 ELECTRONIC DRIVE. SPRINGFIELD, VA 22151	Title Address
Name of Individual to Whom Notice Given	Title / Date 9/16/80

It is possible that EPA will receive public requests for release of the information obtained during inspection of the facility above. Such requests will be handled by EPA in accordance with provisions of the Freedom of Information Act (FOIA), 5 U.S.C. 552; EPA regulations issued thereunder, 40 CFR Part 2; and the Toxic Substances Control Act, Section 14. EPA is required to make inspection data available in response to FOIA requests unless the Administrator of the Agency determines that the data contains information entitled to confidential treatment.

Any or all of the information collected by EPA during the inspection may be claimed confidential if it relates to trade secrets or commercial or financial matters that you consider to be confidential. If you make claims of confidentiality, EPA will disclose the information only to the extent, and by means of the procedures, set forth in the regulations (cited above) governing EPA's treatment of confidential information. Among other things, the regulations require that EPA notify you in advance of publicly disclosing any information you have claimed and certified confidential.

To claim information confidential, you must certify that each claimed item meets all of the following criteria:

1

.. Your company has taken measures to protect the confidentiality of the information, and intends to continue to take such measures.

. The information is not, and has not been, reasonably obtainable without your company's consent by other persons (other than governmental bodies) by use of legitimate means (other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding).

. The information is not publicly available elsewhere.

. Disclosure of the information would cause substantial harm to your company's competitive position.

t the completion of the inspection, you will be given a receipt for all documents, samples, nd other materials collected. At that time, you may make claims that some or all of the -formation is confidential and meets the four criteria listed above.

f you are not authorized by your company to make confidentiality claims, this notice will e sent by certified mail, along with the receipt for documents, samples, and other materials, o the Chief Executive Officer of your firm within two days of this date. The Chief Executive fficer must return a statement specifying any information which should receive confidential reatment.

(continued)

Facility

he statement from the Chief Executive Officer should be addressed to:

nd reach the address shown here within seven (7) calendar days after receipt of the notice. he statement should be sent by registered, return receipt requested mail.

ailure by your firm to submit a written request that information be treated as confidential, ither at the completion of the inspection or by the Chief Executive Officer within the even-day period, will be treated by EPA as a waiver by your company of any claims for onfidentiality regarding the inspection data a nd the data will be available to the public ithout any further notice to you.

be filled out by the facility official ceiving this notice if he DOES have the ith ity to make confidentiality claims:	To be filled out by the facility official receiving this notice if he DOES NOT have the authority to make confidentiality claims:
have received and read this statement. hereby certify that I am authorized make confidentiality claims for company.	I have received and read this statement. I hereby certify that I am not authorized to make confidentiality claims for my company.
nature	signature
te	date

9-16-80

I HAVE RECEIVED THIS CONFIDENTIALITY NOTICE ON THIS DATE 9-16-80.

Glen R. Ohl
SENIOR ENGINEER
CFO - GM

RECEIPT FOR DOCUMENTS, SAMPLES, AND PHOTOGRAPHS

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGIONAL ADDRESS: _____

COMPANY NAME AND ADDRESS: GENERAL MOTORS - BEDFORD IND.

NAME AND TITLE OF RESPONSIBLE OFFICIAL: G.R. OHL
SENIOR ENGINEER

ARTICLES

ARTICLE NUMBER	DATE & TIME	DESCRIPTION	REQUESTED & PROVIDED	NOT REQUESTED	SAMPLE	PHOTO	DOCUMENT
1. GM-6	9/16/1112	SLUDGE FROM COLLECTION SYSTEM D/K #2	X		X		
2. GM-7A&B	9/16/1121	FLUID FROM BE or D/K #102	X		X		
3. GM-8	9/16/1129	FLUID FROM B.E OR D/K #107	X		X		
4. GM-9	9/16/1150	WATER/OIL AT MAIN COLLECTION SUMP	X		X		
5. GM-10	9/16/1200	FLUID FROM STORED D/K #2	X		X		
6. GM-11	9/16 1409	SORBENT MATERIAL SAMPLE	X		Y		
7. GM-12	9/16 1435	OIL FROM BOTTOM of CHARI-THICKENER	X		X		
8. GM-13	9/16 1455	FILTER CAKE	X		X		
9. GM-14	9/16 1505	STORAGE LAGOON	X		X		
10. GM-15	9/16 1520	SOIL SAMPLE / TANK STORAGE AREA	X		Y		

ACKNOWLEDGMENT OF RESPONSIBLE OFFICIAL

THE UNDERSIGNED ACKNOWLEDGES THAT THE ARTICLES DESCRIBED ABOVE HAVE BEEN RECEIVED AND AN OFFER TO COPY THE ARTICLE WITH THE ABOVE MENTIONED COMPANY WAS MADE AND IF A COPY WAS REQUESTED, THE COMPANY RECEIVED DUPLICATE ARTICLES.

SIGNATURE OF RESPONSIBLE OFFICIAL: G.R. Ohl

TITLE OF OFFICIAL: SENIOR ENGINEER

NAME OF PERSON WHO RECEIVED ARTICLE: ERIC D JUERGENS

SIGNATURE OF RECEIVER : E D Juergens

TITLE OF RECEIVER : INSPECTOR

ALL SAMPLES (SPLIT WITH FACILITY (

RECEIPT FOR DOCUMENTS, SAMPLES, AND PHOTOGRAPHS

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGIONAL ADDRESS: _____

COMPANY NAME AND ADDRESS: General Motors - Bedford, Ind.

NAME AND TITLE OF RESPONSIBLE OFFICIAL: G.R. Ohl
Senior Engineer

ARTICLES

ARTICLE NUMBER	DATE & TIME	DESCRIPTION	REQUESTED & PROVIDED	NOT REQUESTED	SAMPLE	PHOTO	DOCUMENT
1. A1	9/16/80 0738	Participant List	X				X
2. A2	9/16/80 0936	Flow Diagram - Plant		X			X
3. A3	9/16/80 0945	D/C Machines; Trim Presses Arrays	X				X
4. A4	9/16/80 0951	Plant Layout	X				X
5. A5	9/16/80 0955	CFD Bedford PCB Record.	X				X
6. GM-1	9/16 1030	Sample - Fluid from D/C #2	X		X		
7. GM-2	9/16/ 1036	Sample - Fluid From TP #2	X		X		
8. GM-3	9/16/ 1046	Sample - Fluid From D/C #8	X		X		
9. GM-4	9/16/ 1051	Sample - Fluid From TP #8	X		X		
10. GM-5	9/16/ 1100	Sample - Sludge Floor drain	X		X		

ACKNOWLEDGMENT OF RESPONSIBLE OFFICIAL

THE UNDERSIGNED ACKNOWLEDGES THAT THE ARTICLES DESCRIBED ABOVE HAVE BEEN RECEIVED AND AN OFFER TO COPY THE ARTICLE WITH THE ABOVE MENTIONED COMPANY WAS MADE AND IF A COPY WAS REQUESTED, THE COMPANY RECEIVED DUPLICATE ARTICLES.

SIGNATURE OF RESPONSIBLE OFFICIAL: G.R. Ohl

TITLE OF OFFICIAL: Senior Engineer

NAME OF PERSON WHO RECEIVED ARTICLE: Eric D. Jugrens

SIGNATURE OF RECEIVER: Eric D Jugrens

TITLE OF RECEIVER: Inspector OZA

ALL SAMPLES SPLIT WITH FACILITY

RECEIPT FOR DOCUMENTS, SAMPLES, AND PHOTOGRAPHS

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGIONAL ADDRESS: _____

COMPANY NAME AND ADDRESS: GENERAL MOTORS, - BEDFORD, IND.

NAME AND TITLE OF RESPONSIBLE OFFICIAL: G R. OHL
SENIOR ENGINEER

ARTICLES

ARTICLE NUMBER	DATE & TIME	DESCRIPTION	REQUESTED & PROVIDED	NOT REQUESTED	SAMPLE	PHOTO	DOCUMENT
1. GM-16	9/16/1525	002 DISCHARGE	X		X		
2. GM-17	9/16/1536	48 INCH RUNOFF SEWER	X		X		
3. GM-18	9/16 1605	001 DISCHARGE					
4.							
5.							
6.							
7.							
8.							
9.							
10.							

ACKNOWLEDGMENT OF RESPONSIBLE OFFICIAL

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SIGNATURE OF RESPONSIBLE OFFICIAL: G. R. Ohl

TITLE OF OFFICIAL: SENIOR ENGINEER

NAME OF PERSON WHO RECEIVED ARTICLE: ERIC D. JUERGENS

SIGNATURE OF RECEIVER : Eric D. Juergens

TITLE OF RECEIVER : INSPECTOR

ALL SAMPLES SPLIT WITH FACILITY

APPENDIX G.25

CONSENT AGREEMENT TSCA-V-C-138-87

GM Legal Staff

Inter-Organizatio

Date: July 6, 1987

To: William Schoonmaker
Environmental Engineer
Central Foundry Division
Bedford, IN

From: Michael G. Cooke MGC

Subject: Central Foundry - Bedford
North Lagoon Closure

Enclosed for Bedford's files is a copy of the executed and adopted Consent Agreement and Final Order (CAFO) for closure of the North Lagoon. The effective date of the order is June 25, 1987. Thus, the time periods outlined on page 6 of the CAFO for completing work commenced June 25. If you experience difficulty meeting these time-frames or if you have any questions on this matter, please contact me.

MGC:sb

Enclosure

c: Gary Toth
Joseph Chu
Denise Leduc

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

IN RE:	)	
	)	
GENERAL MOTORS CORPORATION	)	TSCA-V-C- TSCA-V-C- 138-87
CENTRAL FOUNDRY DIVISION	)	
BEDFORD, INDIANA	)	CONSENT AGREEMENT
	)	AND
	)	FINAL ORDER
Respondent.	)	

RECEIVED
JUN 29 1987
REGIONAL HEARING CLERK
U.S. ENVIRONMENTAL
PROTECTION AGENCY

CONSENT AGREEMENT

1. This civil administrative proceeding for the assessment of a penalty was initiated pursuant to Section 16(a) of the Toxic Substances Control Act (TSCA), 15 U.S.C. § 2615.

2. A Complaint and Notice of Opportunity for Hearing was filed by Complainant on June 29, 1987 charging that Respondent violated Section 15 of TSCA, 15 U.S.C. § 2614 by failure to comply with federal regulations regarding the storage and disposal of polychlorinated biphenyls (PCBs), 40 C.F.R. Part 761, promulgated under Section 6 of TSCA.

3. Count I of the Complaint alleged a violation of Section 15 of TSCA, 15 U.S.C. § 2614 and 40 C.F.R. § 761.65(b) in that an open, unlined lagoon located on Respondent's property in Bedford, Indiana (hereafter referred to as "North Lagoon") containing PCBs at concentrations greater than 50 parts per million (ppm), did not meet the physical requirements set forth in the aforesaid regulation for a PCB storage area, for which Complainant sought a civil penalty of $15,000.00.

4. Count II of the Complaint alleged a violation of 15 U.S.C. § 2614 and 40 C.F.R. § 761.65(a) in that Respondent failed to remove and dispose of the PCBs which had been stored in the North Lagoon since 1980, prior to January 1, 1984, for which Complainant sought a civil penalty of $15,000.

5. Count III of the Complaint alleged a violation of 15 U.S.C. § 2614 and 40 C.F.R. § 761.60(a) in that in March 1981, Respondent drained part of the contents from the North Lagoon, which constituted an uncontrolled discharge of PCBs in concentrations greater than 50 ppm, for which Complainant sought a civil penalty of $25,000.

6. Respondent admits the jurisdictional allegations in the Complaint.

7. Respondent neither admits nor denies the factual allegations of the Complaint.

8. Respondent contends that the PCBs in the North Lagoon were placed there prior to February 17, 1978, the "grandfathered" disposal date of the TSCA regulations, or are otherwise unregulated because they resulted from influent water containing less than 50 ppm PCBs. Respondent also contends that the North Lagoon is not a PCB storage site within the meaning of 40 C.F.R. § 761.65, and that, in any event, the materials entering and leaving the North Lagoon were not PCBs within the meaning of 40 C.F.R. § 761.

9. Respondent further contends that its actions in March 1981 were in full compliance with TSCA in that backfilling the North Lagoon

was not disposal under 40 C.F.R. § 761.60 and the water drained from the North Lagoon was unregulated material (less than 50 ppm PCBs). Respondent, however, acceded to the request of state and federal agencies to suspend further action on the North Lagoon pending review.

10. Complainant does not acquiesce in the interpretation of the PCB regulations advocated by Respondent; however, Complainant has determined that settlement of this matter in accordance with the terms set forth herein is in the public interest.

NOW, THEREFORE, solely for purposes of this proceeding without trial or other litigation of the issues or any adjudication of the facts, the parties stipulate and agree as follows:

1. Respondent, General Motors Corporation, at its Central Foundry Plant, Bedford, Indiana, owns and operated a storm water retention lagoon located on the north end of the plant property off Jackson Road (the North Lagoon). The North Lagoon was built in the early 1950's and used primarily as a water reservoir and then later as a retention lagoon for storm water and noncontact cooling water.

2. As a result of construction of a new storm water retention lagoon, the Central Foundry Plant terminated the use of the North Lagoon and blocked the inlet and discharge pipe on March 9, 1981. On March 13, 1981, General Motors began to drain the water in the North Lagoon and to backfill the North Lagoon with soil. Closure operations continued until representatives of the Indiana State Board of Health (ISBH) requested that General Motors discontinue its activities until

the matter could be reviewed by ISBH and U.S. EPA Region V. Other than periodic draining of the lagoon, General Motors has not resumed closure of the North Lagoon pending the resolution of this matter.

3. Samples of the lagoon sediment taken in 1981 and 1982 revealed the presence of PCBs in the sediment in concentrations greater than 50 ppm.

4. Respondent agrees to excavate, sample, remove, transport and dispose of waste and PCB-contaminated soil from the North Lagoon pursuant to the terms of the following final Order.

5. In consideration of Respondent's agreement to expeditiously undertake and complete the removal and disposal of the PCB-contaminated wastes and soil in its North Lagoon in accordance with this Consent Agreement and Final Order, Complainant agrees to mitigate the civil penalty proposed in the Complaint to $0.00.

6. Respondent expressly waives its right to an adjudicatory hearing on the allegations of the Complaint.

7. Respondent consents to the terms and conditions of the following final Order.

For Respondent, General Motors Corporation

Dated: 6/9/87 Robert W. Hurn

STATE OF INDIANA

COUNTY OF LAWRENCE

On this 9th day of June, 1987, before me personally came Robert W. Herr, to me known, who being duly sworn did depose and say that he resides in Lawrence County, that he is Plant Manager of the Corporation described in and which executed the foregoing instrument, and that he signed his name as authorized by said Corporation.

L. Jeannine Toper
Notary Public

For Complainant, U.S. Environmental Protection Agency,

Dated: 6/24/81

WILLIAM H. SANDERS, III, P.E.
Director
Environmental Services Division
U.S. Environmental Protection Agency, Region V
230 South Dearborn Street
Chicago, Illinois 60604

FINAL ORDER

1. Respondent shall excavate and remove all waste and contaminated soil from the North Lagoon to the level of the earthen liner of the lagoon. Beginning at the level of the earthen liner, Respondent shall excavate and remove soil from the side walls and bottom of the lagoon until samples from the remaining soil show the PCB concentration to be 3 ppm or less, or until a maximum of four feet of soil beyond the level of the earthen liner at the side walls and the bottom of the lagoon has been excavated.

2. If the PCB concentration of the remaining soil in the Lagoon is over 3 ppm after four feet of excavation beyond the earthen liner, Respondent shall install an underdrain system to cover the bottom of the excavated area to collect any future water infiltration. The collected water shall be treated at the Respondent's on-site wastewater treatment plant.

3. The excavated area shall be backfilled within eight inches of grade with clean burrow (less than 2 ppm PCBs) and the burrow capped with eight inches of clean clay soil (less than 2 ppm PCBs).

4. Respondent shall dispose of the PCB-contaminated wastes and soils removed from the North Lagoon in accordance with 40 C.F.R. § 761.60 and all other applicable state and federal laws and regulations.

5. Respondent shall undertake the actions required by Paragraphs 1 through 4 of this Order in accordance with the Work Plan which is attached hereto and which is hereby incorporated into this Order, no later than the dates set forth in the following schedule:

	SCHEDULE INCREMENTS	DATE
A.	Commence waste and contaminated soil excavation	Within 90 days of the effective date of this Final Order.
B.	Submit sample analyses demonstrating PCB concentrations in remaining soil at 3 ppm or less, or commence underdrain installation	Within six months of the effective date of this Final Order.
C.	Complete all soil excavation and underdrain installation if required	Within seven months of the effective date of this Final Order.
D.	Dispose of PCB-contaminated waste and soil in accordance with 40 C.F.R. § 761.60	Within 18 months of the effective date of this Final Order.

6. Within 15 days of the compliance date for each of the schedule increments in Paragraph 5A, B and C, Respondent shall notify Complainant in writing of its compliance or noncompliance with such schedule increment.

7. General Motors shall submit the final report called for in the Work Plan under Part II, Task 9.B, to U.S. EPA Region V within 30 days after receipt from the contractor.

8. Respondent shall perform the requirements under this Order within the time limits set forth herein, unless the performance is prevented or delayed solely by events which constitute a force majeure. A force majeure is defined as any event arising from causes not reasonably foreseeable and beyond the control of the Respondent including, but not limited to, action of a national or local government, body or court, an act of God, war, strike, riot or catastrophe, as to any of which the negligence or willful misconduct of the Respondent was not the proximate cause, and which delays or prevents performance by a date required by this Consent Order.

Respondent must notify EPA in writing within 15 working days after it becomes aware of events which it believes constitute a force majeure. Such notice shall estimate the anticipated length of delay, including necessary demobilization and remobilization, its cause, measures taken or to be taken to minimize the delay, and an estimated timetable for implementation of these measures. Respondent shall adopt reasonable measures to avoid and minimize the delay.

If Respondent demonstrates to EPA that a delay or nonperformance is caused solely by a force majeure, the time for performance of that task shall be extended for a period equal to the delay resulting from such circumstances. Such an extension does not alter the schedule for performance of any other requirement of this Consent Order unless these are also specifically altered by amendment of the Consent Order or underlying plan. In the event EPA does not accept Respondent's

demonstration of a force majeure, EPA must notify Respondent in writing within 15 working days. If agreement cannot be reached, EPA and Respondent reserve their respective rights to undertake appropriate action as provided by law.

9. All submissions and notifications required by this Order shall be sent to:

Chief
Toxic Substances Section (5SPT)
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

10. Respondent's failure to comply with the terms and conditions of this Order by the dates contained therein will render the full proposed civil penalty of $55,000 due and payable within 15 days of written demand by U.S. EPA. Payment shall be made as specified in said demand.

11. Interest shall accrue on any amounts overdue under the terms of this Consent Agreement and Final Order at the rate established by the Secretary of the Treasury pursuant to 31 U.S.C. § 3717. A late payment handling charge of $20.00 will be imposed after thirty (30) days with an additional charge of $10.00 for each subsequent 30-day period an unpaid balance remains. In addition, a six percent per annum penalty will be applied on any principal amount not paid within ninety (90) days of the date that this Consent Agreement and Final Order is signed by the Regional Administrator.

12. The effective date of this Consent Agreement and Final Order is the date of signature by the Regional Administrator.

13. The failure to comply with the terms of this Consent Agreement and Final Order will result in a referral of this matter to the United States Attorney for enforcement.

14. Nothing in this Consent Agreement and Final Order shall relieve Respondent of its duty to comply with all applicable provisions of TSCA, 15 U.S.C. § 2601, et. seq.

15. Nothing in this Consent Agreement and Final Order shall relieve Respondent from any liability under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601, et. seq.

IT IS SO ORDERED.

Dated: 6/25/87

Frank M. Covington

VALDAS V. ADAMKUS
for Regional Administrator
U.S. Environmental Protection
Agency, Region V

WORK PLAN FOR NORTH LAGOON CLOSURE

The following describes the Work Plan for the closure of the North Lagoon of the General Motors Corporation, Central Foundry Division - Bedford plant.

I. Background

1. The North Lagoon that is addressed by this plan is shown on Figure 1. The North Lagoon is located on the plant property immediately east of North Jackson Street and the plants manufacturing facility. The lagoon was constructed in the early 1950's and was used primarily as a water reservoir and storm water retention lagoon until 1981. It is oval in shape and is approximately 310 feet long, 250 feet wide, and 22 feet deep at its maximum outline. The lagoon is no longer needed because a new larger storm water retention lagoon was constructed in 1981 as part of an overall wastewater treatment project.

2. The objectives of this plan are to:

A. Excavate, remove, transport, and dispose of waste and contaminated soil from the North Lagoon. The North Lagoon area included in this project is described in "1" above.

B. Sample and analyze the exçavated waste and contaminated soil to meet all applicable disposal facility permit and Department of Transportation requirements.

C. Sample and analyze the remaining soil in the excavated area. If any of the samples show the soil to be contaminated with 3 ppm or more of PCBs, an underdrain system will be installed at the bottom of the excavated area to collect any future water infiltration. The collected water will be treated at the Central Foundry on-site wastewater treatment plant. The plant's NPDES permit requires the effluent to meet a PCB limitation of 1 ppb.

D. Backfill the excavated areas to provide and maintain adequate drainage and runoff control.

E. Cover the back-filled area with top soil and seed to provide appropriate groundcover.

II. Tasks

The major tasks in the work plan are described below. The Project Time Schedule for implementing the work plan is shown in Figure 2. All tasks in the work plan are planned to be completed within 180 working days. Since the contractor for implementing the Work Plan has not been selected, the schedule may be revised after the contractor has been selected and given an opportunity to review the Work Plan.

Task 1. Mobilization and Site Preparation

The first task will be for the contractor to mobilize equipment to the site and prepare the site for waste and soil handling operations. Site preparation will include:

A. Designation of three basic work zones:

a. Exclusion Zone - the North Lagoon area as identified in Figure 1.

b. Contamination Reduction Zone - the area where vehicles and equipment are cleaned off prior to leaving the project site.

c. Support Zone - the area, outside of Exclusion and Contamination Reduction Zones, where support services are located.

B. Installation of Support Zone and Contamination Reduction Zone facilities that may include, as necessary:

a. Office trailer.

b. Laboratory trailer.

c. Personnel decontamination trailer.

d. Equipment storage trailer.

e. Equipment/vehicle decontamination pad.

f. Utilities - water, electricity and telephone service.

C. Provision of adequate construction drainage controls to contain storm water runoff from the North Lagoon work area as shown in Figure 1 for removal and treatment (see Task 2).

D. Construction, as necessary, of site access roads, equipment decontamination pad and waste staging facilities. The contractor may use any existing appropriate facilities.

Task 2. Lagoon Water and Storm Water Removal/Treatment

Existing lagoon water and storm water that is retained by the drainage control for the North Lagoon work area will be pumped to the plant's wastewater treatment plant for treatment, including activated carbon adsorption. The PCB limitation for the treated effluent in the NPDES permit for this wastewater treatment plant is 1 ppb.

Task 3. Waste and Contaminated Soil Excavation

The contractor shall properly excavate and remove (and stage within the Exclusion Zone, as necessary) waste and contaminated soils from within the North Lagoon to the level of the earthen liner of the Lagoon. Beginning at the level of the earthen liner, soil will be excavated and removed from the bottom and side walls of the North Lagoon until samples from the remaining soil show PCB concentration to be 3 ppm or less (see Task 4 for sampling and analysis). In no event, however, will GM be required to remove more than a

maximum of four feet of soil beyond the level of the earthen liner at the side walls and the bottom of the North Lagoon. All excavated materials shall be transported and disposed as described in Task 5.

Task 4. Sampling and Analysis

The contractor will sample and analyze the waste materials and contaminated soil removed from the North Lagoon for meeting disposal facility permit and Department of Transportation requirements.

After removal of contaminated soils, the contractor will sample and analyze the remaining soil for PCB concentration using Method 8080, "Test Methods for Evaluating Soil Waste - Physical/Chemical Methods", SW-846, 2nd. Ed., U.S. EPA, July 1982. The soil borings will be six inches in depth located at the grid point of each of the 50-foot by 50-foot grids established for the bottom and each 50-foot horizontal location at the side walls of the excavated area, resulting in more than 30 borings which will be analyzed. Each boring will be throughly mixed for analysis. The Central Foundry on-site laboratory may be used for PCB analysis.

Task 5. Loading, Transportation, and Disposal

The contractor will load all waste and contaminated soil properly on vehicles. Each vehicle will be lined with an impermeable, flexible material prior to loading with sufficient areal dimensions to allow the loaded materials to be fully enveloped with the lining material. A tarpaulin cover will be placed over the loaded materials.

The contractor will transport all wastes and contaminated soils off-site to an appropriate federal and state approved disposal facility. Transportation vehicles will meet applicable state and federal laws, including applicable DOT requirements. All vehicles will be weighed prior to and after loading at the on-site scale to certify that the tonnage of materials transported by each vehicle is correctly stated on the waste manifest or shipping paper.

GM Central Foundry is investigating the feasibility of on-site treatment for the removal/destruction of PCBs in the waste and contaminated soils. Treatment methods such as the Detox Industries' biological process for PCB degradation and disposal, as permitted by EPA Region VI, will be investigated. If GM Central Foundry determines that use of a PCB destruction process in lieu of off-site disposal is preferred, EPA approval

will be requested prior to utilization of such an option.

Task 6. Underdrain Installation

Upon completion of the analysis of the soil borings described in Task 4, if any one of the more than 30 borings is shown to contain PCBs in excess of 3 ppm (mg/kg), an underdrain system will be installed to cover the total bottom of the excavated area to collect any future water infiltration. The underdrain tile will be spaced in a 50-foot by 50-foot grid sloped to one collection point. The collected water will be treated at the Central Foundry on-site wastewater treatment plant. The plant's NPDES permit requires the effluent to meet a PCB limitation of 1 ppb.

Task 7. Backfill and Cover

The excavated area will be back-filled with local off-site borrow material. After backfilling, a six-inch top-soil layer will be placed over the back-filled area, and seeded. The cover will be sloped and maintained to prevent rainwater accumulation.

Task 8. Equipment Decontamination and Demobilization

The contractor will decontaminate all equipment prior to leaving the site at the completion of the project. Vehicles for transporting waste and contaminated soils from the North Lagoon area will be pressure washed to remove exterior contamination prior to leaving the Contamination Reduction Zone. All decontamination water and liquids from washing of vehicles and from decontamination of staff personnel safety equipment shall be collected for treatment through the on-site wastewater treatment plant.

Task 9. Administration and Support

A. Safety Plan

Prior to initiation of site work, the contractor must develop a satisfactory site safety plan for GM Central Foundry's approval. Failure to follow the plan may be a basis for termination of the work. All trailers, decontamination units and other safety equipment required in the plan shall be provided by the contractor. Site activities may require modification of the plan.

B. Final Report

Within 30 days after completion of the Tasks delineated in this Work Plan, the contractor shall prepare a final report delineating the results of the remedial action. All the information generated during the closure should be included as appendices to the document. The report should include maps drawn to scale indicating waste excavation areas, depths of excavations, all sample locations and analytical results, and all other data collected during the remedial action.

Attached Figure 1 & Figure 2

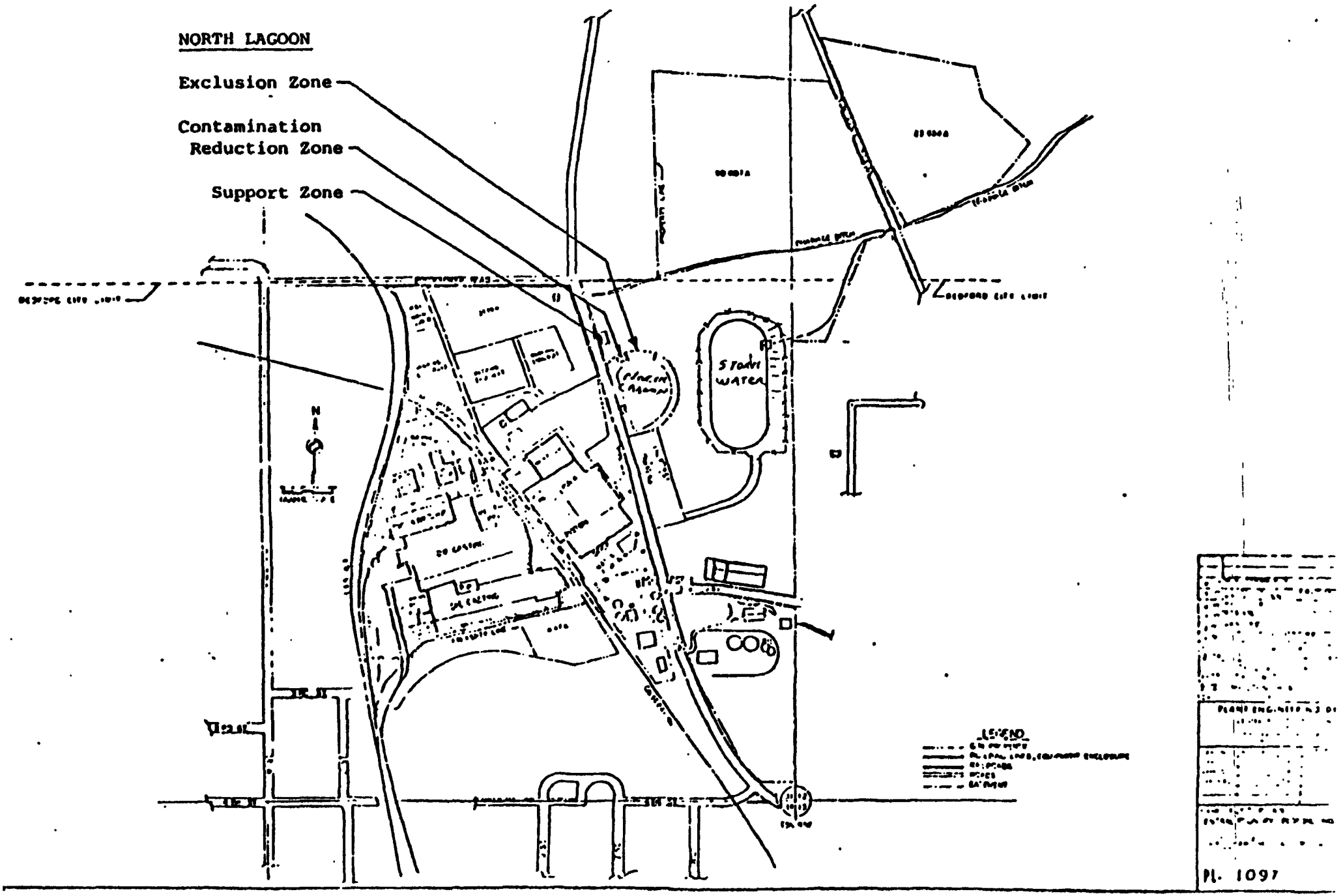
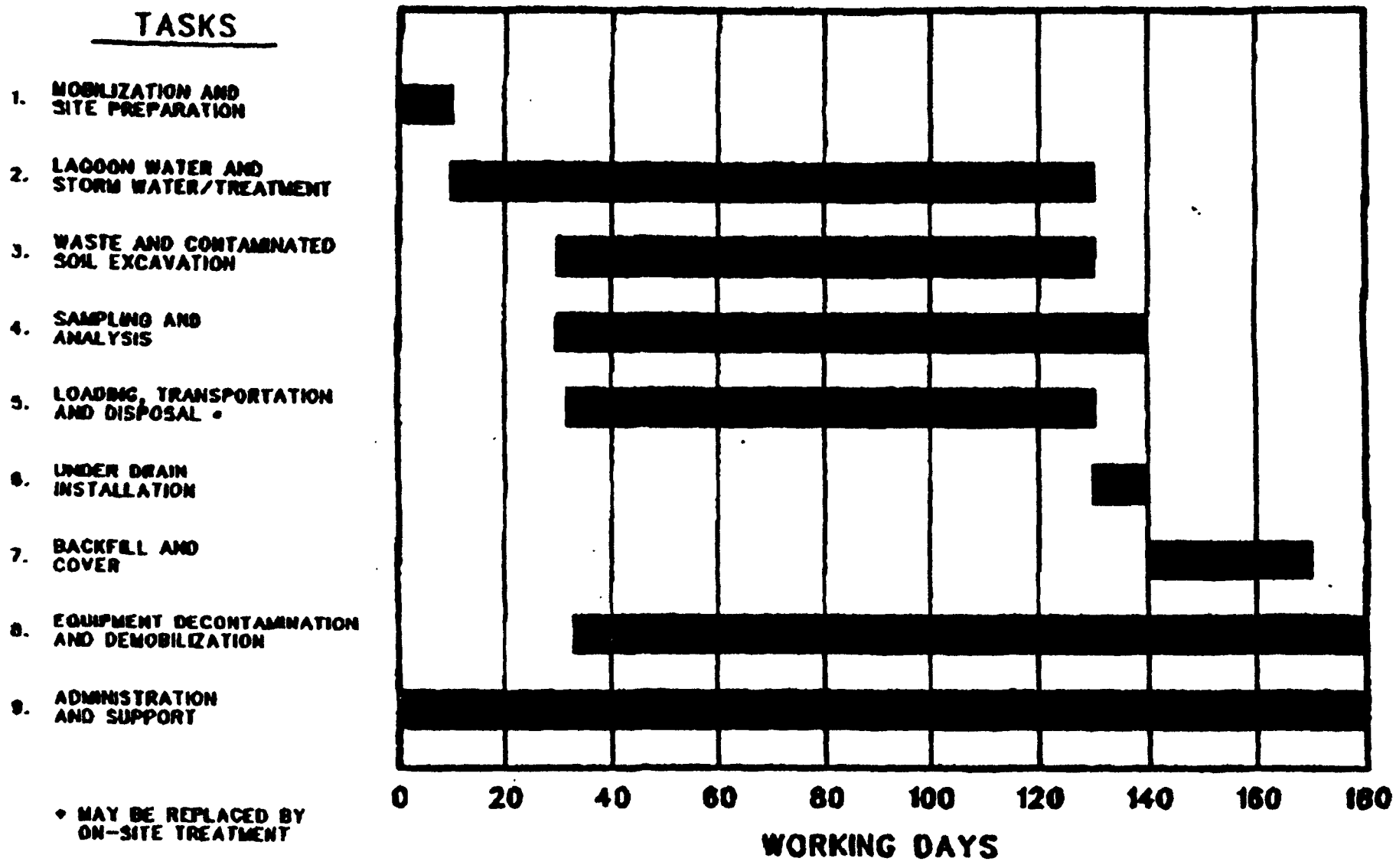


FIGURE 4. NORTH LAGOON LOCATION

FIGURE 2. # PROJECT TIME SCHEDULE



MAY 25, 2001

APPENDIX G.26

NORTH LAGOON CLOSURE REPORT

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

September 20, 1988

CERTIFIED MAIL
RETURN RECEIPT

Chief Toxic Substances Section - 5SPT
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, IL 60604

Gentlemen:

Paragraph 7 of the Consent Agreement and Final Order for the Central Foundry-Bedford North Lagoon requires General Motors Corporation to submit a final report detailing the results of the remedial action to the U.S. Environmental Protection Agency within 30 days of receipt from the contractor. Enclosed please find the report which satisfies the final task of the Consent Agreement and signifies the completion of the remediation.

If you have any questions regarding this matter, please contact Greg Etzel at 812/279-7310.

Very truly yours,

R.W. Herr

Bob Herr
Plant Manager

bc: Joseph Medved
Michael Cooke
Denise Leduc

Lets Get It Together
SAFETY BELTS SAVE LIVES

Final Report

Closure Activities on the North Lagoon

for Central Foundry Division

General Motors Corporation

Bedford, Indiana

Pursuant to USEPA (V)

Consent Agreement

and

Final Order

TSCA-V-C-138-87

The North Lagoon at the Bedford Central Foundry Plant had accumulated approximately 750,000 gallons of sediment during its 30 years of operation. In order to accomplish the removal of the material in the most efficient manner a filter press contractor was retained to dewater the sediments. IFAD Division of O. H. Materials of Lafayette, Louisiana was contracted to dewater the sediments, Fort Transfer of Morton, Illinois was contracted to transport the dewatered filter cake in bulk semi loads and National Electric of Coffeyville, Kansas was contracted to incinerate the filter cake.

On June 6, 1987, the trailer mounted plate and frame filter press was mobilized to the site along with the small dredge which was used to remove the sediments from the lagoon. The sediments were conditioned using ferric chloride and lime prior to dewatering in the press. The effluent from the press was pumped to the Central Foundry Wastewater Treatment Plant as required in the Consent Agreement. A total of 1,411.11 tons of filter cake was produced including the 60 tons of additives used to condition the sludge. The filter cake was loaded onto semi dump trailers with plastic-lined beds for transport to Coffeyville, Kansas. Upon arrival in Coffeyville, the filter cake was packaged in drums and incinerated. The final drum of material was incinerated on December 24, 1987. The entire dewatering operation was completed in two months from June 6, 1987, to August 4, 1987. No significant equipment failures or accidents occurred during this phase of the project, only minor pieces of equipment experienced problems during the two month project.

Concurrent with the dewatering operation, Chemical Waste Management began mobilization to the site and subsequent excavation operations on July 6, 1987. Both contractors worked together for approximately one month with no adverse affects to the project. Upon completion of the IFAD portion of the project they demobilized and the site was turned over to Chemical Waste Management. The remainder of the Final Report details the events during the excavation phase of the project.

Chemical Waste Management, Inc.
Environmental Remedial Action Division
4300 West 123rd Street
Alsip, Illinois 60658
312/396-2710

August 31, 1988

Mr. Greg Etzel
Project Manager
General Motors Corporation
Central Foundry Division
Bedford Plant, Box 271
Bedford, Indiana 47421

REFERENCE: Closure Document for
North Lagoon, Bedford, Indiana
CWM-ENRAC Control No. 87-02-087

Dear Mr. Etzel:

The Environmental Remedial Action Division (ENRAC) of Chemical Waste Management, Inc. (CWM) is pleased to present the attached closure document for work completed at the Central Foundry, Bedford, Indiana.

The closure plan is presented in five major components consisting of the following items:

- Remedial Investigation
- General REmedial Activities
- Sampling Plan
- Transportation and Disposal
- Leachate Collection System

Provided under separate cover are the sampling and analytical data generated during closure activities.

CWM-ENRAC trusts that the attached documents will meet with the satisfaction of General Motors. We have appreciated the opportunity to have served General Motors and look forward to assisting in your needs as they arise.

Very truly yours,

CHEMICAL WASTE MANAGEMENT, INC.
ENVIRONMENTAL REMEDIAL ACTION DIVISION

M. Cooley

Michael C. Cooley
Project Manager

MCC/jes
Enclosures

Final Report
Closure Activities on the North Lagoon for Central Foundry Division General Motors Corporation Bedford, Indiana

Pursuant to USEPA (V)
Consent Agreement
and
Final Order
TSCA-V-C-138 -87

CWM-ENRAC Control No. 87-02-087

TABLE OF CONTENTS

Executive Overview	2
Introduction	5
Remedial Investigation	5
- Drilling and Surveying	5
- CAD Mapping and Volume Estimates	8
General Remedial Activities	10
- Site Work	12
Sampling Plan	18
- Sampling Methodology	18
Transportation and Disposal	24
- Loading and Dispatch	24
- Disposal	26
- Disposal Volumes	26
Leachate Collection System	28
Appendices	32
List of Illustrations	iii

List of Illustrations

Figures

1.	ENRAC/GM Project Organization	3
2.	Lawrence County, Indiana	6
3.	North Lagoon Boundary	7
4.	North Lagoon Sampling Points	9
5.	Site Operational Areas	11
6.	Aerial Photo of North Lagoon	15
7.	North Lagoon Final Elevations	16
8.	Sampling Grids and Results	19
9.	Leachate Piping as Built	29
10.	Leachate System Specifications	30
10a.	Leachate Discharge Piping System	31
11.	Project Schedule	53

Tables

1.	Progressive Elevations	8
2.	Summary of Analytical Results	20
3.	Summary of Transportation & Disposal	25

EXECUTIVE OVERVIEW

Executive Overview

Pursuant to USEPA (V) Consent Agreement and Final order TSCA-V-C-138-87, Central Foundry Division General Motors Corporation (CFD-GMC) Bedford, Indiana contracted Chemical Waste Management - Environmental Remedial Action Division (CWM-ENRAC) to provide on-site services, transportation and disposal as part of the general closure plan for the North Lagoon. The North Lagoon was used primarily as a storm water retention lagoon. Lagoon capacity was about 12-13 million gallons. The project organizational hierarchy is provided in Figure 1, page 3.

On July 6, 1987 CWM-ENRAC mobilized to the site to begin remedial activities as required by the closure plan. During the period from 7/17/87-10/16/87 approximately 55,400 tons of PCB contaminated soils and miscellaneous debris were transported to the Chemical Waste Management - Emelle, Alabama disposal facility.

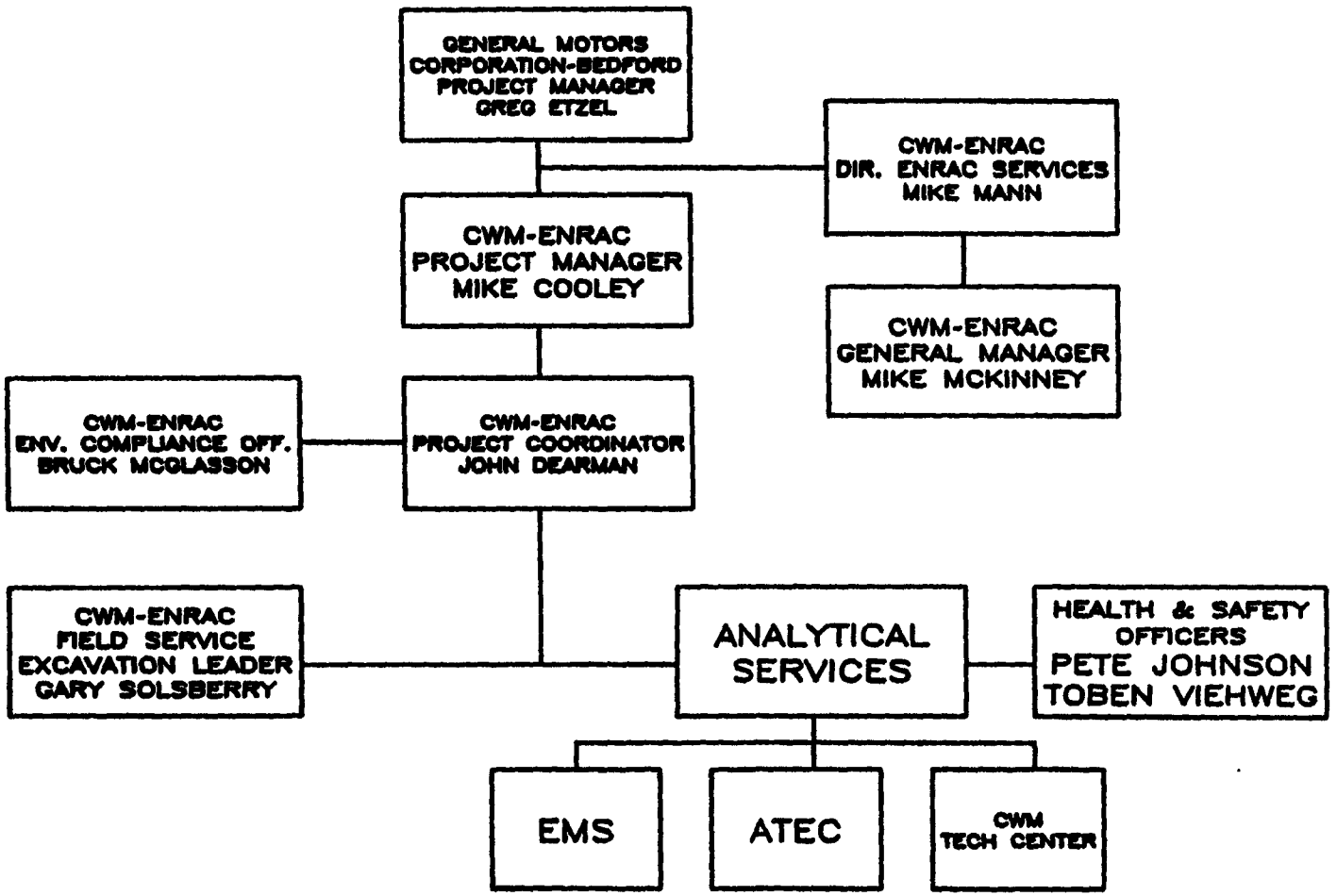
The sampling program commenced after the overburden and visual contamination was removed. A total of 43 quadrants were sampled based upon a 50 foot by 50 foot grid system. Sample results are provided under separate cover in the "Analytical Report for the Sampling program at General Motors Central Foundry Bedford, Indiana". The leachate collection system was installed with the leachate to be treated at the General Motors wastewater treatment plant in accordance with the requirements of the consent agreement. Installation was completed during the week of 10/18/87.

The final lift of common backfill, top soil, finish grading and seeding was completed the week of 4/18/88. Backfilling of the pond was delayed until spring by rain and sub-zero temperatures. However, 90 to 95% of the backfill was complete before the delays were encountered. Due to the high clay content of the common fill (_ 60%), the cap was an integral part of the final lifts placed.

Figure 1

ENRAC/GM PROJECT ORGANIZATION

GENERAL MOTORS CORPORATION
BEDFORD, INDIANA
NORTH LAGOON SITE



INTRODUCTION

Introduction

The Bedford Plant of General Motors Corporation, Central Foundry Division (GMCFD) located at Bedford, Indiana, Fig. 2, page 6 is an aluminum casting facility which began operations in the 1950's. During the mid-1950's, an impoundment was created northeast of the foundry through construction of a natural berm across a clay lined ravine. This impoundment, commonly referred to as the North Lagoon, served as the primary retention area for plant process water.

The North Lagoon is located on the plant property immediately east of North Jackson Street and the plants manufacturing facility. The lagoon was used primarily as a water reservoir and storm water retention lagoon until 1981. It was oval in shape and approximately 350 feet long, 300 feet wide, and 32 feet deep at its maximum outline, Fig. 3, page 7. The lagoon is no longer needed because a new larger storm water retention lagoon was constructed in 1981 as part of an overall wastewater treatment project.

On 12 March 1987, GMCFD issued a Request for Quotation (F7318G) to remove and dispose of PCB contaminated materials in the North Lagoon and close the same North Lagoon. The lagoon closure was to comply with the terms of the Consent Agreement and Final Order, dated 29 June 1987, between U.S. Environmental Protection Agency Region V and GMCFD-Bedford, see Appendix 1.

Chemical Waste Management, Inc. - ENRAC Division (ENRAC) was awarded Agreement No. 5444 by GMCFD to perform the closure activities per CWM proposal 87-02-087, Rev. 4-21-87, Alt. 3A.

Remedial Investigation

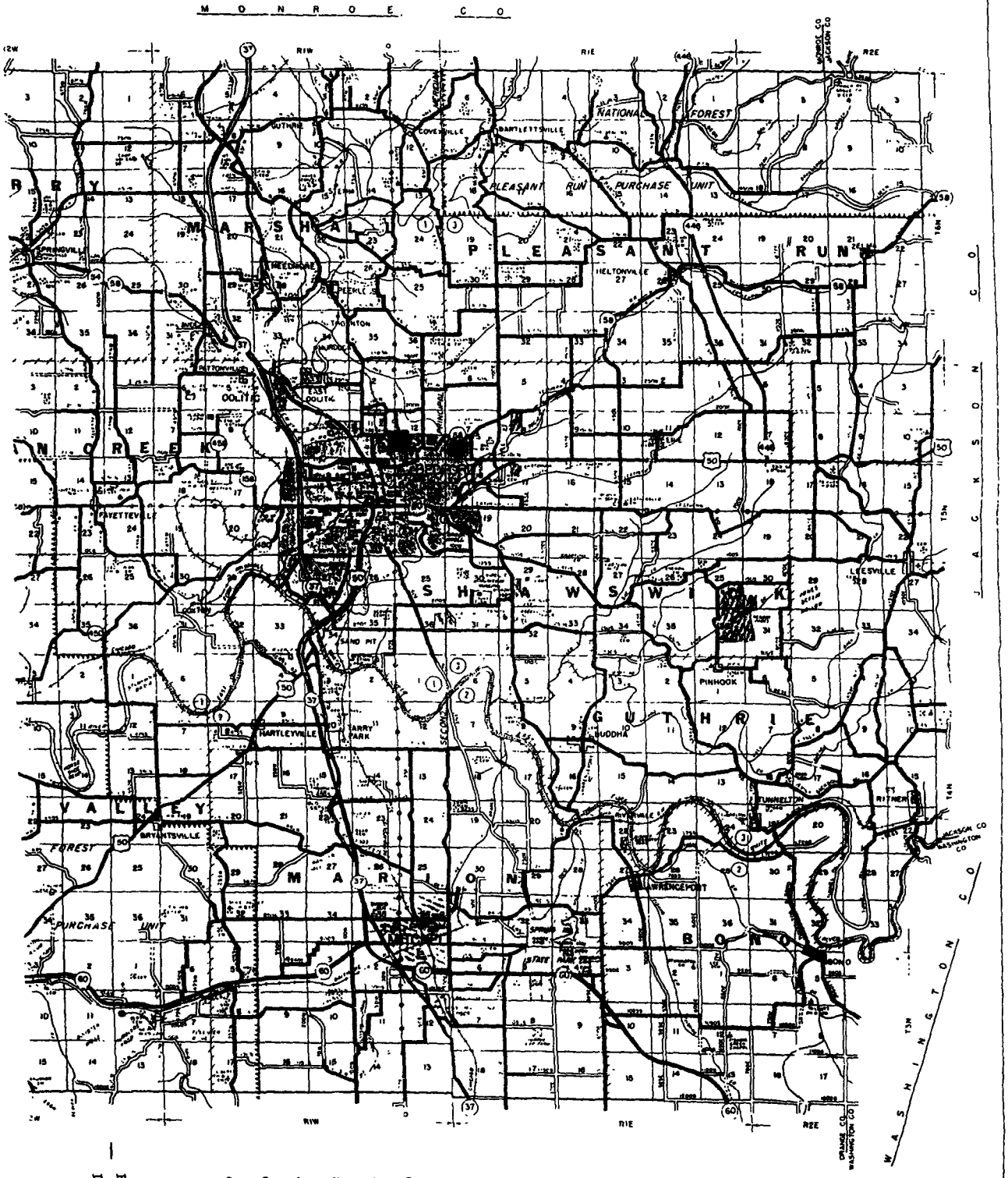
In order to determine credible volumetric units for bidding estimates, an engineering study was performed by CWM-ENRAC. Under the direction of W. J. Seno, C.P.G., (CWM-ENRAC), outside resources were utilized to generate the necessary data. Bateman Engineering, Seymour, Indiana and Alt. & Witzig Engineering, Indianapolis, Indiana provided surveying and soil boring data. All data collected was assembled at CWM-ENRAC, Oak Brook, Illinois for introduction into the Computer Aided Design System (CAD) for cut and fill estimates, see Appendix 2.

On 3/10/87 an ENRAC sampling team consisting of Jim Darin, Kevin Staton and Jim McInytre sampled the North Lagoon from randomly selected points in the sludge and fill areas of the lagoon. Four sludge samples were taken from the actual pond area. These samples were identified as "A", "B", "C", and "D".

Five sample points were located on the fill area and one sampling point was located on the south slope of the pond wall. The fill samples were identified as "E", "F", "G", "H", "M" and "O". Sample points "M" and "P" were not sampled but identified for use in surveying and boring operations to be performed later.

Drilling and Surveying

On 3/30/87 representatives from Bateman and Alt & Witzig conducted a survey. One objective of the survey was to define exact surface elevations of the



ROAD MAP OF LAWRENCE COUNTY, INDIANA

ADOPTED

SHOWING
ROAD INTERSECTIONS AND THEIR NUMBERS & NAMES, STATE & COUNTY ROADS
TOWNSHIPS — SECTIONS — CITIES — TOWNS —
CREEKS — RIVERS — RAILROADS — RURAL SUBDIVISIONS — STATE PROPERTY — FEDERAL PROPERTY
CHURCHES — CEMETERYS SCHOOLS — COMMISSIONER DISTRICTS — HISTORICAL POINTS

LEGEND

Figure 2
LAWRENCE COUNTY, INDIANA

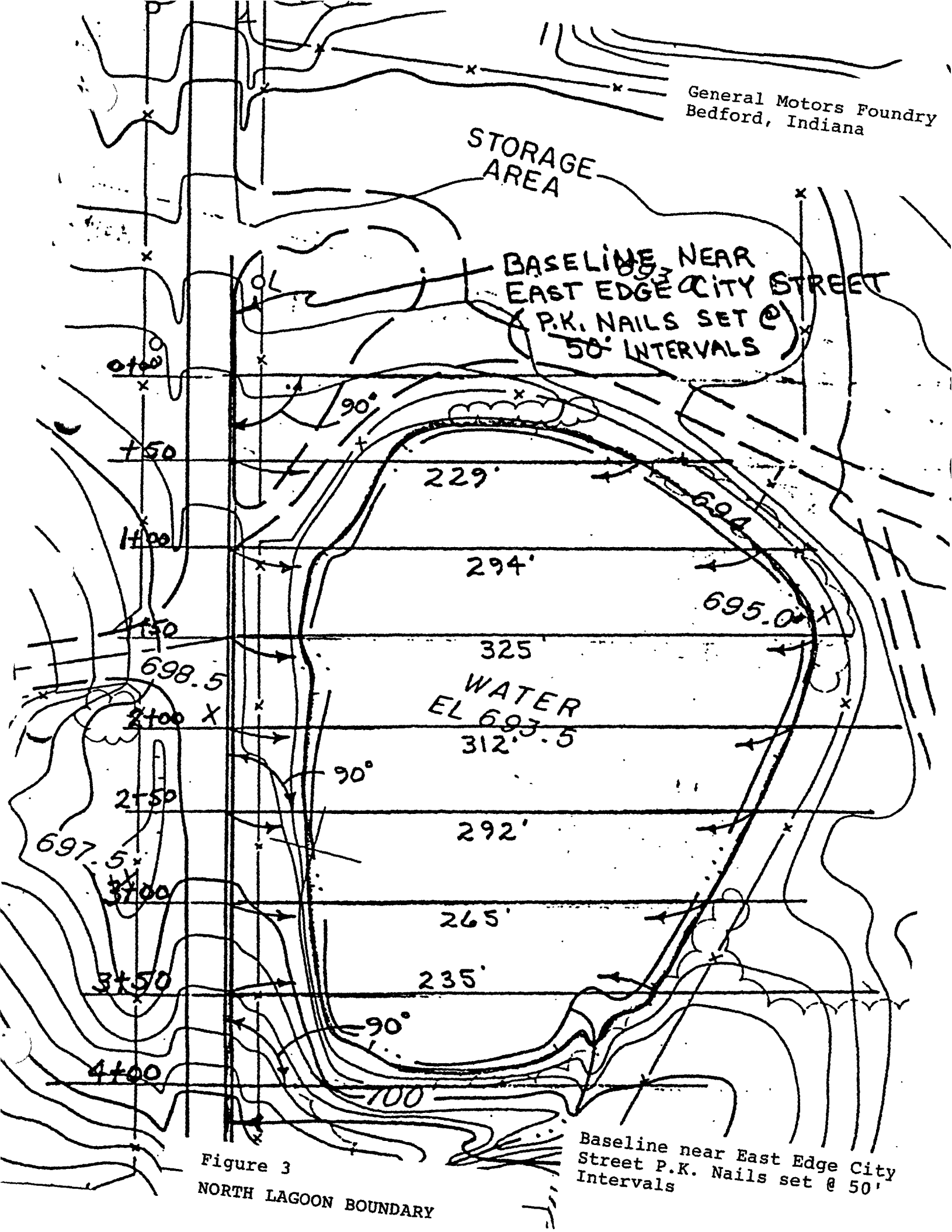


Figure 3
NORTH LAGOON BOUNDARY

Baseline near East Edge City Street P.K. Nails set @ 50' Intervals

bore hole locations. In addition to the bore hole elevations the surveyor accumulated several other elevations to assist the CAD-MOSS system in evaluation of the field data. The sampling points previously identified were set by Bateman using existing topographical drawings and benchmarks provided by Central Foundry personnel. Elevations were then established at the sampling locations. See Fig. 4, page 9 and Table 1.

Alt & Witzig set up a portable drilling rig and began boring operations to determine a lower elevation of the fill materials in the pond and to define the top of the earthen clay liner. Sample points "F" and "M" were bored and completed on 3/30. Sample points "G", "H", and "O" were bored and completed on 3/31. This drilling revealed that the earthen clay liner was encountered at different depths within the Lagoon. Samples of the material were retrieved at one foot intervals and logged by the CWM-ENRAC Certified Professional Geologist. During the drilling of the five holes it was apparent that in bore hole "G", what may have been a cement block was encountered. The hole was off-set four feet and a second attempt was made and completed. Results from previous borings performed in 1984 are also included. See Appendix 3 for the boring logs of the points.

TABLE 1. PROGRESSIVE ELEVATIONS AT BORING LOCATIONS

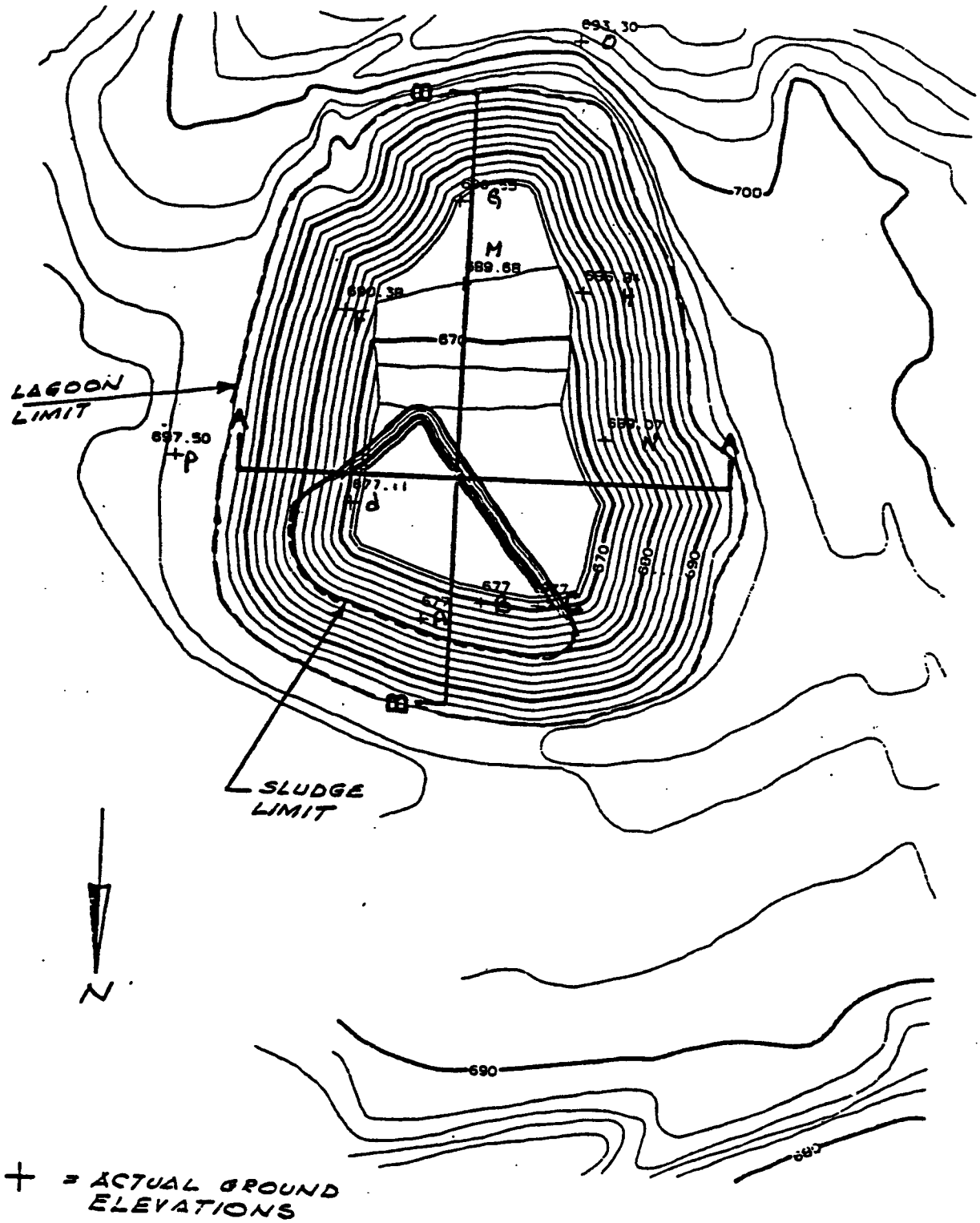
GENERAL MOTORS CORPORATION
CENTRAL FOUNDRY DIVISION
BEDFORD, INDIANA

SAMPLE POINTS	3/30/87	7/31/87	10/12/87
P	697.50	693.18	
F	690.40	687.25	678.70
M	689.70	683.88	669.50
G	690.50	686.86	673.20
O	693.30	694.27	690.90
H	685.80	681.59	670.80
N	689.10	677.14	671.70

Computer Aided Design (CAD) Mapping and Volumetric Estimates

The results of the drilling and the field surveying form the empirical basis for the volumetric estimates of soils and sludges.

The remedial topographic map was designed using CWM's in-house CAD system. Two sections were created on that map. Invert elevations (depths) were then input into the diagram in order to prepare the composite 3-dimensional model. The sectional views, elevations and supporting data are presented in Appendix 2. With this model in place, a successive end-area approximation model was used to determine the volumes of soils and sludges. One of the difficulties in estimating volumes is the varying contour of the lagoon bottom and the



PLAN VIEW

GM-BEDFORD NORTH LAGOON

Figure 4

NORTH LAGOON SAMPLING POINTS

actual sludge depth. In order to determine sludge depth, we attempted to measure the sludge by physical "sticking". A maximum depth of 13 feet was measured near the Southeast corner of the sludge pond. At other locations, 10 feet of sludge was measured. The calculations for soils and sludges are shown in the Appendix. Some physical features of the lagoon were difficult to model using this approach. Side slopes of the lagoon vary significantly and "outcrops" of soil complicated the assessment.

For the purposes of this closure report only the activities associated with the excavation of the pond fill materials, contaminated clay liners, and pond sediments will be detailed as the sludges were removed under another contract.

GENERAL REMEDIAL ACTIVITIES

After final approval of the closure plan submitted by GMCFD, ENRAC began mobilization on July 6, 1987. The site layout is shown in figure 5, page 11.

In order to complete the project under the terms of the closure agreement, a work plan was developed to minimize material handling, assure a smooth flow of waste transport vehicles through the site and provide for a timely start to the pond sampling program to determine further remediation requirements.

To complete mobilization approximately 10 days onsite were required. During this time the following equipment was mobilized:

CAT 215 Excavator	CAT 977 Loader
KOM WA400 Loader	CAT D-8 Dozer
Office Trailer	Decon Trailer
Emer. Resp. Trailer	40 Kw Generator
Personnel Vehicles (6)	Water Truck
Scaffolding	Masstron Weigh Scale (MP 750)

As the support facilities were being set-up, work was begun on the truck loading area. This entailed construction of a post-tensioned concrete loading pad for the weigh scales. This post-tensioning is the same technique as applied to nuclear containment structures. The tensioning cables through the pad allow the structure to flex when loaded to eliminate the development of cracks or fissures in the concrete. This in turn eliminates the possibility of contaminant migration through the loading pad. Once these pads were formed the approach ramp to the loading pad was constructed of shot rock and unwashed Grade No. 53 crushed limestone. The shot rock was used as a base course to provide a wide bridge of support for the smaller No. 53's which were used to bind the road surface together. A total of 746 tons of both grades were used for the roadwork.

The next phase involved the construction of the loading ramp where the contaminated material was staged for eventual loading, transport and disposal. Timbers were used to construct a retaining wall 5' in height and about 120' in length. This retaining wall enabled the operators to see inside the bed of the dump trailers thereby providing greater loading accuracy. Concurrent with this activity two large mounds of material abutting the loading area were cut back to facilitate efficient loading operation.

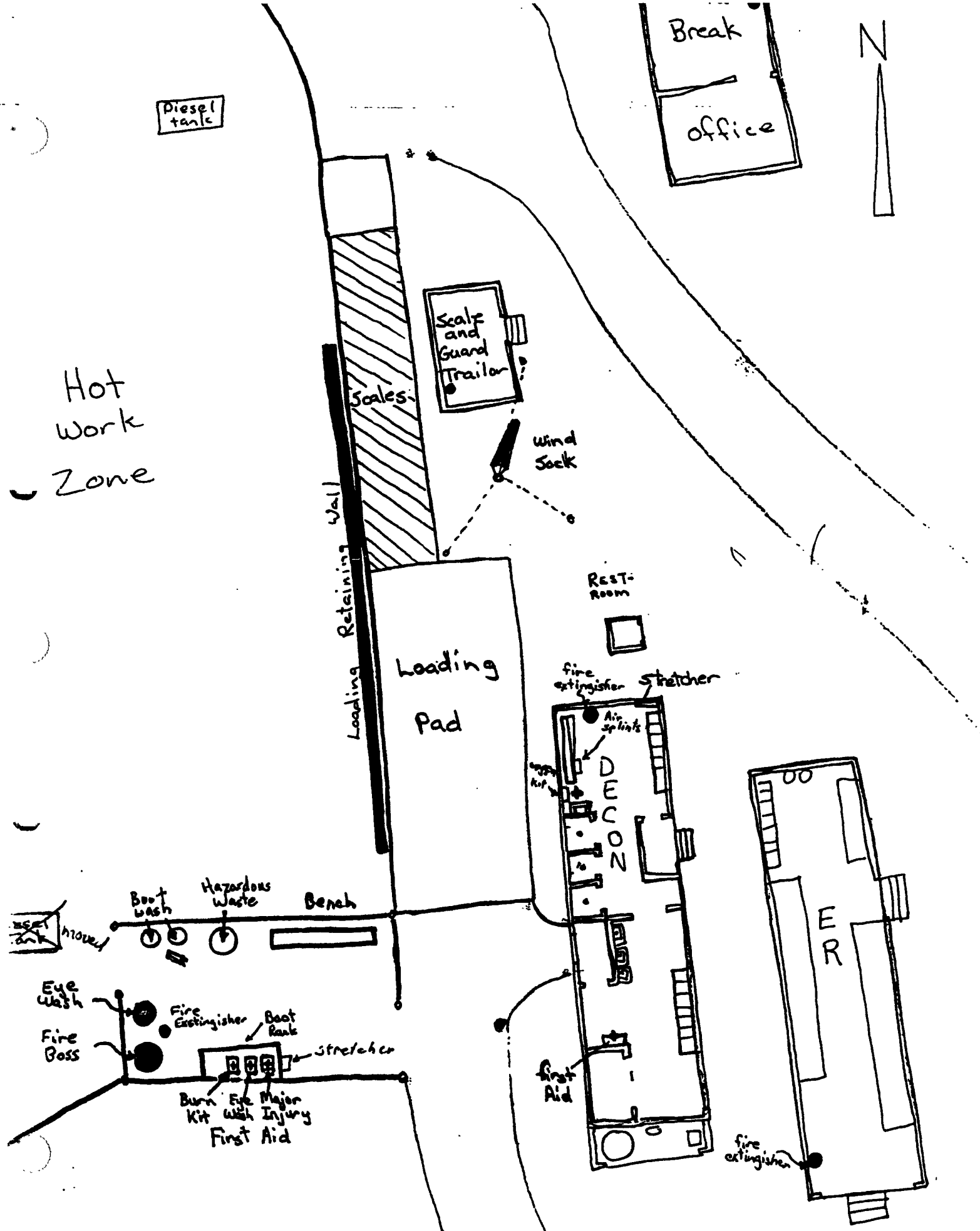


FIGURE 5. SITE OPERATIONAL AREAS

Site Work

The D-8 dozer was used to begin movement of the fill material placed in the pond. With the goal of providing areas to sample to determine further remediation needs, the material was moved from the north end of the "peninsula" in the pond to the loading area. All material movement was from the northwest corner of the pond to the southeast corner for staging and removal. During this movement a number of large (8-10 ton) to medium sized (2-4 ton) limestone rocks were uncovered. All such rock was moved to the south bank of the pond.

On 7/22/87 a Komatsu D-53P wide track dozer was mobilized in an effort to begin pushing in the borders of the sludge remaining in the northeast corner of the pond. This expedited the sludge dewatering operations being performed by IFAD concurrent with ENRAC's excavation activities.

Material handling required a larger effort than anticipated. The greater effort was attributed to two significant factors. First, the large amount of rock buried with the material required excessive machine handling. In some instances two machines were required to move a single rock. The second factor contributing to delays was the change in the nature of the material being moved.

Initially the material consisted of a mixture of local soils and clays covered by an uncultivated vegetative growth. As this overburden layer was removed a more sand-like material was encountered. This material had a greater moisture content than its cover. Because of the entrapment of water within the sand zone and the depth of the material, wide tracked equipment was needed to efficiently operate.

Between 7/22 - 8/11 additional wide-tracked equipment was mobilized to the site as availability permitted. The following equipment was involved:

Kom D-53P Dozer	Case 1150C Dozer
Kom P220 Excavator	Cat D-5 Dozer

Through the use of these smaller dozers and the excavator, site work was able to progress as projected. Material movement followed the same NW to SE direction. The additional equipment enabled work in other areas in the pond concurrent with the work in the fill material peninsula. The west wall from the NW corner to the SW corner was cleared of any overburden and visual contamination. This material was then moved to the staging/loading area for shipment.

On 7/31/87 Bateman engineering was recalled to the site to provide progress elevations. Using the same bench mark new elevations were established at each boring location, see Table 1, page 8. Also on this date the eastern portion of the original pond was established using a topographical map supplied by GM. See Figure 3, page 7. The eastern edge of Jackson Street was used as a Base Line. The center line consisted of an existing drive West of Jackson Street near the center of the pond. It was used to establish Station 1 + 50. The Base Line was established at 50 foot intervals using PK nails from Station 0 + 00 to Station 4 + 00. This was done so that the Base

Line could be kept for future use in laying the sampling grid. Using electronic distance measuring equipment, from Station 1 + 00 through Station 3 + 50 a 90° angle was turned and field measurements taken across the pond to determine the eastern edge.

On 8/4/87 the sludge pond area controlled by IFAD was completed and released to ENRAC. At this time the pond bottom and sidewalls were included in the excavation activities proceeding in the fill area, West and North walls of the pond.

On 8/17/87 preparations for sampling began. See the Sampling Plan section for a detailed discussion of sampling activities. While excavation was nearing completion on the North and West walls an apparent "vein" of contaminated material was uncovered. This west vein was approximately 20 feet in height and 120 feet in width and 5 feet in depth. It was located in the lower quarter of the wall. The vein in the North wall was confined to the northeast corner with dimensions of 20 feet width, 48 feet in height and 25 feet in depth. The west vein was excavated to a visually clean standard. Sampling in this area revealed only surface contaminants in three grids. The northeast vein was excavated also. Both veins were excavated to "not detected" for PCB.

Two days later on 8/19/87 core samples were obtained from grid area A-1 through A-8. Excavation continued through out the pond with the goal of preparing grids B-1, C-1, D-1, B-8, and C-8 for the next sampling round. At this point site activities consisted primarily of excavation, material handling and sampling.

During the week of 8/30/87, concurrent with excavation, the washing and demolition of large stones, steel and concrete construction debris began. The steel was cut into transportable lengths using an oxygen-acetylene cutting torch. The concrete was demolished with a Komatsu P150 backhoe fitted with a hydraulic breaker attachment. Seven working days were required to complete this task. The large stones were piled at the south end of the lagoon. Verbal authorization was obtained from USEPA(V) to decontaminate the stone with a 20% penetone solution, remove it to a clean area and backfill in place. After the washing was completed the stones were relocated to the southwest quadrant of the pond.

As excavation continued on the lagoon bottom a substantial amount of bedrock was uncovered. The bedrock was in fact part of the liner system. All material covering the bedrock was removed and the bedrock broom swept prior to securing chips of the bedrock as representative sample in any affected sample quadrants.

During the week of 9/6/87 Bateman Engineering returned to establish a grid system on property which was used as a source of backfill material. The property, located 3/4 mile west on Breckenridge road was gridded on 50 foot intervals to establish the base for later removal quantities. Demolition of the concrete and steel was completed this week.

During the week of 9/27/87 the bedrock sweeping was completed. On 9/30/87 with 94% of the excavation completed an aerial photograph of the lagoon was taken by Accu-Air Surveys, Seymour, Indiana, see Figure 6, page 15. The

remaining quadrants to be sampled(F-4-6) were completed. Bateman Engineering completed a final pond cross section. Also obtained were the elevations of all grid sample points, grid sample corners and the final elevations of the seven original boring points see Appendix 4.0. These elevations were used to obtain an estimate on the amount of backfill required. A plan drawing showing these elevations is provided as Figure 7, page 16.

During the week of 10/4/87 work was begun on the installation of the leachate collection system. Based upon an earlier visit by James Stenborg, Waste Management, Inc. Oak Brook, Illinois, the installation proceeded according to standardized landfill construction parameters. See Leachate Collection System for a more detailed discussion.

During the week of 10/11/87 all loading of PCB contaminated material was completed. Work continued on the leachate collection piping system. Decontamination of equipment and demobilization of both men and equipment was continued as the level of activity decreased.

During the week of 10/18/87 the piping and sump of the leachate system were installed. At this time backfilling was begun by Hancock Excavators of Mitchell, In. Most CWM-ENRAC personnel and equipment were demobilized. From this point on all collected leachate was pumped from the sump to Central Foundry Wastewater treatment plant. A field office and ENRAC supervisor remained on-site to supervise subcontractors completing the non-hazardous portions of the closure project.

The terms of the final order required that all fill be clean (less than 2 ppm PCB's). After placement of the general fill, six (6) inches of clean (less than 2 ppm PCB's) topsoil was placed in preparation for seeding of the groundcover. The backfill material placed in the lagoon was analyzed by Alt & Witzig for % clay content, and permeability. Test results (See Appendix 4.1) indicated two grades of clay were available for backfilling. The majority of the general fill placed contained not less than 30% clay. The final one foot of clay contained not less than 60% clay.

All layers were compacted using a vibrating roller. A final compaction of 90-95% was obtained.

During the week of 4/18/88 the spreading of topsoil and final contour grading was completed. Craig Landscaping Bedford, Indiana performed seeding, fertilizing and mulching to provide the groundcover. Craig used a seed mixture of 40% fescue, 30% Annual Rye, and 30% Pre-Annual Rye at a rate of 100 lbs seed/acre. Tri-12 (NPK) fertilizer was applied at a rate of 500 lbs/acre. Seeding and fertilization were applied by a Finn Hydroseeder. An erosion control cover of straw was applied as a final cover with a mulch blower at a rate of 2 tons/acre.

FIGURE 6. AERIAL PHOTOGRAPH OF NORTH LAGOON 9/30/82

Figure 7
NORTH LAGOON FINAL ELEVATIONS

SAMPLING PLAN

SAMPLING PLAN

Introduction

The purpose of the sampling program was to minimize waste sent to the disposal site and to determine if all contamination was removed.

A grid system was set up in the lagoon to identify sampling locations. Each quadrant of the grid was 50 foot by 50 foot square and each sample point was located approximately in the center of the square. A 50 foot chain was used to find the corners of each quadrants and a stake was driven into the soil at each corner. The quadrants were named with a letter/number code to identify its location. Letters, A to F, were used from West to East and numbers, 1 to 8, were used from North to South, see Figure 8, page 19.

Sampling Methodology

Samples were taken of the clay liner after all soil, sludge and visible contamination was excavated. The liner was reported to be four feet thick but GM and CWM agreed that approximately 1 foot of liner was removed during the initial excavation. Split spoon sampling tubes were pushed into the liner, to a depth of 3 feet, at the center of each quadrant. The cores obtained were divided into individual samples from the 2, 3 and 4 foot levels, assigned an unique sample number, and placed in a new sample jar. If the spoon encountered bedrock, the core was stopped there. If there was no clay over bedrock, the bedrock was chipped and placed in a new sample jar.

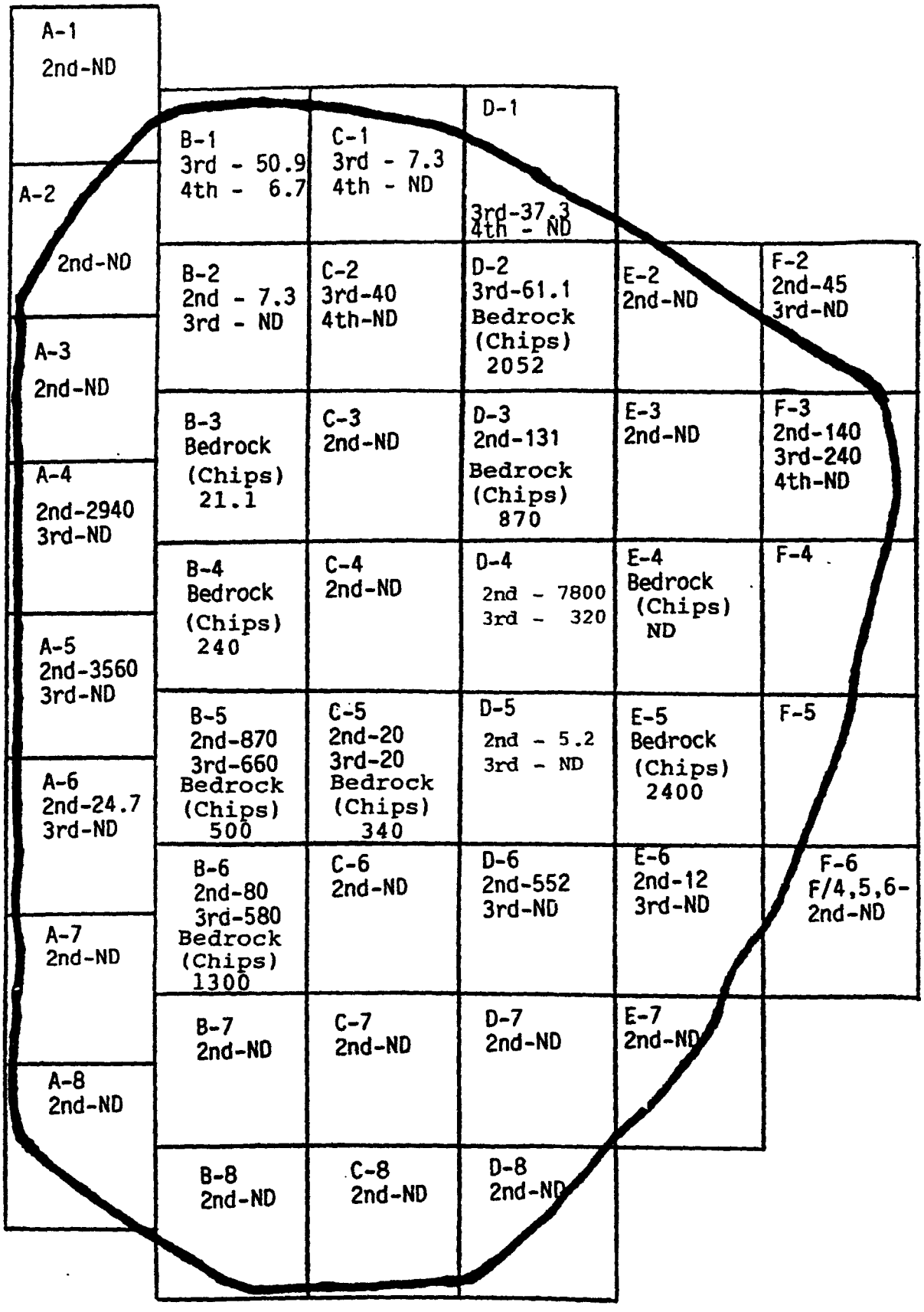
The split spoon sample tubes were cleaned prior to and after each use. The cleaning procedure was: an initial cleaning in penetone/water to remove all visible dirt, a second cleaning in penetone/water, and finally a water rinse. The penetone/water solution concentration was 1:5. Wipe samples were taken to determine if the cleaning procedure was effective. Negative results indicated effective decon procedures.

A chain of custody and a certificate of representative sample was filled out for each sample.

The samples were submitted to one of three labs for analysis. The labs were: EMS Laboratories Inc., ATEC Associates Inc. of Indianapolis, Indiana and also CWM Technical Center of Riverdale, Illinois. Analysis was for PCB per method SW846-8080 see Appendix 5. Only the centers of the core samples were analyzed. The second foot layer was analyzed first. If the PCB concentrations was greater than 3ppm, the successive layers below it were analyzed until concentrations of less than 3 ppm were found in a layer or all three levels were analyzed.

Several third and fourth foot samples were analyzed. For an overview of analytical results see Figure 8, page 19. Quadrants F-4, 5, and 6 were combined due to the small amount of sampling area in each quadrant.

All sampling documentation is provided for review in the "Analytical Report for The Sampling Program at General Motors/Central Foundry Bedford, Indiana October 1987". A summarized table of analytical results by grid and level is provided in Table 2.



All results are in ppm.
ND=Not Detected or <3ppm

Figure 8 NORTH LAGOON
SAMPLING GRIDS AND RESULTS

TABLE 2. SUMMARY OF ANALYTICAL RESULTS BY GRID AND LEVEL

QUADRANT	DATE SAMPLED	DEPTH LEVEL (FT)	RESULT/PPM
A-1	8/17	2	N/D
		3	N/D
A-2	8/17	2	N/D
		3	N/D
A-3	8/17	2	N/D
		3	N/D
A-4	8/17	2	2940
		3	N/D
A-5	8/17	2	3560
		3	N/D
A-6	8/17	2	24.7
		3	N/D
A-7	8/17	2	N/D
		3	N/D
A-8	8/17	2	N/D
		3	N/D
B-1	8/21	3	50.9
		4	6.7
C-1	8/21	3	7.3
		4	N/D
E-2	8/21	2	3
		3	N/D
D-1	8/21	3	37.3
		4	N/D
F-2	8/21	2	45.0
		3	N/D
B-2	8/24	2	7.3
		3	N/D
C-2	8/24	3	40
		4	N/D
D-2	8/24	3	59.1
		Bedrock	2052
B-7	8/24	2	N/D

QUADRANT	DATE SAMPLED	DEPTH LEVEL (FT)	RESULT/PPM
B-3	8/24	Bedrock	21.1
B-4	8/24	Bedrock	240
C-3	8/26	2	ND
D-3	8/26	2 Bedrock	130 870
E-3	8/26	2	ND
F-3	8/26	2 3 4	140 240 ND
B-7	8/26	2	ND
C-8	8/26	2	ND
B-6	9/01	2 3 Bedrock	80 580 1300
B-5	9/01	2 3 Bedrock	870 660 500
C-7	9/01	2	ND
C-6	9/01	2	ND
C-5	9/01	3 Bedrock	20 340
C-4	9/01	2	ND
D-8	9/16	2	ND
D-7	9/16	2	ND
D-5	9/16	2 3	5.2 ND
D-4	9/16	2 3	7800 320
E-4	9/16	Bedrock	ND
E-5	9/16	Bedrock	2400

QUADRANT	DATE SAMPLED	DEPTH LEVEL (FT)	RESULT/PPM
D-6	9/18	2	552
		3	ND
E-7	9/18	2	ND
E-6	9/23	2	12
		3	ND
F-4/5/6	10/3	2	ND

TRANSPORTATION AND DISPOSAL

TRANSPORTATION AND DISPOSAL

Transportation and disposal arrangements were provided and managed by CWM-ENRAC. Approximately 210 semi-dump trailers were dedicated to the project. To assure a rapid turnaround arrangements were made with the Emelle disposal facility to avoid delays and minimize truck congestion at the disposal site.

As shown in Table 3 shipments ranged from 2 to 74 trucks per day. Tonnages varied accordingly. A total of 2,433 loads were shipped during a 72-day period ending 10/16/87.

Transportation

Jack Gray Transport, Gary, Indiana was utilized as the sole transporter, see Appendix 6.0 for applicable permits. In addition to hauling Gray provided complete support services for its vehicles, (i.e. on-site movement, daily scheduling, lining and tarping).

A primary vehicle route was developed to insure minimal disruption to the local community and assure a readily traceable route from generator to disposer should emergency response be required. All traffic to and from the site was routed from Route 37 to North Jackson St. Once a vehicle was ready for departure the route from Bedford to the disposal site at Emelle, Alabama was,

1. Rt. 37 - South to Rt. 60
2. Rt. 60 - East to I-65
3. I-65 - South to I-20 & I-59
4. I-20 & I-59 - West to Rt. 28
5. Rt. 28 - West To Rt. 17
6. Rt. 17 - North to disposal facility.

Loading and Dispatch

Once a vehicle arrived on-site it proceeded to a lining station where a 6-mil polyethylene liner was placed in the dump trailer. The vehicle then entered the loading queue. Adjacent to the decon pad was a set of Toledo Masstron MP750 weighing scales. The loaded vehicle was pulled onto the scales 1 axle set at a time to obtain a gross load weight. The empty weight was then subtracted from the gross weight to obtain a net load weight which was then entered into the hazardous waste manifest. Using pre-determined empty weights, all vehicles were pre-loaded while on a bermed concrete decontamination pad.

Upon completion of the required manifest documents the loaded vehicle entered the tarping area where the load was secured. At this time the vehicle was dispatched to the disposal facility.

During the site preparation stage, CWM-ENRAC designed and built a clean road system. When trucks were dispatched to the site and cleared for entry, they proceeded to the loading area on the clean road and remained in a clean area while being loaded. Because the trucks remained on uncontaminated surfaces during the entire sequence, decontamination was minimized.

SUMMARY OF TRANSPORTATION AND DISPOSAL ACTIVITIES
DAILY TRANSPORTATION AND DISPOSAL VOLUMES

TABLE No. 3

DATE	# LOADS	TONS	TONS/TRCK	TONS TO DATE	TOTAL LOADS
7/17/87	42	968.28	23.05	968.28	42
7/18/87	51	1138.88	22.33	2107.16	93
7/20/87	36	821.97	22.83	2929.13	129
7/21/87	41	929.53	22.67	3858.66	170
7/22/87	45	1028.05	22.85	4886.71	215
7/23/87	25	570.93	22.84	5457.64	240
7/24/87	28	630.98	22.54	6088.62	268
7/25/87	24	550.35	22.93	6638.97	292
7/27/87	44	995.49	22.62	7634.46	336
7/28/87	54	1219.22	22.58	8853.68	390
7/29/87	51	1149.21	22.53	10002.89	441
7/30/87	53	1198.26	22.61	11201.15	494
7/31/87	55	1237.44	22.50	12438.59	549
8/1/87	48	1071.84	22.33	13510.43	597
8/3/87	67	1520.61	22.70	15031.04	664
8/4/85	61	1379.43	22.61	16410.47	725
8/5/87	70	1582.28	22.60	17992.75	795
8/6/87	60	1357.46	22.62	19350.21	855
8/7/87	67	1532.1	22.87	20882.31	922
8/8/87	54	1222.8	22.64	22105.11	976
8/10/87	70	1587.7	22.68	23692.81	1046
8/11/87	67	1519.36	22.68	25212.17	1113
8/12/87	74	1664.58	22.49	26876.75	1187
8/13/87	63	1445.23	22.94	28321.98	1250
8/14/87	71	1628.5	22.94	29950.48	1321
8/15/87	65	1492.37	22.96	31442.85	1386
8/17/87	59	1340.67	22.72	32783.52	1445
8/18/87	53	1217.3	22.97	34000.82	1498
8/19/87	40	889.09	22.23	34889.91	1538
8/20/87	46	1057.19	22.98	35947.1	1584
8/21/87	37	844.44	22.82	36791.54	1621
8/22/87	2	44.24	22.12	36835.78	1623
8/24/87	30	690.6	23.02	37526.38	1653
8/25/87	28	637.7	22.78	38164.08	1681
8/26/87	28	646.87	23.10	38810.95	1709
8/27/87	28	644.16	23.01	39455.11	1737
8/28/87	29	666.34	22.98	40121.45	1766
8/29/87	19	436.9	22.99	40558.35	1785
8/31/87	2	46.16	23.08	40604.51	1787
9/1/87	27	626.15	23.19	41230.66	1814
9/2/87	37	840.5	22.72	42071.16	1851
9/3/87	25	577.29	23.09	42648.45	1876
9/4/87	0	0	ERR	42648.45	1876
9/8/87	0	0	ERR	42648.45	1876
9/9/87	28	637.53	22.77	43285.98	1904
9/10/87	32	732.71	22.90	44018.69	1936
9/11/87	20	466.93	23.35	44485.62	1956
9/12/87	0	0	ERR	44485.62	1956
9/14/87	30	695.66	23.19	45181.28	1986
9/15/87	30	686.52	22.88	45867.8	2016
9/16/87	32	743.26	23.23	46611.06	2048
9/17/87	25	575.35	23.01	47186.41	2073
9/18/87	30	691.9	23.06	47878.31	2103
9/19/87	24	548.58	22.86	48426.89	2127
9/21/87	6	133.26	22.21	48560.15	2133
9/22/87	29	670.25	23.11	49230.4	2162
9/23/87	23	531.53	23.11	49761.93	2185
9/24/87	24	553.24	23.05	50315.17	2209
9/25/87	4	89.79	22.45	50404.96	2213
9/26/87	0	0	ERR	50404.96	2213
9/28/87	28	645.59	23.06	51050.55	2241
9/29/87	20	454.89	22.74	51505.44	2261
9/30/87	26	586.82	22.57	52092.26	2287
10/01/87	correct	-8.75	ERR	52083.51	2287
10/01/87	20	459.48	22.97	52542.99	2307
10/02/87	10	229.85	22.99	52772.84	2317
10/03/87	8	187.54	23.44	52960.38	2325
10/05/87	6	136.15	22.69	53096.53	2331
10/05/87	correct	0.58	ERR	53097.11	2331
10/06/87	8	182	22.75	53279.11	2339
10/07/87	7	159.15	22.74	53438.26	2346
10/08/87	16	374.07	23.38	53812.33	2362
10/09/87	15	340.36	22.69	54152.69	2377
10/12/87	13	291.86	22.45	54444.55	2390
10/13/87	16	365.94	22.87	54810.49	2406
10/14/87	13	292.8	22.52	55103.29	2419
10/15/87	8	183.51	22.94	55286.8	2427
10/16/87	6	139.23	23.21	55426.03	2433

Disposal

EMELLE TREATMENT FACILITY - EMELLE, ALABAMA

The Emelle facility is located in the Demopolis Chalk, a geological formation, in Sumter County, Alabama. The formation is a homogenous clay-chalk mixture approximately 700 feet thick from the surface to the first aquifer, with a permeability coefficient in the range of 10^{-7} to 10^{-8} cm/sec. Groundwater is 900 feet deep. The 350 acre operational area is secured by 6 foot chain link fence. The address of the facility is:

Chemical Waste Management, Inc.
Emelle Treatment Facility
P.O. Box 55
Emelle, Alabama 35459

The Emelle Treatment Facility is a fully permitted hazardous waste facility. The site covers approximately 2,400 acres, of which about 350 are dedicated to hazardous waste management. It is fully permitted to treat and dispose of a broad range of hazardous and PCB wastes.

The Emelle Treatment Facility holds a Hazardous Waste Permit and Air Quality Permit from the Alabama Department of Environmental Management, and is also licensed by the USEPA, permit #ALD 000622464.

The hazardous waste management facility presently consists of secure landfill cells, a complete analytical laboratory, vehicle maintenance facilities, a groundwater monitoring system, and an office complex. For further discussion of the Emelle facility site data see Appendix 6.1.

Disposal Volumes

All PCB-contaminated materials removed under the excavation phase of the project were shipped to Emelle, Alabama. Shipping tonnages ranged from 44.24 tons to 1,664.58 tons over the 72-day loading period.

No waste discrepancies were reported by the disposal site. A total weight of 55,426.03 tons was disposed. The material was disposed in Trench 21A in levels 10 through 13.

LEACHATE COLLECTION SYSTEM

Leachate Collection System

Based on the analytical results from the sampling phase, it was determined that the leachate collection system would be required. Due to the varied elevations and outcropping of bedrock, the piping system was installed as shown in the as-built drawing, Figure 9, page 29.

On October 7, 1987 installation of the leachate collection was begun. Due to the natural slope of the pond bottom, the collection system was installed with the sump and pumping system located in the bedrock at the north end of the pond. To achieve the desired slope for drainage a 4.5' diameter by 2.5' deep basin was created by chipping away bedrock. Upon completion of this task a 48" diameter pre-cast concrete culvert was set in the basin to act as the sump/riser for the collection system. The culvert houses the pump for the system as well.

The following procedure was used to install the collection system:

1. Determine existing/required slopes for proper drainage to sump;
2. Place 6" bed of No. 7 gravel for leachate piping (440 tons);
3. Install 477' of 6" Sch. 80 PVC perforated pipe;
4. Place 2.5" of No. 7 gravel over pipe system (2,146 tons);
5. Install geotextile fabric to overlap a minimum of 2.5' for bedrock and soil areas at the edge of pipe system; and
6. Begin clay backfill over the geotextile adding sections of culvert as the clay fill progressed incrementally with elevation changes. See Figure 10 and 10a, pages 30 and 31 notes for a detailed discussion of system installation requirements.

During the week of 12/28/87 final connection of the leachate collection system to the GM water treatment facility was completed. The collection system sump pump was installed, a Flygt pump Model No. CP3127. At 10 hp the pump is rated at a flow of 50 gpm at 83 feet and 1750 rpm. It was wired for 3 phase 460 volts. A 4 inch schedule 80 PVC line was connected from the pump to the manhole and then tied in to a 4 inch ductile iron discharge line to GM.

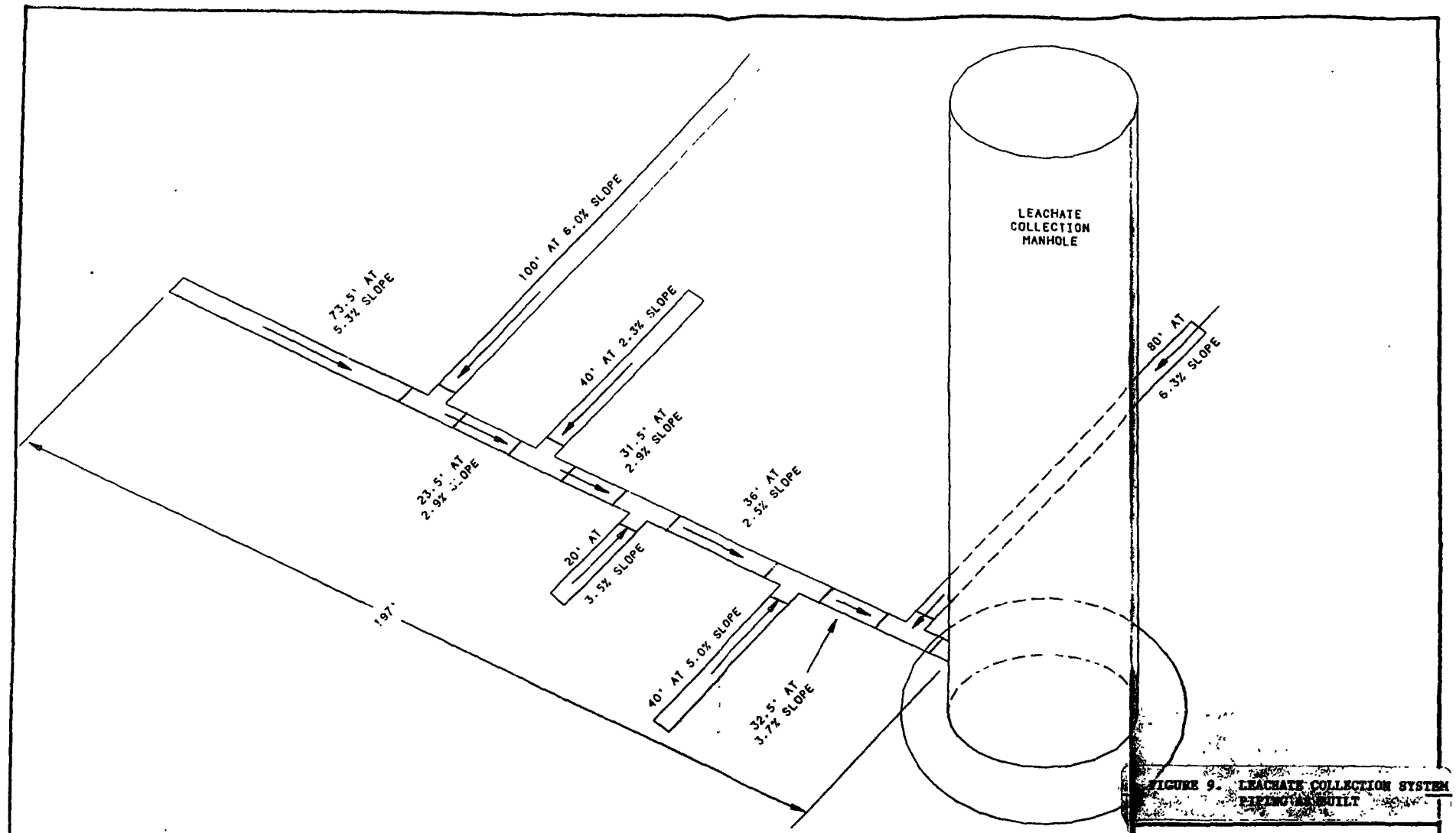
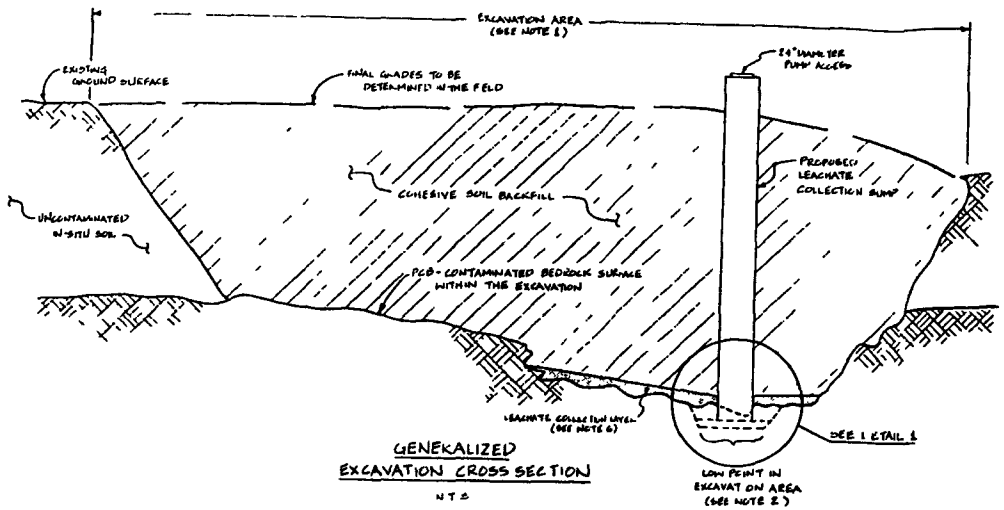


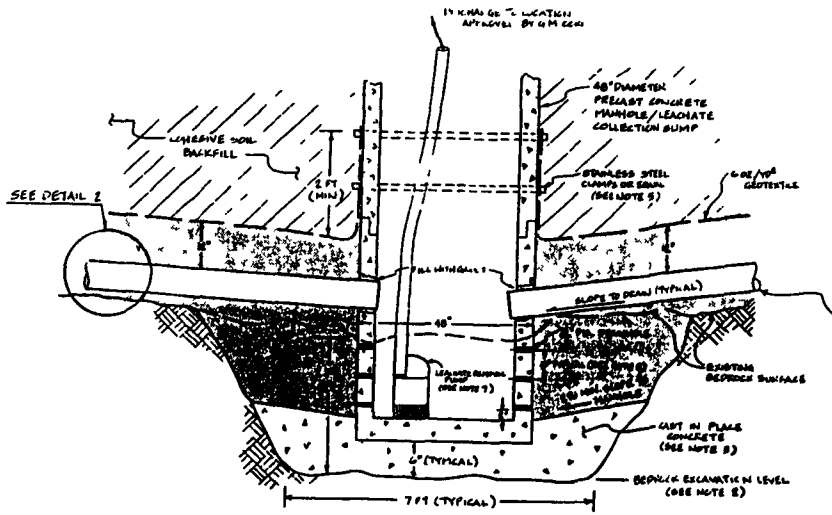
FIGURE 9. LEACHATE COLLECTION SYSTEM PIPING AS BUILT

ISOMETRIC DIAGRAM OF
LEACHATE COLLECTION SYSTEM
NORTH LAGOON REMEDIATION
GEMERAL MOTORS CORPORATION
BEDFORD, INDIANA
DES: JWS DR: PAW 1-4-88



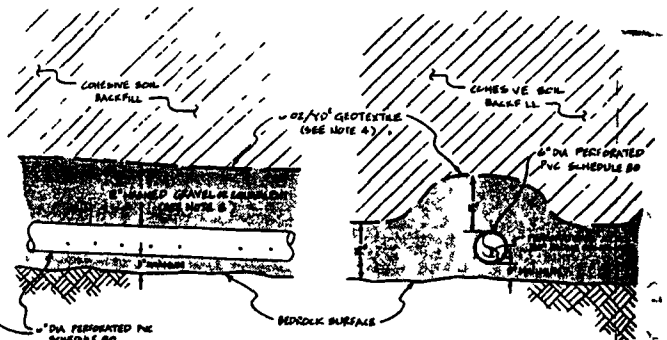
GENERALIZED
EXCAVATION CROSS SECTION

NTS



DETAIL 1
TYPICAL LEACHATE COLLECTION SUMP

NTS



DETAIL 2
TYPICAL LEACHATE COLLECTION PIPE

NTS

NOTES

(1) THE GENERALIZED CROSS SECTION WAS PREPARED BASED ON A SITE VISIT MADE ON 10 SEPTEMBER 1987. AN EXCAVATION AS GENERALLY SHOWN IN CROSS SECTION WAS OBSERVED WHICH RESULTED FROM THE NORTH LAGOON REMEDIATION.

(2) THE LEACHATE COLLECTION SUMP SHOULD BE PLACED IN THE LOW POINT OF THE EXCAVATION. THE LOW POINT WAS APPARENT IN THE NORTH END OF THE EXCAVATION BASED ON LOCALIZED PONDING OF WATER. THE SUMP AREA SHOULD BE EXCAVATED INTO BEDROCK SO THAT IT IS ABOUT TWO FEET BELOW THE GRADE ELEVATION ADJACENT TO THE SUMP AREA. THE SUMP SHOULD THEN BE CONSTRUCTED AS SHOWN ON DETAIL 1.

(3) THE BASE SECTION OF THE SUMP SHOULD BE POURED IN THE FIELD. CAST IN PLACE CONCRETE. THE CONCRETE SHOULD HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI. THE CONCRETE SHOULD BE ALLOWED TO CURE FOR AT LEAST THREE DAYS PRIOR TO PLACING GRAVEL BACKFILL AND AT LEAST SEVEN DAYS PRIOR TO PLACING ADDITIONAL MANHOLE SECTIONS ON THE BASE SECTION.

(4) A GEOTEXTILE SHOULD BE PLACED BETWEEN THE GRAVEL LAYER AND THE COHESIVE SOIL BACKFILL AS SHOWN. THE GEOTEXTILE SHOULD BE A 6 OZ/YD² OR HEAVIER NON WOVEN NEEDLE PUNCHED FABRIC SUCH AS TREVIRA SPUNBOND 1120 OR EQUIVALENT. ADJACENT GEOTEXTILE PANELS SHOULD BE OVERLAPPED BY AT LEAST 6 INCHES. ALL SEAMS SHOULD BE JOINED BY SEWING OR HEAT BONDING THE PANELS TOGETHER AT THEIR EDGES AND ENDS.

(5) THE GEOTEXTILE ADJOINING THE PRECAST CONCRETE MANHOLE SHOULD BE HELD SECURELY TO THE MANHOLE WITH STAINLESS STEEL CLAMPS DURING CONSTRUCTION OF THE COHESIVE SOIL BACKFILL. A MINIMUM OF TWO CLAMPS SHOULD BE INSTALLED WHICH PROVIDE CONTINUOUS CONTACT OF THE GEOTEXTILE WITH THE MANHOLE.

(6) A CLEAN WASHED GRAVEL OR EQUIVALENT SHOULD BE USED AS THE LEACHATE COLLECTION LAYER. THE LEACHATE COLLECTION LAYER SHOULD BE PLACED IN AREAS WHERE SEEPAGE WATER IS OBSERVED TO BE FLOWING OR PONDED; AROUND THE LEACHATE COLLECTION PIPES AND SUMP; AND AS REQUIRED BY FIELD CONDITIONS. A MINIMUM OF 12 INCHES OF GRAVEL COVER SHOULD BE PLACED OVER THE LEACHATE COLLECTION PIPES. THE SURFACE OF THE LEACHATE COLLECTION LAYER SHOULD BE COVERED WITH A GEOTEXTILE AS DESCRIBED IN NOTE 4 ABOVE.

(7) BASED ON VISUAL OBSERVATIONS MADE ON 10 SEPTEMBER 1987 THE LEACHATE REMOVAL PUMP SHOULD BE CAPABLE OF PUMPING AT A RATE OF ABOUT 5 TO 10 GPM. THE HEIGHT OF LIFT REQUIRED OF THE PUMP AND A MORE ACCURATE MEASUREMENT OF PUMPING RATE REQUIREMENTS SHOULD BE DETERMINED IN THE FIELD.

(8) THE LEACHATE COLLECTION MANHOLE SHOULD BE A 48 INCH DIAMETER PRECAST CONCRETE MANHOLE. A 36 INCH DIAMETER MANHOLE IS ALSO ACCEPTABLE DEPENDING ON AVAILABILITY OF MATERIALS. DRAIN HOLES SHOULD BE DRILLED IN THE BASE SECTION OF THE SUMP BELOW THE PIPE INLET TO ALLOW INFLOW BELOW THE LEACHATE COLLECTION PIPE AS SHOWN ON DETAIL 1. THE DRAIN HOLES SHOULD BE ABOUT 1/2 INCH DIAMETER OR SMALLER THAN THE 10th SIZE (D_{10}) OF THE WASHED GRAVEL. THE DRAIN HOLE SPACING AROUND THE PERIMETER OF THE BASE SECTION OF THE MANHOLE SHOULD BE ABOUT 12 INCHES.

(9) THE LEACHATE COLLECTION PIPE NETWORK SHOULD CONSIST OF PRIMARY AND SECONDARY PIPES. THE PRIMARY AND SECONDARY LEACHATE COLLECTION PIPES SHOULD BE 6 INCH DIAMETER, SCHEDULE 80 PERFORATED PVC PIPE. THE PRIMARY PIPES SHOULD DRAIN INTO THE MANHOLE AND EXTEND ACROSS THE BASE OF THE EXCAVATION AT PLAN LOCATIONS DETERMINED IN THE FIELD. THE SECONDARY PIPE SHOULD DRAIN INTO AND EXTEND AWAY FROM THE PRIMARY PIPE AT 20 FOOT INTERVALS IN ALL AREAS WHERE GRAVEL IS PLACED. THE PERFORATIONS ON THE LEACHATE COLLECTION PIPES SHOULD FACE DOWNWARD EXCEPT WITHIN 10 FEET OF THE MANHOLE. PRIMARY LEACHATE COLLECTION PIPES WITHIN 10 FEET OF THE MANHOLE SHOULD FACE UPWARD TO PROMOTE DRAINAGE INTO THE MANHOLE THROUGH THE PIPE RATHER THAN THE DRAIN HOLES BELOW THE LEACHATE COLLECTION PIPE INLETS.

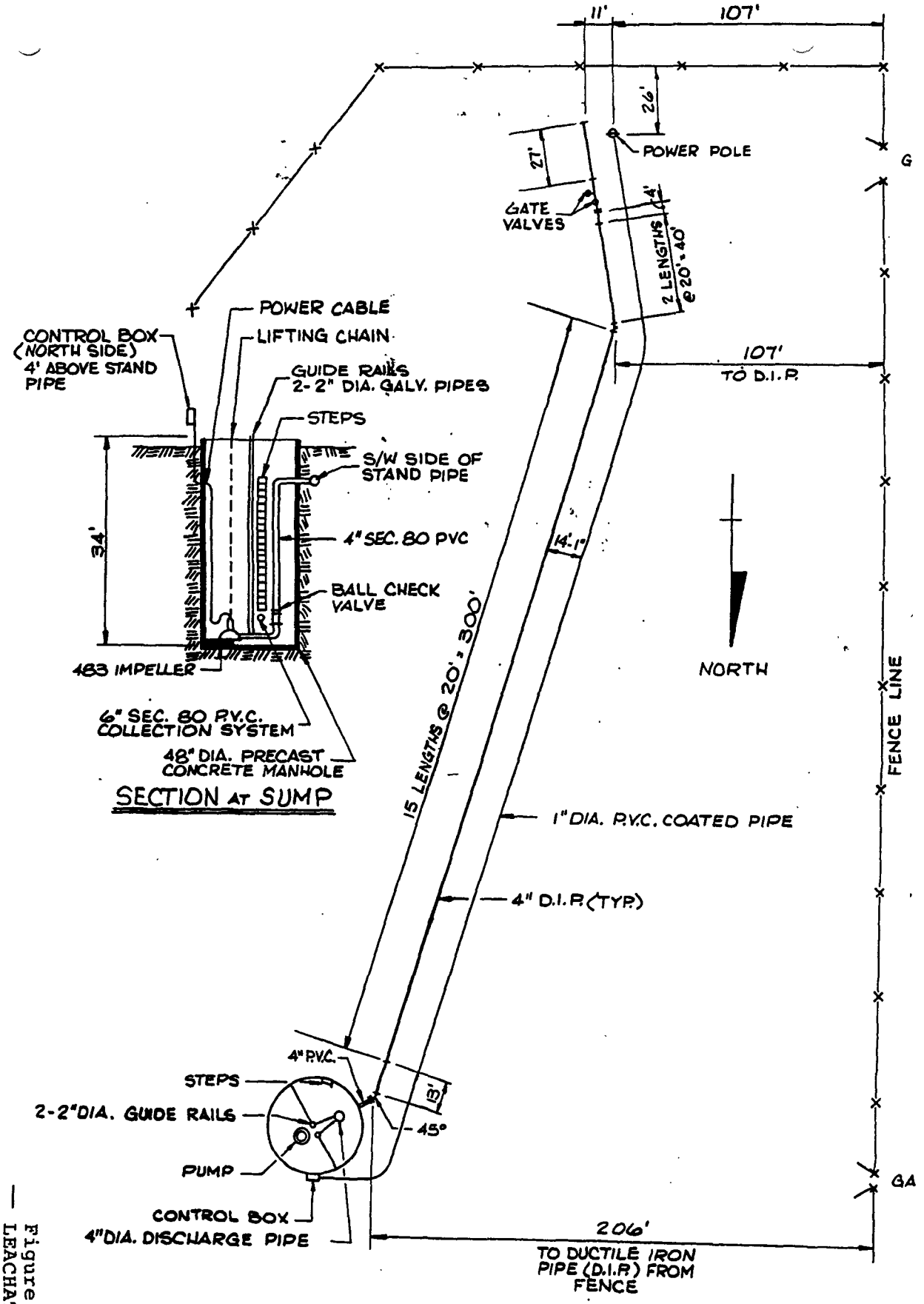
FIGURE 10. LEACHATE COLLECTIONS SYSTEM DESIGN SPECIFICATIONS

D	9-1-87	FOR FINAL REVIEW	JPD	JNS
A	4-87	FOR ENERAC REVIEW	JPD	JNS

SCALE: NTS
PROJECT: NORTH LAGOON REMEDIATION
ARMAGH TOWNSHIP, CAMBRIA COUNTY, PENNSYLVANIA
DESIGNED JNS
DRAWN JPD
CHECKED
APPROVED JNS
SHEET TITLE: LEACHATE COLLECTION SYSTEM SECTION AND DETAILS

Waste Management, Inc.
Oak Brook, Illinois 60521

SHEET 1 OF 1
DRAWING NO. GM-1



PLAN VIEW

LEACHATE DISCHARGE PIPING SYSTEM

GM - NORTH LAGOON REMEDIATION

BEDFORD, INDIANA

Figure 10A — LEACHATE DISCHARGE PIPI SYSTEM

APPENDIX 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

IN RE:	)	
	)	
GENERAL MOTORS CORPORATION CENTRAL FOUNDRY DIVISION BEDFORD, INDIANA	)	TSCA-V-C- TSCA-V-C- 138-87
	)	CONSENT AGREEMENT AND FINAL ORDER
	)	
Respondent.	)	

JUN 29 1987
REGIONAL HEARING CLERK
U.S. ENVIRONMENTAL
PROTECTION AGENCY

CONSENT AGREEMENT

1. This civil administrative proceeding for the assessment of a penalty was initiated pursuant to Section 16(a) of the Toxic Substances Control Act (TSCA), 15 U.S.C. § 2615.

2. A Complaint and Notice of Opportunity for Hearing was filed by Complainant on June 29, 1987 charging that Respondent violated Section 15 of TSCA, 15 U.S.C. § 2614 by failure to comply with federal regulations regarding the storage and disposal of polychlorinated biphenyls (PCBs), 40 C.F.R. Part 761, promulgated under Section 6 of TSCA.

3. Count I of the Complaint alleged a violation of Section 15 of TSCA, 15 U.S.C. § 2614 and 40 C.F.R. § 761.65(b) in that an open, unlined lagoon located on Respondent's property in Bedford, Indiana (hereafter referred to as "North Lagoon") containing PCBs at concentrations greater than 50 parts per million (ppm), did not meet the physical requirements set forth in the aforesaid regulation for a PCB storage area, for which Complainant sought a civil penalty of $15,000.00.

4. Count II of the Complaint alleged a violation of 15 U.S.C. § 2614 and 40 C.F.R. § 761.65(a) in that Respondent failed to remove and dispose of the PCBs which had been stored in the North Lagoon since 1980, prior to January 1, 1984, for which Complainant sought a civil penalty of $15,000.

5. Count III of the Complaint alleged a violation of 15 U.S.C. § 2614 and 40 C.F.R. § 761.60(a) in that in March 1981, Respondent drained part of the contents from the North Lagoon, which constituted an uncontrolled discharge of PCBs in concentrations greater than 50 ppm, for which Complainant sought a civil penalty of $25,000.

6. Respondent admits the jurisdictional allegations in the Complaint.

7. Respondent neither admits nor denies the factual allegations of the Complaint.

8. Respondent contends that the PCBs in the North Lagoon were placed there prior to February 17, 1978, the "grandfathered" disposal date of the TSCA regulations, or are otherwise unregulated because they resulted from influent water containing less than 50 ppm PCBs. Respondent also contends that the North Lagoon is not a PCB storage site within the meaning of 40 C.F.R. § 761.65, and that, in any event, the materials entering and leaving the North Lagoon were not PCBs within the meaning of 40 C.F.R. § 761.

9. Respondent further contends that its actions in March 1981 were in full compliance with TSCA in that backfilling the North Lagoon

was not disposal under 40 C.F.R. § 761.60 and the water drained from the North Lagoon was unregulated material (less than 50 ppm PCBs). Respondent, however, acceded to the request of state and federal agencies to suspend further action on the North Lagoon pending review.

10. Complainant does not acquiesce in the interpretation of the PCB regulations advocated by Respondent; however, Complainant has determined that settlement of this matter in accordance with the terms set forth herein is in the public interest.

NOW, THEREFORE, solely for purposes of this proceeding without trial or other litigation of the issues or any adjudication of the facts, the parties stipulate and agree as follows:

1. Respondent, General Motors Corporation, at its Central Foundry Plant, Bedford, Indiana, owns and operated a storm water retention lagoon located on the north end of the plant property off Jackson Road (the North Lagoon). The North Lagoon was built in the early 1950's and used primarily as a water reservoir and then later as a retention lagoon for storm water and noncontact cooling water.

2. As a result of construction of a new storm water retention lagoon, the Central Foundry Plant terminated the use of the North Lagoon and blocked the inlet and discharge pipe on March 9, 1981. On March 13, 1981, General Motors began to drain the water in the North Lagoon and to backfill the North Lagoon with soil. Closure operations continued until representatives of the Indiana State Board of Health (ISBH) requested that General Motors discontinue its activities until

the matter could be reviewed by ISBH and U.S. EPA Region V. Other than periodic draining of the lagoon, General Motors has not resumed closure of the North Lagoon pending the resolution of this matter.

3. Samples of the lagoon sediment taken in 1981 and 1982 revealed the presence of PCBs in the sediment in concentrations greater than 50 ppm.

4. Respondent agrees to excavate, sample, remove, transport and dispose of waste and PCB-contaminated soil from the North Lagoon pursuant to the terms of the following final Order.

5. In consideration of Respondent's agreement to expeditiously undertake and complete the removal and disposal of the PCB-contaminated wastes and soil in its North Lagoon in accordance with this Consent Agreement and Final Order, Complainant agrees to mitigate the civil penalty proposed in the Complaint to $0.00.

6. Respondent expressly waives its right to an adjudicatory hearing on the allegations of the Complaint.

7. Respondent consents to the terms and conditions of the following final Order.

For Respondent, General Motors Corporation

Dated: 6/9/87 Robert W. Herr

For Complainant, U.S. Environmental Protection Agency,

Dated: 6/24/81

WILLIAM H. SANDERS, III, P.E.
Director
Environmental Services Division
U.S. Environmental Protection
Agency, Region V
230 South Dearborn Street
Chicago, Illinois 60604

FINAL ORDER

1. Respondent shall excavate and remove all waste and contaminated soil from the North Lagoon to the level of the earthen liner of the lagoon. Beginning at the level of the earthen liner, Respondent shall excavate and remove soil from the side walls and bottom of the lagoon until samples from the remaining soil show the PCB concentration to be 3 ppm or less, or until a maximum of four feet of soil beyond the level of the earthen liner at the side walls and the bottom of the lagoon has been excavated.

2. If the PCB concentration of the remaining soil in the Lagoon is over 3 ppm after four feet of excavation beyond the earthen liner, Respondent shall install an underdrain system to cover the bottom of the excavated area to collect any future water infiltration. The collected water shall be treated at the Respondent's on-site wastewater treatment plant.

3. The excavated area shall be backfilled within eight inches of grade with clean burrow (less than 2 ppm PCBs) and the burrow capped with eight inches of clean clay soil (less than 2 ppm PCBs).

4. Respondent shall dispose of the PCB-contaminated wastes and soils removed from the North Lagoon in accordance with 40 C.F.R. § 761.60 and all other applicable state and federal laws and regulations.

5. Respondent shall undertake the actions required by Paragraphs 1 through 4 of this Order in accordance with the Work Plan which is attached hereto and which is hereby incorporated into this Order, no later than the dates set forth in the following schedule:

	SCHEDULE INCREMENTS	DATE
A.	Commence waste and contaminated soil excavation	Within 90 days of the effective date of this Final Order.
B.	Submit sample analyses demonstrating PCB concentrations in remaining soil at 3 ppm or less, or commence underdrain installation	Within six months of the effective date of this Final Order.
C.	Complete all soil excavation and underdrain installation if required	Within seven months of the effective date of this Final Order.
D.	Dispose of PCB-contaminated waste and soil in accordance with 40 C.F.R. § 761.60	Within 18 months of the effective date of this Final Order.

6. Within 15 days of the compliance date for each of the schedule increments in Paragraph 5A, B and C, Respondent shall notify Complainant in writing of its compliance or noncompliance with such schedule increment.

7. General Motors shall submit the final report called for in the Work Plan under Part II, Task 9.B, to U.S. EPA Region V within 30 days after receipt from the contractor.

8. Respondent shall perform the requirements under this Order within the time limits set forth herein, unless the performance is prevented or delayed solely by events which constitute a force majeure. A force majeure is defined as any event arising from causes not reasonably foreseeable and beyond the control of the Respondent including, but not limited to, action of a national or local government, body or court, an act of God, war, strike, riot or catastrophe, as to any of which the negligence or willful misconduct of the Respondent was not the proximate cause, and which delays or prevents performance by a date required by this Consent Order.

Respondent must notify EPA in writing within 15 working days after it becomes aware of events which it believes constitute a force majeure. Such notice shall estimate the anticipated length of delay, including necessary demobilization and remobilization, its cause, measures taken or to be taken to minimize the delay, and an estimated timetable for implementation of these measures. Respondent shall adopt reasonable measures to avoid and minimize the delay.

If Respondent demonstrates to EPA that a delay or nonperformance is caused solely by a force majeure, the time for performance of that task shall be extended for a period equal to the delay resulting from such circumstances. Such an extension does not alter the schedule for performance of any other requirement of this Consent Order unless these are also specifically altered by amendment of the Consent Order or underlying plan. In the event EPA does not accept Respondent's

demonstration of a force majeure, EPA must notify Respondent in writing within 15 working days. If agreement cannot be reached, EPA and Respondent reserve their respective rights to undertake appropriate action as provided by law.

9. All submissions and notifications required by this Order shall be sent to:

Chief
Toxic Substances Section (5SPT)
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

10. Respondent's failure to comply with the terms and conditions of this Order by the dates contained therein will render the full proposed civil penalty of $55,000 due and payable within 15 days of written demand by U.S. EPA. Payment shall be made as specified in said demand.

11. Interest shall accrue on any amounts overdue under the terms of this Consent Agreement and Final Order at the rate established by the Secretary of the Treasury pursuant to 31 U.S.C. § 3717. A late payment handling charge of $20.00 will be imposed after thirty (30) days with an additional charge of $10.00 for each subsequent 30-day period an unpaid balance remains. In addition, a six percent per annum penalty will be applied on any principal amount not paid within ninety (90) days of the date that this Consent Agreement and Final Order is signed by the Regional Administrator.

12. The effective date of this Consent Agreement and Final Order is the date of signature by the Regional Administrator.

13. The failure to comply with the terms of this Consent Agreement and Final Order will result in a referral of this matter to the United States Attorney for enforcement.

14. Nothing in this Consent Agreement and Final Order shall relieve Respondent of its duty to comply with all applicable provisions of TSCA, 15 U.S.C. § 2601, et. seq.

15. Nothing in this Consent Agreement and Final Order shall relieve Respondent from any liability under the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601, et. seq.

IT IS SO ORDERED.

Dated: 6/25/87

for VALDAS V. ADAMKUS
Regional Administrator
U.S. Environmental Protection
Agency, Region V

STATE OF INDIANA

COUNTY OF LAWRENCE

On this 9th day of June, 1987, before me personally came Robert W. Herr, to me known, who being duly sworn did depose and say that he resides in Lawrence County, that he is Plant Manager of the Corporation described in and which executed the foregoing instrument, and that he signed his name as authorized by said Corporation.

Notary Public

WORK PLAN FOR NORTH LAGOON CLOSURE

The following describes the Work Plan for the closure of the North Lagoon of the General Motors Corporation, Central Foundry Division - Bedford plant.

I. Background

1. The North Lagoon that is addressed by this plan is shown on Figure 1. The North Lagoon is located on the plant property immediately east of North Jackson Street and the plants manufacturing facility. The lagoon was constructed in the early 1950's and was used primarily as a water reservoir and storm water retention lagoon until 1981. It is oval in shape and is approximately 310 feet long, 250 feet wide, and 22 feet deep at its maximum outline. The lagoon is no longer needed because a new larger storm water retention lagoon was constructed in 1981 as part of an overall wastewater treatment project.

2. The objectives of this plan are to:

A. Excavate, remove, transport, and dispose of waste and contaminated soil from the North Lagoon. The North Lagoon area included in this project is described in "1" above.

B. Sample and analyze the excavated waste and contaminated soil to meet all applicable disposal facility permit and Department of Transportation requirements.

C. Sample and analyze the remaining soil in the excavated area. If any of the samples show the soil to be contaminated with 3 ppm or more of PCBs, an underdrain system will be installed at the bottom of the excavated area to collect any future water infiltration. The collected water will be treated at the Central Foundry on-site wastewater treatment plant. The plant's NPDES permit requires the effluent to meet a PCB limitation of 1 ppb.

D. Backfill the excavated areas to provide and maintain adequate drainage and runoff control.

E. Cover the back-filled area with top soil and seed to provide appropriate groundcover.

II. Tasks

The major tasks in the work plan are described below. The Project Time Schedule for implementing the work plan is shown in Figure 2. All tasks in the work plan are planned to be completed within 180 working days. Since the contractor for implementing the Work Plan has not been selected, the schedule may be revised after the contractor has been selected and given an opportunity to review the Work Plan.

Task 1. Mobilization and Site Preparation

The first task will be for the contractor to mobilize equipment to the site and prepare the site for waste and soil handling operations. Site preparation will include:

A. Designation of three basic work zones:

a. Exclusion Zone - the North Lagoon area as identified in Figure 1.

b. Contamination Reduction Zone - the area where vehicles and equipment are cleaned off prior to leaving the project site.

c. Support Zone - the area, outside of Exclusion and Contamination Reduction Zones, where support services are located.

B. Installation of Support Zone and Contamination Reduction Zone facilities that may include, as necessary:

a. Office trailer.

b. Laboratory trailer.

c. Personnel decontamination trailer.

d. Equipment storage trailer.

e. Equipment/vehicle decontamination pad.

f. Utilities - water, electricity and telephone service.

C. Provision of adequate construction drainage controls to contain storm water runoff from the North Lagoon work area as shown in Figure 1 for removal and treatment (see Task 2).

D. Construction, as necessary, of site access roads, equipment decontamination pad and waste staging facilities. The contractor may use any existing appropriate facilities.

Task 2. Lagoon Water and Storm Water Removal/Treatment

Existing lagoon water and storm water that is retained by the drainage control for the North Lagoon work area will be pumped to the plant's wastewater treatment plant for treatment, including activated carbon adsorption. The PCB limitation for the treated effluent in the NPDES permit for this wastewater treatment plant is 1 ppb.

Task 3. Waste and Contaminated Soil Excavation

The contractor shall properly excavate and remove (and stage within the Exclusion Zone, as necessary) waste and contaminated soils from within the North Lagoon to the level of the earthen liner of the Lagoon. Beginning at the level of the earthen liner, soil will be excavated and removed from the bottom and side walls of the North Lagoon until samples from the remaining soil show PCB concentration to be 3 ppm or less (see Task 4 for sampling and analysis). In no event, however, will GM be required to remove more than a

maximum of four feet of soil beyond the level of the earthen liner at the side walls and the bottom of the North Lagoon. All excavated materials shall be transported and disposed as described in Task 5.

Task 4. Sampling and Analysis

The contractor will sample and analyze the waste materials and contaminated soil removed from the North Lagoon for meeting disposal facility permit and Department of Transportation requirements.

After removal of contaminated soils, the contractor will sample and analyze the remaining soil for PCB concentration using Method 8080, "Test Methods for Evaluating Soil Waste - Physical/Chemical Methods", SW-846, 2nd. Ed., U.S. EPA, July 1982. The soil borings will be six inches in depth located at the grid point of each of the 50-foot by 50-foot grids established for the bottom and each 50-foot horizontal location at the side walls of the excavated area, resulting in more than 30 borings which will be analyzed. Each boring will be throughly mixed for analysis. The Central Foundry on-site laboratory may be used for PCB analysis.

Task 5. Loading, Transportation, and Disposal

The contractor will load all waste and contaminated soil properly on vehicles. Each vehicle will be lined with an impermeable, flexible material prior to loading with sufficient areal dimensions to allow the loaded materials to be fully enveloped with the lining material. A tarpaulin cover will be placed over the loaded materials.

The contractor will transport all wastes and contaminated soils off-site to an appropriate federal and state approved disposal facility. Transportation vehicles will meet applicable state and federal laws, including applicable DOT requirements. All vehicles will be weighed prior to and after loading at the on-site scale to certify that the tonnage of materials transported by each vehicle is correctly stated on the waste manifest or shipping paper.

GM Central Foundry is investigating the feasibility of on-site treatment for the removal/destruction of PCBs in the waste and contaminated soils. Treatment methods such as the Detox Industries' biological process for PCB degradation and disposal, as permitted by EPA Region VI, will be investigated. If GM Central Foundry determines that use of a PCB destruction process in lieu of off-site disposal is preferred, EPA approval

will be requested prior to utilization of such an option.

Task 6. Underdrain Installation

Upon completion of the analysis of the soil borings described in Task 4, if any one of the more than 30 borings is shown to contain PCBs in excess of 3 ppm (mg/kg), an underdrain system will be installed to cover the total bottom of the excavated area to collect any future water infiltration. The underdrain tile will be spaced in a 50-foot by 50-foot grid sloped to one collection point. The collected water will be treated at the Central Foundry on-site wastewater treatment plant. The plant's NPDES permit requires the effluent to meet a PCB limitation of 1 ppb.

Task 7. Backfill and Cover

The excavated area will be back-filled with local off-site borrow material. After backfilling, a six-inch top-soil layer will be placed over the back-filled area, and seeded. The cover will be sloped and maintained to prevent rainwater accumulation.

Task 8. Equipment Decontamination and Demobilization

The contractor will decontaminate all equipment prior to leaving the site at the completion of the project. Vehicles for transporting waste and contaminated soils from the North Lagoon area will be pressure washed to remove exterior contamination prior to leaving the Contamination Reduction Zone. All decontamination water and liquids from washing of vehicles and from decontamination of staff personnel safety equipment shall be collected for treatment through the on-site wastewater treatment plant.

Task 9. Administration and Support

A. Safety Plan

Prior to initiation of site work, the contractor must develop a satisfactory site safety plan for GM Central Foundry's approval. Failure to follow the plan may be a basis for termination of the work. All trailers, decontamination units and other safety equipment required in the plan shall be provided by the contractor. Site activities may require modification of the plan.

B. Final Report

Within 30 days after completion of the Tasks delineated in this Work Plan, the contractor shall prepare a final report delineating the results of the remedial action. All the information generated during the closure should be included as appendices to the document. The report should include maps drawn to scale indicating waste excavation areas, depths of excavations, all sample locations and analytical results, and all other data collected during the remedial action.

Attached Figure 1 & Figure 2

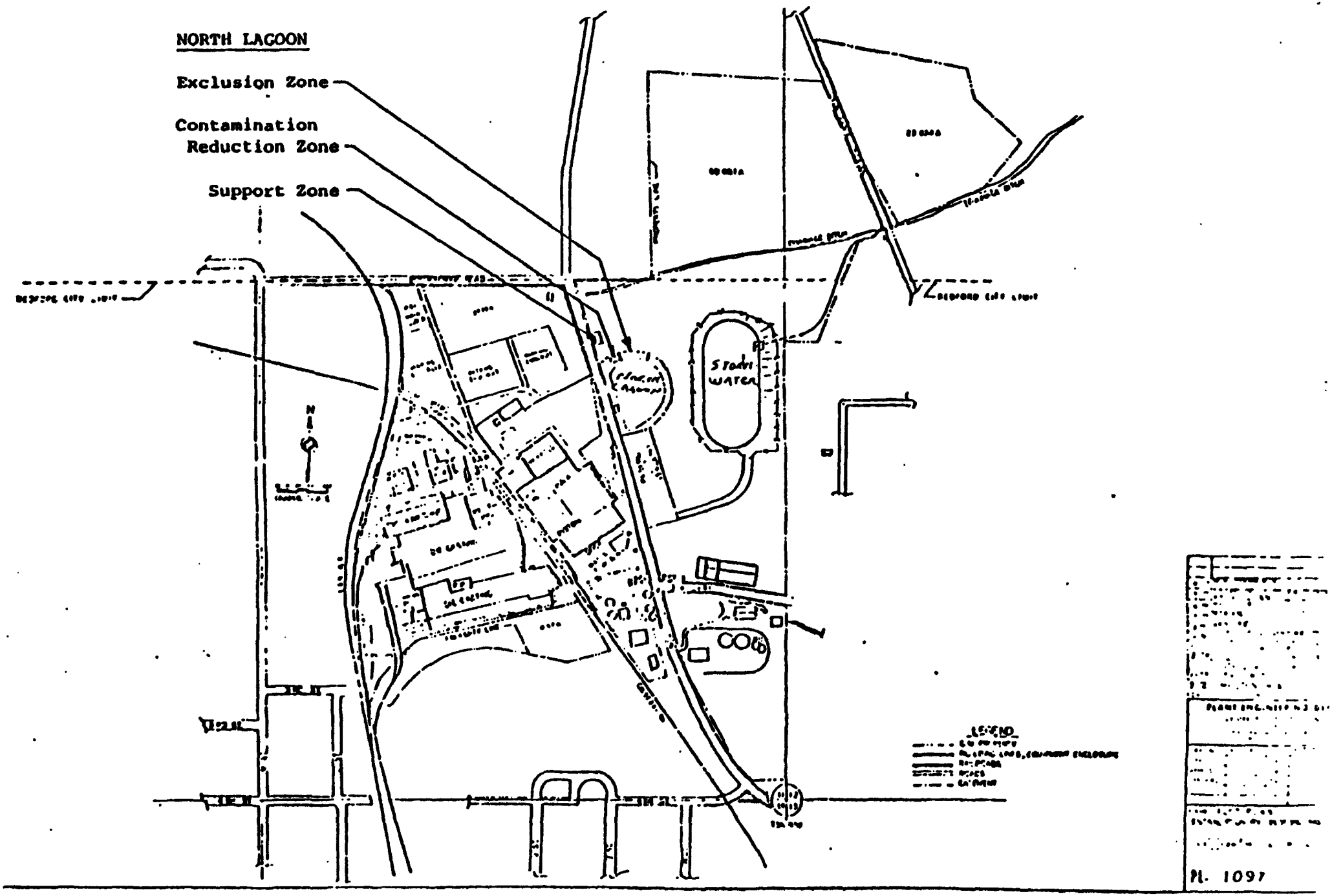


FIGURE 1. NORTH LA[illegible] LOCATION

FIGURE 2. PROJECT TIME SCHEDULE

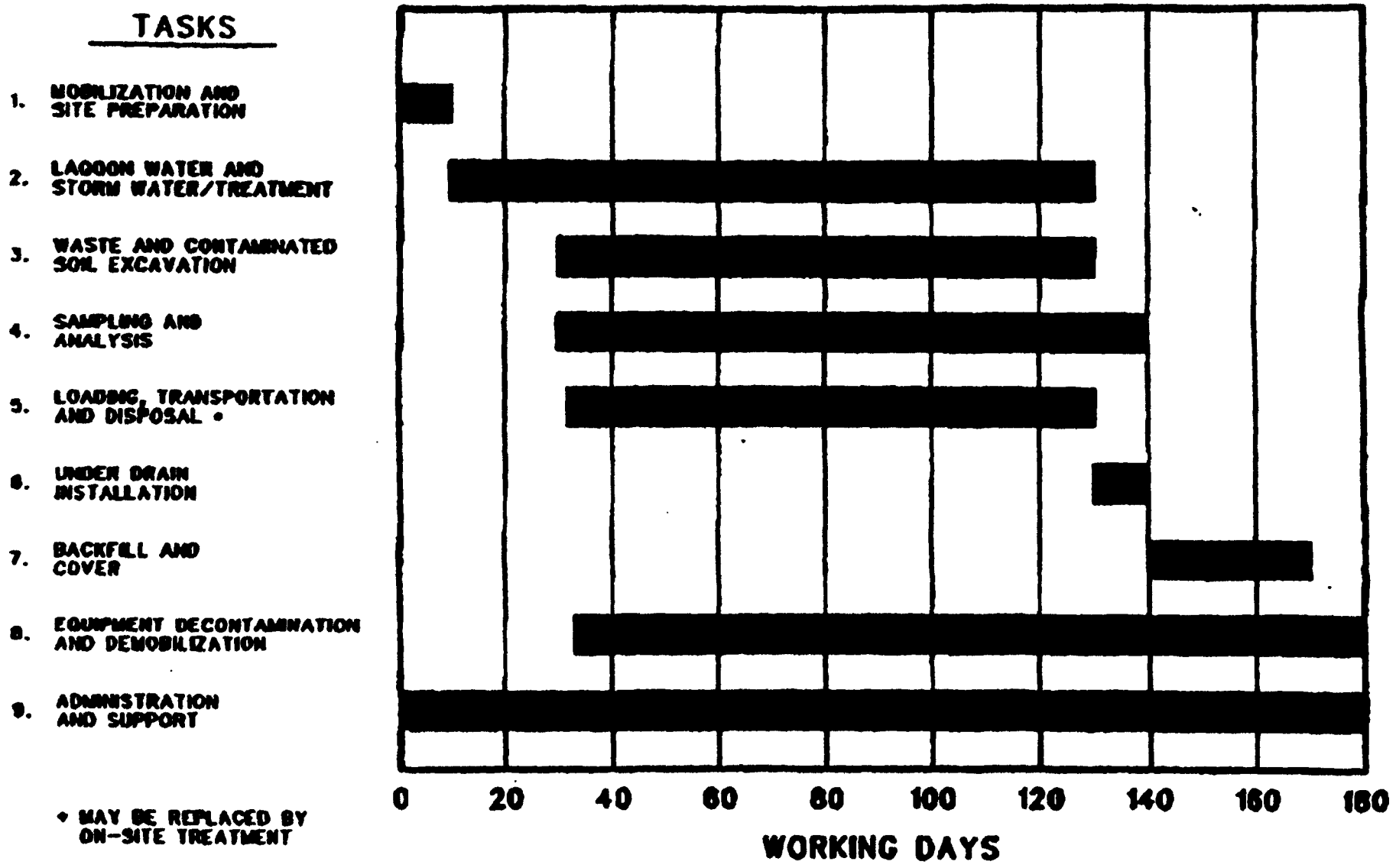
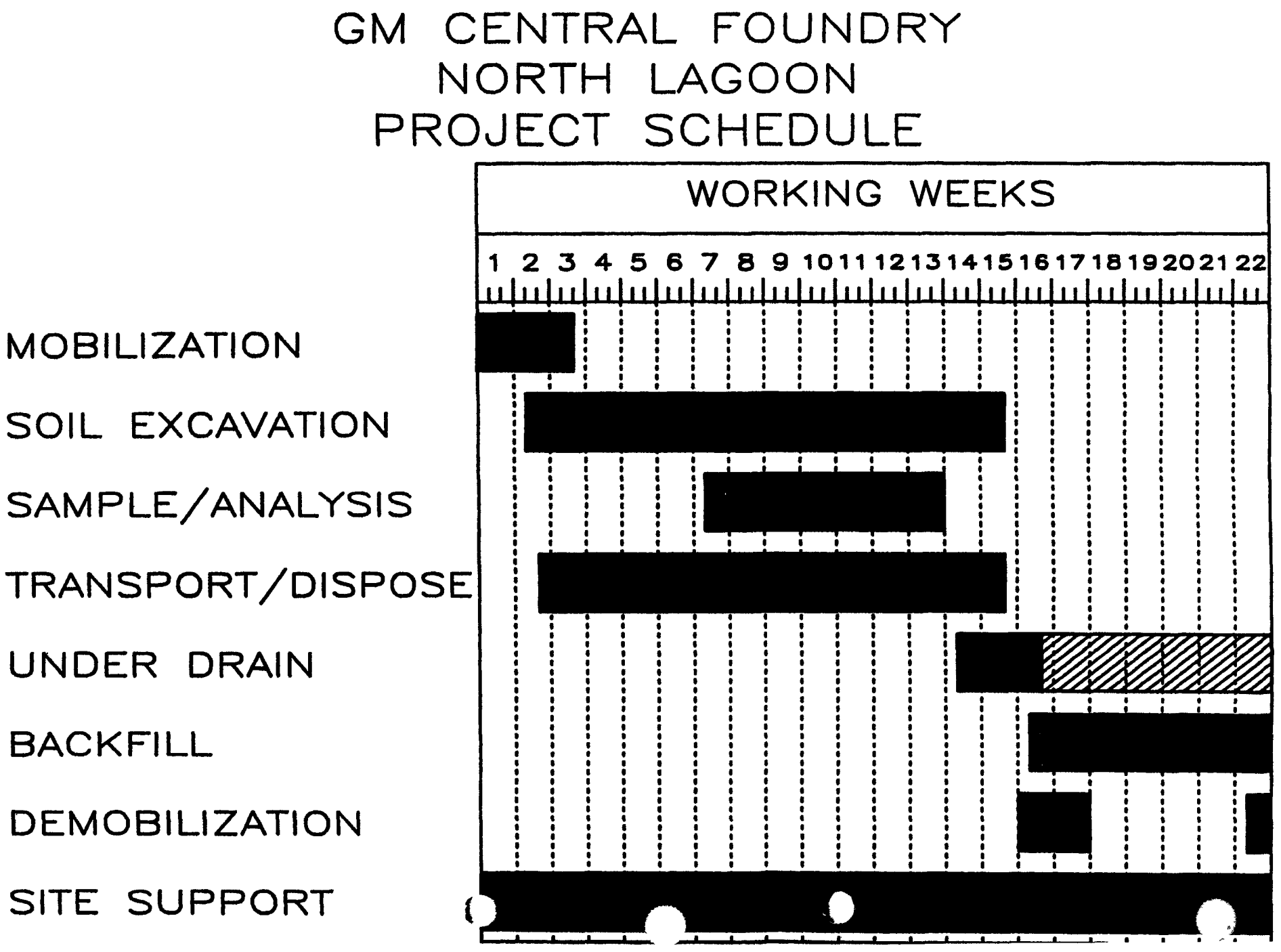
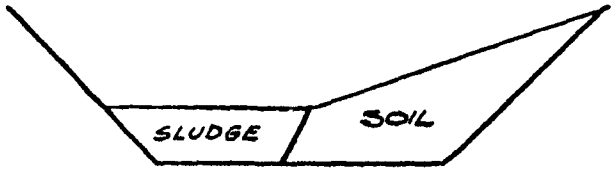


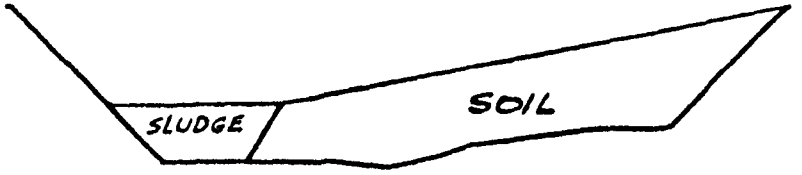
Figure 11
NORTH LAGOON PROJECT SCHEDULE



APPENDIX 2


SLUDGE
SOIL

| | | |


SLUDGE
SOIL

| | | |

Print file "VOLUME_OF_MAIN_BOUNDARY" (1)

VOLUME WITHIN BOUNDARY DESIGNATED 'D015'

BASELINE DETAILS :
START POINT 278.3540 433.8340 FINISH POINT 278.3540 786.2470
MAXIMUM LEFT OFFSET 0.0000 MAXIMUM RIGHT OFFSET 273.5870
NUMBER OF SECTIONS - 19 AT 20.000 INTERVAL, PERPENDICULAR TO A LINE AT AN ANGLE OF 0.0000 DEGREES

-CHAINAGE- /DISTANCE-	——SECTIONAL AREAS—— —CUT—	—FILL—	-INTERMEDIATE VOLUMES- —CUT—	—FILL—	-ACCUMULATIVE VOLUMES- —CUT—	—FILL—
0.000	0.000	0.000			0.000	0.000
			-7617.281	0.000		
20.000	-781.726	0.000			-7817.261	0.000
			-29603.754	0.000		
40.000	-2198.849	0.000			-37221.015	0.000
			-60095.950	0.000		
60.000	-3810.946	0.000			-97316.965	0.000
			-88034.587	0.000		
80.000	-4992.513	0.000			-185351.552	0.000
			-103252.445	0.000		
100.000	-5332.731	0.000			-288603.997	0.000
			-107361.125	0.000		
120.000	-5403.381	0.000			-395965.122	0.000
			-105646.895	0.000		
140.000	-5181.308	0.000			-501612.017	0.000
			-100489.289	0.000		
160.000	-4887.620	0.000			-602101.306	0.000
			-96043.508	0.000		
180.000	-4716.730	0.000			-698144.814	0.000
			-90968.810	0.000		
200.000	-4380.151	0.000			-789113.625	0.000
			-83455.056	0.000		
220.000	-3985.355	0.000			-872568.681	0.000
			-75980.620	0.000		
240.000	-3632.707	0.000			-948549.301	0.000
			-67322.584	0.000		
260.000	-3099.551	0.000			-1015871.884	0.000
			-54868.576	0.000		
280.000	-2387.306	0.000			-1070740.460	0.000
			-42802.125	0.000		
300.000	-1892.906	0.000			-1113542.585	0.000
			-30368.019	0.000		
320.000	-1143.896	0.000			-1143910.604	0.000
			-14514.650	0.000		
340.000	-307.569	0.000			-1158425.254	0.000
			-1908.930	0.000		
352.413	0.000	0.000			-1160334.184	0.000

(1) This "Volume of Main Boundary" represents the total volume of sludge and soil in the North Lagoon.

NOTE:
ACCUMULATED CUT VOLUMES ARE STATED IN CUBIC FEET.

The volume, converted to cubic yards = 42,975 yd^3.

Print file "VOLUME_OF_INTERIOR_LAGOON" (1)

VOLUME WITHIN BOUNDARY DESIGNATED 'SL02'

BASELINE DETAILS :
START POINT 296.9570 455.0860 FINISH POINT 296.9570 608.0940
MAXIMUM LEFT OFFSET 0.0000 MAXIMUM RIGHT OFFSET 176.5120
NUMBER OF SECTIONS - 9 AT 20.000 INTERVAL, PERPENDICULAR TO A LINE AT AN ANGLE OF 0.0000 DEGREES

-CHAINAGE- /DISTANCE-	——SECTIONAL AREAS—— —CUT—	—FILL—	-INTERMEDIATE VOLUMES- —CUT—	—FILL—	-ACCUMULATIVE VOLUMES- —CUT—	—FILL—
0.000	0.000	0.000			0.000	0.000
			-10382.055	0.000		
20.000	-1038.205	0.000			-10382.055	0.000
			-23915.470	0.000		
40.000	-1353.341	0.000			-34297.525	0.000
			-27757.180	0.000		
60.000	-1422.376	0.000			-62054.705	0.000
			-26893.495	0.000		
80.000	-1286.973	0.000			-88948.200	0.000
			-21779.000	0.000		
100.000	-910.927	0.000			-110727.200	0.000
			-14344.205	0.000		
120.000	-523.493	0.000			-125071.405	0.000
			-7058.490	0.000		
140.000	-182.355	0.000			-132129.895	0.000
			-1186.040	0.000		
153.008	0.000	0.000			-133315.935	0.000

(1) This "Volume of Interior Lagoon" represents a sludge volume relating to a continuous depth of 13 feet. This is expected to be a maximum sludge volume.

NOTE:
ACCUMULATED CUT VOLUMES ARE STATED IN CUBIC FEET.

The volume, converted to cubic yards = 4,397 yd^3.

VOLUME WITHIN BOUNDARY DESIGNATED 'SL02'

BASELINE DETAILS :
START POINT 296.9570 455.0860 FINISH POINT 296.9570 608.0940
MAXIMUM LEFT OFFSET 0.0000 MAXIMUM RIGHT OFFSET 176.5120
NUMBER OF SECTIONS - 9 AT 20.000 INTERVAL, PERPENDICULAR TO A LINE AT AN ANGLE OF 0.0000 DEGREES

-CHAINAGE- /DISTANCE-	——SECTIONAL AREAS—— —CUT—	—FILL—	-INTERMEDIATE VOLUMES- —CUT—	—FILL—	-ACCUMULATIVE VOLUMES- —CUT—	—FILL—
0.000	0.000	0.000			0.000	0.000
			0.000	0.000		
20.000	0.000	0.000			0.000	0.000
			-4423.463	0.000		
40.000	-442.346	0.000			-4423.463	0.000
			-13925.466	0.000		
60.000	-950.200	0.000			-18348.929	0.000
			-19213.580	0.000		
80.000	-871.158	0.000			-37562.509	0.000
			-17692.017	0.000		
100.000	-798.044	0.000			-55254.526	0.000
			-13433.905	0.000		
120.000	-545.346	0.000			-68688.431	0.000
			-7277.020	0.000		
140.000	-182.355	0.000			-75965.451	0.000
			-1186.040	0.000		
153.008	0.000	0.000			-77151.491	0.000

(2) This "Volume of Interior Lagoon" represents a sludge volume relating to a continuous depth of 10 feet. This is expected to be a conservative volume estimate.

NOTE:
ACCUMULATED CUT VOLUMES ARE STATED IN CUBIC FEET.

The volume, converted to cubic yards = 2,857 yd^3

APPENDIX 3

AW PROJECT GM FOUNDRY BORING POINT M DATE 3/30/87

DRILLERS RON - STEVE WEATHER COLD - CLOUDY

WATER: RODS _____ COMPLETION _____ 24 HOURS _____ OTHER _____

ELEVATION 689.68

I.F.V.	DESCRIPTION	DEPTH	SAMPLE	6	6	6	N	%	Qu	Qp	Hc
.2	TOP SOIL										
3/3.2	BLK SiCl w/ SA AND Org.	13.5									
	LIMESTONE * AUGER REFUSAL @ 17.3	15.5									
		17.5									

AW PROJECT GM FOUNDARY BORING POINT F. DATE 3/30/87

DRILLERS RON - STEVE WEATHER COLD - CLOUDY

R: RODS _____ COMPLETION _____ 24 HOURS _____ OTHER _____

ATION _____ ELEVATION 690.38

LEV.	DESCRIPTION	DEPTH
2	TOP SOIL	
7.0	BLK. SiCL w/ SAND AND ORG.	7.0
18.0	LT BR/GRY HARD SiCL	9.0 11.0 13.0 14.0 16.0
	BTH - 18.0	

SAMPLE	6	6	6	N		Qu	Qp	Hc

HWW PROJECT GM-BEDFORD BORING POINT G DATE 3/31/87

DRILLERS RON/STEVE WEATHER COLD-CLEAR

WATER: RODS _____ COMPLETION _____ 24 HOURS _____ OTHER _____

STATION _____ ELEVATION 690.55

I.F.V.	DESCRIPTION	DEPTH
2	TOP SOIL	
14.9	BLK Si Sa CL w/ORGANIC	13.5
		15.5
1	AUGER REFUSAL 14.9'	17.5
	HOLE OFF-SET 4'	

SAMPLE	6	6	6	N	=	Qu	Qu	Hr:
SAMPLE TAKEN BUT NOT RETRV.								

IW PROJECT GM-BEDFORD BORING POINT H DATE 3/31/87

DRILLERS RON/STEVE WEATHER

WATER: RODS COMPLETION 24 HOURS OTHER

LOCATION ELEVATION 685.84

REV.	DESCRIPTION	DEPTH	SAMPLE	6	6	6	N	Σ	Qu	Qp	Hc
0.2	TOP SOIL										
2 3.8	BLK S. Sa. Cl w/org.	9.0									
		11.0									
2.8 5.0	CLAY LINER BN/RED SiCl	13.0									
	BTH - 15.0'										

AW PROJECT GM-BEDFORD BORING POINT O DATE 3/31/87

DRILLERS RON/STEVE WEATHER COLD-CLEAR

WATER: RODS _____ COMPLETION _____ 24 HOURS _____ OTHER _____

LOCATION _____ ELEVATION 693.30'

REV.	DESCRIPTION	DEPTH	SAMPLE	6	6	6	N	≈	Qu	Qp	Hc
	TOP SOIL										
W/S	BLK S. Sa CL	4.0	5.0								
	CLAY LINER BR/RED SCL										

RECORD OF SUESURFACE EXPLORATION

Boring [illegible]

Project Name G.M. Fill Investigation Date of Boring [illegible]

Site Bedford, Indiana Project No 54190

DESCRIPTION	DEPTH	SAMPLE	N	C_u	C_o	M_c	PEN...
SURFACE							
Miscellaneous Fill Material		1SS	12				
		2SS	16				
		3SS	21				
		4SS	15				
		5SS	24				
	10	6SS	18				
		7SS	6				
	15	8SS	9				
		9SS	4				
Boring terminated at 18.0 feet.							
Brown Silty CLAY (natural) was encountered at 18.0 feet.							
Boring Dry on Completion.							

SLUDGE
14 18'

N. END OF PENINSULA

AW

RECORD OF SUBSURFACE EXPLORATION

Boring B-2

A. W. Associates Engineering Inc.

Project Name. G.M. Fill Investigation Date of Boring [illegible]

Site Bedford, Indiana Project No. S4190

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Miscellaneous Fill Material		1SS	7				
		2SS	15				
	5	3SS	36				
		4SS	24				
		5SS	21				
	10	6SS	16				
		7SS	8				
	15	8SS	56/5	[illegible]			
		9SS	12				
Boring terminated at 18.0 feet.							
Brown Silty CLAY (natural) was encountered at 18.0 feet.							
Boring Dry on Completion.							

SLUDGE 16-18'

1/2 way up Penn

AW

RECORD OF SUBSURFACE EXPLORATION

Engineering Inc

Boring B-3

Project Name G.M. Fill Investigation Date of Boring [illegible]

Site Bedford, Indiana Project No S4190

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Miscellaneous Fill Material		1SS	7				
		2SS	50/4				
	5	3SS	31				
		4SS	7				
		5SS	3				
	10	6SS	6				
		7SS	16				
	15	8SS	50/4				
Boring terminated at 16.0 feet.							
Brown Silty CLAY (natural) was encountered at 16.0 feet.							

No noticible Sludge Odor was present.

South side of Lagoon

APPENDIX 4

VOLUME OF FILL FOR CLEANED OUT LAGOON

STATION	DIST.	END AREA	AVE. END AREA	CU. YDS.			
							JOB# 87-2
0+25		0					ZERO SECTION
	25		621.9	575.9			
0+50		1243.85					
	50		2966.0	5492.6			
1+00		4688.18					
	50		5350.4	9908.2			
1+50		6012.63					
	50		5861.6	10854.8			
2+00		5710.60					
	50		5603.7	10377.2			
2+50		5496.80					
	50		4710.2	8722.6			
3+00		3923.58					
	50		3481.0	6446.3			
3+50		3038.38					
	50		2042.6	3782.6			
4+00		1046.85					
	30		523.4	581.6			
4+30		0					ZERO SECTION
				56741.8	Cu.	Yds.	Fill
			+10%	5674.2			
				62,416	Cu.	Yds.	Fill Total

K.P.

APPENDIX ~~4.2~~

Alt & Witzig Engineering, Inc.

2405 W. 86th Street
INDIANAPOLIS, INDIANA 46260
(317) 875-7990

November 20, 1987

Chemical Waste Management
401 North Jackson
Bedford, Indiana
ATTN: Mr. Gary Salsbury

RE: Tests on Fill Soils
G.M. Central Foundry
Bedford, Indiana
Alt & Witzig File: S7327

Gentlemen:

In compliance with your request, laboratory tests were performed on two samples of fill materials.

The results of our laboratory tests indicate these soils are both cohesive materials with large percentages of clay particles. The results of grain size analysis and Atterburg Limit tests are presented on Figures 1 and 2. The results of laboratory permeability tests are presented on Figure 3.

If you have further questions regarding the soils or materials on this project, please contact us at your convenience.

Very truly yours,

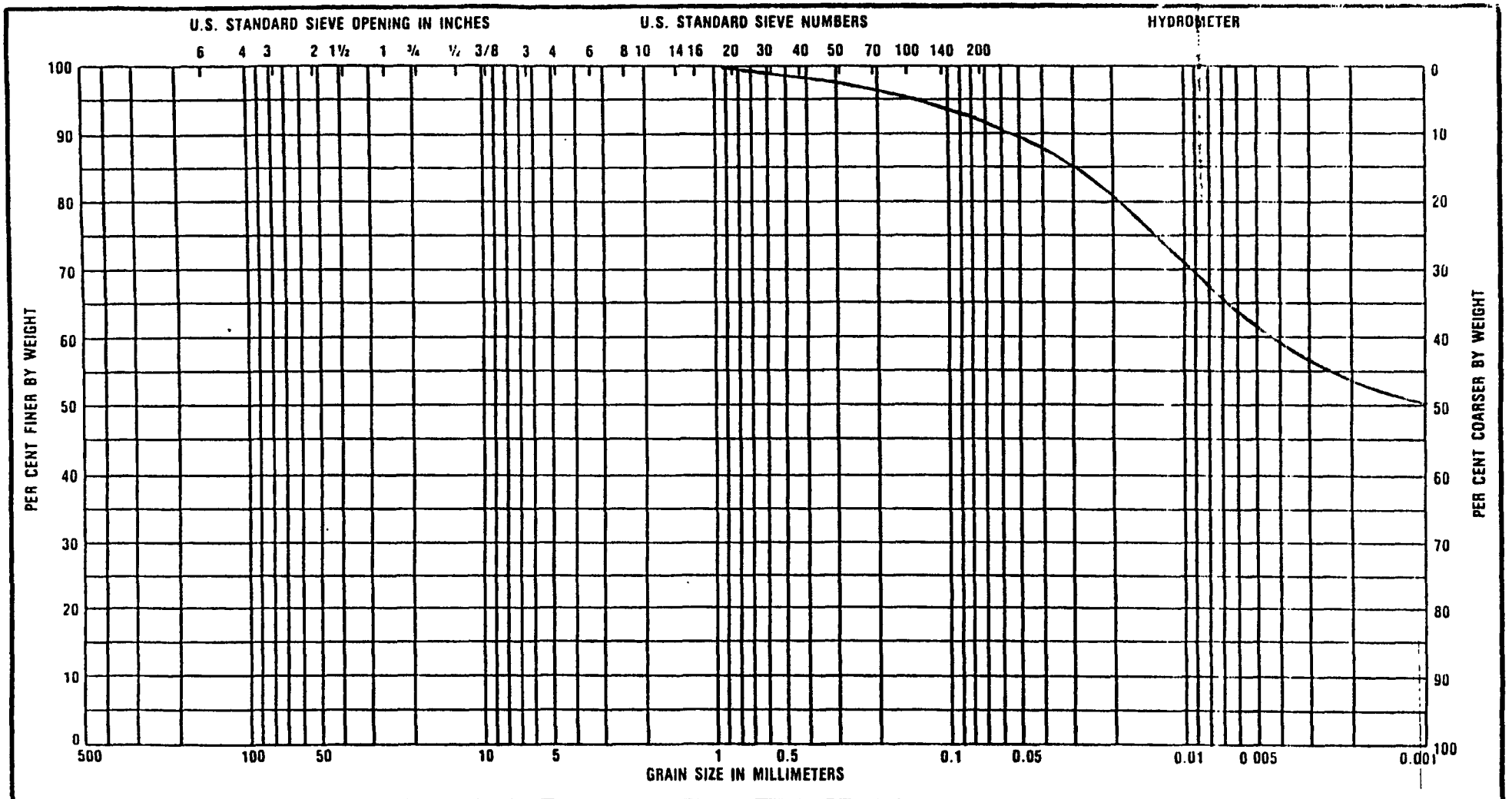
ALT & WITZIG ENGINEERING, INC.

William E. Witzig

William E. Witzig, P.E.

WEW:kdc

REPORT OF SOIL ANALYSIS



Boring No.	Sample No	Elev. or Depth	Classification	Nat w %	LL	PL	PI
1			Reddish Brown CLAY		60	22	28

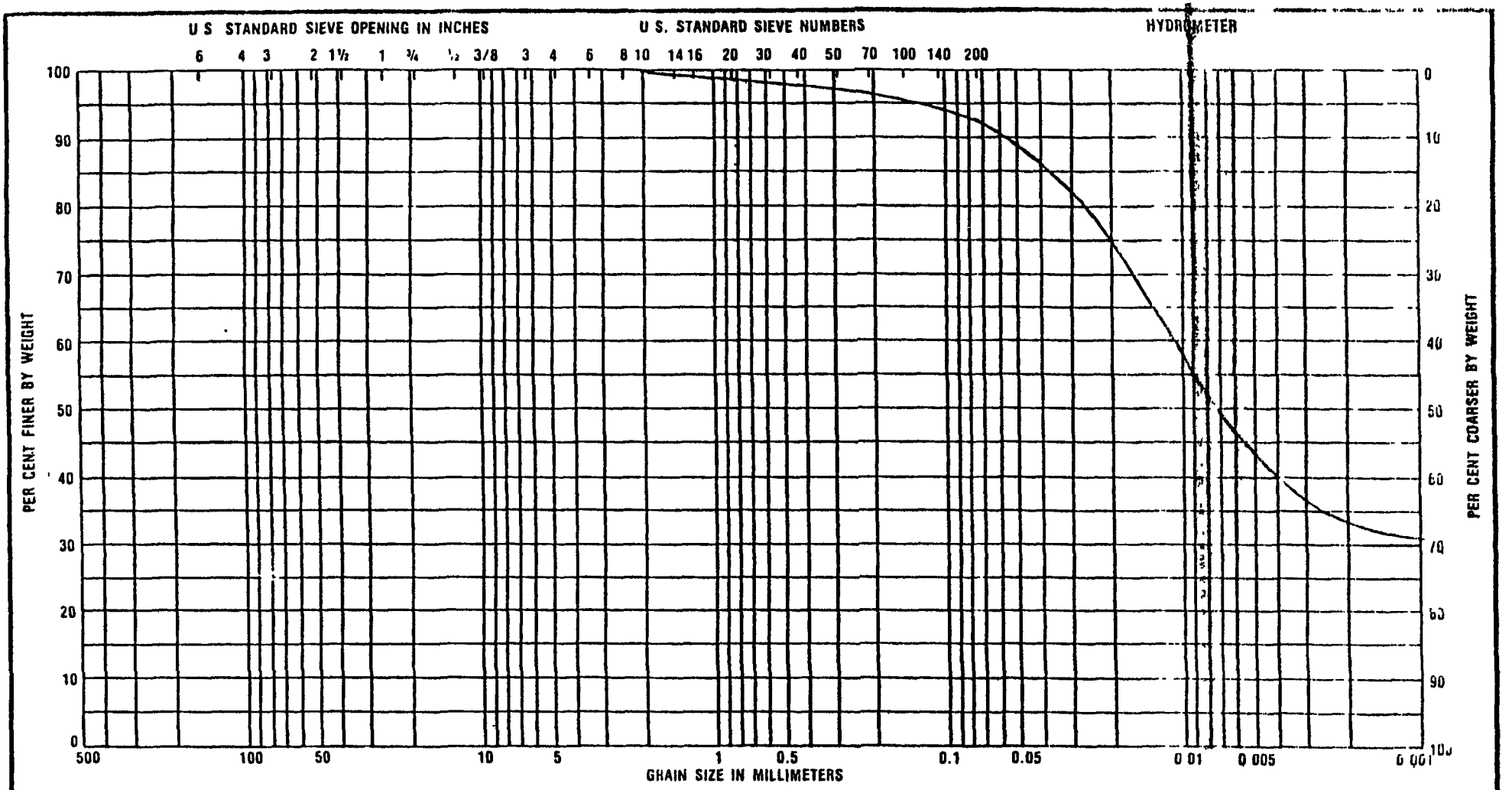
Project: GM Central Foundry
Bedford, Indiana
S7327

Date: 11/87

AW

Figure 1

REPORT OF SOIL ANALYSIS



boring No	Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI	Project
2			Brown SILTY CLAY		38	18	20	GM Central Foundry Bedford, Indiana S7327
								Date /87

Fig. 2

Results of
LABORATORY PERMEABILITY TESTS

Sample No: 1

Sample Description: Reddish Brown CLAY

Permeability Rate: 8.4×10^{-8} cm/sec

Sample No: 2

Sample Description: Light Brown SILTY CLAY

Permeability Rate: 1.3×10^{-7} cm/sec

Prepared For: Chemical Waste Management Bedford, Indiana	Figure 3	Prepared By: Alt & Witzig Engineering, Inc. Indianapolis, Indiana	
PROJECT NAME GM Central Foundry Bedford, Indiana		PROJECT NO S7327	DATE 11/87

APPENDIX 5

ORGANOCHLORINE PESTICIDES AND PCB'S

1.0 Scope and Application

1.1 Method 8080 is used to determine the concentration of certain organochlorine pesticides and polychlorinated biphenyls (PCB's) in groundwater, liquid, and solid sample matrices. Specifically, Method 8080 may be used to detect the following substances:

Aldrin	Endrin aldehyde
a-BHC	Heptachlor
B-BHC	Heptachlor epoxide
w-BHC	Kepone
g-BHC (Lindane)	Methoxychlor
Chlordane	Toxaphene
4,4'-DDD	PCB-1016
4,4'-DDE	PCB-1221
4,4'-DDT	PCB-1232
Dieldrin	PCB-1242
Endosulfan I	PCB-1248
Endosulfan II	PCB-1254
Endosulfan sulfate	PCB-1260
Endrin	

1.2 Method 8080 is recommended for use only by, or under the close supervision of, experienced residue analysts.

2.0 Summary of Method

2.1 Method 8080 provides cleanup and chromatographic conditions for the detection of ppb levels of organochlorine pesticides and PCB's. Prior to the use of this method, appropriate sample extraction techniques must be used. Groundwater and other aqueous samples are extracted at a neutral pH with methylene chloride as a solvent using a separatory funnel (Method 3510) or a continuous liquid-liquid extractor (Method 3520). Both neat and diluted organic liquids may be analyzed by direct injection. Solid samples are extracted with hexane:acetone (1:1) using either the Soxhlet extraction (Method 3540) or sonication (Method 3550) procedures. A 2- to 5-µl sample is injected into a gas chromatograph (GC) using the solvent flush technique, and compounds in the GC effluent are detected by an electron capture detector (ECD) or another halogen-specific detector. An aliquot of each sample will be spiked with standards to determine the spike recovery and the limits of detection for that particular sample. It is recommended that the analyst carefully select the compounds used in sample spiking to avoid coelution under the GC conditions given in Table 1. Aroclor 1221 will give minimal interference with the single component pesticides listed in Table 1. Chlordane and toxaphene may require individual spiked sample analysis to yield valid recovery data.

TABLE 1. GAS CHROMATOGRAPHY OF PESTICIDES AND PCB's[a]

Parameter	Retention time (min) Column 1[c]	Retention time (min) Column 2[d]	Detection limit[b] (µg/l)
Aldrin	2.40	4.10	0.004
a-BHC	1.35	1.82	0.004
B-BHC	1.90	1.97	0.006
w-BHC	2.15	2.20	0.009
g-BHC (Lindane)	0.70	2.13	0.004
Chlordane	e	e	0.014
4,4'-DDD	7.83	9.08	0.012
4,4'-DDE	5.13	7.15	0.004
4,4'-DDT	9.40	11.75	0.012
Dieldrin	5.45	7.23	0.002
Endosulfan I	4.50	6.20	0.014
Endosulfan II	8.00	8.28	0.004
Endosulfan sulfate	14.22	10.70	0.066
Endrin	6.55	8.10	0.006
Endrin aldehyde	11.82	9.30	0.023
Heptachlor	2.00	3.35	0.004
Heptachlor epoxide	3.50	5.00	0.083
Methoxychlor	18.20	26.60	0.176
PCB-1016	e	e	ND
PCB-1221	e	e	ND
PCB-1232	e	e	ND
PCB-1242	e	e	0.065
PCB-1248	e	e	ND
PCB-1254	e	e	ND
PCB-1260	e	e	ND

ND = not determined.

[a]Taken from reference 6.

[b]Detection limit is calculated from the minimum detectable GC response being equal to five times the GC background noise, assuming a 10-ml final volume of a 1-liter liquid extract, and assuming a GC injection of 5 µl.

[c]Column 1 conditions: Supelcoport 100/120 mesh coated with 1.5% SP-2250/1.95% SP-2401 packed in a 180-cm long x 4-mm I.D. glass column with 5% Methane/95% Argon carrier gas at 60 ml/min flow rate. Column temperature is 200° C.

[d]Column 2 conditions: Supelcoport 100/200 mesh coated with 3% OV-1 in a 180-cm long x 4-mm I.D. glass column with 5% Methane/95% Argon carrier gas at 60 ml/min flow rate. Column temperature is 200° C.

[e]Multiple peak response.

2.2 The sensitivity of Method 8080 usually depends on the level of interferences rather than on instrumental limitations. Table 1 lists the limits of detection that can be obtained in wastewaters in the absence of interferences. Detection limits for a typical waste sample may be significantly higher.

3.0 Interferences

3.1 Solvents, reagents, glassware, and other sample processing hardware may yield discrete artifacts and/or elevated baselines causing misinterpretation of gas chromatograms. All these materials must therefore be demonstrated to be free from interferences under the conditions of the analysis by running method blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required.

3.2 Interferences coextracted from the samples will vary considerably from waste to waste. While general cleanup techniques are provided as part of this method, unique samples may require additional cleanup approaches to achieve desired sensitivities.

3.3 Glassware must be scrupulously clean. Clean all glassware as soon as possible after use by rinsing with the last solvent used. This should be followed by detergent washing in hot water. Rinse with tap water, distilled water, acetone, and finally pesticide-quality hexane. Heavily contaminated glassware may require treatment in a muffle furnace at 400° C for 15 to 30 min. Some high boiling materials, such as PCB's, may not be eliminated by this treatment. Volumetric ware should not be heated in a muffle furnace. Glassware should be sealed/stored in a clean environment immediately after drying or cooling to prevent any accumulation of dust or other contaminants. Store inverted or capped with aluminum foil.

3.4 Interferences by phthalate esters can pose a major problem in pesticide analysis. These materials elute in the 15% and 50% fractions of the Florisil cleanup. They usually can be minimized by avoiding contact with any plastic materials. The contamination from phthalate esters can be completely eliminated with a microcoulometric or electrolytic conductivity detector.

3.5 Before processing any samples, the analyst should demonstrate daily through the analysis of an organic-free water or solvent blank that the entire analytical system is interference-free. Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be analyzed to validate the accuracy of the analyses. Where doubt exists over the identification of a peak on the gas chromatogram, confirmatory techniques such as mass spectroscopy should

be used. Detection limits for groundwater and EP extracts are given in Table 1. Detection limits for these compounds in wastes should be set at 1 µg/g.

4.0 Apparatus and Materials

4.1 Drying column: 20-mm I.D. pyrex chromatographic column with coarse frit.

4.2 Kuderna-Danish (K-D) apparatus

4.2.1 Concentrator tube: 10 ml, graduated. Calibration must be checked at 1.0- and 10.0-ml level. Ground glass stopper (size 19/22 joint) is used to prevent evaporation of extracts.

4.2.2 Evaporative flask: 500 ml. Attach to concentrator tube with springs.

4.2.3 Snyder column: Three-ball macro (Kontes K503000-0121 or equivalent).

4.2.4 Boiling chips: Extracted, approximately 10/40 mesh.

4.3 Water bath: Heated, with concentric ring cover, capable of temperature control (±2° C). The bath should be used in a hood.

4.4 Gas chromatograph: Analytical system complete with gas chromatograph suitable for on-column injection and all required accessories including electron-capture or halogen-specific detector, column supplies, recorder, gases, syringes. A data system for measuring peak areas is recommended.

4.5 Chromatographic column: Pyrex, 400 mm x 25 mm O.D., with coarse fritted plate and Teflon stopcock (Kontes K-42054-213 or equivalent).

5.0 Reagents

5.1 Preservatives

5.1.1 Sodium hydroxide: (ACS) 10 N in distilled water.

5.1.2 Sulfuric acid (1+1): (ACS) Mix equal volumes of conc. H_2SO_4 with distilled water.

5.2 Methylene chloride: Pesticide quality or equivalent.

5.3 Sodium sulfate: (ACS) Granular, anhydrous (purified by heating at 400° C for 4 hr in a shallow tray).

5.4 Stock standards: Prepare stock standard solutions at a concentration of 1.00 µg/µl by dissolving 0.100 g of assayed reference material in pesticide quality isooctane or other appropriate solvent and diluting to volume in a 100-ml ground-glass-stoppered volumetric flask. The stock solution is transferred to ground-glass-stoppered reagent bottles, stored in a refrigerator, and checked frequently for signs of degradation or evaporation, especially just prior to preparing working standards from them.

5.5 Mercury: Triple distilled.

5.6 Hexane: Pesticide residue analysis grade.

5.7 Isooctane (2,2,4-trimethyl pentane): Pesticide residue analysis grade.

5.8 Acetone: Pesticide residue analysis grade.

5.9 Diethyl ether: Nanograde, redistilled in glass if necessary.

5.9.1 Must be free of peroxides as indicated by EM Quant test strips (Test strips are available from EM Laboratories, Inc., 500 Executive Blvd., Elmsford, N.Y. 10523).

5.9.2 Procedures recommended for removal of peroxides are provided with the test strips. After cleanup, 20 ml ethyl alcohol preservative must be added to each liter of ether.

5.10 Florisil: PR grade (60/100 mesh); purchase activated at 1250° F; store in glass containers with glass stoppers or foil-lined screw caps. Before use, activate each batch at least 16 hr at 130° C in a foil-covered glass container.

6.0 Sample Collection, Preservation, and Handling

6.1 Grab samples must be collected in appropriately cleaned glass containers and the sampling bottle must not be prewashed with the sample before collection. Composite samples should be collected in refrigerated glass containers in accordance with the requirements of the program. Automatic sampling equipment must be free of tygon and other potential sources of contamination.

6.2 The samples must be iced or refrigerated from the time of collection until extraction. Chemical preservatives should not be used in the field unless more than 24 hr will elapse before delivery to the laboratory. If the samples will not be extracted within 48 hours of collection, the sample should be adjusted to a pH range of 6.0-8.0 with sodium hydroxide or sulfuric acid.

6.3 All samples must be extracted within 7 days and completely analyzed within 30 days of collection.

7.0 Procedures

7.1 Sample preparation

7.1.1 Extraction - Extract water samples at a neutral pH with methylene chloride as a solvent using a separatory funnel (Method 3510) or a continuous liquid-liquid extractor (3520). Extract solid samples with hexane:acetone (1:1) using either the Soxhlet extraction (Method 3540) or sonication procedures (Method 3550). Spiked samples are used to verify the applicability of the chosen extraction technique to each new sample type. Each sample must be spiked to determine the % recovery and the limit of detection for that sample.

7.1.2 Florisil column cleanup

7.1.2.1: Add a weight of Florisil (nominally 21 g), predetermined by calibration (Section 7.3) to a chromatographic column. Settle the Florisil by tapping the column. Add sodium sulfate to the top of the Florisil to form a layer 1-2 cm deep. Add 60 ml of hexane to wet and rinse the sodium sulfate and Florisil. Packing the Florisil in a hexane slurry is an alternative method which has proven effective. Just prior to exposure of the sodium sulfate to air, stop the elution of the hexane by closing the stopcock on the chromatography column. Discard the eluate. Adjust the sample extract volume to 10 ml and transfer it from the K-D concentrator tube to the Florisil column. Rinse the tube twice with 1-2 ml hexane, adding each rinse to the column.

7.1.2.2 Place a 500-ml K-D flask and clean concentrator tube under the chromatography column. Drain the column into the flask until the sodium sulfate layer is nearly exposed. Elute the column with 200 ml of 6% ethyl ether in hexane (Fraction 1) using a drip rate of about 5 ml/min. Remove the K-D flask and set aside for later concentration. Elute the column again, using 200 ml of 15% ethyl ether in hexane (Fraction 2), into a second K-D flask. Perform the third elution using 200 ml of 50% ethyl ether in hexane (Fraction 3). The elution patterns for the pesticides and PCB's are shown in Table 2.

7.1.2.3 Concentrate the eluates by standard K-D techniques, as described in the referenced extraction procedures, substituting hexane for the glassware rinses and using the water bath at about 85° C. Adjust final volume to 10 ml with hexane. Analyze by gas chromatography.

TABLE 2. DISTRIBUTION AND RECOVERY OF CHLORINATED PESTICIDES AND PCB's USING FLORISIL COLUMN CHROMATOGRAPHY[a]

Parameter	Percent recovery by fraction[b]		
	1(6%)	2(15%)	3(50%)
Aldrin	100		
a-BHC	100		
β-BHC	97		
w-BHC	98		
g-BHC (Lindane)	100		
Chlordane	100		
4,4'-DDD	99		
4,4'-DDE	98		
4,4'-DDT	100		
Dieldrin	0	100	
Endosulfan I	37	64	
Endosulfan II	0	7	91
Endosulfan sulfate	0	0	106
Endrin	4	96	
Endrin aldehyde	0	68	26
Heptachlor	100		
Heptachlor epoxide	100		
Methoxychlor	100		
Toxaphene	96		
PCB-1016	97		
PCB-1221	97		
PCB-1232	95	4	
PCB-1242	97		
PCB-1248	103		
PCB-1254	90		
PCB-1260	95		

[a]Taken from reference 1.

[b]Eluting solvent composition given in Section 7.1.2.2.

7.2 Gas chromatography conditions. The recommended gas chromatographic columns and operating conditions for the instrument are:

Column 1 conditions: Supelcoport 100/120 mesh coated with 1.5% SP-2250/ 1.95% SP-2401 packed in a 180-cm long x 4-mm I.D. glass column with 5% Methane/95% Argon carrier gas at 60 ml/min flow rate. Column temperature is 200° C.

Column 2 conditions: Supelcoport 100/120 mesh coated with 3% OV-1 in a 180-cm long x 4-mm I.D. glass column with 5% Methane/95% Argon carrier gas at 60 ml/min flow rate. Column temperature is 200° C.

7.3 Calibration

7.3.1 Establish gas chromatographic operating parameters equivalent to those indicated in Table 1. The gas chromatographic system can be calibrated using the external standard technique (Section 7.3.2) or the internal standard technique (Section 7.3.3).

7.3.2 External standard calibration procedure

7.3.2.1 For each parameter of interest, prepare calibration standards at a minimum of three concentration levels by adding volumes of one or more stock standards to a volumetric flask and diluting to volume with isooctane. One of the external standards should be at a concentration near, but above, the method detection limit. The other concentrations should correspond to the expected range of concentrations found in real samples or should define the working range of the detector.

7.3.2.2 Using injections of 2 to 5 µl of each calibration standard, tabulate peak height or area responses against the mass injected. The results can be used to prepare a calibration curve for each parameter. Alternatively, the ratio of the response to the mass injected, defined as the calibration factor (CF), can be calculated for each parameter at each standard concentration. If the relative standard deviation of the calibration factor is less than 10% over the working range, linearity through the origin can be assumed and the average calibration factor can be used in place of a calibration curve.

7.3.2.3 The working calibration curve or calibration factor must be verified on each working day by the measurement of one or more calibration standards. If the response for any parameter varies from the predicted response by more than ±10%, the test must be repeated using a fresh calibration standard. Alternatively, a new calibration curve or calibration factor may be prepared for that parameter.

7.3.3 Internal standard calibration procedure. To use this approach, the analyst must select one or more internal standards similar in analytical behavior to the compounds of interest. The analyst must further demonstrate that the measurement of the internal standard is not affected by method or matrix interferences. Due to these limitations, no internal standard applicable to all samples can be suggested.

7.3.3.1 Prepare calibration standards at a minimum of three concentration levels for each parameter of interest by adding volumes of one or more stock standards to a volumetric flask. To each calibration standard, add a known constant amount of one or more internal standards, and dilute to volume with isooctane. One of the standards should be at a concentration near, but above, the method detection limit. The other concentrations should correspond to the expected range of concentrations found in real samples, or should define the working range of the detector.

7.3.3.2 Using injections of 2 to 5 µl of each calibration standard, tabulate the peak height or area responses against the concentration for each compound and internal standard. Calculate response factors (RF) for each compound as follows:

$$RF = (A_s C_{is})/(A_{is} C_s)$$

where:

A_s = Response for the parameter to be measured.

A_{is} = Response for the internal standard.

C_{is} = Concentration of the internal standard in µg/l.

C_s = Concentration of the parameter to be measured in µg/l.

If the RF value over the working range is constant, less than 10% relative standard deviation, the RF can be assumed to be invariant and the average RF can be used for calculations. Alternatively, the results can be used to plot a calibration curve of response ratios, A_s/A_{is} against RF.

7.3.3.3 The working calibration curve or RF must be verified on each working day by the measurement of one or more calibration standards. If the response for any parameter varies from the predicted response by more than ±10%, the test must be repeated using a fresh calibration standard. Alternatively, a new calibration curve must be prepared for that compound.

7.3.4 Florisil standardization. The cleanup procedure described in Section 7.1.2 utilizes Florisil chromatography. Florisil from

different batches or sources may vary in absorption capacity. To determine the amount of Florisil to be used, the absorption capacity of each separate batch of Florisil is measured using lauric acid values (2). The referenced procedure determines the adsorption from hexane solution of lauric acid (mg) per g Florisil. The amount of Florisil to be used for each column is calculated by dividing this factor into 110 and multiplying by 20 g.

[redacted]

Inject 1-5 µl of the sample extract using the solvent flush technique. Smaller (1.0 µl) volumes can be injected if automatic devices are employed. Record the volume injected to the nearest 0.05 µl, and the resulting peak size, in area units.

7.4.2 If the peak areas exceed the linear range of the system, dilute the extract and reanalyze.

7.4.3 If peak detection is prevented by the presence of interferences, further cleanup is required. Before using any cleanup procedure, the analyst must process a series of calibration standards through the procedure to validate elution patterns and the absence of interferences from the reagents.

7.4.4 Examples of chromatograms for organochlorine pesticides are shown in Figures 1-5.

8.0 Quality Control

8.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank that all glassware and reagents are interference-free. Each time a set of samples is extracted or there is a change in reagents, a method blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement steps.

8.2 Standard quality assurance practices should be used with this method. Field replicates should be collected to validate the precision of the sampling technique. Laboratory replicates should be analyzed to validate the precision of the analysis. Fortified samples should be analyzed to validate the sensitivity and accuracy of the analysis. If the fortified waste samples do not indicate sufficient sensitivity to detect less than or equal to 1 µg/g of sample, then the sensitivity of the instrument should be increased or the extract subjected to additional cleanup. Detection limits to be used for groundwater samples are indicated in Table 1. The fortified samples should be carried through all stages of the sample preparation and measurement steps. Where doubt exists over the identification of a peak on the chromatograph, confirmatory techniques such as mass spectroscopy should be used.

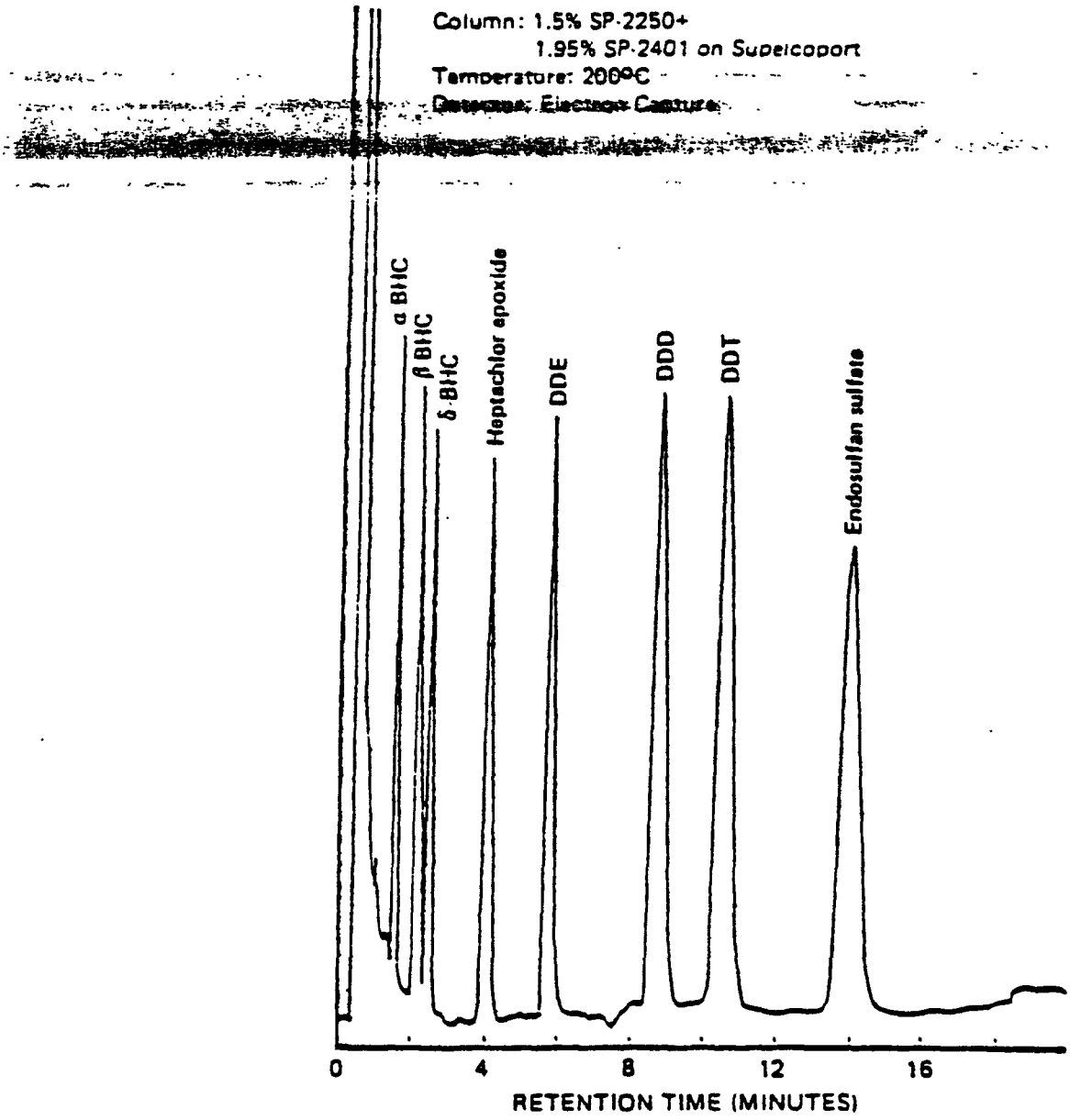


Figure 1. Gas chromatogram of pesticides.

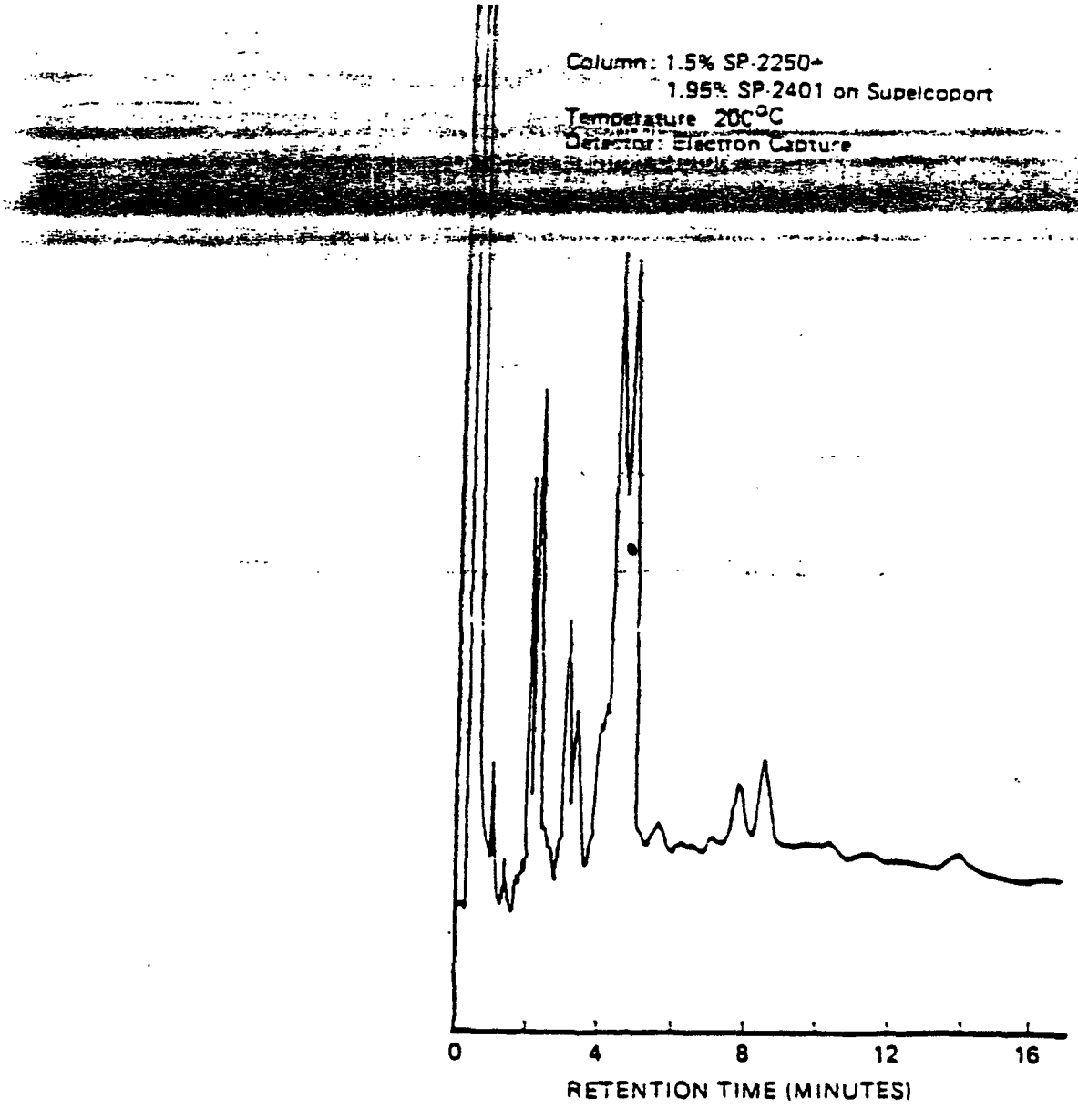


Figure 2. Gas chromatogram of chlordane.

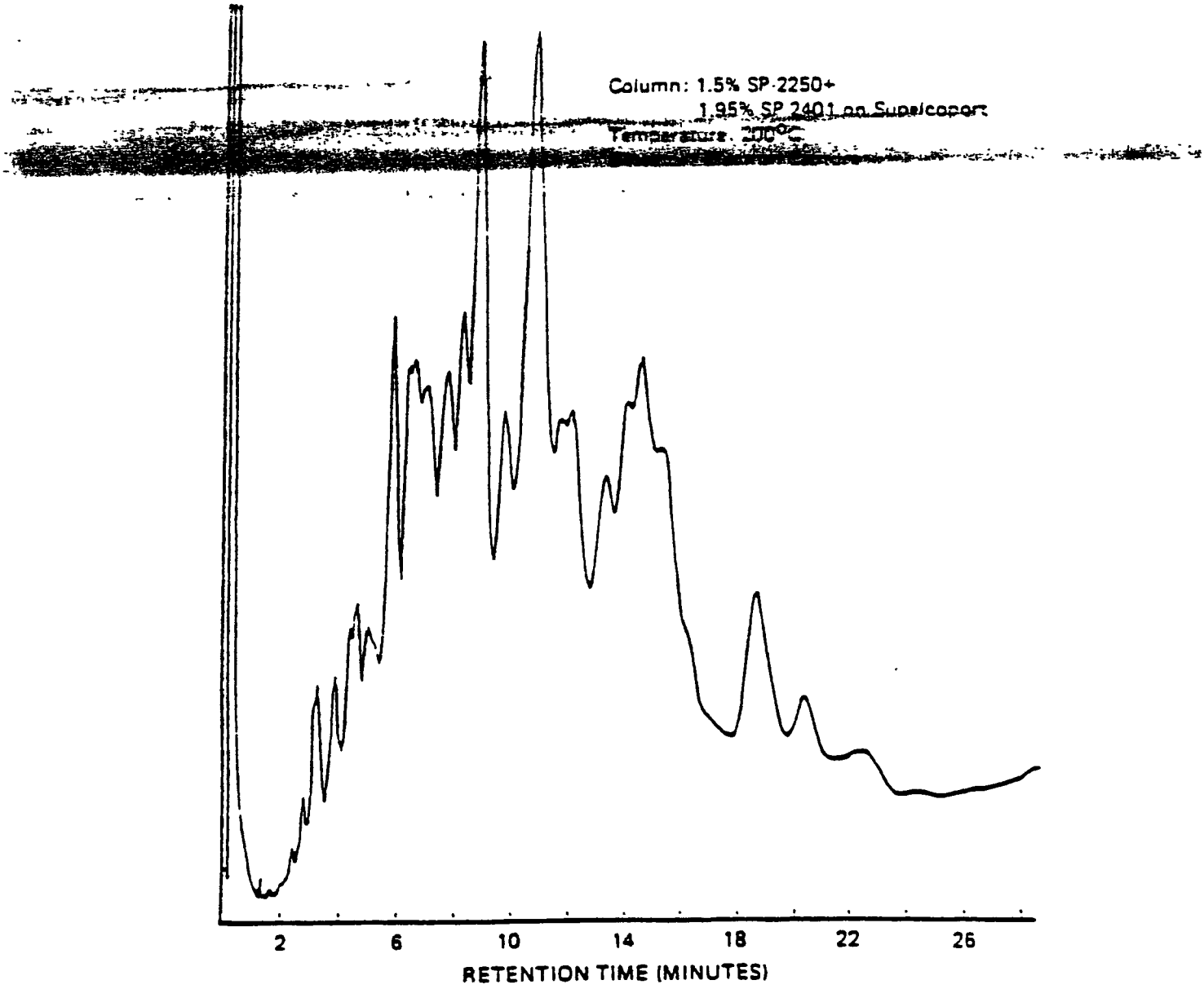


Figure 3. Gas chromatogram of toxaphene.

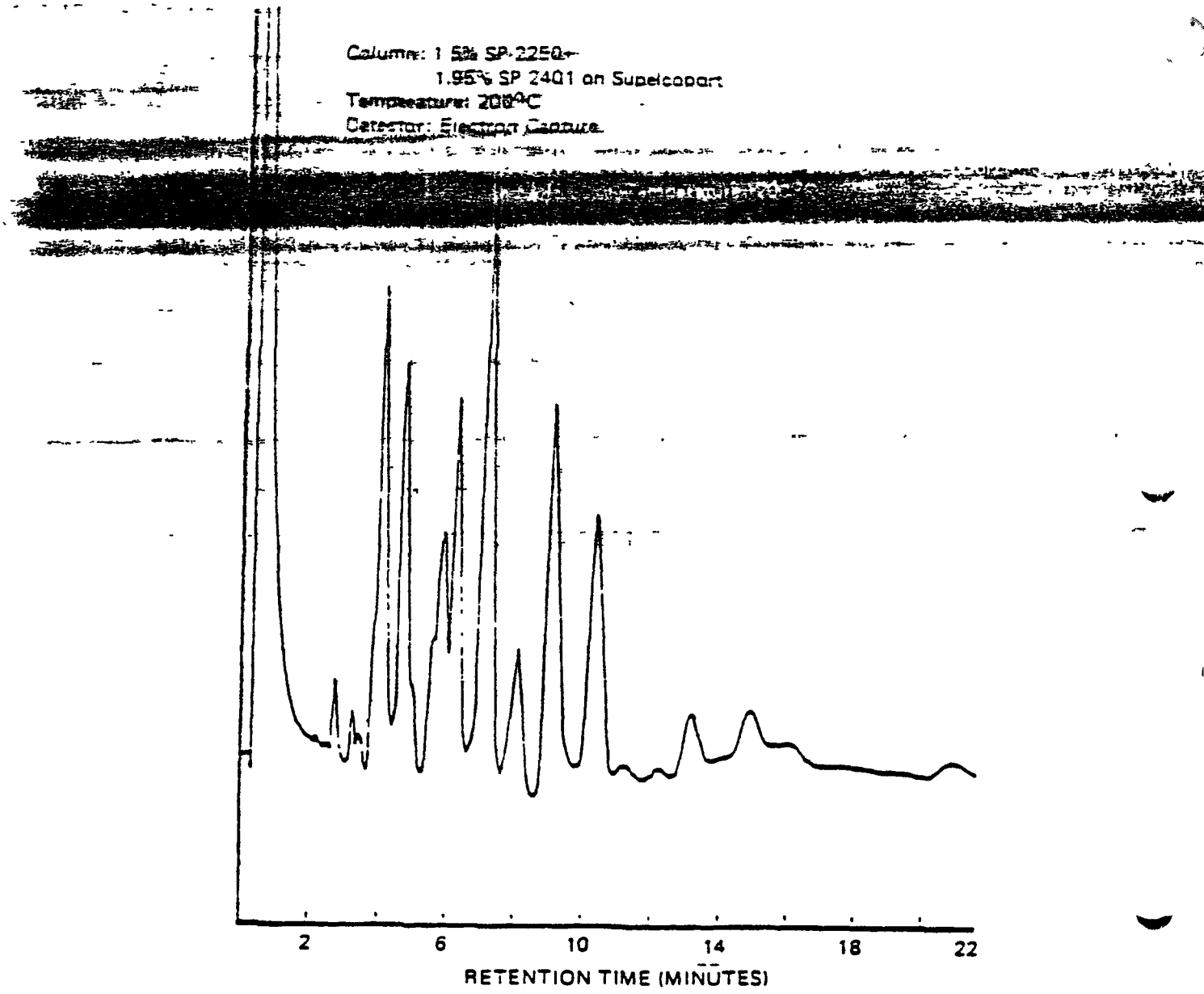


Figure 4. Gas chromatogram of PCB-1254.

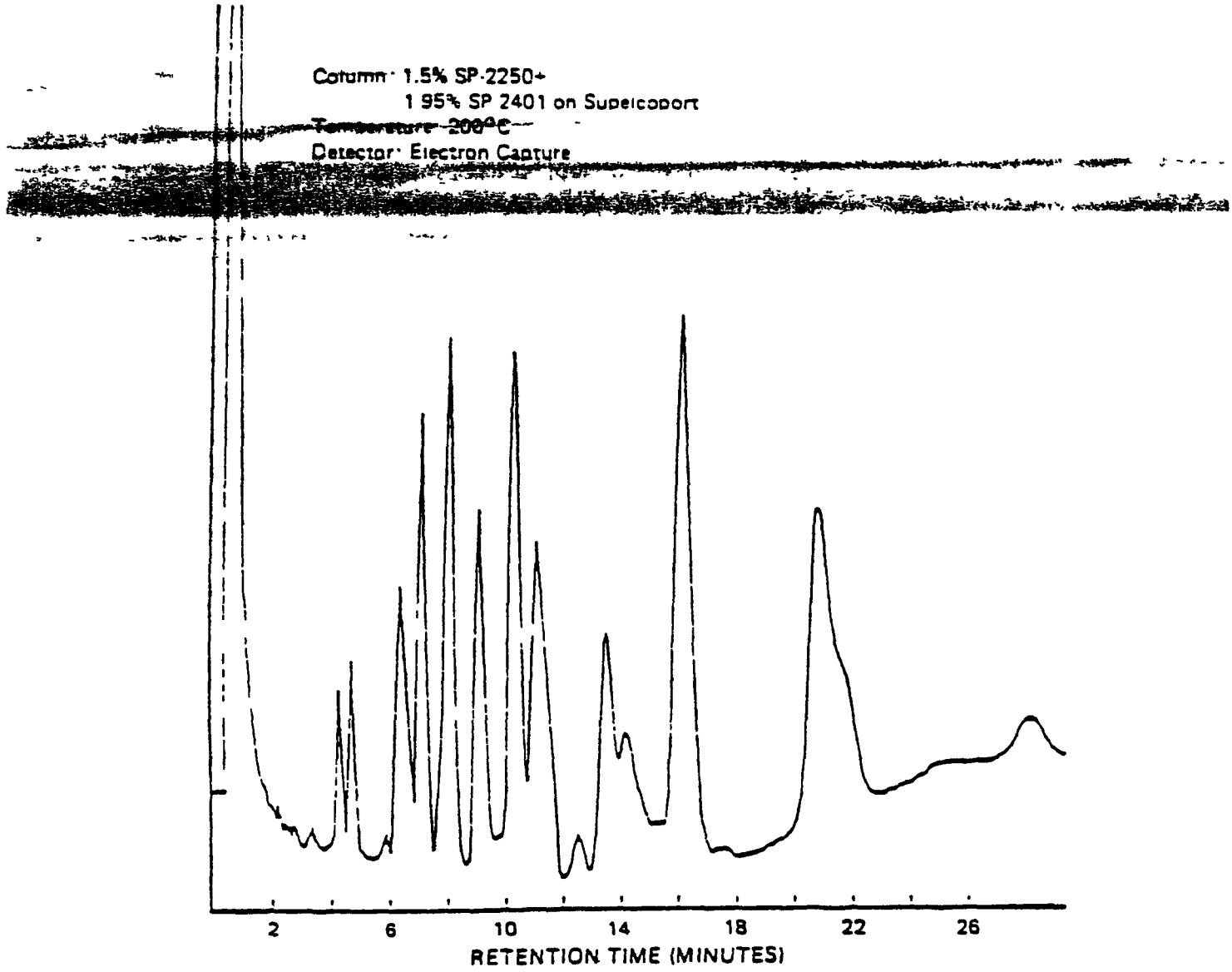


Figure 5. Gas chromatogram of PCB-1260.

8.3 The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL concentrations listed in Table 1 were obtained using reagent water. Similar results were achieved using representative wastewaters. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

[illegible] In a single laboratory, using reagent water and wastewaters spiked at [illegible] listed in Table 3.

TABLE 3. SINGLE OPERATOR ACCURACY AND PRECISION

Parameter	Average percent recovery	Standard deviation (%)	Spike range (µg/l)	Number of analyses	Matrix types
Aldrin	89	2.5	2.0	15	3
a-BHC	89	2.0	1.0	15	3
B-BHC	88	1.3	2.0	15	3
w-BHC	86	3.4	2.0	15	3
g-BHC (Lindane)	97	3.3	1.0	15	3
Chlordane	93	4.1	20	21	4
4,4'-DDD	92	1.9	6.0	15	3
4,4'-DDE	89	2.2	3.0	15	3
4,4'-DDT	92	3.2	8.0	15	3
Dieldrin	95	2.8	3.0	15	2
Endosulfan I	96	2.9	3.0	12	2
Endosulfan II	97	2.4	5.0	14	3
Endosulfan sulfate	99	4.1	15	15	3
Endrin	95	2.1	5.0	12	2
Endrin aldehyde	87	2.1	12	11	2
Heptachlor	88	3.3	1.0	12	2
Heptachlor epoxide	93	1.4	2.0	15	3
Toxaphene	95	3.8	200	18	3
PCB-1016	94	1.8	25	12	2
PCB-1221	96	4.2	55-100	12	2
PCB-1232	88	2.4	110	12	2
PCB-1242	92	2.0	28-56	12	2
PCB-1248	90	1.6	40	12	2
PCB-1254	92	3.3	40	18	3
PCB-1260	91	5.5	80	18	3

9.0 References

1. Development and application of test procedures for specific organic toxic substances in wastewaters. Category 10 - Pesticides and PCB's. Report for EPA Contract 68-03-2606.

2. Mills, P.A. 1968. Variation of florisil activity: simple method for measuring absorbent capacity and its use in standardizing florisil columns. J. Assoc. Official Anal. Chem. 51 (29).

3. U.S. EPA. 1980. Interim methods for the sampling and analysis of priority pollutants in sediments and fish tissue. October 1980. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.

4. Bellar, T., J. Lichtenburg, and S. Lonnesman. 1980. Recovery of organic compounds from environmentally contaminated bottom materials. In Contaminants and sediments, Volume 2, ed. R. Baker, Ann Arbor Science Publ., Inc., Ann Arbor, Michigan.

5. Rodriguez, C., W. McMahon, and K. Thomas. 1980. Method development for determination of polychlorinated hydrocarbons in municipal sludge. EPA Report-600/2-80-029.

6. U.S. EPA. Method 617. Organochlorine pesticides and PCB's. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

APPENDIX 6

STATE OF INDIANA

DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT

INDIANAPOLIS, 46225

105 South Meridian Street

October 28, 1986

Ms. Lois Rhea
Jack Gray Transport, Inc.
4600 E. 15th Avenue
Gary, IN 46403

Re: Liquid Industrial Waste Hauler Permit

Dear Ms. Rhea:

Your Liquid Industrial Waste Hauler Permit is due to expire February 28, 1987.

It will not be necessary to submit an application to renew your permit for 1987. This letter will serve as your Liquid Industrial Waste Hauler permit for 1987. This permit will become effective on March 1, 1987, and this permit shall expire on February 28, 1988.

The $100 fee provided for by 330 IAC 4 (the Liquid Industrial Waste Hauler Rule) to defray the expenses of processing applications will be waived because no applications for renewal are being processed.

Vehicle decals will continue to be required in 1987. The decals that were issued with your 1986 permit will be valid in 1987. It will be necessary to obtain decals for any vehicles which are not already permitted, and to replace lost or damaged decals. The fee for additional decals is $10 per vehicle.

The reporting requirements of 330 IAC 4-10 are also still in effect. It is requested that all delinquent reports be submitted to this office within fifteen (15) days of receipt of this letter and that all future reports be submitted by the 15th day of the month following the reporting period. On the following list, all received reports have been designated with an "X". If you have previously submitted a report that is not indicated on this list, please submit a copy of the report to insure that your records are complete.

Month	Received
January	x
February	x
March	x
April	x
May	x
June	x
July	x
August	x
September	

If you have any questions, please contact Ms. Pat Carrasquero at AC 317-232-8401.

Very truly yours,

David D. Lehm
Assistant Commissioner for
Solid and Hazardous Waste Management

PEC/drc

Control 02551

State Of Indiana
Environmental Management Board
Liquid Industrial Waste Hauler
Permit

Operation Permit No. IN 4542-0000-11 Money Receipt No. L 61557
Page 1 of 6 Fee $ 100.00

In compliance with the provisions of the Indiana Environmental Management Board Rule 320 IAC 5-10-1 et. seq.,

Jack Gray Transport, Inc.
4600 East 15th Avenue
Gary, IN 46403

is authorized to remove and transport liquid industrial waste in accordance with requirements and conditions set forth in this permit.

This permit shall become effective on March 1, 1986

This permit and the authorization to remove and transport liquid industrial waste shall expire at midnight, February 28, 1987. In order to receive authorization to continue operation beyond this date of expiration, the Permittee shall submit such information and forms as are required by the Indiana Environmental Management Board no later than 60 days prior to the date of expiration.

Signed this 20th day of January 1986 for the Indiana Environmental Management Board

SEAL OF THE STATE OF INDIANA 1816

Joseph O. Bickel

Technical Secretary

State Form 30435 R
SBM 66-019

Approved By State Board of Accounts for State Board of Health -1980

State of Tennessee
Department of Health and Environment
Division of Solid Waste Management
Customs House, Fourth Floor
701 Broadway
Nashville, Tennessee 37219-5403

PERMIT TO TRANSPORT HAZARDOUS WASTES

Tennessee permit number and EPA identification number

IND 04-253-4875

Issued to:

JACK GRAY TRANSPORT, INC.
4600 EAST 15TH AVE.
GARY, IN 46403

This certifies that the above identified transporter has been granted a permit to transport hazardous wastes in the state and has paid the Hazardous Waste Transporter Maintenance Fees due for the period beginning upon issuance and terminating on March 1, 1988.

This permit expires on the date listed above. No hazardous wastes may be transported by the above named company after that date unless this permit is renewed by paying the next year's fee.

Persons who renew prior to the expiration date above may do so by paying only the current permit fee. However, if the permit is not renewed prior to the expiration date above, the current permit fee plus a $100.00 application fee must be paid to renew the permit.

A copy of this permit must be kept in each truck used by the above named company to transport hazardous wastes which are shipped from or received by any facility, terminal or location in Tennessee, regardless of where the hazardous wastes were generated.

Issued: March 3, 1987 by Padmanabhan Padmapallam

Payment receipt number: 2573

Tom Tiesler

Tom Tiesler, Director
Division of Solid Waste Management

ADEM

ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

HAZARDOUS WASTE

TRANSPORT PERMIT

PERMITTEE: JACK GRAY TRANSPORT, INCORPORATED

ADDRESS: 4600 East 15th Avenue
Gary, Indiana 46403

PERMIT NUMBER: IND 042 534 875A

HAZARDOUS WASTES APPROVED: All hazardous wastes identified by Sections 4-233 through 4-236, inclusive, of the Alabama Hazardous Waste Management Regulations.

TRANSPORTATION MODE: Highway

In accordance with and subject to the provisions of the Hazardous Wastes Management Act of 1978, as amended, Code of Alabama 1975, §§ 22-30-1 to 22-30-24 ("HWMA"), the Alabama Environmental Management Act, as amended, Code of Alabama 1975, §§ 22-22A-1 to 22-22A-15, and rules and regulations adopted thereunder, and subject further to the conditions set forth in this permit, the Permittee is hereby authorized to transport the above-described hazardous wastes by the above-described transportation mode.

ISSUANCE DATE: November 1, 1985

EFFECTIVE DATE: November 1, 1985

EXPIRATION DATE: November 1, 1988

Alabama Department of Environmental Management

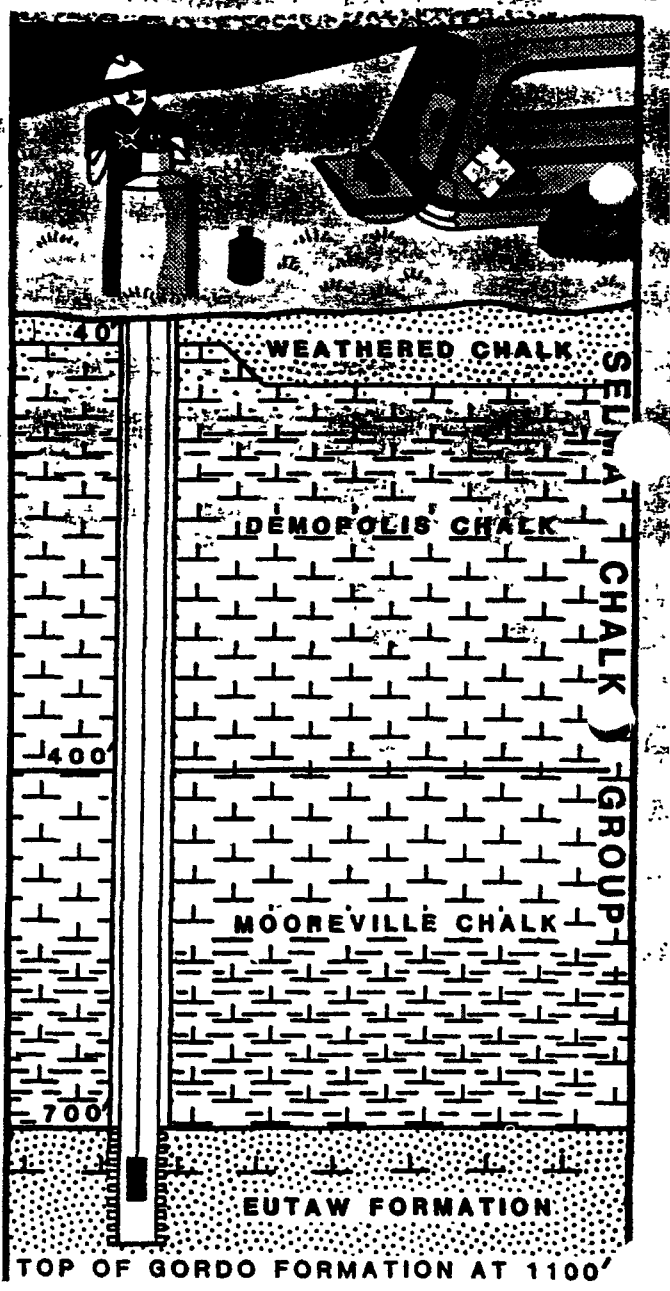
EMELLE FACTS

Siting and Geology

The Emelle facility is located in Sumter County, Alabama primarily because of the geology of the area described by a 1973 EPA Office of Solid Waste Report to Congress. Largely on the strength of the information in that report, a group of investors acquired the land and developed the site. In 1978 the facility was acquired by Waste Management, Inc.

The inherent soundness and integrity of the geology is Emelle's best-known characteristic. The facility is located atop the Selma Chalk, a massive and stable homogeneous geologic unit stretching across central Alabama and Mississippi. The physical character and thickness of the Selma far exceeds the requirements of conventional industry and regulatory standards and conservative projections estimate 10,000-year security against negative environmental impact on groundwater resources.

There are few places in the world with a geologic setting so favorable for containment of wastes. The Emelle facility is located in one band of the chalk beds that extend across eastern Mississippi and western Alabama. Other such chalk formations include the London basin which is known for the white cliffs of Dover, the formations beneath the Paris basin, and the chalk under the western desert of the Sahara.



CHEMICAL WASTE MANAGEMENT, INC.
P.O. BOX 1496, LIVINGSTON, AL 35470 TEL. (205) 652-6721

Some general criteria to be considered in selecting a suitable landfill site for potentially hazardous wastes are:

1. Low population density and low alternative land use.
2. An absence of flood plains, depressions, and excessive slopes.
3. High clay or chalk content to provide low permeability and adsorptive potential.
4. Good transportation access.
5. Minimum, if any, leachate movement to aquifers; low groundwater contamination potential.
6. Minimum, if any, hydraulic connection with surface water.

CWM's Emelle site is naturally suited for favorable disposal of wastes and was selected on the basis of all these criteria.

Beneath Emelle there is about 700 to 900 feet of the Selma Chalk Group. This unit was deposited 60 million years ago on the bottom of an ocean that extended far north of the present Emelle site. In that ocean, billions of little particles and shells settled to the bottom to form layer after layer of relatively impermeable chalk, marl, and limestone.

The chalk at Emelle is relatively homogeneous throughout, even though it is layered and contains individual beds of chalk and limestone. The chalk is fine-grained and the pore space between the grains is small, so that moisture entrapped in these sediments is held stationary by adhesive and cohesive molecular forces. The chalk beds act as aquitards--they do not let water flow easily through them--rather than aquifers, which permit easy groundwater flow. Water wells cannot be developed in these beds because they are tight and virtually impermeable to the movement of liquids.

The first water-bearing formation occurs at a depth of about 700 to 900 feet below the surface of beneath the very thick aquitard of chalk, clay, and mark. This water-bearing zone is in the sand of the Eutaw formation, which is also 60 million years old. Monitor wells at Emelle penetrate this water-bearing zone. Chemical analysis of this water shows that it is high in total dissolved solids and chloride content.

From the surface to a depth of about 20 feet, the chalk beds are weathered with minor fracturing. This weathered material is stripped prior to emplacement of waste. Trenches are cut in the chalk, and a liner system is installed. Waste is then placed in the lined trenches.

CWM maintains about 50 shallow monitoring wells between 50-200 feet in the upper zone of the chalk formation. Since these wells are not in an aquifer, they are low-yield wells that produce very little water. These wells are monitored regularly and serve as an early detection system to indicate contaminant migration. Many of these wells are very close to disposal trenches (some within 5 feet), but no waste migration has ever been confirmed in any of these wells.

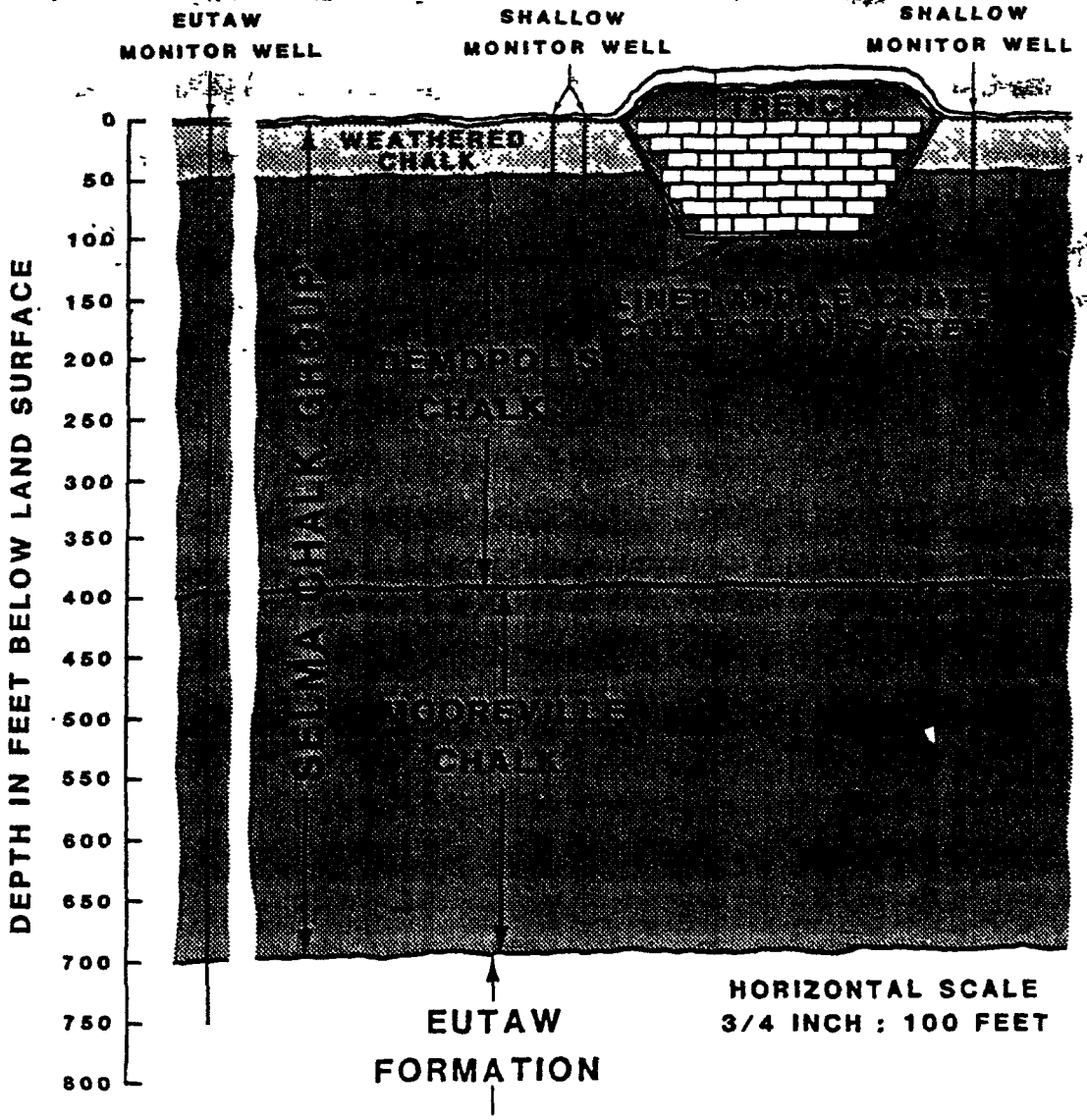
There is also a select set of monitoring wells that are completed in the Eutaw formation to determine if there is any degradation of the Eutaw Aquifer. The Eutaw is also relatively non-transmissive and is unsuitable for public drinking water supplies because of the high concentration of sodium chloride and other natural minerals. Beneath the Eutaw is the Coker Formation, also considered generally unsuitable for drinking. The Gordo Formation at a depth of about 2,000 feet contains good quality drinking water.

Interpretation of the analyses is much more important than the raw data. Many compounds that may be harmful at higher concentrations have no known effect on health or environment at the lower limits of detection.

At the Emelle plant, environmental monitoring is an ongoing part of the task. Some samples are analyzed at our on-site lab which is equipped with a gas chromatograph mass spectrometer (GCMS) for analyzing unknown compounds. Samples used for record and regulatory purposes, however, are usually sent to an EPA-approved lab that specializes in such work.

All environmental data collected and evaluated to date indicates that there has been no adverse environmental impact from waste handling activities. There will always be abberations in data and errors in analysis, sampling, and handling, but with patience, and an understanding of the procedures followed, the environmental monitoring record is convincing evidence that proper and safe handling of the waste has prevented negative impact of the environment.

SHALLOW MONITOR WELL SYSTEM



*THE TOP OF THE GORDO FORMATION IS APPROXIMATELY 400 FEET BELOW THE TOP OF THE EUTAW FORMATION

EMELLE FACTS

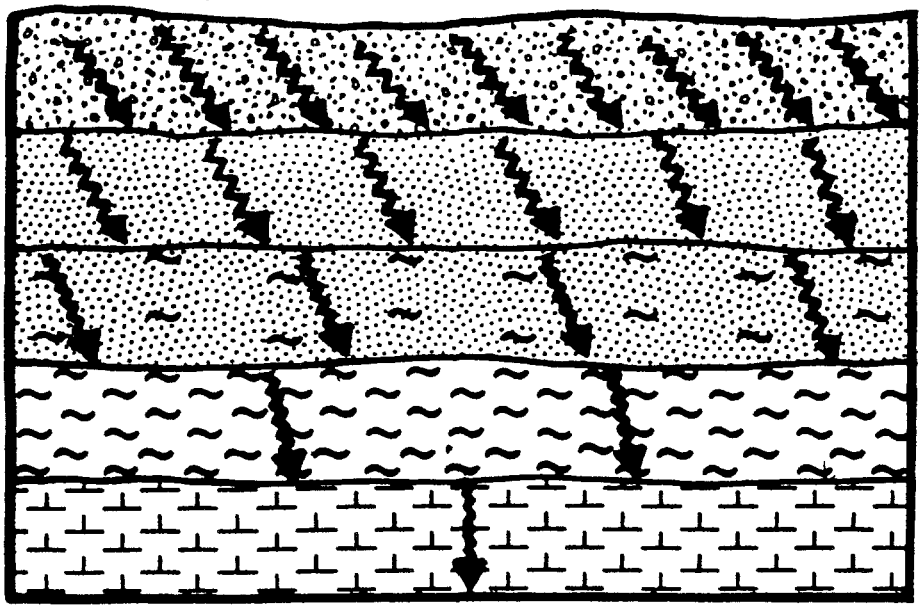
Natural and Man-Made Protection

The waste treatment, storage, and disposal facility operated by Chemical Waste Management, Inc., located at Emelle in Sumter County, Alabama, provides a unique and ideal location for the safe and effective management of hazardous wastes. Some 700 feet of Selma Chalk with a permeability of 10^{-8} cm/sec. isolate the facility from the nearest groundwater-producing aquifer in the Eutaw. The aquifer in the upper part of the Eutaw contains water high in chloride content that limits its use.

This geologic setting, combined with the hydrogeologic conditions of the area, is recognized as one of the best locations in the nation for proper and safe management of hazardous waste materials. The natural, "in-situ" chalk occurring in north Sumter County is massive, stable, homogeneous and essentially impermeable.

The thickness and extremely low transmissivity of the chalk provides many centuries of environmental protection, but in addition to the natural security features of cell engineering and design provide additional protection that exceed regulatory requirements. The cells are constructed with double synthetic liners and leachate collection systems for removal of liquids. Design and construction of the cells ensures that the environment is protected.

Comparative Time for Movement of Water



GRAVEL
(.00013 DAY)*

CLEAN SAND
(.07 DAY)*

SILTY SAND
(71 DAYS)*

SILT
(710 DAYS)*

SELMA CHALK
(14,900 DAYS)*

* Comparative values listed are average times for movement of water through 6 feet of saturated homogeneous media. A hydraulic gradient of one is assumed.

CHEMICAL WASTE MANAGEMENT, INC.
P.O. BOX 1496, LIVINGSTON, AL 35470 TEL. (205) 652-6721

Landfill Design

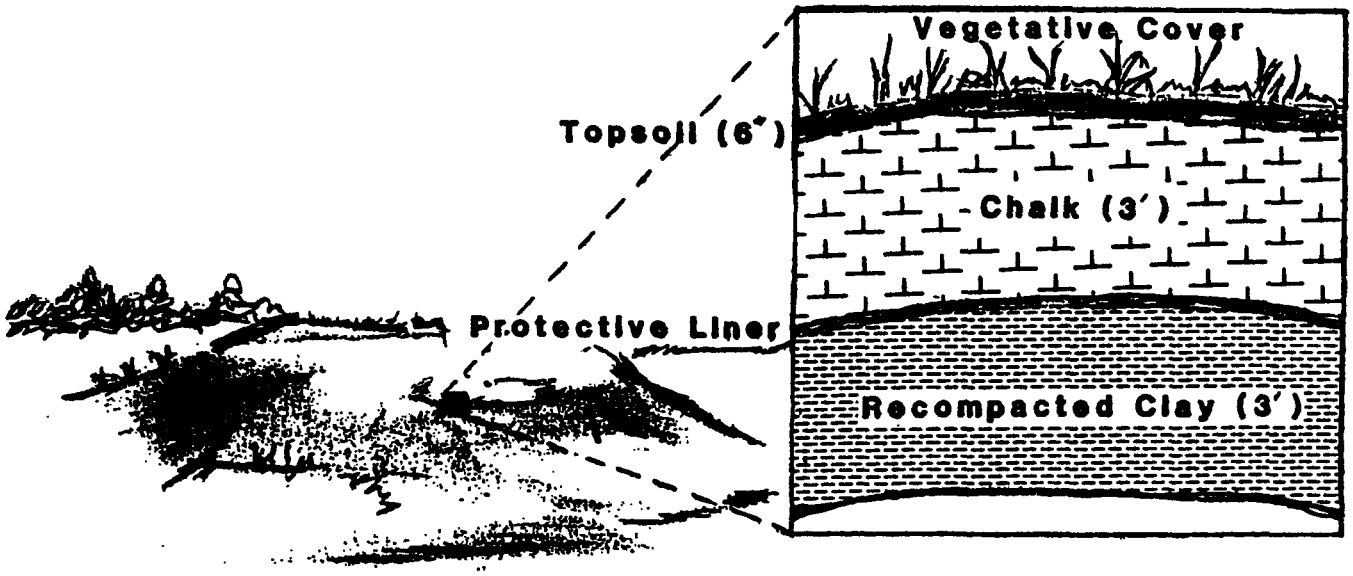
Chemical Waste Management, Inc. has selected a 60 mil, high density, polyethylene (HDPE), geomembrane liner material, based on extensive review of manufacturers' test data, prior operating experience, and the company's on-going testing program. This testing program is extensive and is designed to ensure the compatibility of liner materials with the type of wastes that are managed at the facility. HDPE liner materials are generally accepted by the industry as the most suitable and chemically resistant materials for use as landfill liners.

When the landfill reaches its maximum designed capacity, a protective cover is built. This cover, constructed in accordance with EPA guidelines, includes compacted chalk and high-density polyethylene liners. The topsoil will be sown with natural vegetation to minimize erosion and the surface sloped at approximately ten percent (10%) in order to promote drainage of rainwater away from the landfill unit.

The double liner systems must meet both state and federal requirements for design and construction. Prior to construction, the engineering designs are reviewed by the Alabama Department of Environmental Management and the United States Environmental Protection Agency (EPA). The purpose of this review is to ensure that the liner systems meet regulatory requirements and will protect the environment.

Installation of state-of-the-art composite double synthetic liner systems, coupled with the geologic setting, hydrogeologic conditions, and Chemical Waste Management, Inc.'s groundwater and environmental monitoring programs, provide added assurances that operations at the Emelle, Alabama facility are protecting public health and the environment while providing an indispensable service to the public and industry.

Final Protective Cover

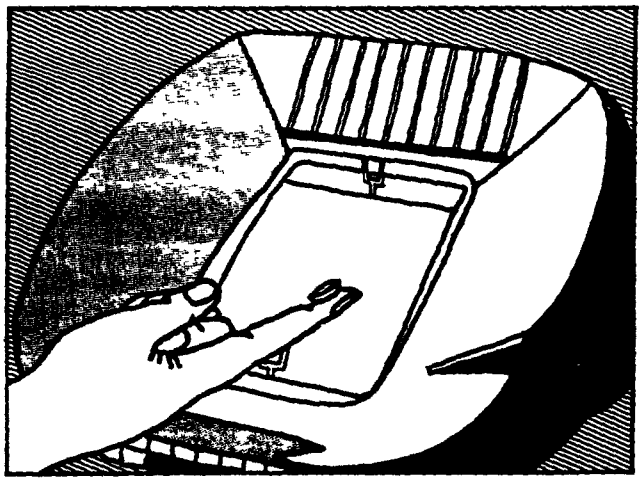


EMELLE FACTS

Environmental Monitoring

The most convincing evidence of environmental integrity and security is data obtained by comprehensive monitoring. Environmental monitoring, however, is a difficult and demanding task that requires a high degree of precision, and a good understanding of the issues in order to interpret results.

The CWM operations at Emelle have three full-time environmental scientists to perform monitoring operations. In addition, samples are often "split" with representatives from ADEM and EPA. Regulatory authorities may also collect samples independently. Samples may be collected from on-site or off-site locations, and depending on the need, samples may include water, soil, sediment, or air.



One part per billion is a measure which can be represented by the following equivalents:

1 contact lens —— area of 55 football fields
1 second —— 32 years
1 hard-boiled egg —— 83,333,334 dozens raw eggs

In order to get valid results, there are carefully prescribed methods that must be followed and procedures for documenting proper handling and transfer of samples. However, because of the highly sensitive analytical instruments, even "clean" samples sometimes show low levels of "contamination." With instrumentation that can detect compounds in the low part per billion range, samples can become "contaminated" by merely opening a sample bottle in the laboratory or some other action.

In the case of a monitoring well, for example, misleading results may come from such sources as: solvents used to clean augers prior to drilling, pipes, tools, and pumps used to construct the well, vehicles passing by while the well is open, colognes, soaps, gloves, rainwear, etc., worn by the sampler, and air or contact with foreign matter in the laboratory or analyzer.

Because of the possibility of contamination from outside sources, samples frequently must be checked on several different occasions to be sure that the results are accurate. In addition, while samples are expected to be "clean" and have no contamination, many samples show "background" levels of compounds. These may be present because of naturally occurring materials such as lead, chromium, and other metals, or because of various activities such as auto traffic, farming, construction, and other common activities.

CHEMICAL WASTE MANAGEMENT, INC.
P.O. BOX 1496, LIVINGSTON, AL 35470 TEL. (205) 652-6704

EMELLE FACTS

Landfill Construction

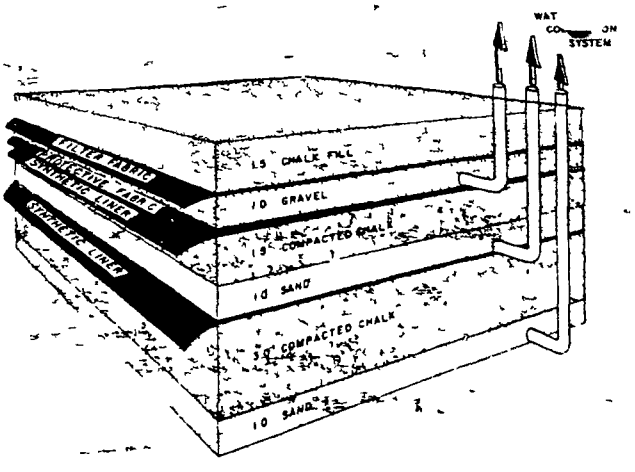
The secure landfills at the Emelle, Alabama facility are carefully engineered and constructed for secure containment of waste materials which have been approved for disposal. The landfill liner system utilized at the Emelle, Alabama facility consists of two (2) separate composite liners and two (2) leachate collection systems, with an underlying pressure relief system. This provides for state-of-the-art secure containment for waste materials placed in the landfill units. Leachate, which is primarily rainwater that becomes contaminated as it passes through waste in the landfill, is collected for treatment and disposal by the leachate collection systems. No liquid waste materials are placed in the secure landfill units.

After excavation of the landfill unit, a system consisting of gravel, slot drains, and a sand blanket is installed in order to extract any ground water before it can reach the landfill. A secondary, composite liner/leachate collection system is installed above the sand blanket.

The composite liner consists of 3 feet of compacted chalk with a permeability of 10^{-8} cm/sec., which is overlain by a 60 mil. high-density, polyethylene, synthetic liner. The secondary leachate collection system is installed above the synthetic liner and consists of 1 foot of sand, in which is installed slot drains, a sump, and a leachate collection riser pipe.

A primary liner is installed above the secondary leachate collection system and consists of 1.5 feet of compacted chalk, overlain by a 60 mil. high-density, polyethylene, synthetic liner, which is overlain by a protective synthetic fabric. The primary leachate collection system is installed above the protective fabric and consists of 1 foot of gravel, in which is installed slot drains, a sump, and a leachate collection riser pipe.

Above the primary leachate collection system is a filter fabric which is overlain by 1.5 feet of chalk fill. A secondary leachate collection system, located between the primary and secondary composite liner systems, serves as a backup.



Facility Liner Schematic

CHEMICAL WASTE MANAGEMENT, INC.
P.O. BOX 1496, LIVINGSTON, AL 35470 TEL. (205) 652-6721

APPENDIX G.27

U.S.EPA LETTER DATED OCTOBER 10, 1983

Central Foundry Division
General Motors Corporation
Bedford Plant
P. O. Box 271
Bedford, Indiana 47421

October 10, 1983

U.S. Environmental Protection Agency
Region V, Enforcement Division
Attn: Chief, Compliance Section
1 North Wacker Drive
Chicago, Illinois 60606

Subject: National Response Center Notification
NPDES Permit No. IN0003573

Dear Sir:

The purpose of this letter is to notify your agency that the National Response Center (contact: Miss Bowman) and the Indiana State Board of Health (contact: Mr. Frost) were contacted on October 5, 1983 by the General Motors Corporation, Central Foundry Division, Bedford, Indiana Plant. This telephone call was made to inform these agencies that there may have been a release of water containing PCB's into a lagoon that was being dredged and excavated on the plant's property. The water was observed the week of September 19, 1983 during the excavation of the lagoon and was thought to be water that had been held in the lagoon. However, when the lagoon was completely excavated it was observed that a small amount of water continued to flow into the bottom of the lagoon at the base of the lagoon wall. All of the water was captured and collected. A leacheate collection pipe and well has been installed to collect any water that might continue to flow after the filling in of this lagoon is completed.

General Motors does not believe that the reporting was necessary, but elected to report in an abundance of caution. General Motors, also believes that it did not exceed any reportable quantity of PCB's.

If there are further questions on the above, please contact me.

Yours truly,

Central Foundry Division
General Motors Corporation

W. A. Butler

W. A. Butler
Superintendent
Plant Engineering

cc: R. Herr
W. Cheek

APPENDIX G.28

U.S.EPA LETTER DATED JANUARY 11, 1984

Central Foundry Division
General Motors Corporation

P. O. Box 271
Bedford, Indiana 47421

bcc: R. Herr
P. Murphy
W. Cheek
J. Medved
J. Chu - GM-EAS
P. Gerwert - GM-EAS
P. Zavala - GM-Legal
G. Ohl

January 11, 1984

Mr. V. Adamkus, Administrator
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, IL 60604

Subject: General Motors - Central Foundry Division
Bedford Plant, Sludge Storage Lagoon

Dear Sir:

The purpose of this letter is to inform the U.S. EPA that General Motors, Central Foundry Division has completed the cleanup of the PCB contaminated materials in the subject sludge storage lagoon.

General Motors contracted with CECOS International for the total "turnkey" cleanup and disposal of the contaminated lagoon sludge and soil and the backfilling of the cleaned lagoon.

The project report from CECOS International is enclosed for your information.

Central Foundry Division would like to express its appreciation to your staff for their recommendations which were given in joint meetings when the discussion concerned the subject lagoon. This spirit of cooperation has assisted General Motors' in meeting its commitment to the U.S. EPA to complete the cleanup of the subject lagoon by December 31, 1983.

Sincerely,

W. A. Butler

W. A. Butler
Superintendent
Plant Engineering

WAB/sc
Enclosure

Central Foundry Division
General Motors Corporation
Bedford Plant
P. O. Box 271
Bedford, Indiana 47421

January 11, 1984

Mr. J. Stallsmith
Chief, Operations Branch
Stream Pollution Control
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, Indiana 46202

Subject: NPDES Permit No. IN0003573

Dear Sir:

The General Motors Central Foundry Division-Bedford Plant has completed the cleanup of a sludge storage lagoon. The excavated area was backfilled and graded to direct all surface runoff water to the storm water collection system and storm water collection lagoon. The area was seeded to minimize erosion of soils. Prior to backfilling the cleaned lagoon, a leacheate collection system was installed in the bottom of the excavated lagoon area. The leacheate is discharged into the plant's wastewater treatment system where it is treated along with the plant's process water and storm water prior to being recycled in the plant or being discharged. The treatment of the surface water and leacheate has not caused any violations of the effluent limitations of the subject permit.

If there are further questions on above, please contact me.

Sincerely,

W. A. Butler

W. A. Butler
Superintendent
Plant Engineering

WAB/sc

bcc: R. Herr
P. Murphy
W. Cheek
J. Medved
P. Gerwert - GM-EAS
J. Chu - GM-EAS
P. Zavala
G. Ohl

TOJ-SAND-84011 -LRS

APPENDIX G.29

NRC LETTER DATED FEBRUARY 3, 1986

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

February 3, 1986

Duty Officer, U.S. Coast Guard
National Response Center, Room 2611
2100 Second Street, S.W.
Washington, D.C. 20593

Re: Confirmation of Telephone Contact
on January 11, 1986

Dear Sir:

The purpose of this letter is to confirm the telephone call from the General Motors, Central Foundry Division-Bedford, Indiana Plant to the National Response Center and the State of Indiana Emergency Response Center at approximately 12:45 a.m. on January 11, 1986. The contacts were Ensign Middlebrooks at the National Response Center and Messrs. Hatfield and Mauck at the State of Indiana. The telephone call was made to report the breakage of an underground stormwater pipeline that resulted in the loss of storm and process water to the Bailey's Branch of Pleasant Run Creek. The broken line was discovered at approximately 10:00 p.m. on January 10, 1986, and immediate action was taken to shut off the pumps and valves to isolate the broken section of pipe, shut off water flow and to dike and contain the water. These efforts were completed at approximately 11:20 p.m. 1-10-86.

The McIntyre Construction Company was contacted at 12:15 a.m. January 11, 1986, and arrived at the job site the morning of January 11, 1986. Excavation of the 8-inch pipe under the pump building showed that a 90° elbow had moved and separated from a vertical run under the building. The problem necessitated rerouting approximately 40 feet of pipe from under the building. Pipe tie rods were used to tie the sections of pipe together in order to minimize the possibility of the pipe separating in the future. Concrete thrust blocks were also poured at the pipe turns to further reduce the possibility of pipe movement. The repair work continued through January 11, 12, and 13, 1986. The stormwater pumping system was returned to normal operation at approximately 1:00 p.m. January 13, 1986. Further corrective

Lets Get It Together
SAFETY BELTS SAVE LIVES

action included the addition of a check valve in the stormwater line to prevent process water from backflowing into the stormwater line if the storm line failed in the future.

Sincerely,

P. J. Murphy
Manager Plant Engineering
and Maintenance

HD4/DOC22/sc

cc: Emergency Center
Indiana State Board of Health

bcc: R. Herr
W. Cheek
J. Medved
M. Cooke - GM Legal
P. Gerwert - GM Legal
G. Ohl

APPENDIX G.30

IDEM LETTER DATED NOVEMBER 8, 1988

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

November 8, 1988

CERTIFIED MAIL

Mr. Paul Cluxton
Office of Water Management
Indiana Department of Environmental Management
105 South Meridian Street
Indianapolis, IN 46206

Dear Mr. Cluxton:

This is to confirm our conversation of November 7, 1988, regarding the Central Foundry, Bedford 003 NPDES discharge.

On November 5, 1988, beginning at approximately 8 a.m. and ending on November 6, at approximately 4 a.m., a discharge occurred from the Storm Lagoon labeled 003 outfall in Central Foundry's NPDES Permit No. IN 0003573. Approximately 360,000 gallons of water was discharged. Samples were collected and have been sent to an independent laboratory for analysis of oil and grease and PCB's. The pH of the discharge was measured at Central Foundry's laboratory and was 7.9.

The events which led to this discharge were a combination of rainfall and equipment failure which began on September 28, 1988. On that date, failure of a pump in the surge basins in the water treatment plant caused a combination of wastewater and filter backwash to flow into the stormwater collection system. Immediate efforts to repair the pump were begun, but due to the untimely death of the plant's pump repairman and delays in ordering parts, a new pump had to be ordered. The pump was replaced on October 25, 1988, and efforts were begun immediately to pump the water from the storm lagoon. The removal was hampered by high flows from the production facility and filamentus bacteria in the activated sludge system. Additionally, the Raw Waste Pump Station capacity has deteriorated due to age and excess water which is diverted to the surge basins, has slowed removal of the water from the storm lagoon. These events, accompanied by the rainfall received on November 4 and 5, 1988, caused the combination of stormwater and wastewater to be discharged from 003 outfall. The certified operator notified the IDEM receptionist on November 5, 1988, and

Let's Get It Together
SAFETY BELTS SAVE LIVES

this letter confirms your notification on November 7, 1988. The U.S. Coast Guard was not notified as you indicated it was not required.

Efforts to replace the pumps have been expedited and an emergency pump has been ordered and will be installed today.
Attempts to control the filamentus floc through chlorination and nutrient control have been partially successful. High flows from the production facility have been investigated and efforts are underway to eliminate them. Every effort is being made to remove the water from the lagoon and to prevent recurrence of the overflow.

If you have any questions regarding these matters please contact me at AC 812/279-7310.

Sincerely,

Gregory Etzel

Gregory Etzel
Environmental Engineer

bc: Joe Medved, CFD
Bernie Scherschel, CFB
Bill Schoonmaker, CFB
John Takle, EAS
Don Schiemann, Legal Staff

APPENDIX G.31

GM LETTER DATED OCTOBER 15, 1982

Brent

Central Foundry Division
General Motors Corporation
Bedford Plant
P. O. Box 271
Bedford, Indiana 47421

October 15, 1982

Mr. Paul Zavala
Office of General Counsel
General Motors Corporation
3044 West Grand Boulevard
Detroit, Michigan 48202

RE: Versar Samples - PCB Inspection

Dear Mr. Zavala:

The samples collected by the U.S. EPA's contractor, Versar, Inc., during their inspection of the Central Foundry Division - Bedford Plant on May 19, 1982 have been analyzed for their PCB level.

The analyses of these samples were performed by G. Brent, Supervisor of the Wastewater Treatment Laboratory. The results are listed below.

Versar Sample No.	Location and Description	PCB Level
CDF 01	Die Cast North Make 3 Sump, H_2O (water)	9 PPB
CDF 02	Die Cast North Make 3 Sump, sediment (solids)	121 PPM
CDF 03	Die Cast South Make 1, North Make 1 Sump, H_2O (water)	18 PPB
CDF 04	Die Cast South Make 1, North Make 1 Sump, sediment (solids)	12 PPM
CDF 05	Die Cast Machine Storage Yard, soil (oil dry on concrete slab)	7 PPM
CDF 06	Grit chamber, soil, (solids) (Bar screen ahead of Water Treatment Plant)	253 PPM
CDF 07	Groundwater Sump, H_2O (water) (Sump near "spring" location west of Water Treatment Plant)	< 1 PPB

Versar Sample No.	Location and Description	PCB Level
CDF 08	Storm Sewer by Treatment Plant, H_2O (water) (Catch basin by loading dock)	< 1 PPB
CDF 09	Filter Press, solids (dewatered sludge)	59 PPM
CDF 10	Waste Lagoon, multi media (South sludge storage lagoon)	876 PPM
CDF 11	Cake from Lagoon, solids (South sludge lagoon)	694 PPM
CDF 12	Million gallon storage tank, oil (hydraulic fluid)	156 PPM
CDF 13	Upper Pond by 14 storage tanks, sediment space composite (Diked area no longer used)	6 PPM
CDF 14	Water from pond near 7 storage tanks (Small sump in diked area that CECOS removed in conjunction with cleanup and disposal of the 7 tanks and PCB tainted soils)	9 PPM Total Sample 346 PPM Oil phase of sample
CDF 15	7 Tank area - SE Sample (soil)	90 PPM
CDF 16	7 Tank area - NE Sample (soil)	110 PPM
CDF 17	7 Tank area - Center Sample (soil)	60 PPM
CDF 18	7 Tank area - SW Sample (soil)	388 PPM
CDF 19	7 Tank area - NW Sample (soil)	N.D.
CDF 20	Discharge 002 (H_2O) (Calgon carbon discharge pipe)	< 1 PPB
CDF 21	Run off and stormwater near discharge 002 (From 48" diameter storm sewer ahead of lift station)	< 1 PPB
CDF 22	Soil at base of discharge 002 (at property fence line)	10 PPM
CDF 23	Soil from North Lagoon 10 feet above water line on bank	2376 PPM
CDF 24	Soil from North Lagoon just below water level	3068 PPM

Versar Sample No.	Location and Description	PCB Level
CDF 25	Discharge 001 (H_2O) (This is the old 001 corrugated pipe from the North Lagoon)	< 1 PPB
CDF 26	Soil at base of discharge 001 (This is below the outlet of the corrugated pipe at old 001 outfall)	7.2 PPB

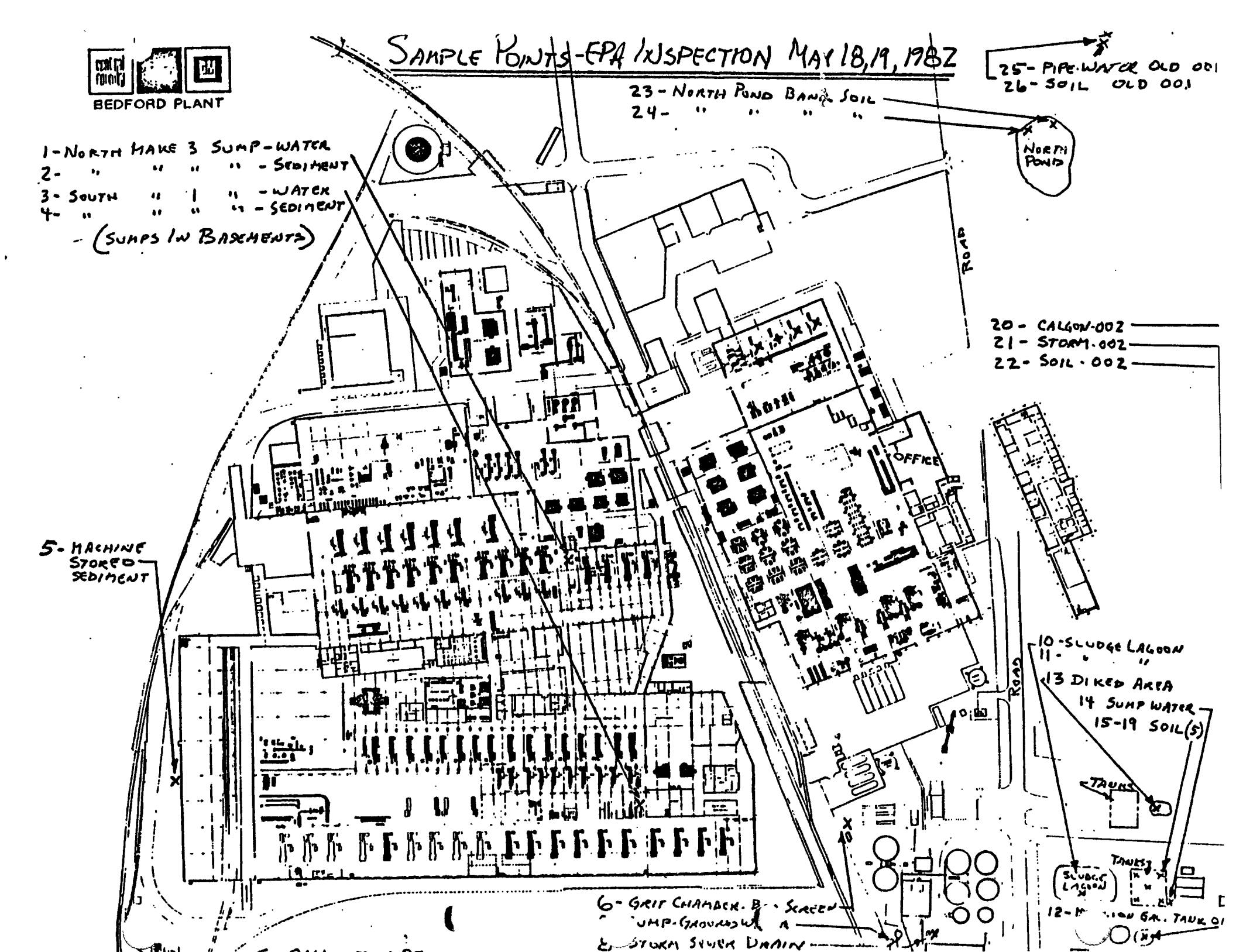
If there are any questions, please contact me.

Glen R. Ohl
Environmental Coordinator

GRO/sc

Attachments

cc: W. Butler
J. Medved
J. Chu


BEDFORD PLANT
SAMPLE POINTS-EPA INSPECTION MAY 18,19, 1982
1-NORTH MAKE 3 SUMP-WATER
2- " " " " -SEDIMENT
3-SOUTH " 1 " -WATER
4- " " " " -SEDIMENT
-(SUMPS IN BASEMENTS)
5-MACHINE STORED SEDIMENT
23-NORTH POND BANK SOIL
24- " " " "
25-PIPE-WATER OLD 001
26-SOIL OLD 001
NORTH POND
ROAD
20-CALGON-002
21-STORM-002
22-SOIL-002
OFFICE
ROAD
10-SLUDGE LAGOON
11- " "
13 DIKED AREA
14 SUMP WATER
15-19 SOIL(S)
TANKS
SLUDGE LAGOON
TANKS
6-GRIT CHAMBER-B- SCREEN
UMP-GROUNDWA A
&-STORM SEWER DRAIN

EPA United States Environmental Protection Agency

NOTICE OF INSPECTION

Firm GMC Bedford PLANT	
Firm Address CENTRAL FOUNDRY DIVISION NORTH 34th St. Bedford, INDIANA	
Inspector Name and Address M Calhoun / B Murphy / B Moran VERSAR INC 6621 Electronic Dr Springfield VA 22151	Date 5/18/82 Time ~9AM
Inspector's Signature Michael C Calhoun	Name and Title of Recipient SUPERINTENDENT WILLIAM A. BUTLER - PLANT ENGINEER
Title Compliance Auditor	Signature of Recipient William A. Butler

REASON FOR INSPECTION

Under the authority of Section 11 of the Toxic Substances Control Act

PCBS

☒ For the purpose of inspecting (including taking samples, photographs, statements, and other inspection activities) an establishment, facility, or other premises in which chemical substances or mixtures or articles containing same are manufactured, processed or stored, or held before or after their distribution in commerce (including records, files, papers, processes, controls, and facilities) and any conveyance being used to transport chemical substances, mixtures, or articles containing same in connection with their distribution in commerce (including records, files, papers, processes, controls and facilities) bearing on whether the requirements of the Act applicable to the chemical substances, mixtures, or articles within or associated with such premises or conveyance have been compiled with.

☐ In addition, this inspection extends to (circle appropriate letters):

(A) Financial data
(B) Sales data
(C) Pricing data
(D) Personnel data
(E) Reserach data

The nature and extent of inspection of such data specified in A through E above as follows:

United States Environmental Protection Agency

TSCA Inspection Confidentiality Notice

Inspector Name: B Murphy / B. Moran / M Calhoun

Inspector Address: Versar Inc 6621 Electronic Drive. Springfield, VA 22151

Facility Address: Central Foundry Division, North Jackson St. Bedford, Ind. 4742

Chief Executive Officer of Firm: R. W. Hett

Title: Plant Manager

Name of Individual to Whom Notice Given: William A. Butler

Title: Superintendent - Plant Engineering

It is possible that EPA will receive public requests for release of the information obtained during inspection of the facility above. Such requests will be handled by EPA in accordance with provisions of the Freedom of Information Act (FOIA), 5 U.S.C. 552; EPA regulations issued thereunder, 40 CFR Part 2; and the Toxic Substances Control Act, Section 14. EPA is required to make inspection data available in response to FOIA requests unless the Administrator of the Agency determines that the data contains information entitled to confidential treatment.

Any or all the information collected by EPA during the inspection may be claimed confidential if it relates to trade secrets or commercial or financial matters that you consider to be confidential. If you make claims of confidentiality, EPA will disclose the information only to the extent, and by means of the procedures, set forth in the regulations (cited above) governing EPA's treatment of confidential information. Among other things, the regulations require that EPA notify you in advance of publicly disclosing any information you have claimed and certified confidential.

To Claim Confidential Information

To claim information confidential, you must certify that each claimed item meets all of the following criteria:

1. Your company has taken measures to protect the confidentiality of the information, and it intends to continue to take such measures.
2. The information is not, and has not been, reasonably obtainable without your company's consent by other persons (other than governmental bodies) by use of legitimate means (other than discovery based on a showing of special need in a judicial or quasi-judicial proceeding).
3. The information is not publicly available elsewhere.
4. Disclosure of the information would cause substantial harm to your company's competitive position.

At the completion of the inspection, you will be given a receipt for all documents, samples, and other materials collected. At that time, you may make claims that some or all of the information is confidential and meets the four criteria listed above.

If you are not authorized by your company to make confidentiality claims, this notice will be sent by certified mail, along with the receipt for documents, samples, and other materials to the Chief Executive Officer of your firm within two days of this date. The Chief Executive Officer must return a statement specifying any information which should receive confidential treatment.

The statement from the Chief Executive Officer should be addressed to:

and mailed by registered, return-receipt-requested mail within seven (7) calendar days of receipt of this Notice.

Failure by your firm to submit a written request that information be treated as confidential, either at the completion of the inspection or by the Chief Executive Officer within the seven-day period, will be treated by EPA as a waiver by your company of any claims for confidentiality regarding the inspection data.

To be completed by facility official receiving this notice

I have received and read this Notice.

Name: William A. Butler

Title: Superintendent - Plant Engineering

Signature: William A. Butler

Date: May-19 1982

If there is no one on the premises of the facility who is authorized to make business confidentiality claims for the firm, a copy of this Notice and other inspection materials will be sent to the company's chief executive officer. If there is another company official who should also receive this information, please designate below.

Name:

Title:

Address:

EPA Agency

GMC - Bedford Ind

RECEIPT FOR SAMPLES AND DOCUMENTS

Firm Address: N. JACKSON ST. Bedford, Ind

Inspector Name: BOB MURPHY, MIKE CALHOUN, BILL MORAN

Inspector Address: VERSAR, INC 6621 ELECTRONIC DRIVE SPRINGFIELD, VA

Name of Individual: William Butler

Title: Superintendent - Plant Engineer

Date Collected	Duplicate Samples Requested and Received	Sample Numbers
5/19/82	(✓) Yes ( ) No	CDF 01 - CDF 13

The documents and samples of chemical substances and/or mixtures described below were collected in connection with the administration and enforcement of the Toxic Substances Control Act.

Receipt for the document(s) and/or sample(s) described is hereby acknowledged:

SAMPLES @ CDF

(1) NORTH MAKE 3 SUMP, H_2O, CDF 01
(2) NORTH MAKE 3 SUMP, SEDIMENT, CDF 02
(3) SOUTH MAKE 1, NORTH MAKE 1, H_2O; DUPLICATE, CDF 03
(4) SOUTH MAKE 1, NORTH MAKE 2, Soil, CDF 04
(5) DIE CAST MACHINE STORAGE YARD, Soil, CDF 05
(6) GRIT CHAMBER, Soil CDF 06
(7) GROUND WATER SUMP, H_2O, CDF 07
(8) STORM SEWER BY TREATMENT PLANT, H_2O, CDF 08
(9) FILTER PRESS, Solids, CDF 09
(10) WASTE LAGOON, MULTI MEDIA, CDF 10
(11) CAKE FROM LAGOON, SOLIDS, CDF 11
(12) MILLION GALLON STORAGE TANK, OIL; DUPLICATE, CDF 12
(13) Upper Pond by 14 STORAGE TANKS, SEDIMENT SPACE COMPOSITE, CDF 13

PHOTOGRAPHS (TO BE PROVIDED BY CFD WHEN DEVELOPED)

6 rolls 110 film (12 exposures)
1 roll 35 film (24 exposures)

26

Signature of Inspector	Signature of Owner, Operator, or Agent
William Moran	William A Butler
Title: ENVIRONMENTAL SCIENTIST	Title: May 19, 1982

EPA

RECEIPT FOR SAMPLES AND DOCUMENTS

Inspector Name: M Calhoun / R Morrell / B Mundy

Inspector Address: WESTON
6621 Electronic Drive
Springfield VA 22151

Firm Address: North Jackson Bedford Indiana

Name of Individual: William Butler

Title: Superintendent - Plant Engineer

Date Collected	Duplicate Samples Requested and Received	Sample Numbers
5/19/82	(X) Yes ( ) No	CDF-14 - CDF-26

The documents and samples of chemical substances and/or mixtures described below were collected in connection with the administration and enforcement of the Toxic Substances Control Act.

Receipt for the document(s) and/or sample(s) described is hereby acknowledged:

Sample #

CDF14 Water from pond near 7 storage tanks near injection
CDF15 7 tanks area - SE sample
CDF16 7 tanks area NE sample
CDF17 7 tanks area center sample
CDF18 7 tanks area SW sample
CDF19 7 tanks area NW sample
CDF20 Discharge 002 (H2O)
CDF21 Run off/stormwater near Discharge 002
CDF22 Soil at base of discharge 002
CDF23 Soil from North Lagoon 10 feet from groundwater bank
CDF24 Soil from North Lagoon just below water level
CDF-25 Discharge 001 (H2O)
CDF-26 Soil at base of discharge 001

Signature of Inspector: M. Calhoun

Signature of Owner, Operator, or Agent: William A. Butler

Title: Compliance Auditor

Title: Superintendent - Plant Engineer

VERSAR Sample Results

Sample No.	Location	Sample Type	Analys.
01	NM3 Sump	WATER	9 PPB
02	NM3 Sump	Solid	121 PPM
03	SM1 Sump	WATER	18 PPB
04	SM1 Sump	Solid	12 PPM
05	Under D/C Mach	Solid	7 PPM
06	Grit Chamber	Solid	253 PPM
07	Spring	WATER	<1 PPB
08	Below Dock	WATER	<1 PPB
09	Filter Cake	Solid	59 PPM
10	Lagoon	WATER	876 PPM
11	Lagoon	Solid	694 PPM
12	Mil Gal Tnk	Oil	156 PPM
13	Soil (Upper Pond By 14 Tanks)	Solid	16 PPM
14	Tank Sump	Oil/Water	(Oil 346)(Total S...
15	Tank Area Soil	Solid	90 PPM
16	"	"	110 PPM
17	"	"	160 PPM
18	"	"	388 PPM
19	"	"	ND
20	Carbon Discharge	WATER	<1 PPB
21	002 Storm Disch.	WATER	<1 PPB
22	" " " Soil	Solid	10 PPM
23	North Pond	Solid	2376 PPM
24	" "	"	3068 PPM
25	Old 001 Pipe	WATER	<1 PPB
26	" " Soil	Solid	7.2 PPB

By G. Brent
10-14-82

cc: B. Butcox
G. Ohl

TABLE 1. PCB ANALYTICAL RESULTS FOR SAMPLES COLLECTED AT THE CENTRAL FOUNDRY DIVISION ON MAY 19, 1982*

Sample Number	Description	PCB Concentration (ppm)**	Aroclor Type
1	Water: North Make 3 Sump	400 ppb	1242
2	Sludge: North Make 3 Sump	24	1242
3	Water: North and South Make 1 Sump	87 ppb	1242
4	Sludge: North and South Make 1 Sump	1,200	1242
5	Solids: Die Cast Machine at West Storage Yard	4	1242
6	Solids: Grit Chamber at Treatment Plant	160	1242
7	Water: Groundwater Sump	ND+	--
8	Water: Storm Sewer by Treatment Plant	4 ppb	1242
9	Solids: Filter Cake in the Dumpster	1,500	1242
10	Oil/Water: From Storage Lagoon	20,000	1242
11	Solids: Cake from Storage Lagoon	27,000	1242
12	Oil: East Million Gallon Storage Tank	580	1242
13	Sediment: Space Composite by North Pond	97	Mix
14	Oil/Water: From South Pond	3,800	1242
15	Sediment: SE Side of Seven Leaking Storage Tanks	1,900	1242
16	Sediment: NE Side of Seven Leaking Storage Tanks	2,100	1242
17	Sediment: Center of Seven Leaking Storage Tanks	2,000	1242
18	Sediment: SW Side of Seven Leaking Storage Tanks	9,700	1242
19	Sediment: NW Side of Seven Leaking Storage Tanks	57	1248
20	Water: Discharge 002	ND+	--
21	Water: Stormwater Runoff into Bailey's Branch	7 ppb	1242
22	Sediment: Discharge 002 into Bailey's Branch	170	1242
23	Sediment: NE Corner of Old Watershed Lagoon, 10 feet above water level	9,600	1242
24	Sediment: North Side of Old Watershed Lagoon near water surface	69,000	1242
25	Water: Discharge 001	6 ppb	1242
26	Sediment: Base of Discharge 001 (Core sample)	29	1248

* The facility collected two duplicates for each of the eight water samples and two splits on the remaining samples. One duplicate/split was collected in a bottle supplied by Versar personnel, the second duplicate/split was collected in a bottle supplied by the Central Foundry Division. All samples were collected by Versar inspectors.

** All water samples are reported in parts per billion.

\+ Not detected at 1 part per billion.

MAY 25, 2001

APPENDIX G.32

CECOS TRANSPORTATION AND DISPOSAL OF PCB CONTAMINATED SOIL AND TANKS SUMMARY REPORT

Division of General Motors Corporation
Bedford Plant
Bedford, Indiana 47421

September 21, 1982

Mr. Paul Zavala
Office of General Counsel
General Motors Corporation
3044 West Grand Boulevard
Detroit, Michigan 48202

Dear Mr. Zavala:

The CECOS/CER Co. has submitted the enclosed report on the removal and disposal of the seven bulk storage tanks and contaminated soil located near the south lagoon. The soil and tanks were disposed of in the CECOS/CER Co.'s Secure Chemical Management Facility located near Williamsburg, Ohio. It should be noted that this is the soil referred to by Ms. Barbara Magel, EPA attorney, in her letter to you dated June 4, 1982 and by myself in my letter to Barbara Magel dated July 26, 1982.

Sincerely,

W. A. Butler
Superintendent
Plant Engineering

WAB/sc

cc: P. Murphy
W. Cheek
J. Medved

FILE

CECOS
CER CO.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS
4879 Spring Grove Ave. Cincinnati, Ohio 45232

SUMMARY REPORT FOR

GENERAL MOTORS
CENTRAL FOUNDRY DIV.
BEDFORD, INDIANA PLANT

TRANSPORTATION AND DISPOSAL OF PCB CONTAMINATED SOIL AND TANKS

SUMMARY REPORT SUBMITTED BY:

CECOS/CER CO.
SPECIAL ENVIRONMENTAL SERVICES DIV.

PREPARED BY:

MICHAEL A. VERDE
SPECIAL SERVICES MANAGER

CECOS CER CO.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS

Administrative Offices
4879 Spring Grove Avenue
Cincinnati, Ohio 45232
(513) 681-5731

Operations Site
5092 Aber Road
Williamsburg, Ohio 45
(513) 724-6[illegible]

SUMMARY REPORT

On July 26, 1982 CECOS/CER CO. commenced work on removal of seven (7) contaminated tanks and PCB contaminated soil from the General Motors Plant located in Bedford, Indiana. A total of five (5) days was required to complete the project.

CECOS/CER CO. was responsible for the removal of the seven (7) tanks and all contaminated soil. All work was performed in a bermed area adjacent to the General Motors, Central Foundry Division, Bedford Plant South Lagoon.

Area within the berms measured 110 feet x 70 feet.

Initially, CECOS/CER CO. removed the residual sludge like material from the bottom of the tanks. This material was processed through the General Motors Sludge Dewatering Facility. All dewatered sludge was shipped to CECOS/CER CO.'s Secure Chemical Management Facility located near Williamsburg, Ohio for disposal.

After removal of the residual material, the seven (7) tanks were cut into sections and shipped to CECOS/CER CO.'s Secure Chemical Management Facility located near Williamsburg, Ohio for disposal.

After removal of the tanks, all visually stained soil was removed from within the bermed area and shipped to CECOS/CER CO.'s Secure Chemical Management Facility located near Williamsburg, Ohio for disposal. The Federal EPA ID Number for the CECOS/CER CO. Williamsburg facility is OHD 087 433 744.

Visual inspection and removal of all stained areas is an acceptable procedure within the industry for determining the initial scope of the job. Final determination of PCB contamination can only be accomplished through analytical tests of the area.

Soil samples were taken by CECOS/CER CO. and given to General Motors Central Foundry for analysis. Soil sampling was accomplished by partitioning 110 ft. x 70 ft. bermed area into six (6) distinct sections. Each section was approximately 35 x 35. From the center of each section, a 4 inch core sample was taken. General Motors was given six (6) individual samples ... plus a composite sample for analysis. The above sampling protocal is based on sound scientific principles.

General Motors analysis of the composite showed 21.2 ppm PCB, per a verbal report from General Motors to CECOS/CER CO.

CECOS
CER CO.
CHEMICAL AND ENVIRONMENTAL CONSERVATION SYSTEMS
4879 Spring Grove Ave. Cincinnati, Ohio 45232

SUMMARY REPORT
PAGE TWO

ITEM ONE: Job commenced Monday, July 26, 1982 and ended Friday, July 30, 1982. Work days ranged from 8 to 16 hours a day (averaging 12.7 hours per day). All work was performed under the direction of a CECOS/CER Supervisor.

ITEM TWO: Equipment utilized includes:

Cat 977-L Loader (1)
Case 580-C Loader/Grappler (1)
Passenger Vehicle (1)
Equipment Vehicles (2)
Storage Vehicle (1)
Torches and Fuel
Personnel Safety Equipment

ITEM THREE: Transportation consisted of:

Monday - no loads
Tuesday - 4 loads
Wednesday - 1 load
Thursday - 4 loads
Friday - 11 loads

ITEM FOUR: DISPOSAL: 345.15 Tons disposal at CECOS/CER CO. Secure Chemical Management Facility.

ITEM FIVE: Cost: Total cost of the project as invoiced $89,431.00

Should additional information be needed, please contact Michael A. Verde.

Glen Ohl

Subject: PCB Analysis of Soil Sample Taken from Old Tank Storage Area After Cecos Clean-up.

Area was sectioned per attached drawing and samples of soil were taken from each of the 6 sections. (by Cecos).

Laboratory removed equal quantities from each container and composited. Sample was extracted and PCB analysis run.

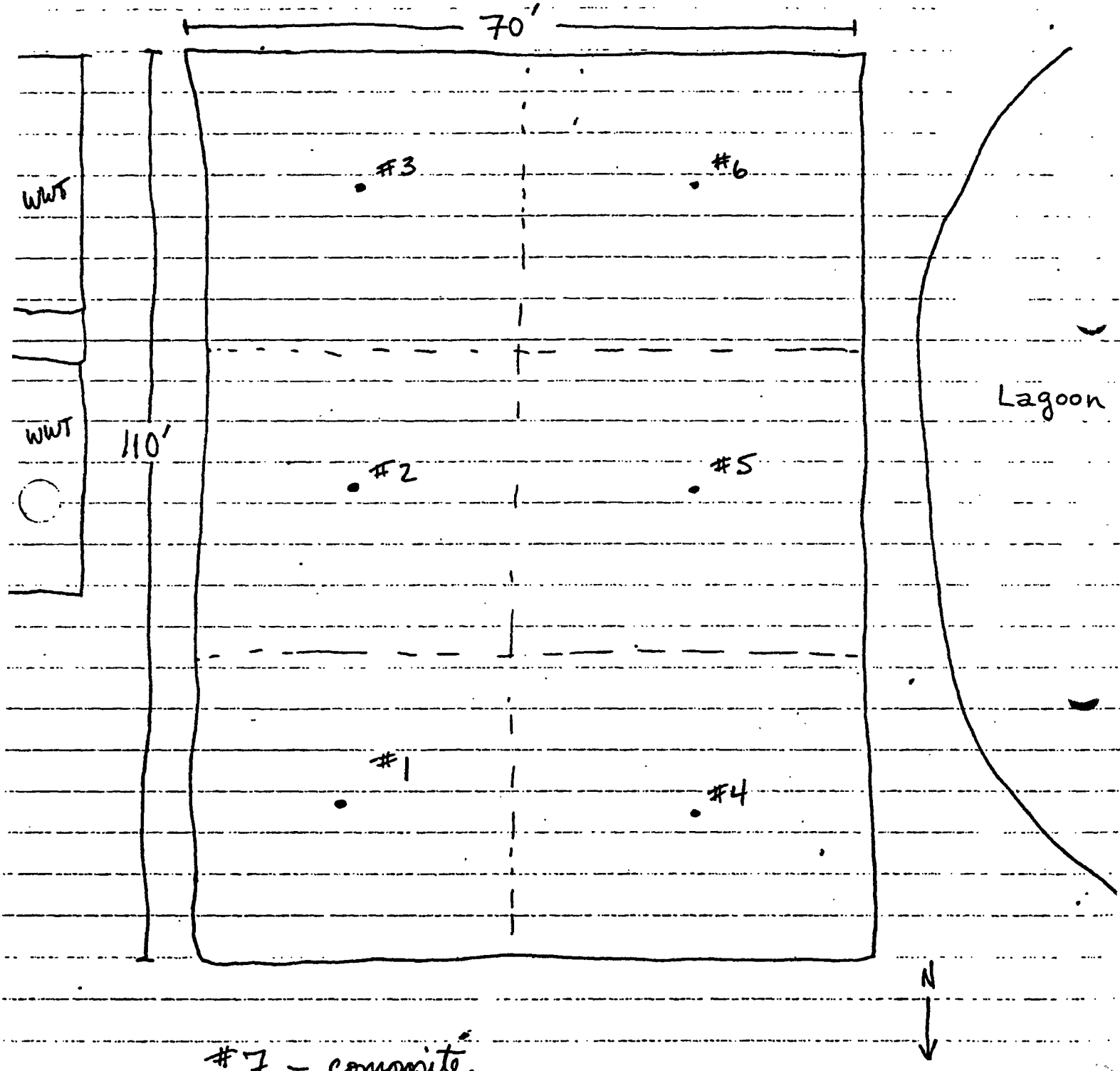
Composite - Analysis — 21.2 ppm PCB.

cc: Bill Butler
P. Murphy

S. E. Hornbuckle
8-1-82

GM - Bedford, IN 8:30 PM July 30, 1982

Sampling Diagram



#7 - composite

APPENDIX G.33

ISPCB LETTER DATED FEBRUARY 23, 1977

Division of General Motors Corporation
Bedford Plant
P. O. Box 271
Bedford, Indiana 47421

February 23, 1977

Mr. Patrick L. Stevens
Indiana Stream Pollution Control Board
1330 West Michigan Street
Indianapolis, Indiana 46206

Dear Mr. Stevens:

A small quantity of mineral hydraulic fluid escaped plant boundaries on Tuesday, February 22, 1977 at 3:00 p.m. Approximately five gallons or less entered a storm sewer at a company owned manhole and appeared to have discharged onto a surface ditch approximately 100 feet from the manhole. The oil originated from a storage tank used to hold mineral fluid for eventual disposal. Oil on the ground around the storage tank accumulated as a result of pumping error and was contained by sand dams awaiting final clean up, however, melting snow raised the fluid level above the sand dam and a small amount of oil and water escaped company property before discovery.

Yours truly,

M. J. Tahy
Plant Manager

MJT:mw

cc: Mr. Paul McBride
Lawrence County Health Dept.

Wm. C. Cheek
CFD Saginaw

APPENDIX G.34

NRC LETTER DATED SEPTEMBER 27, 1984

Division of General Motors Corporation
Bedford Plant
Bedford, Indiana 47421

September 27, 1984

Duty Officer
National Response Center
U.S. Coast Guard
400 Seventh Street, S.W.
Washington, D.C. 20590

Re: Confirmation of Telephone Contact
on September 15, 1984

Dear Sir:

The purpose of this letter is to confirm the telephone call from the General Motors, Central Foundry Division-Bedford, Indiana Plant to the National Response Center and the State of Indiana Emergency Response Center at approximately 12:50 a.m. on September 15, 1984. The contacts were Mr. Ambrozewicz at the National Response Center and Messrs. McClellon and McFall at the State of Indiana. The telephone call was made to report an incident regarding the loss of approximately 2,500 gallons of hydraulic fluid during the unloading of a Consolidated Recycling Company tanker truck at the General Motors, Central Foundry Division-Bedford, Indiana Plant. The incident occurred at approximately 10:15 p.m. on September 14, 1984. The fluid leaked onto a concrete slab and immediate action was taken to contain the fluid. None of the fluid left General Motors property. General Motors and its contractor, Commercial Sewer Cleaners, cleaned up the lost material. The surrounding area and drainage systems were also inspected and cleaned to insure that all material was recovered.

Sincerely,

W. A. Butler
Superintendent
Plant Engineering

E#2/sc

cc: Emergency Center
Indiana State Board of Health

bcc: R. Herr
P. Murphy
W. Cheek
J. Medved
J. Chu - GM-EAS
P. Zavala - GM-Legal
G. Ohl

APPENDIX G.35

ORIGINAL NOTIFICATION FOR UST – EPA FORM 7530

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES: 10-88

FOR TANKS IN IN

RETURN COMPLETED FORM TO
Division of Land Pollution Control
UST Program
Indiana State Board of Health
P.O. Box 7015
Indianapolis, IN 46207
(317) 243-5060

I D Number

STATE USE ONLY

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes,
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws,
5. surface impoundments, pits, ponds, or lagoons,
6. storm water or waste water collection systems,
7. flow-through process tanks,
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 1

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
GMC Central Foundry Division Bedford Plant

Street Address
North Jackson Street

County
Lawrence

City: Bedford | State: IN | ZIP Code: 47421

Area Code: 812 | Phone Number: 279-7000

Type of Owner *(Mark all that apply)*

- [X] Current
- [ ] Former
- [ ] State or Local Gov't
- [ ] Federal Gov't (GSA facility I.D. no. _____)
- [X] Private or Corporate
- [ ] Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here [X])

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable

County

City (nearest) | State | ZIP Code

Indicate number of tanks at this location: 2

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands: [ ]

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here [ ])	Job Title	Area Code	Phone Number
G. R. Ohl	Environmental Coordinator	(812)	279-7302

IV. TYPE OF NOTIFICATION

[ ] Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

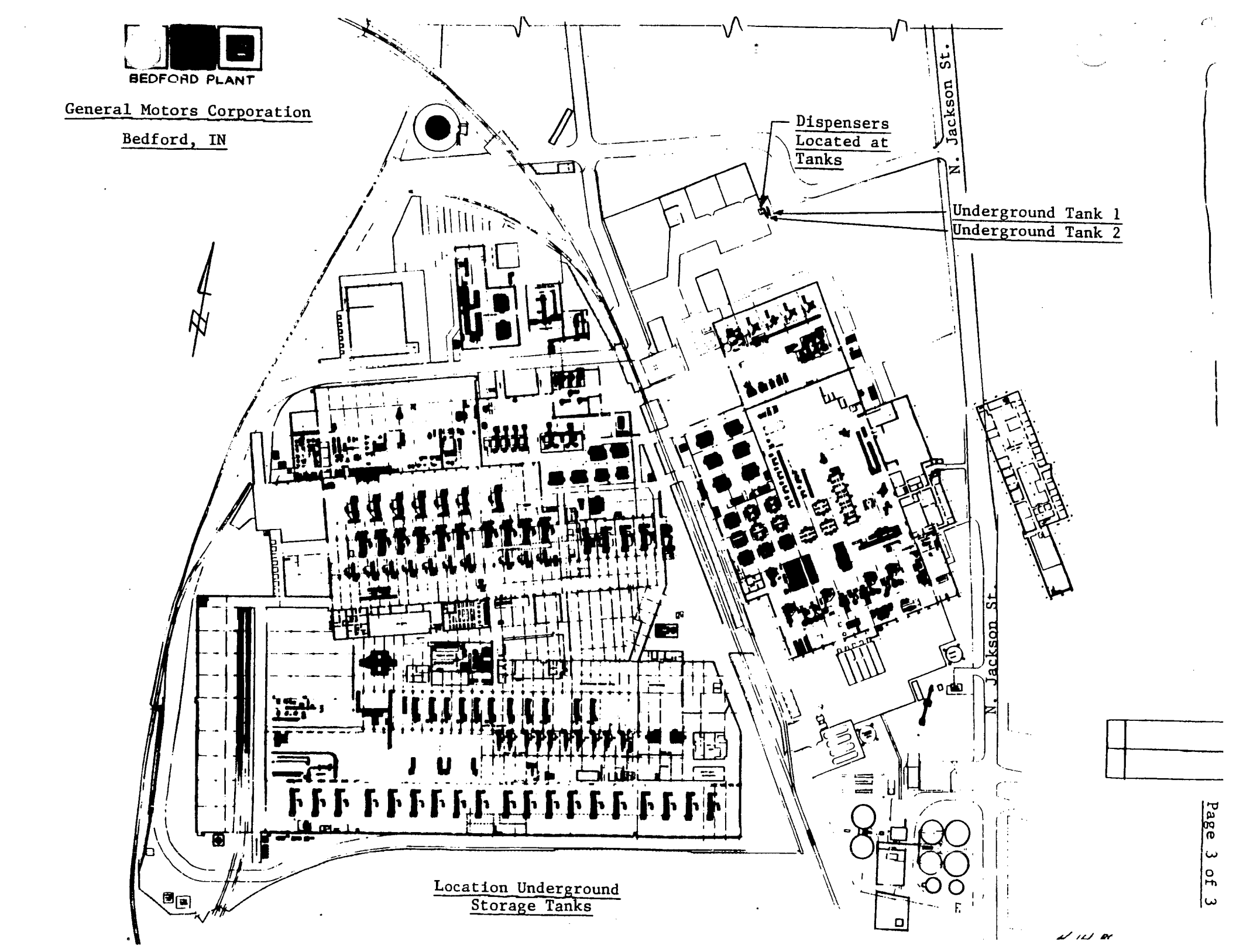
I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. This certification is made on behalf of General Motors Corporation.

Name and official title of owner or owner's authorized representative	Signature	Date Signed
R. W. Herr, Plant Manager	R. W. Herr	4-14-86

CONTINUE ON REVERSE SIDE

VI DESCRIPTION OF UNDERGROUND STORAGE TANKS - Complete for each tank at this location

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)		Tank No. 1	Tank No. 2	Tank No.	Tank No.	Tank No.
1. Status of Tank (Mark all that apply ☒)	Currently in Use	X	X			
	Temporarily Out of Use					
	Permanently Out of Use					
	Brought into Use after 5/8/86					
2. Estimated Age (Years)		9	9			
3. Estimated Total Capacity (Gallons)		2,000	10,000			
4. Material of Construction (Mark one ☒)	Steel	X	X			
	Concrete					
	Fiberglass Reinforced Plastic					
	Unknown					
	Other, Please Specify					
5. Internal Protection (Mark all that apply ☒)	Cathodic Protection					
	Interior Lining (e.g., epoxy resins)					
	None	X	X			
	Unknown					
	Other, Please Specify					
6. External Protection (Mark all that apply ☒)	Cathodic Protection					
	Painted (e.g., asphaltic)	X	X			
	Fiberglass Reinforced Plastic Coated					
	None					
	Unknown					
	Other, Please Specify					
7. Piping (Mark all that apply ☒)	Bare Steel					
	Galvanized Steel	X	X			
	Fiberglass Reinforced Plastic					
	Cathodically Protected					
	Unknown					
	Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒)	a. Empty					
	b. Petroleum					
	Diesel					
	Kerosene					
	Gasoline (including alcohol blends)	X	X			
	Used Oil					
	Other, Please Specify					
	c. Hazardous Substance					
	Please Indicate Name of Principal CERCLA Substance					
	OR Chemical Abstract Service (CAS) No.					
	Mark box ☒ if tank stores a mixture of substances					
	d. Unknown					
9. Additional Information (for tanks permanently taken out of service)	a. Estimated date last used (mo/yr)	/	/	/	/	/
	b. Estimated quantity of substance remaining (gal.)					
	c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					


BEDFORD PLANT
General Motors Corporation
Bedford, IN
Dispensers Located at Tanks
Underground Tank 1
Underground Tank 2
N. Jackson St.
N. Jackson St.
Location Underground Storage Tanks

CC: R Herr
P Murphy
W. Clark
D. Medvick
M Cooke GM-Logs
J. Chu " EA's
/ NM

STATE OF INDIANA

INDIANAPOLIS

STATE BOARD OF HEALTH

AN EQUAL OPPORTUNITY EMPLOYER

Address Reply to:
Division of Land Pollution Control--UST
P.O. Box 7015
Indianapolis, IN 46207-7015

3-24-81

March 1986

Gentlemen:

Re: Underground Storage Tank
Notification

In November of 1984, the Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA) were passed into law. Subtitle I of these amendments established the Underground Storage Tank (UST) Program requiring all owners and operators of underground storage tanks that are either currently in service or were taken out of service after January 1, 1974, but are still in the ground, to notify of their existence. The Division of Land Pollution Control, Indiana State Board of Health, has been designated to receive this notification.

To meet the requirements of notification, each owner and operator must:

1. Fill out the enclosed notification form;

2. Sign the certification at the bottom of the form; and

3. In addition, please include a diagram of the facility on standard 8 1/2 by 11-inch white bond paper. The diagram should include the location of any underground storage tank and associated piping, the location of above ground structures, the location of the tank dispenser, a north directional arrow, and a street address. The diagram should be in black ink for microfilming purposes.

   The notification form may be photocopied if additional copies are required.

When complete, return the form to the Division of Land Pollution Control, UST Program, Indiana State Board of Health, P.O. Box 7015, Indianapolis, Indiana, 46207-7015.

All questions should be directed to Mr. Michael T. Scanlon at AC 317/243-5060.

Very truly yours,

David D. Lamm, Director
Division of Land Pollution Control

MTS/sk
Enclosure

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN IN

RETURN COMPLETED FORM TO
Division of Land Pollution Control
UST Program
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STATE USE ONLY
I D Number
Date Received

GENERAL INFORMATION

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The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage use, or dispensing of regulated substances, and

(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground Some examples are underground tanks storing, 1. gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes,
2. tanks used for storing heating oil for consumptive use on the premises where stored,
3. septic tanks,
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979 or which is an intrastate pipeline facility regulated under State laws
5. surface impoundments, pits, ponds, or lagoons
6. storm water or waste water collection systems,
7. flow-through process tanks,
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations,
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA It also includes petroleum, e g , crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14 7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached ☐

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)

Street Address

County

City State ZIP Code

Area Code Phone Number

Type of Owner *(Mark all that apply ☒)*

☐ Current ☐ State or Local Gov't ☐ Private or Corporate
☐ Former ☐ Federal Gov't (GSA facility I.D. no. _____) ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable

County

City (nearest) State ZIP Code

Indicate number of tanks at this location ☐

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐) Job Title Area Code Phone Number

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature	Date Signed

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)		Tank No.	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tank *(Mark all that apply ☒)*	Currently in Use	☐	☐	☐	☐	☐
	Temporarily Out of Use	☐	☐	☐	☐	☐
	Permanently Out of Use	☐	☐	☐	☐	☐
	Brought into Use after 5/8/86	☐	☐	☐	☐	☐
2. Estimated Age (Years)						
3. Estimated Total Capacity (Gallons)						
4. Material of Construction *(Mark one ☒)*	Steel	☐	☐	☐	☐	☐
	Concrete	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify	_____	_____	_____	_____	_____
5. Internal Protection *(Mark all that apply ☒)*	Cathodic Protection	☐	☐	☐	☐	☐
	Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
	None	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify	_____	_____	_____	_____	_____
6. External Protection *(Mark all that apply ☒)*	Cathodic Protection	☐	☐	☐	☐	☐
	Painted (e.g., asphaltic)	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic Coated	☐	☐	☐	☐	☐
	None	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify	_____	_____	_____	_____	_____
7. Piping *(Mark all that apply ☒)*	Bare Steel	☐	☐	☐	☐	☐
	Galvanized Steel	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Cathodically Protected	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify	_____	_____	_____	_____	_____
8. Substance Currently or Last Stored in Greatest Quantity by Volume *(Mark all that apply ☒)*	**a. Empty**	☐	☐	☐	☐	☐
	b. Petroleum					
	Diesel	☐	☐	☐	☐	☐
	Kerosene	☐	☐	☐	☐	☐
	Gasoline (including alcohol blends)	☐	☐	☐	☐	☐
	Used Oil	☐	☐	☐	☐	☐
	Other, Please Specify	_____	_____	_____	_____	_____
	c. Hazardous Substance	☐	☐	☐	☐	☐
	Please Indicate Name of Principal CERCLA Substance	_____	_____	_____	_____	_____
	OR					
	Chemical Abstract Service (CAS) No.	_____	_____	_____	_____	_____
	Mark box ☒ if tank stores a mixture of substances	☐	☐	☐	☐	☐
	d. Unknown	☐	☐	☐	☐	☐
9. Additional Information (for tanks permanently taken out of service)						
	a. Estimated date last used (mo/yr)	/	/	/	/	/
	b. Estimated quantity of substance remaining (gal.)	_____	_____	_____	_____	_____
	c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)	☐	☐	☐	☐	☐

☆ U.S. Government Printing Office: 1986—496-735

APPENDIX G.36

IDEM LETTER DATED JULY 12, 1991

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 12, 1991

Indiana Department of Environmental Management
Underground Storage Tank Section
2321 Executive Drive
Indianapolis, IN 46241

Re: General Motors Central Foundry
Bedford, Indiana
UST Removal
IDEM Incident No. 9107058/NRC Case No. 78944

Gentlemen:

In the course of executing an underground storage tank closure project administered by your office, subsurface contamination was discovered at the above referenced site. Subsequently, representatives of our organization notified IDEM and the National Response Center of this incident in accordance with applicable notification requirements. The intent of this letter is to further document this incident, and to advise your office of subsequent actions to be taken by GM - Central Foundry.

By way of background, your office was advised by GM - Central Foundry of our intent to close (remove) two underground storage tanks. This notification was received by your office on May 28, 1991, and subsequent approval was issued on June 5, 1991. This approval stipulated a commencement date of June 28, 1991. As noted on our notification form, we intended to excavate and remove two underground storage tanks; a 2000 gallon tank and a 10,000 gallon tank. Both tanks were formerly used to store gasoline (unleaded and leaded) and were reported to be 14 years old.

On the morning of July 10, 1991, excavation activities were begun at the subject site. It should be noted that the contractor retained by GM - Central Foundry is properly certified by the State Fire Marshal for this type of work. The initial soils encountered revealed no signs of subsurface contamination; however, at a depth of approximately 4 feet, visual evidence of contamination as well as odors were encountered. This discovery was made mid-morning of the same day.

Upon discovery, excavation was continued in order to probe the extent of contamination. At this point, a temporary containment area consisting of poly sheeting and diking was erected onto which all contaminated soils removed from the excavation were placed. It should also be noted that a cover was placed over these contaminated soils during cessations in the excavation work. Additionally, an internal assessment of the situation was

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SAFETY BELTS SAVE LIVES

under way in order to determine appropriate actions. This included consultation with our environmental consultant, O'Brien & Gere Engineers, Inc., who was retained to assist us with this project.

Initial observations of the site conditions seemed to indicate that the contamination was very much localized due to the presence of a dense clay which surrounded the excavation in which the tanks were installed. These confining soils caused some volume of water to accumulate in the granular fill surrounding the tank. This water, however, is not believed to be hydraulically connected to any aquifer systems due to the low hydraulic conductivity of the native clay. It was not possible from these initial observations to make any estimation of the volume of material which had been released. Furthermore, the specific component(s) from which the material leaked was not readily obvious.

At 3:50 PM that same day, Mr. Dorel Hunt of the IDEM Emergency Response Commission was contacted by representatives of GM - Central Foundry and the incident was verbally reported. An IDEM incident number was assigned (No. 9107058) at this time. Additionally, Mr. Hunt advised GM - Central Foundry that this reported incident would be forwarded to your office thus satisfying the notification requirements set forth in the approval letter dated June 5, 1991.

At 10:15 AM on July 11, 1991, a similar report of this incident was made to Mr. Jim Robinson of the National Response Center (NRC Case N. 78944). Mr. Robinson indicated that this report would be forwarded to USEPA Region 5.

Having made the appropriate notifications, GM - Central Foundry intends to implement the following actions:

1. Complete the removal of the tanks and associated piping in accordance with the approved protocols. This will include removal and segregation of visually contaminated soils, and placement of these soils in a secure containment area to await proper transportation and disposal.

2. Expansion of the existing excavation to remove all visually contaminated soils.

3. Collection of up to eight soil samples from the excavation. These samples are to be analyzed for Total Petroleum Hydrocarbons using USEPA Method 8015 (Modified).

4. Placement of poly sheeting to line the completed excavation.

5. Installation of clean backfill in the excavation to remove the physical hazards associated with the excavation which is in a traffic area. Also, an impervious cover will be installed to prevent the accumulation of water in the clean granular fill.

6. Upon receipt of sample results, GM - Central Foundry will forward to your office a completed closure notification form along with analytical data from the aforementioned soil samples.

As evidenced by by our proactive response, GM - Central Foundry is committed to proper resolution of this matter. We are confident that through this letter, we have adequately advised your office of this incident as well as our intended course of actions. Furthermore, it is our understanding that these actions are consistent with IDEM requirements and, as such, will allow us to accomplish our common objective of properly closing these tanks.

Should there be any questions related to this matter, please do not hesitate to contact Mr. William Schoonmaker at (812) 279-7308.

Sincerely,

R W. Herr

Robert W. Herr
Plant Manager

cc: NRC
Wm. S. Schoonmaker, CF Bedford Environmental Director

bcc: Fred Koehler, GM EAS
Keith West, CFD EAS

APPENDIX G.37

O'BRIEN & GERE UST REMOVAL ENVIRONMENTAL SITE ASSESSMENT

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

September 18, 1991

Indiana Department of Environmental Management
Office of Environmental Response
UST Program
P.O. Box 7015
Idianapolis, IN 46207-7015

Gentlemen:

As stated in our letter of July 12, 1991, GM - Central Foundry is forwarding with this letter the completed closure notification form along with the analytical data from the soil samples obtained during the closure.

Should there be any questions related to this matter, please do not hesitate to contact Mr. William Schoonmaker at (812) 279-7308.

Sincerely,

R. W. Herr

Robert W. Herr
Plant Manager

Enclosure

cc: Wm. S. Schoonmaker, CF Bedford Environmental Director

Lets Get It Together
SAFETY BELTS SAVE LIVES

O'BRIEN & GERE

September 3, 1991

Mr. Bill Litkenhous
GM Central Foundry
North Jackson Street
P O Box 271
Bedford, IN 47421-0271

RE: UST Closure

FILE: 2488-295

Dear Bill:

Please find attached a site assessment report to be submitted to IDEM in accordance with the tank closure requirements. Also note that the notification form has been revised to reflect completion of the closure. This form will need to be signed by Mr. Herr.

Please call with any questions.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Lowell W. McBurney, P.E.
Office Manager

LWM/kc/A45.LTR

Attachment

cc: J Rauschkolb - OBG Technical Services, Inc.

REPORT

UST REMOVAL -

SITE ASSESSMENT

GM CENTRAL FOUNDRY

BEDFORD, INDIANA

SEPTEMBER 1991

PREPARED BY:

OBG TECHNICAL SERVICES, INC.

INDIANAPOLIS, INDIANA

NOTIFICATION FOR UNDERGROUND STORAGE TANKS

FORM APPROVED
OMB NO. 2050-0068
APPROVAL EXPIRES 9-30-91

FOR TANKS IN **IN**

RETURN COMPLETED FORM TO: Indiana Department of Environmental Management
Office of Environmental Response
UST Program
P.O. Box 7015
Indianapolis, Indiana 46207-7015
(317) 243-5022

STATE USE ONLY
ID Number
Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974 that are in the ground as of May 8, 1986 or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records or, in the absence of such records, your knowledge, belief or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means:

(a) In the case of an underground storage tank in use on November 8, 1984 or brought into use after that date, any person who owns an underground storage tanks used for the storage, use or dispensing of regulated substances; and

(b) In the case of an underground storage tank in use before November 8, 1984 but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances" and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1) gasoline, used oil or diesel fuel and 2) industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1) Farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;

2) Tanks used for storing heating oil for consumptive use on the premises where stored;

3) Septic tanks;

4) Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which are intrastate pipeline facilities regulated under State laws;

5) Surface impoundments, pits, ponds or lagoons;

6) Storm water or wastewater collection systems;

7) Flow-through process tanks;

8) Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;

9) Storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as a hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) with the exception of those substances regulated as a hazardous waste under subtitle C of RCRA. It also includes petroleum (e.g. crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When to Notify? Owners of underground storage tanks in use or that were taken out of operation after January 1, 1974 but still in the ground must notify. Any owner who brings underground storage tanks into use after May 8, 1986 must notify within 30 days of bringing the tanks into use.

Penalties. Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. This form must be completed for each location containing underground storage tanks. If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 1

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
GMC CENTRAL FOUNDRY DIV. BEDFORD PLANT

Street Address
NORTH JACKSON STREET

County
LAWRENCE

City: BEDFORD
State: IN
ZIP Code: 47421

Area Code: (812)
Phone Number: 279-7360

Type of Owner (mark all that apply)

- [X] Current
- [ ] Former
- [ ] State or Local Gov't
- [ ] Federal Gov't (GSA facility I.D. no. _____)
- [XX] Private or Corporate
- [ ] Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section I, mark box here) [X]

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable

County

City (nearest)
State
ZIP Code

Indicate number of tanks at this location: 2

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands [ ]

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here) [ ]: WILLIAM S. SCHOONMAKER
Job Title: ENVIRONMENTAL DIRECTOR
Area Code: (812)
Phone Number: 279-7308

IV. TYPE OF NOTIFICATION

[ ] Mark box here only if this is an amended or subsequent notification for this location

V. CERTIFICATION (READ AND SIGN AFTER COMPLETING SECTION VI)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. This certification is made on behalf of General Motors Corp.

Name and official title of owner or owner's authorized representative	Signature	Date Signed
Robert W. Herr, Plant Manager		

VII. CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW OR EXISTING UPGRADED TANKS AT THIS LOCATION)

☐ The information in items 11 through 14 applies to all tanks at ths facility

☐ The information in items 11 through 14 applies to tank number _____

(Refer to the tank numbers used on page 2 in completing this item Then use copies of page 3 to supply information for each remaining tank)

11 Release Detection (mark all that apply):

☐ Manual tank gauging.
☐ Tank tightness testing with inventory controls.
☐ Automatic tank gauging.
☐ Vapor monitoring.
☐ Ground-water monitoring.
☐ Interstitial monitoring within a secondary barrier
☐ Interstitial monitoring within secondary containment
☐ Automatic line leak detectors
☐ Line tightness testing.
☐ Another method allowed by the implementing agency Please specify:

_____

12 Cathodic Protection (if applicable):

☐ As specified for coated steel tanks with cathodic protection — Circle one: Impressed current / Sacrificial anodes
☐ As specified for coated steel piping with cathodic protection — Circle one: Impressed current / Sacrificial anodes
☐ Another method allowed by the implementing agency Please specify:

_____

13 Spill and Overfill Control:

☐ Catchment basins
☐ Automatic shut off devices.
☐ Overfill alarms
☐ Ball float valves
☐ Another method allowed by the implementing agency Please specify:

_____

14 Installation, Upgrade or Closure (mark all that apply):

☐ The installer has been certified by the tank and piping manufacturers.
☒ The installer or closure contractor has been certified or licensed by the State Fire Marshal's Office
☐ The installation has been inspected and certified by a registered professional engineer
☒ The installation or closure has been inspected and approved by the State Fire Marshal's Office
☐ All work listed on the manufacturer's installation checklists has been completed
☐ Another method was used as allowed by the implementing agency Please specify.

_____

(Section VII continued on Page 4)

EXHIBITS

1 - SITE PLAN

2 - CLOSURE NOTIFICATION FORM

3 - IDEM APPROVAL LETTER

4 - SAMPLE SUMMARY

5 - LABORATORY REPORTS

EXHIBIT 1

SITE PLAN

General Motors Corporation

Bedford, IN

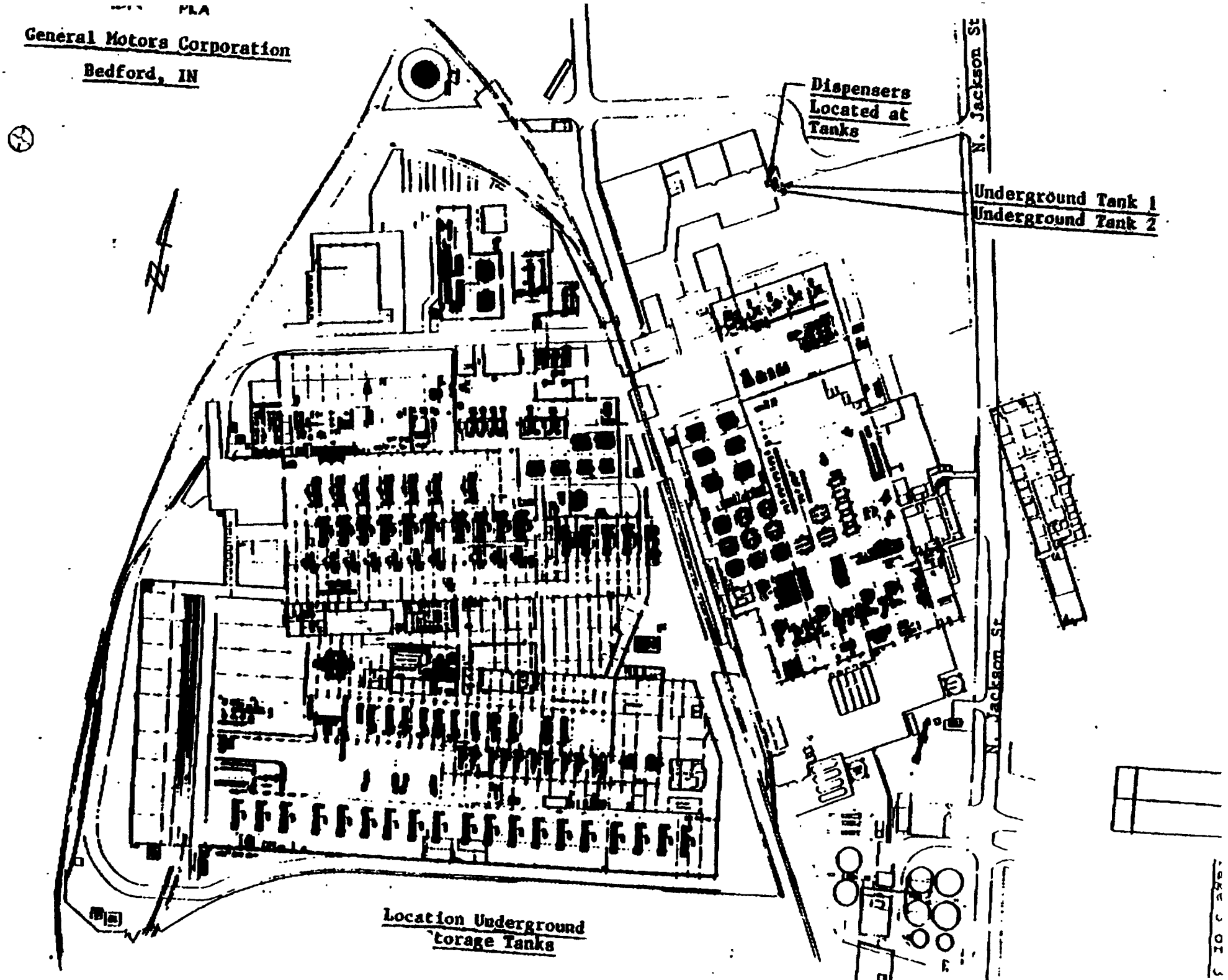


EXHIBIT 2

CLOSURE NOTIFICATION FORM

Underground Storage Tank Closure Notification Form

Mail 30 days prior to intended tank closure date to:
Indiana Dept. of Environmental Management
Office of Environmental Response
UST Section/Closure Notice
5500 West Bradbury Avenue
Indianapolis, IN 46241

Tank Owner Information

Owner Name: GM - CENTRAL FOUNDRY
Street Address: NORTH JACKSON STREET
City, State, Zip: BEDFORD, INDIANA 47421
Telephone: (812) 279-7257
Contact Person: BILL LITKENHOUS

Tank Location Information

Location Name: SAME
Street Address:
City, State, Zip:
Telephone/County:
Contact Person:

Tank Information

Tank #	Size (gallons)	Contents	Age	Closure Method	Comments
1	2,000	GASOLINE	14 YRS.	REMOVAL / DISPOSAL	
2	10,000	GASOLIN	14 YRS.	REMOVAL/DISPOSAL	

Intended Closure Date JUNE 24, 1991

Contractor Information

Name: WILLIAM TIMOTHY WALTERS
Street Address: RURAL ROUTE 2, BOX 46
City, State, Zip: SUMMITVILLE, IN 46070
Telephone: (317) 536-2524
Contact Person: DAVID TAYLOR (317) 879-3133
Certification Number: # 90-49-90

Fire Department Information

Department Name: BEDFORD FIRE DEP
Street Address: 1900 H STREET
City, State, Zip: BEDFORD, IN 47421
Telephone: (812) 275-4544
Contact Person: JACK BUTTERFIELD
ASSISTANT CHIEF

Tank closures must be performed by persons certified by the State Fire Marshal's Office

Tank Owner Signature R.W. Hirn
Date Signed 5/24/91

If the intended closure date is changed please contact IDEM at (317) 243-5022.

If the site assessment shows signs of soil contamination please call (317) 243-5022.

EXHIBIT 3

IDEM APPROVAL LETTER

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

105 South Meridian Street
P.O. Box 6015
Indianapolis 46206-6015
Telephone 317/232-8603

June 5, 1991

Mr. Bill Litkenhous
G. M. Central Foundry
North Jackson Street
Bedford, IN 47421

Re: Intent to Close
Underground Storage Tank

Dear Mr. Litkenhous:

On May 28, 1991, the Indiana Department of Environmental Management (IDEM), Underground Storage Tank Section (UST), received your letter indicating your intent to close (an) underground storage tank(s) located at North Jackson Street, Bedford. The closure must be completed in accordance with 40 CFR 280.71 and with the requirements of the Indiana State Fire Code. Federal regulation 40 CFR 280.71 requires that American Petroleum Institute Recommended Practice 1604 (API 1604) be followed in completing tank closures. A brief synopsis of recommended tank closure practices is enclosed but is not intended as a substitute for API 1604. It is the responsibility of the tank owner/operator to ensure that all provisions of API 1604 are followed during a tank closure.

If the method of closure is removal, you may begin closing your tank(s) on June 28, 1991. If the method of closure is to fill the tank(s) in place, approval of the closure date will be given by IDEM only after review of site assessment results for the proposed in place closure. If your tank(s) have been temporarily closed for more than twelve (12) months, additional approval for an in-place closure must be received from the State Fire Marshal's Office. Ninety (90) days after your approved closure date, the approval will expire and you will be required to resubmit the 30-day closure notification. Two weeks prior to your closure date, you must notify the local fire department and the State Fire Marshal's Office (AC 317/232-7648) of the tank closure and of the closure date. If the closure date should change from the date above, please call our office (AC 317/243-5022), the State Fire Marshal's Office, and the local fire department to advise of the change.

When completing a tank closure, a site assessment (soil borings or soil samples) must be performed in accordance with 40 CFR Part 280 Subpart G, to assess whether a release has occurred. To determine the

location and the amount of samples, please contact our office. If the method of closure is to fill the tank in place rather than remove it, the site assessment must be done prior to beginning the tank closure. Site assessment results for in-place closures must then be sent to our office for review. If this review determines that an in-place closure can begin, our office will send you an approval letter for the in-place closure. During closure if any visible soil or water contamination is found, it must be reported to our office within 24 hours. If the site assessment laboratory results show any detectable contamination, it must also be reported within 24 hours and the results submitted to IDEM. Please include with these results the site assessment sampling locations and any site characteristics that would aid IDEM in determining the extent of contamination.

The appropriate testing methods are listed below:

Type of Sample/Product	EPA Method
Soil	
- Gasoline, Diesel or Waste Oil	8015 Modified (GC/FID) or 8240 (GC/MS) for Total Petroleum Hydrocarbons
Water	624 (GC/MS) for BTEX

These are the only methods that will meet IDEM's site assessment requirements. To report any soil or water contamination, call our office at AC 317/243-5022.

To comply with the new requirements of IC 13-7-20, tank closures must now be performed by contractors or individuals certified by the State Fire Marshal's Office. During the closure, at least one certified person must be on site at all times. It is required that a copy of this IDEM letter be kept at the tank closure site at all times. (If an in-place closure is being completed, the IDEM approval letter for an in-place closure must also be kept at the tank closure site at all times.) This will ensure that fire department officials recognize that you have fulfilled the IDEM closure notification requirements. If a noncertified contractor or individual performs any tank closure, their names will be forwarded to the State Fire Marshal's Office for potential enforcement action.

Once the closure is finished, complete the enclosed notification form with an original signature in ink and return it to our office. The certified contractor or individual who performs the closure must also sign the form and provide their certification number (pg. 4, item 15). Closure records must be kept for at least three (3) years. If they cannot be kept on site, they may be sent to our office to be filed with our records on the facility.

When completed, return the notification form to:

Indiana Department of Environmental Management
Underground Storage Tank Section
2321 Executive Drive
Indianapolis, Indiana 46241

This address should also be used for submitting any required site assessment results.

If you have any questions, please contact Mark Billington at AC 317/240-6216.

Sincerely,

John P. Gunter

John P. Gunter, Chief
Underground Storage Tank Section
Office of Environmental Response

MAB

Enclosure(s)

cc: Tricia Crull
Office of the State Fire Marshal
William Walters

UNDERGROUND STORAGE TANK CLOSURE ACTIVITIES

The permanent removal or in-place closure of tank systems may be conducted for a number of reasons, including compliance with regulations. The determination of whether to excavate and remove a tank permanently, to close it in place, or to repair it depends on a number of factors, such as the location of the tank, State and local regulations, availability of equipment, labor, and materials. The State and local Fire Marshal's office should be consulted to obtain information on specfic requirements. The Indiana Department of Environmental Management (IDEM) must be given at least 30 days written prior notice to an underground storage tanks (USTs) closure.

To comply with the new requirements of IC 13-7-20, tank closures must now be performed by contractors or individuals certified by the State Fire Marshal's Office. During the closure, at least one certified person must be on site at all times. If a non-certified contractor or individual performs the tank closure, their name will be forwarded to the State Fire Marshal's Office for further action.

TANK REMOVAL

An understanding of tank removal procedures is important, since site observations made during these removals can often provide the first direct evidence of leaks and the extent of soil contamination. The following steps may be followed during tank removal:

a) Drain the product from the piping into the tank;

b) Pump the product from the tank;

c) Remove the fill line, disconnect the product line and the fill gauge, and cap or plug all open ends of lines (except vent lines);

d) Eliminate explosive conditions in the tank; e.g., by placing dry ice inside (1.5 lbs. per 100 gallons of tank capacity) or by ventilating the tank with air by use of a small gas exhauster;

e) Clean residual sludge from the tank. A recommended method is to cut an 18" x 18" hole into the tank to facilitate removal of the sludge; this should be done before removing the tank from the ground (See API 1631, "Interior Lining of Underground Storage Tanks" as recommended in 40 CFR 280.71.);

f) Remove the tank and place it in a secure location (i.e., to prevent movement obstruction);

g) Check tank for explosive conditions;

h) Remove soil accretion on the outside of the tank as much as possible;

i) Check certain parts of the tank for evidence of leakage; i.e., the seams, the tank bottom (particulary the area beneath the fill pipe where stick tests frequently hit the tank), and the parts of the tank which are located near patches of stained soils;

j) Plug or cap all openings, execpt the vent, after vapor removal;

k) Check for explosive conditions and secure the tank on a truck for transporation to the disposal site.

Arrangements for a disposal site should be made prior to excavation. With the ongoing capacity shortages at landfills and recent regulations restricting land disposal, it may take time to finalize an agreement with a disposal site. In those cases, an open excavation or stockpiled soils could pose unnecessary risks during the negotiation period. Similarly, arrangements should be made for a supply of clean fill or security fencing for a site before beginning operations.

Managing soils during removal is another aspect of the project that should be planned. Some states prohibit any contaminated soils from being placed back in an excavation during a tank removal, even if more extensive soil removal will need to be conducted in the near future.

TANK CLOSURE IN PLACE

Tank closure in place is often a viable option when a tank removal would be extremely difficult (i.e. a tank is located directly underneath a building, and/or removal would severely disrupt a facility's operation). As with tank removals, in-place closures involve emptying the tank of all liquids and dangerous vapors and cleaning out the accumulated sludge. Additionally, a tank closed in place should be filled with a harmless, chemically inactive solid, such as sand, concrete or pea gravel.

SITE ASSESSMENT

In order to ensure that a tank being closed is not responsible for any contamination, a site assessment must be conducted prior to the completion of closure activities. Contact IDEM about specific site assessment requirements for tank closures. If any contaminated soil and/or ground water or any free product is discovered during this assessment, the owner/operator must report the release and conduct appropriate clean-up measures.

IDEM/UST SECTION: AC/317-243-5022

IN STATE FIRE MARSHAL: AC/317-232-2222

NOTIFICATION FOR UNDERGROUND STORAGE TANKS

FORM APPROVED
OMB NO. 2050-0068
APPROVAL EXPIRES 9-30-91

FOR TANKS IN

RETURN COMPLETED FORM TO **Indiana Department of Environmental Management**
Office of Environmental Response
UST Program
P.O. Box 7015
Indianapolis, Indiana 46207-7015 **(317) 243-5022**

STATE USE ONLY
I.D Number

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means--

(a) In the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tanks used for the storage, use or dispensing of regulated substances, and

(b) In the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. gasoline, used oil, or diesel fuel; and 2. industrial solvents, pesticides, herbicides, or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. Farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. Tanks used for storing heating oil for consumptive use on the premises where stored;
3. Septic tanks;
4. Pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. Surface impoundments, pits, ponds, or lagoons;
6. Storm water or waste water collection systems;
7. Flow-through process tanks;
8. Liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. Storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When to Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties. Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. This form must be completed for each location containing underground storage tanks. If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached ☐

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)

Street Address

County

City State ZIP Code

Area Code Phone Number

Type of Owner (mark all that apply)

☐ Current ☐ State or Local Gov't ☐ Private or Corporate
☐ Former ☐ Federal Gov't ☐ Ownership uncertain
(GSA facility I.D. no. _____)

II. LOCATION OF TANK(S)

(If same as Section I, mark box here) ☐

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable

County

City (nearest) State ZIP Code

Indicate number of tanks at this location ☐

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here) ☐ Job Title Area Code Phone Number

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location

V. CERTIFICATION (READ AND SIGN AFTER COMPLETING SECTION VI)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature	Date Signed

Owner Name (from Section I) _____ Location (from Section II) _____ Page No. _____ of _____ Pag

V. DESCRIPTION OF UNDERGROUND STORAGE TANKS (COMPLETE FOR EACH TANK AT THIS LOCATION)

Tank Identification No (e.g., ABC-123) or Arbitrarily Assigned Sequential Number e.g., 1,2,3)		Tank No.	Tank No.	Tank No.	Tank No.	k
1. **Status of Tank** (mark all that apply)	Currently in Use	☐	☐	☐	☐	☐
	Temporarily Out of Use	☐	☐	☐	☐	☐
	Permanently Out of Use	☐	☐	☐	☐	☐
	Brought into Use after 5/8/86	☐	☐	☐	☐	☐
2. **Year Installed (e.g., 1986)**						
3. **Estimated Total Capacity (Gallons)**						
4. **Material of Construction** (mark all that apply)	Steel	☐	☐	☐	☐	☐
	Concrete	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other Please Specify	_____	_____	_____	_____	_____
5. **Internal Protection** (mark all that apply)	Cathodic Protection	☐	☐	☐	☐	☐
	Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
	None	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other Please Specify	_____	_____	_____	_____	_____
6. **External Protection** (mark all that apply)	Cathodic Protection	☐	☐	☐	☐	☐
	Painted (e.g., asphaltic)	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic Coated	☐	☐	☐	☐	☐
	None	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other Please Specify	_____	_____	_____	_____	_____
7. **Piping** (mark all that apply)	Bare Steel	☐	☐	☐	☐	☐
	Galvanized Steel	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Cathodically Protected	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other Please Specify	_____	_____	_____	_____	_____
8. **Substance Currently or Last Stored in Greatest Quantity by Volume** (mark all that apply)	a. Empty	☐	☐	☐	☐	☐
	b. Petroleum					
	Diesel	☐	☐	☐	☐	☐
	Kerosene	☐	☐	☐	☐	☐
	Gasoline	☐	☐	☐	☐	☐
	Used Oil	☐	☐	☐	☐	☐
	Other Please Specify	_____	_____	_____	_____	_____
	C. Hazardous Substance	☐	☐	☐	☐	☐
	Please Indicate Name of Principal CERCLA Substance or Chemical Abstract Service (CAS) No	_____	_____	_____	_____	_____
	Mark box if tank stores a mixture of substances	☐	☐	☐	☐	☐
	D. Unknown	☐	☐	☐	☐	☐
9. **Additional Information (for tanks permanently taken out of service)**	a. Closure Date (mo./yr.)	/	/	/	/	/
	b. Mark box if removed from the ground	☐	☐	☐	☐	☐
	c. Mark box if tank filled with inert material (e.g., sand, concrete gravel)	☐	☐	☐	☐	☐

Owner Name (from Section I) _____ Location (from Section II) _____ Page No. _____ of _____ Pages

VII CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW OR EXISTING UPGRADED TANKS AT THIS LOCATION)

10 ☐ The information in items 11 through 14 applies to all tanks at ths facility

☐ The information in items 11 through 14 applies to tank number _____

(Refer to the tank numbers used on page 2 in completing this item Then use copies of page 3 to supply information for each remaining tank)

11 Release Detection (mark all that apply):

☐ Manual tank gauging.
☐ Tank tightness testing with inventory controls.
☐ Automatic tank gauging.
☐ Vapor monitoring.
☐ Ground-water monitoring.
☐ Interstitial monitoring within a secondary barrier
☐ Interstitial monitoring within secondary containment
☐ Automatic line leak detectors
☐ Line tightness testing.
☐ Another method allowed by the implementing agency Please specify.

_____

12 Cathodic Protection (if applicable):

☐ As specified for coated steel tanks with cathodic protection — Circle one: Impressed current / Sacrificial anodes
☐ As specified for coated steel piping with cathodic protection — Circle one: Impressed current / Sacrificial anodes
☐ Another method allowed by the implementing agency Please specify:

_____

13 Spill and Overfill Control:

☐ Catchment basins
☐ Automatic shut off devices
☐ Overfill alarms
☐ Ball float valves
☐ Another method allowed by the implementing agency Please specify

_____

14 Installation, Upgrade or Closure (mark all that apply):

☐ The installer has been certified by the tank and piping manufacturers.
☐ The installer or closure contractor has been certified or licensed by the State Fire Marshal's Office
☐ The installation has been inspected and certified by a registered professional engineer
☐ The installation or closure has been inspected and approved by the State Fire Marshal's Office
☐ All work listed on the manufacturer's installation checklists has been completed
☐ Another method was used as allowed by the implementing agency Please specify.

_____

(Section VII continued on Page 4)

Owner Name (from Section I) _____ Location (from Section II) _____ Page No. _____ of _____ Pages

VII CERTIFICATION OF COMPLIANCE (CONTINUED FROM PAGE 3)

15 OATH: I certify that the information concerning installation, upgrade or closure provided in Item 14 is true to the best of my belief and knowledge

Installer: (Print) _____ _____
Name Date

_____
Position

_____
Company

(Signature) _____ Certification Number. _____
Name

16. ☐ I have financial responsibility in accordance with Subpart I Please specify:

Method. _____

Insurer _____

Policy Number: _____

VIII DIAGRAM OF TANK FACILITY (INCLUDE ALL NEW OR EXISTING TANKS AND THEIR ASSOCIATED PIPING AND DISPENSERS)

EXHIBIT 4

SAMPLE SUMMARY

ANALYTICAL SUMMARY
UST REMOVAL - GM CENTRAL FOUNDRY

Sample No.	Sample Date	Sample Location	Total Petroleum Hydrocarbons (mg/kg)	Benzene (ug/kg)	Toluene (ug/kg)	Ethylbenzene (ug/kg)	Total Xylene (ug/kg)
1	7/17/91	East wall - 8'	<10	ND	<5	<5	<5
2	7/17/91	East wall - 12'	<10	ND	ND	ND	ND
3	7/17/91	South wall - 8'	<10	ND	ND	ND	ND
4	7/17/91	South wall - 12'	<10	ND	ND	ND	ND
5	7/17/91	West wall - 8'	<10	200	<5	15	16
6	7/17/91	West wall - 12'	<10	ND	ND	ND	ND
7	7/17/91	North wall - 8'	<10	ND	ND	ND	ND
8	7/17/91	North wall - 12'	<10	ND	ND	ND	ND
9	7/17/91	Southeast bottom	<10	ND	ND	ND	ND
10	7/17/91	Southwest bottom	<10	ND	ND	ND	ND
11	7/17/91	Northwest bottom	<10	ND	ND	ND	ND
15	7/18/91	Dispensing Station	<10	ND	ND	<5	7

NOTES:

(1) ND = Not Detected

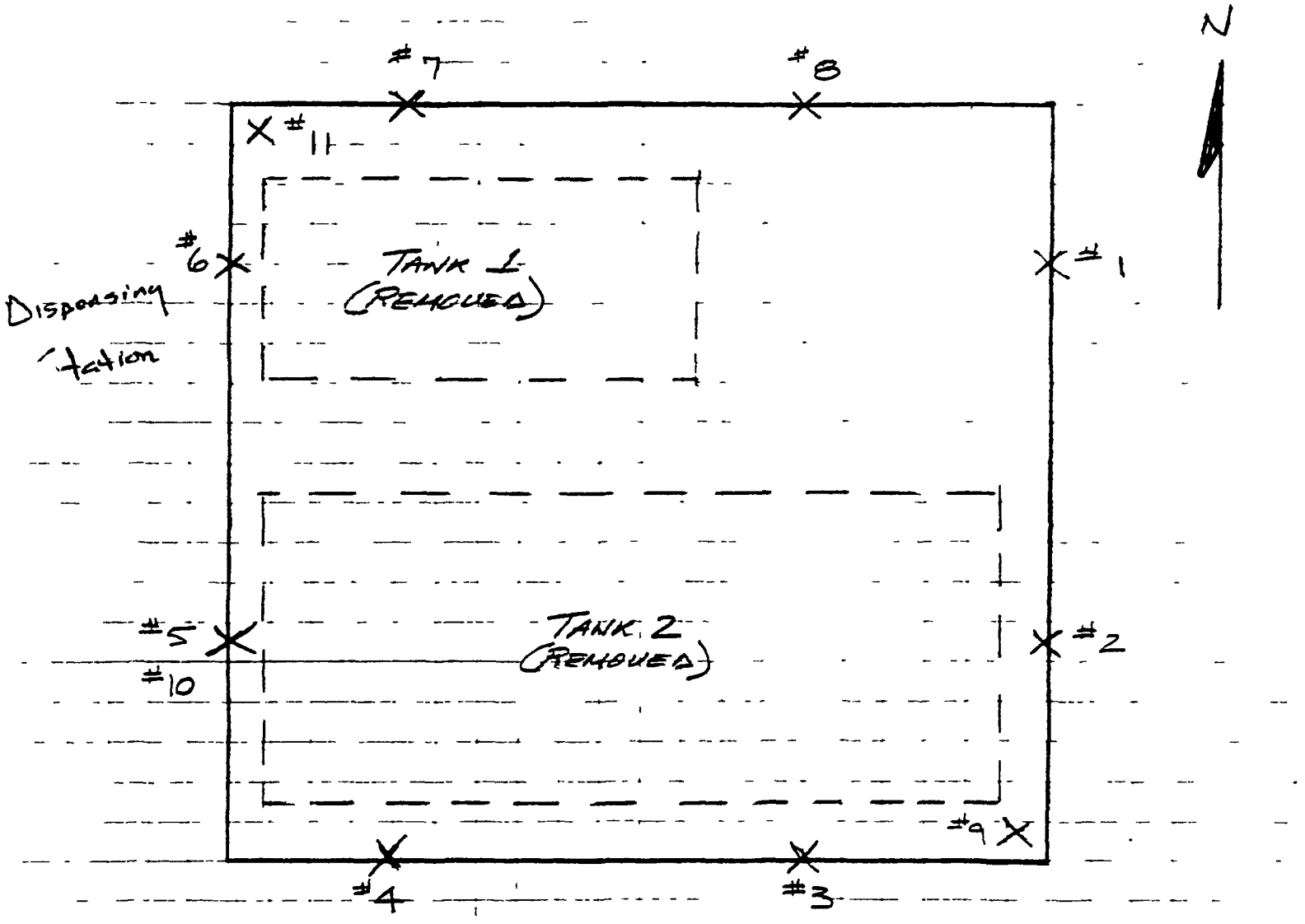
(2) See attached sketch for sample locations.

(3) TPH Analytical Method: EPA Method 8015 Modified

(4) BTEX Analytical Method: EPA Methods 5030/8020

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
Central Foundry - UST Removal Sample Locations	1/1	LWH		



SAMPLE NO.	DEPTH
1	8'
2	12'
3	8'
4	12'
5	8'
6	12'
7	8'
8	12'
9	15' (bottom)
10	15' (bottom)
11	15' (bottom)

Note: Approximate size of excavation = 40' x 40' x 15'

EXHIBIT 5

LABORATORY REPORTS

Environmental Service Group
Division Of Astbury Gabriel Corp.
(317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

CLIENT: NORTH AMERICAN CONSTRUCTION CO.
770 PINEVIEW DR.
ZIONSVILLE, IN 46077
ATTN: KIM DEREMIAH

DATE OF REPORT: JULY 31, 1991

DATE OF SAMPLE: JULY 17, 1991

DATE RECEIVED: JULY 17, 1991

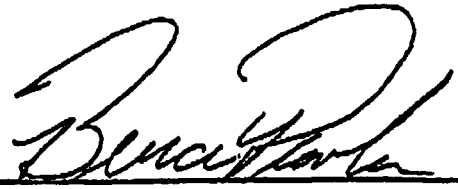
MATRIX: SOIL

SAMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN

LAB NUMBER: SEE BELOW

ANALYTICAL METHOD: SW846 8015 MOD.

LAB NUMBER	SAMPLE IDENTIFICATION	TOTAL PETROLEUM HYDROCARBONS GC/FID
917150	#1 EAST SIDE 8'	< 10 MG/KG
917151	#2 EAST SIDE 12'	< 10 MG/KG
917152	#3 SOUTH SIDE 8'	< 10 MG/KG
917153	#4 SOUTH SIDE 12'	< 10 MG/KG
917154	#5 WEST SIDE 8'	< 10 MG/KG
917155	#6 WEST SIDE 12'	< 10 MG/KG
917156	#7 NORTH SIDE 8'	< 10 MG/KG
917157	#8 NORTH SIDE 12'	< 10 MG/KG
917158	#9 S.E. CORNER BOTTOM	< 10 MG/KG
917159	#10 S.W. CORNER BOTTOM	< 10 MG/KG
917160	#11 N.W. CORNER BOTTOM	< 10 MG/KG

CERTIFIED BY 

Environmental Service Group
Division Of Astbury Gabriel Corp.
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

LIENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

ATE OF REPORT: JULY 31, 1991

TE OF SAMPLE: JULY 17, 1991

TE RECEIVED: JULY 17, 1991

ATE OF ANALYSIS: JULY 18, 1991

RIX: SOIL

MPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#1 EAST SIDE 8'

AB NUMBER: 917150

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLA
ENZENE	71-43-2	ND	ND	5	5
UENE	108-88-3	BQL	ND	5	5
THYLBENZENE	100-41-4	BQL	ND	5	5
AL XYLENE	1330-20-7	BQL	ND	5	F

= NOT DETECTED
QL = DETECTED BELOW QUANTITATION LIMIT

CERTIFIED BY Bruce Parker

Environmental Service Group

Division Of Astbury Gabriel Corp. (317) 290-1471

5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278 FAX (317) 290-1670

)' IENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

)/ 'E OF REPORT: JULY 31, 1991

)ATE OF SAMPLE: JULY 17, 1991

)/.'E RECEIVED: JULY 17, 1991

)/ 'E OF ANALYSIS: JULY 18, 1991

IATRIX: SOIL

/ IPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#2 EAST SIDE 12'

/ : NUMBER: 917151

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLANK
E'ZENE	71-43-2	ND	ND	5	5
OLUENE	108-88-3	ND	ND	5	5
T YLBENZENE	100-41-4	ND	ND	5	5
)TAL' XYLENE	1330-20-7	ND	ND	5	5

) = NOT DETECTED

CERTIFIED BY Bruce Fowler

Environmental Service Group
Division Of Astbury Gabriel Corp.
(317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

LIENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

ATE OF REPORT: JULY 31, 1991

/ 'E OF SAMPLE: JULY 17, 1991

/ 'TE RECEIVED: JULY 17, 1991

ATE OF ANALYSIS: JULY 18, 1991

/ 'RIX: SOIL

AMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#3 SOUTH SIDE 8'

AB NUMBER: 917152

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLA
:NZENE	71-43-2	ND	ND	5	5
) UENE	108-88-3	ND	ND	5	5
THYLBENZENE	100-41-4	ND	ND	5	5
) AL XYLENE	1330-20-7	ND	ND	5	5

) = NOT DETECTED

CERTIFIED BY Bruce Parker

Environmental Service Group,
Division Of Astbury Gabriel Corp.
(317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

..T T:	NORTH AMERICAN CONSTRUCTION 770 PINEVIEW DR. ZIONSVILLE, IN 46077
ATE OF REPORT:	JULY 31, 1991
A E OF SAMPLE:	JULY 17, 1991
ATE RECEIVED:	JULY 17, 1991
AIE OF ANALYSIS:	JULY 18, 1991
A RIX:	SOIL
AMPLE DESCRIPTION:	O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN #4 SOUTH SIDE 12'
AB . JMBER:	917153

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLANK
E..ZENE	71-43-2	ND	ND	5	5
: UENE	108-88-3	ND	ND	5	5
THYLBENZENE	100-41-4	ND	ND	5	5
: AL XYLENE	1330-20-7	ND	ND	5	5

' = NOT DETECTED

CERTIFIED BY

Environmental Service Group
Division Of Astbury Gabriel Corp.
(317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

CLIENT:	NORTH AMERICAN CONSTRUCTION 770 PINEVIEW DR. ZIONSVILLE, IN 46077
DATE OF REPORT:	JULY 31, 1991
DATE OF SAMPLE:	JULY 17, 1991
DATE RECEIVED:	JULY 17, 1991
DATE OF ANALYSIS:	JULY 18, 1991
MATRIX:	SOIL
SAMPLE DESCRIPTION:	O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN #5 WEST SIDE 8'
LAB NUMBER:	917154

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BL
BENZENE	71-43-2	200	ND	5	5
TOLUENE	108-88-3	BQL	ND	5	5
ETHYLBENZENE	100-41-4	15	ND	5	5
TOTAL XYLENE	1330-20-7	16	ND	5	5

ND = NOT DETECTED
BQL = DETECTED BELOW QUANTITATION LIMIT

CERTIFIED BY

Environmental Service Group
Division Of Astbury Gabriel Corp.
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-
FAX (317) 290

CLIENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

DATE OF REPORT: JULY 31, 1991

DATE OF SAMPLE: JULY 17, 1991

DATE RECEIVED: JULY 17, 1991

DATE OF ANALYSIS: JULY 18, 1991

MATRIX: SOIL

SAMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#6 WEST SIDE 12'

LAB NUMBER: 917155

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	BLANK	MINI QUANTIT LIMIT (SAMPLE
BENZENE	71-43-2	ND	ND	5
TOLUENE	108-88-3	ND	ND	5
ETHYLBENZENE	100-41-4	ND	ND	5
TOTAL XYLENE	1330-20-7	ND	ND	5

ND = NOT DETECTED

CERTIFIED BY Bruce Parker

Environmental Service Group
Division Of Astbury Gabriel Corp.
(317) 290-1471
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

..ENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

.TE OF REPORT: JULY 31, 1991

.. E OF SAMPLE: JULY 17, 1991

.TE RECEIVED: JULY 17, 1991

.. E OF ANALYSIS: JULY 18, 1991

.. RIX: SOIL

MPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#7 NORTH SIDE 8'

S NUMBER: 917156

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLANK
N ENE	71-43-2	ND	ND	5	5
L''ENE	108-88-3	ND	ND	5	5
HYLBENZENE	100-41-4	ND	ND	5	5
T L XYLENE	1330-20-7	ND	ND	5	5

NOT DETECTED

CERTIFIED BY Bruce Flood

Environmental Service Group
Division Of Astbury Gabriel Corp.
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

CLIENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

DATE OF REPORT: JULY 31, 1991

DATE OF SAMPLE: JULY 17, 1991

DATE RECEIVED: JULY 17, 1991

DATE OF ANALYSIS: JULY 18, 1991

MATRIX: SOIL

SAMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#9 S.E. CORNER BOTTOM

LAB NUMBER: 917158

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLANK
BENZENE	71-43-2	ND	ND	5	5
TOLUENE	108-88-3	ND	ND	5	5
ETHYLBENZENE	100-41-4	ND	ND	5	5
TOTAL XYLENE	1330-20-7	ND	ND	5	5

ND = NOT DETECTED

CERTIFIED BY

Environmental Service Group

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CLIENT: NORTH AMERICAN CONSTRUCTION
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ZIONSVILLE, IN 46077

DATE OF REPORT: JULY 31, 1991

DATE OF SAMPLE: JULY 17, 1991

DATE RECEIVED: JULY 17, 1991

DATE OF ANALYSIS: JULY 18, 1991

MATRIX: SOIL

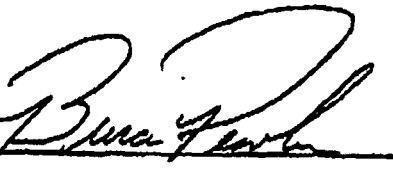
SAMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#10 S.W. CORNER BOTTOM

LAB NUMBER: 917159

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BL
BENZENE	71-43-2	ND	ND	5	5
TOLUENE	108-88-3	ND	ND	5	5
ETHYLBENZENE	100-41-4	ND	ND	5	5
TOTAL XYLENE	1330-20-7	ND	ND	5	

ND = NOT DETECTED

CERTIFIED BY 

Environmental Service Group
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5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
FAX (317) 290-1670

)IENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

DATE OF REPORT: JULY 31, 1991

DATE OF SAMPLE: JULY 17, 1991

DATE RECEIVED: JULY 17, 1991

DATE OF ANALYSIS: JULY 18, 1991

MATRIX: SOIL

SAMPLE DESCRIPTION: O.B.G. TEC. SERVICES GM PLANT - BEDFORD, IN
#11 N.W. CORNER BOTTOM

L_3 NUMBER: 917160

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLAN
BENZENE	71-43-2	ND	ND	5	5
TOLUENE	108-88-3	ND	ND	5	5
ETHYLBENZENE	100-41-4	ND	ND	5	5
TOTAL XYLENE	1330-20-7	ND	ND	5	5

D = NOT DETECTED

CERTIFIED BY

NORTH AMERICAN CONSTRUCTION CO., INC.

P.O. # 2705

770 Pineview Drive Zionsville, Indiana 46077 317-846-575
317-87

CHAIN OF CUSTODY RECORD

Client: O.B.G. Tec. Services | Project: GM Plant - Bedford, In

Sampler(s): Dave Taylor / North American Constr. Co.

Number	Sampling Location	Date	Time	Composite	Grab	No. of Bottles	Remarks (gasoline 602/FID; 8015 TPH / 8020 BTEX (Leach))
1	East Side 8' Deep	7/11/91	8 AM		✓	2	TPH / BTEX (Leach)
2	East Side 12' Deep	"	"		✓	2	
3	South Side 8' Deep	"	"		✓	2	
4	South Side 12' Deep	"	"		-	2	
5	West Side 8' Deep	"	"		-	2	
6	West Side 12' Deep	"	"		-	2	
7	North Side 8' Deep	"	"		-	2	
8	North Side 12' Deep	"	"		-	2	
9	SE Corner Bottom	"	"		-	2	
10	S.W Corner Bottom	"	"		-	2	
11	N.W. Corner Bottom	"	"		-	2	

Relinquished By	Received By	Date	Time
David Taylor	[signature]	7/12/91	5:00

Shipping Notes

NORTH AMERICAN CONSTRUCTION CO., INC.

P.O. # 2705

770 Pineview Drive Zionsville, Indiana 46077 317-846-575
317-875-755

CHAIN OF CUSTODY RECORD

Client: O.B.G. Tec. Services

Project: GM Plant - Bedford, In

Sampler(s): Dave Taylor / North American Constr. Co.

Number	Sampling Location	Date	Time	Composite	Grab	No. of Bottles	Remarks (gasoline 602/610)
1	East Side 8' Deep	7/17/91	8 AM		✓	2	BOIS TPH / BOZO BTEX (1 each)
2	East Side 12' Deep	"	"		✓	2	
3	South Side 8' Deep	"	"		✓	2	
4	South Side 12' Deep	"	"		✓	2	
5	West Side 8' Deep	"	"		✓	2	
6	West Side 12' Deep	"	"		✓	2	
7	North Side 8' Deep	"	"		✓	2	
8	North Side 12' Deep	"	"		✓	2	
9	SE Corner Bottom	"	"		✓	2	
10	SW Corner Bottom	"	"		✓	2	
11	N.W. Corner Bottom	"	"		✓	2	

Relinquished By	Received By	Date	Time
David Taylor	[signature]	7/17/91	5:00

Shipping Notes

Environmental Service Group
Division Of Astbury Gabriel Corp.
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

CLIENT: NORTH AMERICAN CONSTRUCTION CO.
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

DATE OF REPORT: JULY 26, 1991

DATE OF SAMPLE: JULY 18, 1991

DATE RECEIVED: JULY 18, 1991

MATRIX: SOIL

SAMPLE DESCRIPTION: GM CENTRAL FOUNDRY #015

LAB NUMBER: 917218

ANALYTICAL METHOD: SEE BELOW

PARAMETER	ANALYTICAL METHOD	ANALYTICAL RESULT
TOTAL PETROLEUM HYDROCARBONS GC/FID	SW846 8015 MOD.	ND @ 10 MG/KG

ND = NOT DETECTED

CERTIFIED BY Bruce Hoole

Environmental Service Group
Division Of Astbury Gabriel Corp.
5933 WEST 71ST STREET INDIANAPOLIS, INDIANA 46278
(317) 290-1471
FAX (317) 290-1670

.TENT: NORTH AMERICAN CONSTRUCTION
770 PINEVIEW DR.
ZIONSVILLE, IN 46077

E OF REPORT: JULY 26, 1991

TE OF SAMPLE: JULY 18, 1991

E RECEIVED: JULY 18, 1991

TE OF ANALYSIS: JULY 19, 1991

RIX: SOIL

PLE DESCRIPTION: GM CENTRAL FOUNDRY #015

B MBER: 917218

PURGEABLE ORGANICS - BTEX BY GC/PID (SW846 METHOD 5030/8020)

ANALYTE	CAS NUMBER	CONCENTRATION (UG/KG) SAMPLE	CONCENTRATION (UG/KG) BLANK	MINIMUM QUANTITATION LIMIT (UG/KG) SAMPLE	MINIMUM QUANTITATION LIMIT (UG/KG) BLANK
NZENE	71-43-2	ND	ND	5	5
UENE	108-88-3	ND	ND	5	5
HYLBENZENE	100-41-4	BQL	ND	5	5
AL XYLENE	1330-20-7	7	ND	5	5

= NOT DETECTED
L = DETECTED BELOW QUANTITATION LIMIT

CERTIFIED BY Bruce Plank

APPENDIX G.38

IDEM LETTER DATED AUGUST 21, 1991

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

August 21, 1991

Mr. George Oliver
Solid Waste Management Branch
Department of Environmental Management
P.O. Box 6015
Indianapolis, IN 46225-6015

Dear Mr. Oliver:

Re: Disposal of Contaminated Soil from UST Closure

The GMC, Central Foundry Division, which operates an aluminum die casting facility located in Bedford, Indiana, is requesting approval to dispose of "contaminated soil" generated as the result of the closure of an underground storage tank at the plant.

This is a one time disposal of approximately 750 cubic yards of this material.

The Bedford Plant is requesting approval to dispose of this material at Rumpke Landfill in Medora, Indiana.

Attached for your information and review are the results of the TLCP test conducted on this waste stream.

If you have any questions regarding this matter or need additional information, please do not hesitate to contact me at (812) 279-7257.

Very truly yours,

William E. Litkenhous
Environmental Engineer

Attachments

cc: Wm. S. Schoonmaker
Thomas Rumpke

Lets Get It Together
SAFETY BELTS SAVE LIVES

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	18-JUL-91	A234358
	Complete 06-AUG-91	PO Number F568727
	Printed 07-AUG-91	Sampled 18-JUL-91 11:40

Report To	Bill To
GM CENTRAL FOUNDRY DIVISION BILL LITKENHOUS P.O. BOX 271 BEDFORD PLANT - NORTH JACKSON STREET BEDFORD, IN 47421	CENTRAL FOUNDRY DIVISION-GMC DISBURSEMENT ANALYSIS P.O. BOX 5079 SAGINAW, MI 48605-5079

Sample Description

SAMPLE ID:: 001
DESCRIPTION: WASTE SOIL STOCKPILE
VENDOR: 303047

TOTAL SOLIDS EPA 160.3

Analyst: R. RIFE Analysis Date: 25-JUL-91 Test: G401.7. 0

Parameter	Result	Det. Limit	Units
SOLIDS	91	1	Percent

TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Analyst: A. HILSCHER Analysis Date: 19-JUL-91 Test: P107.1. 0

Parameter	Result	Det. Limit	Uni
TOTAL SAMPLE WEIGHT	100		Grams
LIQUID FRACTION (GRAMS)			Grams
EXTRACTED SAMPLE	100		Grams
SOLIDS	100		Percent
9.5 MM SIEVE TEST			Passed
INITIAL PH	8.42		Std. Uni
ADJUSTED PH	2.18		Std. Uni
BUFFER SOLUTION PH	4.94		Std. Uni
FINAL PH	6.57		Std. Uni
VOLUME BUFFERED SOLUTION	2000		mL
VOLUME EXTRACT FILTERED	2000		mL
LIQUID FRACTION			mL
TOTAL VOLUME FILTRATE	2000		mL
INITIAL TIME	10089.5		HRS
FINAL TIME	10106.8		HRS
PHASE 0 VOLUME (REP 0)	2000		mL
PHASE 0 WEIGHT	2000		Grams
PHASE 0 DENSITY	1.0		g/mL

AMBIENT TEMP: 23 DEGREES

FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Analyst: B. HAHN Analysis Date: 24-JUL-91 Test: P130.8. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Result	Det. Limit	Unit
INITIAL WEIGHT OR VOLUME	100		mL
FINAL WEIGHT OR VOLUME	100		mL

TCLP BARIUM FAA (1 POINT MSA) SW846-7080

Analyst: A. STOCKBURGER Analysis Date: 25-JUL-91 Instrument: FAA Test: M704.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spik % Recovery
BARIUM	3.7	0.2	mg/L	2.6	1.00	3.28	70
ADDITION 1			mg/L	2.50			
SAMPLE			Conc	2.58			
SAMPLE + ADD 1			Conc	4.93			
DILUTION				1			

TCLP CADMIUM FAA (1 POINT MSA) SW846-7130

Analyst: A. STOCKBURGER Analysis Date: 25-JUL-91 Instrument: FAA Test: M708.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CADMIUM	BDL	0.02	mg/L	BDL	0.20	0.18	90
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.00			
SAMPLE + ADD 1			Conc	0.50			
DILUTION				1			

TCLP CHROMIUM FAA (1 POINT MSA) SW846-7190

Analyst: A. STOCKBURGER Analysis Date: 25-JUL-91 Instrument: FAA Test: M710.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
CHROMIUM	BDL	0.05	mg/L	BDL	0.40	0.43	108
ADDITION 1			mg/L	1.00			
SAMPLE			Conc	-0.01			
SAMPLE + ADD 1			Conc	1.15			
DILUTION				1			

TCLP LEAD FAA (1 POINT MSA) SW846-7420

Analyst: A. STOCKBURGER Analysis Date: 25-JUL-91 Instrument: FAA Test: M716.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
LEAD	BDL	0.20	mg/L	BDL	2.00	1.69	85
ADDITION 1			mg/L	5.00			
SAMPLE			Conc	-0.03			
SAMPLE + ADD 1			Conc	4.65			
DILUTION				1			

TCLP SILVER FAA (1 POINT MSA) SW846-7760

Analyst: A. STOCKBURGER Analysis Date: 25-JUL-91 Instrument: FAA Test: M730.5. 0

Prep: FAA OR ICP ACID DIGESTION OF LEACHATE SAMPLES SW846-3010

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
SILVER	BDL	0.04	mg/L	BDL	0.20	0.19	95
ADDITION 1			mg/L	0.50			
SAMPLE			Conc	0.00			

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spi % Recovery
SAMPLE + ADD 1			Conc	0.51			
DILUTION				1			

GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Analyst: B. HAHN Analysis Date: 24-JUL-91 Test: P130.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	50		mL
FINAL WEIGHT OR VOLUME	50		mL

TCLP ARSENIC GFAA (1 POINT MSA) SW846-7060

Analyst: W. WATNESS Analysis Date: 25-JUL-91 Instrument: GFAA Test: M703.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spik % Recovery
ARSENIC	BDL	0.005	mg/L	BDL	0.0250	0.0241	96
ADDITION 1			mg/L	0.010			
SAMPLE			Conc	0.0011			
SAMPLE + ADD 1			Conc	0.011			
DILUTION				1			

TCLP SELENIUM GFAA (1 POINT MSA) SW846-7740

Analyst: K. KEHOE Analysis Date: 26-JUL-91 Instrument: GFAA Test: M728.6. 0

Prep: GFAA ACID DIGESTION OF LEACHATE SAMPLES SW846-3020

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix % Recov
SELENIUM	BDL	0.005	mg/L	BDL	0.0250	0.016	64
ADDITION 1			mg/L	0.0100			
SAMPLE			Conc	0.0002			
SAMPLE + ADD 1			Conc	0.0062			
DILUTION				1			

MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Analyst: K. HACK Analysis Date: 23-JUL-91 Test: P131.9. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10		mL
FINAL VOLUME	100		mL

TCLP MERCURY CVAA (1 POINT MSA) SW846-7470

Analyst: J. WARE Analysis Date: 24-JUL-91 Instrument: CVAA Test: M720.6. 0

Prep: MERCURY CVAA ACID DIGESTION OF LEACHATE SAMPLES SW846-7470

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
MERCURY	BDL	0.005	mg/L	BDL	0.020	0.017	86
ADDITION 1			mg/L	0.0010			
SAMPLE			Conc	0.0000			
SAMPLE + ADD 1			Conc	0.00092			
DILUTION				1			

EMS HERITAGE LABORATORIES, INC. Lab Sample ID: A2343

TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Analyst: G. HUGHS Analysis Date: 24-JUL-91 Test: P733.4. 0

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	200		mL
FINAL VOLUME	1		mL

TCLP SEMIVOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8270

Analyst: J. ELLIS Analysis Date: 01-AUG-91 Instrument: GC/MS SVOA Test: 0514.7. 0

Prep: TCLP GC/MS SEPARATORY FUNNEL LIQUID-LIQUID EXTRACTION SW846-3510

Prep: TOX CHAR LEACHING PROCEDURE (TCLP W/ ORGANICS) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spik % Recovery
1,4-DICHLOROBENZENE	BDL	50	ug/L	BDL	500	355	71
2,4-DINITROTOLUENE	BDL	50	ug/L	BDL	500	510	102
HEXACHLOROBENZENE	BDL	50	ug/L	BDL	500	415	83
HEXACHLOROBUTADIENE	BDL	50	ug/L	BDL	500	320	64
HEXACHLOROETHANE	BDL	50	ug/L	BDL	500	340	68
NITROBENZENE	BDL	50	ug/L	BDL	500	510	102
PYRIDINE	BDL	250	ug/L	BDL	500	355	71
2-METHYL PHENOL	BDL	50	ug/L	BDL	500	455	91
METHYL PHENOL		50	ug/L	BDL			
4-METHYLPHENOL	BDL	50	ug/L	BDL	500	370	74
PENTACHLOROPHENOL	BDL	250	ug/L	BDL	500	330	65
2,4,5-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	405	81
2,4,6-TRICHLOROPHENOL	BDL	50	ug/L	BDL	500	375	75
SURROGATE RECOVERY							
FLUOROPHENOL			% Rec	61			
PHENOL-D5			% Rec	34			
NITROBENZENE-D5			% Rec	102			
2-FLUOROBIPHENYL			% Rec	86			
2,4,6-TRIBROMOPHENOL			% Rec	108			
TERPHENYL-D14			% Rec	108			

ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Analyst: G. WILSON Analysis Date: 22-JUL-91 Test: P108.1. 0

Parameter	Result	Det. Limit	Units
TOTAL SAMPLE WEIGHT	25.0		Grams
LIQUID PORTION	0.00		mL
LIQUID FRACTION (GRAMS)	0.00		Grams
EXTRACTED SAMPLE	25.0		Grams
PHASE ONE VOLUME (REP 0)	380.0		mL
PHASE TWO VOLUME (REP 1)	0.00		mL

TCLP VOLATILE ORGANICS (TOXICITY CHARACTERISTIC) SW846-8240

Analyst: T. WIEGAND Analysis Date: 30-JUL-91 Instrument: GC/MS VOA Test: 0513.7. 0

Prep: ZERO HEADSPACE EXTRACTION (TCLP) SW846-1311

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spike % Recovery
BENZENE	BDL	50	ug/L	BDL	500	490	98
CARBON TETRACHLORIDE	BDL	50	ug/L	BDL	500	430	86
CHLOROBENZENE	BDL	50	ug/L	BDL	500	460	92
CHLOROFORM	BDL	50	ug/L	BDL	500	440	88
1,2-DICHLOROETHANE	BDL	50	ug/L	BDL	500	460	92
1,1-DICHLOROETHYLENE	BDL	50	ug/L	BDL	500	480	96
METHYL ETHYL KETONE	BDL	100	ug/L	BDL	500	1500	300

Parameter	Corrected Result	Detection Limit	Units	Observed Result	Matrix Spike True Value	Sample + Spike	Matrix Spi % Recovery
TETRACHLOROETHYLENE	BDL	50	ug/L	BDL	500	430	86
TRICHLOROETHYLENE	BDL	50	ug/L	BDL	500	440	88
VINYL CHLORIDE	BDL	100	ug/L	BDL	500	910	182
.							
SURROGATE RECOVERY							

DICHLOROETHANE-D4			% Rec	98			
TOLUENE-D8			% Rec	102			
BROMOFLUOROBENZENE			% Rec	101			
DILUTION FACTOR 1:10							

VOLATILE ORGANICS SW846-8240

Analyst: R. SHAMP Analysis Date: 30-JUL-91 Instrument: GC/MS VOA Test: 0510.3. 0

Parameter	Result	Det. Limit	Units
ACETONE	BDL	1.2	mg/kg
ACROLEIN	BDL	3.1	mg/kg
ACRYLONITRILE	BDL	4.4	mg/kg
BENZENE	BDL	0.31	mg/k
BROMODICHLOROMETHANE	BDL	0.31	mg/k
BROMOFORM	BDL	0.31	mg/kg
BROMOMETHANE	BDL	0.63	mg/kg
CARBON DISULFIDE	BDL	0.31	mg/kg
CARBON TETRACHLORIDE	BDL	0.31	mg/kg
CHLOROBENZENE	BDL	0.31	mg/kg
CHLOROETHANE	BDL	0.63	mg/kg
CHLOROFORM	BDL	0.31	mg/kg
CHLOROMETHANE	BDL	0.63	mg/kg
DIBROMOCHLOROMETHANE	BDL	0.31	mg/kg
CIS-1,3-DICHLOROPROPENE	BDL	0.31	mg/kg
DICHLORODIFLUOROMETHANE	BDL	0.31	mg/kg
1,1-DICHLOROETHANE	BDL	0.31	mg/kg
1,2-DICHLOROETHANE	BDL	0.31	mg/kg
1,1-DICHLOROETHENE	BDL	0.31	mg/kg
1,2-DICHLOROPROPANE	BDL	0.31	mg/kg
ETHYLBENZENE	1.8	0.31	mg/k
FLUOROTRICHLOROMETHANE	BDL	0.31	mg/k
2-HEXANONE	BDL	0.63	mg/kg
METHYLENE CHLORIDE	BDL	0.31	mg/kg
METHYL ETHYL KETONE	BDL	0.63	mg/kg
4-METHYL-2-PENTANONE	BDL	0.63	mg/kg
STYRENE	BDL	0.31	mg/kg
1,1,2,2-TETRACHLOROETHANE	BDL	0.31	mg/kg
TETRACHLOROETHENE	BDL	0.31	mg/kg
TETRAHYDROFURAN	BDL	1.5	mg/kg
TOLUENE	1.0	0.31	mg/kg
1,2-DICHLOROETHENE (TOTAL)	BDL	0.31	mg/kg
TRANS-1,3-DICHLOROPROPENE	BDL	0.31	mg/kg
1,1,1-TRICHLOROETHANE	BDL	0.31	mg/kg
1,1,2-TRICHLOROETHANE	BDL	0.31	mg/kg
TRICHLOROETHENE	BDL	0.31	mg/kg
VINYL ACETATE	BDL	0.63	mg/kg
VINYL CHLORIDE	BDL	0.63	mg/kg
XYLENE (TOTAL)	12	0.31	mg/kg
.			
SURROGATE RECOVERY			

Parameter	Result	Det. Limit	Units
DICHLOROETHANE-D4	93		% Rec
TOLUENE-D8	104		% Rec
BROMOFLUOROBENZENE	119		% Rec
DILUTION FACTOR 1:63			
ALSO DETECTED			
(1-METHYLETHYL)BENZENE	RT=35.24		
PROPYL BENZENE	RT=31.97		
2,5,6-TRIMETHYLOCTANE	RT=23.7		
UNKNOWN	RT=22.61		
UNKNOWN	RT=26.31		
UNKNOWN	RT=39.16		
UNKNOWN	RT=14.88		
UNKNOWN	RT=23.04		
UNKNOWN	RT=33.06		
2,3-DIMETHYLPENTANE	RT=21.3		

Sample Comments

cc: OBG TECHNICAL SERVICES

BDL Below Detection Limit
RT Retention Time

Quality Assurance Officer: _____

APPENDIX G.39

IDEM LETTER DATED OCTOBER 23, 1991

Central Foundry Division
General Motors Corporation
Bedford Plant
North Jackson Street
Bedford, Indiana 47421-0271

October 23, 1991

Mr. Robert Snodgrass
Solid Waste Management Branch
Department of Environmental Management
P.O. Box 6015
Indianapolis, IN 46225-6015

Dear Mr. Snodgrass:

Re: PCB Analysis of Contaminated Soil from UST Closure

Per our recent telephone conversation, I am enclosing a copy of the PCB analysis done on the soil removed during the UST Closure. As the test data indicates, no PCBs were detected.

If you have any questions regarding this matter or need additional information, please do not hesitate to contact me at (812) 279-7257.

Very truly yours,

William E. Litkenhous
Environmental Engineer

Attachments

cc: Wm. S. Schoonmaker
Jerry Jackson, Rumpke Disposal

Lets Get It Together
SAFETY BELTS SAVE LIVES

CERTIFICATE OF ANALYSIS

Service Location	Received	Lab ID
EMS HERITAGE LABORATORIES, INC. 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	11-OCT-91	A239959
	Complete 18-OCT-91	PO Number F568727
	Printed 21-OCT-91	Sampled 09-OCT-91 14:30

Report To	Bill To
CENTRAL FOUNDRY DIVISION TIM GALLOWAY P.O. BOX 271 BEDFORD PLANT BEDFORD, IN 47421	CENTRAL FOUNDRY DIVISION-GMC DISBURSEMENT ANALYSIS P.O. BOX 5079 SAGINAW, MI 48605-5079

Sample Description

DESCRIPTION: UNDERGROUND TANK FILL
VENDOR: 303047

PCB SONICATION EXTRACTION SW846-3550

Analyst: D. FULP Analysis Date: 14-OCT-91 Test: P231.1. 0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10.01		Grams
FINAL VOLUME	100		mL

POLYCHLORINATED BIPHENYLS (PCBS) SW846-8080

Analyst: D. FULP Analysis Date: 17-OCT-91 Instrument: GC/ECD Test: 0301.2. 0

Prep: PCB SONICATION EXTRACTION SW846-3550

Parameter	Result	Det. Limit	Units
PCB AROCHLOR 1016	BDL	1.0	mg/kg
PCB AROCHLOR 1221	BDL	5.0	mg/kg
PCB AROCHLOR 1232	BDL	1.0	mg/kg
PCB AROCHLOR 1242	BDL	1.0	mg/kg
PCB AROCHLOR 1248	BDL	1.0	mg/kg
PCB AROCHLOR 1254	BDL	1.0	mg/kg
PCB AROCHLOR 1260	BDL	1.0	mg/kg
PCB AROCHLOR 1262	BDL	1.0	mg/kg

Sample Comments

BDL Below Detection Limit

Quality Assurance Officer: _____

MAY 25, 2001

APPENDIX G.40

SOUTH PISTON YARD UST CLOSURE REPORT

GM POWERTRAIN

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
P797554962

August 4, 1994

Ms. Lynette Honeycutt
Indiana Department of Environmental Management
Underground Storage Tank Section
N1253, 100 North Senate Avenue
P.O. Box 7015
Indianapolis, IN 46206-7015

Subject: Incident Number 94-05525 - Submission of UST Closure Report

Dear Ms. Honeycutt:

Please find enclosed one (1) copy of the Underground Storage Tank Closure Report documenting the activities conducted at our facility along with a copy of a Notification For Underground Storage Tanks form. As presented in the Report, we feel the activities to date successfully complete the closure of these underground storage tanks and would not anticipate further action to be required.

We are confident that you will find that this Report satisfies the reporting requirements per the underground storage tank closure regulations. However, if you have any question or require additional information, feel free to contact me at the address below or at (812) 279-7308

Very truly yours

Wm Schoonmaker

Wm. S. Schoonmaker, P.E.
Chemical and Environmental
System Manager

Enclosures

bcc: Laura Tucker, GM Legal
Reg Sobczynski, GM NAO EEO
John Boneberg - OBG Cincinnati

NOTIFICATION FOR UNDERGROUND STORAGE TANKS

FOR TANKS IN **IN**

RETURN COMPLETED FORM TO

Indiana Department of Environmental Management
Office of Environmental Response
UST Program
P.O. Box 7015
Indianapolis, Indiana 46207-7015
(317) 240-6215

DE	
AM	
CL	
SA	

Facility I.D. Number (This number is found on tank fee invoice)	018959	Federal I.D. Number or Social Security Number	
Owner I.D. Number (This number is found on tank fee invoice)	C1040	EPA I.D. Number STATE USE ONLY	IND 006036099

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief or recollection.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks excluded from notification are:

1. Farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. Tanks use for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;.
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons,
6. storm water or waste water collection systems/
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. This form must be completed for each location containing underground storage tanks. If more than 5 tanks are owned at this location, photocopy pages 2 and 3 and staple continuation sheets to this form.

Indicate number of continuation sheets attached: ☐

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
GM POWERTRAIN DIVISION - BEDFORD PLANT

Street Address
P.O. BOX 271 105 GM DRIVE

County
LAWRENCE CO.

City: BEDFORD State: IN ZIP Code: 47421

Area Code Phone Number

Date of Ownership of Tanks(s)
(effective date of current ownership, mo/day/yr) / /

II. LOCATION OF TANK(S)

(If same as Section I, mark box here) ☐

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable

County

City (nearest) State ZIP Code

Type of Operation (mark all that apply):
- ☐ Motor vehicle fuel dispensing station (automotive or marine)
- ☐ Commerical (dry cleaning store, auto equipment/service store, etc.
- ☒ Industrial
- ☐ Residential
- ☐ Agricultural

Description of Owner:
- ☐ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☐ Other _____

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here) ☐	Job Title	Area Code	Phone Number
J.M. SCHOONMAKER	CHEM. E. ENV. SYSTEM MGR.	812	279-7308

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (READ AND SIGN AFTER COMPLETING SECTION VI)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature (signed in ink)	Date Signed
PAUL FORD, PRODUCTION MANAGER	Paul E Ford	8/4/94

(Continue on Reverse Side)

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (COMPLETE FOR EACH TANK AT THIS LOCATION)

Tank Identification No (e.g., ABC-123) or Arbitrarily Assigned Sequential Number e.g. 1,2,3 .)		Tank No. #1	Tank No. #2	Tank No. #3	Tank No. #4	Tank No. ~5
1. Status of Tank (mark all that apply)	Currently in Use					
	Temporarily Out of Use					
	Permanently Out of Use	X	X	X	X	X
	Brought into Use after 5/8/86					
2. Date of Installation (mo/day/yr)		UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNO
3. Estimated Total Capacity (Gallons)		12,000	12,000	12,000	7500	12,00
4. Material of Construction (mark all that apply)	Steel	X	X	X	X	X
	Concrete					
	Fiberglass Reinforced Plastic					
	Unknown					
	Other Please Specify					
5. Internal Protection (mark all that apply)	Cathodic Protection					
	Interior Lining (e.g., epoxy resins)					
	None	X	X	X	X	
	Unknown					
	Other Please Specify					
6. External Protection (mark all that apply)	Cathodic Protection					
	Painted (e.g., asphaltic)					
	Fiberglass Reinforced Plastic Coated					
	None	X	X	X	X	X
	Unknown					
	Other Please Specify					
7. Piping (mark all that apply)	Bare Steel					
	Galvanized Steel					
	Fiberglass Reinforced Plastic					
	Cathodically Protected					
	Unknown	X	X	X	X	X
	Other Please Specify					
8. Substance Currently or Last Stored In Greatest Quantity by Volume (mark all that apply)	a. Empty					
	b. Petroleum					
	Diesel					
	Kerosene					
	Gasoline				X	
	Used Oil					
	Other Please Specify					ETHYL SILICATE
	C. Hazardous Substance					
	Please Indicate Name of Principal CERCLA Substance or Chemical Abstract Service (CAS) No.					
	Mark box if tank stores a mixture of substances					
	D. Unknown	X	X	X		
9. Additional Information (for tanks permanently taken out of service)	a. Closure Date (mo/day/yr)	5/13/94	5/13/94	5/13/94	5/13/94	5/13
	b. Mark box if removed from the ground	X	X	X	X	X
	c. Mark box if tank filled with inert material (e.g. sand, concrete gravel)					
	d Date mo/day/yr last used (for tanks temporarily out of use)	/ /	/ /	/ /	/ /	/ /

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (COMPLETE FOR EACH TANK AT THIS LOCATION)

Tank Identification No (e.g., ABC-123) or Arbitrarily Assigned Sequential Number e.g., 1,2,3...)	Tank No. #1	Tank No. #2	Tank No. #3	Tank No. #4	Tank No. #5
10. Piping Method mark which applies: Pressurized or Suction (European/American)					
NO DISPENSER EXISTED AT THE TIME OF REMOVAL					
Pressurized — This method uses a pump at the bottom of the tank to push product to the dispenser	☐	☐	☐	☐	☐
Suction — This method uses a pump in the dispenser to draw product from the tank to the dispenser. Suction piping is installed in one of the two following manners: EUROPEAN - the check valve is located next to the dispenser pump. or AMERICAN - the check valve is located next to the tank					
European	☐	☐	☐	☐	☐
American	☐	☐	☐	☐	☐

VII. CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW OR EXISTING UPGRADED TANKS AT THIS LOCATION)

SECTION NOT APPLICABLE ALL TANKS REMOVED

☐ The information in items 12 through 15 applies to all tanks at thisfacility

☐ The information in items 12 through 15 applies to tank number _____

[Refer to the tank numbers used on page 2 in completing this item. Use copies of page 3, as needed, to supply information for other tank(s)]

12. Release Detection (mark all that apply):

- ☐ Manual tank gauging.
- ☐ Tank tightness testing with inventory controls
- ☐ Automatic tank gauging
- ☐ Vapor monitoring.
- ☐ Ground-water monitoring
- ☐ Interstitial monitoring within a secondary barrier.
- ☐ Interstitial monitoring within secondary containment
- ☐ Automatic line leak detectors.
- ☐ Line tightness testing.
- ☐ Another method allowed by the implementing agency. Please specify:

13 Cathodic Protection (if applicable):

- ☐ As specified for coated steel tanks with cathodic protection. Circle one: Impressed current / Sacrificial anodes
- ☐ As specified for coated steel piping with cathodic protection. Circle one: Impressed current / Sacrificial anodes
- ☐ Another method allowed by the implementing agency Please specify:

14 Spill and Overfill Control:

- ☐ Catchment basins.
- ☐ Automatic shut off devices.
- ☐ Overfill alarms.
- ☐ Ball float valves.
- ☐ Another method allowed by the implementing agency Please specify:

VII. CERTIFICATION OF COMPLIANCE (CONTINUED FROM PAGE 3)

15 Installation, Upgrade or Closure (mark all that apply):

- ☐ The installer has been certified by the tank and piping manufacturers.
- ☐ The installer, closure or upgrade contractor has been certified by the State Fire Marshal's Office.
- ☐ The installation has been inspected and certified by a registered professional engineer
- ☐ The installation or closure has been inspected by the State Fire Marshal's Office.
- ☐ All work listed on the manufacturer's installation checklists has been completed
- ☐ Another method was used as allowed by the implementing agency. Please specify:

_____

16. OATH: I certify that the information concerning installation, upgrade or closure provided in Item 15 is true to the best of my belief and knowledge.

Installer: (Print) _____ _____
Name Date

_____
Position

_____
Company

(Signature) _____ Certification Number: _____
Name

17. ☐ I have financial responsibility in accordance with Subpart I. Please specify:

Method: _____

Insurer: _____

Policy Number: _____

VIII. DIAGRAM OF TANK FACILITY (INCLUDE ALL NEW OR EXISTING TANKS AND THEIR ASSOCIATED PIPING AND DISPENSERS)

NO UNDERGROUND TANKS EXIST AT THIS FACILITY.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Evan Bayh
Governor
Kathy Prosser
Commissioner

June 14, 1994

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

Mr. Bill Schoonmaker
GM Drive
P.O. Box 271
Bedford, Indiana 47421

RE: Underground Storage Tank Ownership

Dear Mr. Schoonmaker:

Recently, we received notification that you are the current owner of underground storage tanks (USTs) located at GM Powertrain Division.

We have not received a notification form indicating your ownership. Please complete the enclosed form and return it with this letter to:

Lynette Honeycutt
Indiana Department of Environmental Management
Underground Storage Tank Section
N1253, 100 North Senate Avenue
P.O. Box 7015
Indianapolis, IN 46206-7015

If you have any questions, please contact her at (317) 233-6416.

Sincerely,

John P. Gunter

John P. Gunter, Chief
Underground Storage Tank Section
Office of Environmental Response

LH/deh

Enclosure

2488.483

Report

Underground Storage Tank Closure

General Motors Power Train
Bedford, Indiana

August 1994

O'BRIEN & GERE ENGINEERS, INC.

11590 Century Boulevard
Suite 205
Cincinnati, Ohio 45246

Contents

Tables ii

Figures iii

Exhibits iv

1. Facility Background 1

2. Contractor Data 2

3. UST Data 3
- 3.1. Introduction 3
- 3.2. System Information 4
- 3.3. Site Data 5

4. Sampling Data 7
- 4.1. Sample Collection 7
- 4.2. Sample Collection Personnel 9
- 4.3. Sample Results 9
- 4.4. Laboratory Information 10

5. Waste Disposal Data 11
- 5.1. Disposition of UST System 11
- 5.2. Disposition of Solids 11
- 5.3. Disposition of Tank Contents 12

6. Miscellaneous Data 13
- 6.1 Native Soil Description 13
- 6.2. Other Pertinent Information 13

7. Leaking Underground Storage Tank (LUST) Referral 14
- 7.1. IDEM Notification 14
- 7.2. LUST Site Investigation 14

Tables

1 Tank Contents Sample Results
2 Closure Sample Results

Figures

1 Location Plan
2 Site Plan
3 Closure Sample Locations and Results - First Round
4 Closure Sample Locations and Results - Second and Third Round

Exhibits

1 Underground Storage Tank Closure Work Plan
2 Chain-of-Custody Documentation
3 Analytical Reports
4 Disposal Manifests

1. Facility Background

This section provides information pertinent to the Underground Storage Tank (UST) system owner, operator, and facility.

UST System Owner:	GM Powertrain Division General Motors Corporation Bedford Plant P.O. Box 271 North Jackson Street Bedford, IN 47421 Lawrence County Contact: Bill Schoonmaker (812) 279-7308 Title: Environmental Manager
UST System Operator:	Same as above.
Facility Owner:	Same as above.
Facility Location:	Same as above.
IDEM Facility I.D. Number:	None exists.
Past Owner/Operator:	Same as above.

3. UST Data

3.1. Introduction

A UST was uncovered during construction activities being performed to complete a modification to the facility fire suppression system. A subsequent review of plant record drawings revealed the potential presence of four (4) USTs. A ground penetrating radar survey (GPR) was conducted and confirmed the presence of four (4) potential USTs.

General Motors Power Train undertook a voluntary closure program to remove these previously unknown and unregistered USTs. The program was voluntary because the USTs were apparently closed in place prior to 1974. Furthermore, it was assumed that the USTs no longer contained product. Therefore, the USTs were not considered to be regulated under the current IDEM UST regulations. Although the program was voluntary, a Work Plan was developed which included closure methods and sampling requirements consistent with IDEM regulations. A copy of the Work Plan is included as Exhibit 1.

The Work Plan was initially developed for the anticipated removal of 4 USTs. However, during closure activities, a fifth UST was uncovered. The Work Plan was applied to perform the closure of this fifth UST.

Mr. Jack Butterfield, the local fire marshal, was notified by the facility contact prior to field activities to review the Work Plan. Mr. Butterfield also visited the site on May 9, 1994, to review the closure activities.

3.2. System Information

Facility Name:	GM Powertrain Division General Motors Corporation Bedford Plant P O Box 271 North Jackson Street Bedford, IN 47421 Lawrence County (812) 279-7308
IDEM Facility I.D. Number:	None exists.
Number of Tanks:	Five (5)
Tank Capacities:	1) 12,000 gallon 2) 12,000 gallon 3) 12,000 gallon 4) 7,500 gallon 5) 12,000 gallon
Former Contents:	1) Diesel 2) Diesel 3) Diesel 4) Gasoline 5) Ethyl Silicate
Contents at Removal:	1) Water 2) Water 3) Water 4) Water/Residuals 5) Water/Residuals/Solids
Present Condition:	Tanks have been removed and disposed off-site.
Recent Leak Detection Results:	None available.
Records of Tightness Tests:	None available.

Installation Date and Age of USTs:	Unknown.
Material of Construction:	Steel.
Leak Detection Apparatus:	None.
Previously Closed USTs:	None.
Location of USTs:	See Figure 1 for a Location Plan and Figure 2 for a Site Plan.

3.3. Site Data

History of Spill Reports:	None.
Facility Use:	Present and past use has been a foundry for the casting of automotive components.
Coverage:	The facility encompasses approximately 3.5 million square feet of area. Of this total, approximately 1 million square feet is paved with asphalt or concrete, 1.3 million is non-paved (i.e., grass or crushed stone) and the remaining 1.2 million is covered by structures.
Proximity to Humans and Environmentally Sensitive Areas:	The facility is bounded to the north, east, and west by residential property. Due south of the facility is a mineral processing facility and railway yard. South of this property is residential area.

The approximate distances from the subject UST site to this residential property is as follows:

1,200 feet to the east
1,200 feet to the south
1,600 feet to the north
1,400 feet to the west

Soils: No additional information other than that included as part of this report was available.

Site Drainage: Surface flow in the vicinity of the former UST area is contained by the plant storm sewer system and is processed by the facility's wastewater treatment plant.

4. Sampling Data

4.1. Sample Collection

A concrete pad and containment area located above the UST site was removed on March 9, 1994. The subject UST's were exposed and samples of the tank contents were obtained on this date. Samples were analyzed for Benzene, Toluene, Ethylbenzene, Xylenes, (BTEX) and Methyl-tert-butyl-ether (MTBE) using EPA Method 8020. Originally, the Work Plan had called for the tank contents to be analyzed for Total Petroleum Hydrocarbons (TPH). Although the tank contents did not represent groundwater samples, it was decided the contents would be analyzed for BTEX and MTBE, in accordance with the IDEM requirements for analysis of groundwater, due to the aqueous nature of the samples. Visual and olfactory inspection of the contents of Tank No. 5 revealed the potential presence of alcohol compounds. Therefore, the contents of this UST were submitted for the analysis of alcohols in addition to the above parameters. Proper sample jars with an air tight seal and latex gloves were used. The sample jars were then placed into a cooler, packed with ice and transported to the laboratory for analysis.

Removal of UST contents, UST purging and cleaning, and excavation of the USTs and backfill material within which they were situated was initiated on May 9, 1994, and completed on May 13, 1994. The USTs were in fairly good condition. However, some corrosion and pitting was evident.

After removal of the USTs and backfill material was completed, 21 soil samples were collected on May 13, 1994. These closure samples were collected by scrapping away the first few inches of soil and collecting the sample from a previously unexposed area. Latex gloves were worn during the collection of each sample. Samples were collected from the sidewall of the excavation, approximately 6 feet below grade and at locations every 25 feet around the perimeter of the excavation. Samples were also collected from the midpoint and

ends of Tank Nos. 1 - 3 and the ends only of Tank Nos. 4 and 5. See Figure 3 for a plan of sample locations. Samples were submitted for the analysis of TPH using EPA Method 8015 Modified with a quantification between gas and diesel. Six samples in the vicinity of Tank No. 5 were also submitted for the analysis of alcohols.

In addition to the tank closure samples, 3 samples were collected from the stockpiled soils and were analyzed for TPH only. Proper sample jars with an air tight seal were used. The sample jars were then placed into a cooler, packed with ice and transported to the laboratory for analysis.

The results from the first round of closure samples were verbally received on May 16, 1994. The results exhibited by the samples indicated that several areas exhibited concentrations of TPH which were greater than the IDEM action level of 100 milligrams per kilogram (mg/kg). These soils were located in the vicinity of Tank Nos. 1, 2, 4, and 5, and along portions of the north, east, and west walls. Additional excavation activities were performed in these areas on May 16, 1994. The resulting spoils were stockpiled separately from those generated from the initial excavation. A second round of closure samples was collected on May 17, 1994. Sample locations identified in the first round were re-sampled and analyzed for TPH. Additionally, the stockpiled soils generated from the initial excavation were re-sampled along with the separate set of stockpiled soils generated from the additional excavation. A total of 5 stockpile samples were collected and submitted for the analysis of TPH.

The results from the second round of closure samples were received on May 18, 1994. The results indicated that several areas exhibited concentrations of TPH which were greater than the action level of 100 mg/kg. The soils were located in the vicinity of Tank Nos. 1 and 2 and along the north wall. Additional excavation was performed along the north wall on May 18, 1994. No further excavation was done beneath former Tank Nos. 1 and 2 due to the presence of a facility process sewer. After completion of the additional excavation, a third closure sample was collected at the north wall from the same location as the previous sampling rounds. This sample was submitted for the analysis of TPH. The result from this sample was received on May 25, 1994. The sample exhibited a concentration of TPH which was below the detection limit.

Copies of chain-of-custody documentation can be found in Exhibit 2.

4.2. Sample Collection Personnel

GM Powertrain retained OBG Technical Services, Inc. of Indianapolis, Indiana to assist in the removal of the USTs. Mr. Randy Reader, of OBG Technical Services, Inc. collected the samples.

4.3. Sample Results

Four of the five samples collected from the tank contents exhibited detectable concentrations of BTEX and MTBE. The sample from Tank No. 1 exhibited concentrations which were below detection limits for all parameters. Tank No. 5 also exhibited detectable concentrations of several alcohols. Please refer to Table 1 for a summary of results.

Of the 21 samples collected in the first round of confirmatory sampling, 13 samples exhibited concentrations of TPH which were greater than the IDEM action level of 100 mg/kg as shown on Figure 3. These samples were located in the vicinity of Tank Nos. 1, 2, 4, and 5, and along portions of the north, east and west walls. Additionally, the three samples collected from the stockpiled soils also exhibited concentrations of TPH which were above the action level of 100 mg/kg.

Of the six samples collected in the vicinity of Tank No. 5 and submitted for alcohols, one sample exhibited a detectable concentration of alcohols. The only parameter detected was ethanol. A summary of sample locations and results can be found on Table 2.

Of the 13 locations re-sampled for the second round of confirmatory sampling, 5 locations exhibited concentrations of TPH which were above the action level of 100 mg/kg as shown on Figure 4. These samples were located in the vicinity of Tank Nos. 1 and 2 and along a portion of the north wall. The samples collected from the stockpiled soils generated from the additional excavation as well as the re-samples of the initial stockpiles of soils exhibited concentrations of TPH which were below the action level of 100 mg/kg.

The sample collected from the north wall as part of the third round of confirmatory samples exhibited a concentration of TPH which was below the action level of 100 mg/kg. A summary of sample locations and results can be found on Table 2. Copies of the analytical reports can be found in Exhibit 3.

4.4. Laboratory Information

Samples were submitted to the following laboratory:

National Environmental Testing, Inc.
6964 Hillsdale Court
Indianapolis, IN 46250
Contact: Ms. Beth Day
Phone: (317) 842-4261

5. Waste Disposal Data

5.1. Disposition of UST System

Tank Nos. 1, 2, and 3 were excavated on May 11, 1994, and removed off-site on May 12, 1994. Tank Nos. 4 and 5 were excavated on May 12, 1994 and removed off-site on May 13, 1994. The tanks were removed off-site by William K. Hanna Trucking and disposed of at Bedford Recycling located on H Street in Bedford, Indiana. Copies of disposal manifests are included in Exhibit 4.

5.2. Disposition of Solids

A concrete pad and aboveground storage tanks containment area were formerly located above the USTs. Approximately 135 yards of concrete were excavated to provide access to the USTs. The concrete was excavated by Hoosier Equipment Service, Inc. and transported off-site by William K. Hanna Trucking for disposal at the Rumpke Landfill located in Medora, Indiana. Copies of the disposal manifests are included in Exhibit 4.

Initially, soils in the immediate vicinity of the USTs, consisting primarily of backfill material, were excavated to obtain access for removal of the USTs. These soils were stockpiled on plastic sheeting pending results of the confirmational sampling.

All together, approximately 769 cubic yards of soils were excavated. These soils are presently stockpiled on plastic sheeting and will be disposed at USPCI in Nevada. A section has been reserved in the Exhibits for manifests associated with this disposal and will be incorporated.

5.3. Disposition of Tank Contents

Tank No. 1 contained approximately 12,000 gallons of water which was transferred to the on-site wastewater treatment plant for disposal. The on-site wastewater treatment plant utilizes tertiary treatment which includes the capability of treating biologic and organic matter.

Tank No. 2 contained approximately 6,500 gallons of water which was transferred to the on-site wastewater treatment plant for disposal.

Tank No. 3 contained approximately 5,000 gallons of water which was transferred to the on-site wastewater treatment plant for disposal. After this water was removed, one 55 gallon drum of sludge was removed from the tank bottom.

Tank No. 4 contained approximately 5,000 gallons of liquids. Approximately 600 gallons of gasoline was removed and placed into 13 55-gallon drums. Additionally, one 55 gallon drum of sludge was removed from the tank bottom. The remaining water was transferred to the on-site wastewater treatment plant for disposal.

Nine 55-gallon drums of sludge were removed from Tank No. 5. Additionally, approximately 15 cubic yards of solids were removed from the bottom of the tank and placed into a storage container. Decanted liquids from the drums are scheduled to be transferred to the on-site wastewater treatment plant for disposal. Remaining solids are scheduled to be combined with the UST solids in the storage container for off-site disposal. A section in the Exhibits has been reserved for manifests the associated with this disposal and will be incorporated.

The 2 drums of sludge collected from Tank Nos. 3 and 4 and 13 drums of residual collected from Tank No. 4 were removed off-site on June 14, 1994 by Envirosolve Environmental Management, Inc. and transported to their facility located at 5608 Massachusetts Avenue in Indianapolis, IN for disposal. Copies of manifests are included in Exhibit 4.

Wastewater generated from tank cleaning activities was transferred to the on-site wastewater treatment plant for disposal.

6. Miscellaneous Data

6.1 Native Soil Description

During closure activities, it was observed the USTs were primarily located within a backfill material. Removal of the backfill material within the bottom of the excavation revealed the presence of clay. However, the excavation activities were limited to the area in the immediate vicinity of the USTs. Therefore, no additional lithologic data was obtained. No additional explorations, such as boring logs, were performed during closure activities.

6.2. Other Pertinent Information

This section provides other miscellaneous data related to the removal of these two USTs.

Local Inspector:
Mr. Jack Butterfield
State Fire Marshal
1900 H Street
Bedford, IN 47421
(812) 275-4544

Local Fire Department:
Bedford Fire Department
1900 H Street
Bedford, IN 47421
Attn: Mr. Jack Butterfield
(812) 275-4544

7. Leaking Underground Storage Tank (LUST) Referral

7.1. IDEM Notification

General Motors notified IDEM of the discovered conditions on May 23, 1994. A response was received from Mr. Nat Honeycutt of the UST Branch of IDEM on May 31, 1994. An incident number (94-05525) was also assigned at this time.

7.2. LUST Site Investigation

Based on field observations, data collected and IDEM guidance documents, the following presents an overview of the site issues:

Soil Contamination
Analytical results indicate that areas of soils which exhibited concentrations of TPH in excess of 100 mg/kg (ppm) exist underneath Tank No. 1 and the west end of Tank No. 2 An attempt was made to remove these soils during field activities, as evidenced by the collection of 3 separate rounds of closure samples. However, complete excavation of these soils could not be performed due to structural limitations at the site. Specifically, additional soil removal within the bottom of the excavation could not be conducted without potentially undermining the 24" diameter process sewer which traverses underneath the excavation. This sewer conveys flow to the facility wastewater treatment plant and serves a large portion of the facility including operations which are maintained 365 days a year. Additional excavation could cause a disruption to this service. Furthermore, disturbing this process sewer could also cause additional environmental problems due to the nature of the sewer's oily wastewater contents.

Groundwater
Groundwater was not detected during closure activities and no assessment of groundwater impact was made. However, the Bedford water treatment plant was telephoned regarding the presence of groundwater wells within the vicinity of the UST site. It was indicated that no drinking water wells exist in the city of Bedford. Furthermore, residents are supplied by the city's water treatment plant whose intake is situated on the White River located several miles from the former UST site.

Free Product
No free product was detected within the UST excavation during closure activities.

IDEM Determination
Based on the site information collected, no inhabitable buildings have been impacted by the former UST site. Additionally, access to the site is restricted by a security fence and 24 hour surveillance. Furthermore, residential property is located more than 1,200 feet from the former USTs. Therefore, access for off-site inhabitants to come in direct contact with the contamination is not present.

Drinking water has not been affected. As mentioned in Section 7.2 - Groundwater, no drinking water wells are present in the vicinity of the former UST site. Residents are supplied by the treatment plant whose intake is located on the White River several miles from the UST site. The observed presence of clay could further assist in limiting off-site migration of contamination.

A utility conduit does exist in the vicinity of the former UST site. This conduit is the 24-inch diameter process sewer which traverses the excavation from north to south. This sewer conveys an oily wastewater from a portion of the facility to the on-site wastewater treatment plant. Potential impact to this conduit was not assessed during this investigation, however potential impact to this utility would not appear to be a concern due to the nature of its contents.

Upon review of existing site information, it appears that the UST site would be categorized as a low priority. The UST site appears to pose little risk to the surrounding population based upon existing site conditions and proximity to the surrounding population and its drinking water. Therefore, no further site investigation is recommended at this time.

TABLE 1 - TANK CONTENTS
SAMPLE RESULTS
GM POWERTRAIN
BEDFORD, IN

BTEX and MTBE Concentrations reported in micrograms per liter (ug/l)
Alcohols Concentrations reported in milligrams per liter (mg/l)

	LOCATION:				
	TANK 1	TANK 2	TANK 3	TANK 4	TANK 5
REPORTING LIMIT	<1.0	<1.0	<5.0	<100.0	<5.0
Benzene	<1.0	2.6	290	14000	55
Ethylbenzene	<1.0	<1.0	5	7400	67
MTBE	<1.0	3.3	19	<100.0	<5.0
Toluene	<1.0	<1.0	<5.0	16000	18
Xylenes (total)	<1.0	<1.0	38	55000 (1)	<5.0
ALCOHOLS (2)					
Acetone (3)	NA	NA	NA	NA	<150.0
Ethanol	NA	NA	NA	NA	161000
Isopropyl Alcohol	NA	NA	NA	NA	21.3
Methanol (4)	NA	NA	NA	NA	<100.0
MEK	NA	NA	NA	NA	1.5
n-Butyl Alcohol	NA	NA	NA	NA	46.6
Isobutyl Alcohol	NA	NA	NA	NA	22.4
MIBK	NA	NA	NA	NA	<1.0
n-Propyl Alcohol (5)	NA	NA	NA	NA	<10.0
tert-Butyl Alcohol	NA	NA	NA	NA	<1.0

LEGEND:
NA = Not Analyzed
MTBE = Methyl-tert-butyl-ether
MEK = Methyl Ethyl Ketone
MIBK = 4-methyl-1,2-pentanone

NOTES:
(1) Concentration is estimated
(2) Reporting Limit for alcohols was <1.0 mg/l
(3) Reporting Limit elevated to <150.0 mg/l
(4) Reporting Limit elevated to <100.0 mg/l
(5) Reporting Limit elevated to <10.0 mg/l

BEDFORD, INDIANA

All concentrations reported in milligrams per kilogram (mg/kg)

ID#	SAMPLE	SAMPLE I.D.	DATE TAKEN	GASOLINE (RL=15 mg/kg)	DIESEL (RL=15 mg/kg)	ETHANOL (1) (RL=1mg/kg)
5EB	84669	TANK 5 EAST END BOTTOM	5/13/94	170	610	NA
5WB	84670	TANK 5 WEST END BOTTOM	5/13/94	<15.0	<15.0	NA
NW	84671	NORTH END WALL	5/13/94	3400	12500	NA
SW	84672	SOUTH END WALL	5/13/94	<15.0	35	NA
EW1	84673	EAST WALL, SAMPLE #1	5/13/94	<15.0	<15.0	NA
EW2	84674	EAST WALL, SAMPLE #2	5/13/94	21	70	NA
EW3	84675	EAST WALL, SAMPLE #3	5/13/94	35	120	NA
WW1	84676	WEST WALL, SAMPLE #1	5/13/94	<15.0	16	NA
WW2	84677	WEST WALL, SAMPLE #2	5/13/94	620	210	NA
WW3	84678	WEST WALL, SAMPLE #3	5/13/94	480	1600	NA
SN	84679	STOCKPILE A NORTH	5/13/94	160	520	NA
SC	84680	STOCKPILE B CENTER	5/13/94	390	1400	NA
SS	84681	STOCKPILE C SOUTH	5/13/94	180	620	NA
1EB	84682	TANK 1 EAST END BOTTOM	5/13/94	780	2800	NA
1CB	84683	TANK 1 CENTER BOTTOM	5/13/94	58	200	NA
1WB	84684	TANK 1 WEST END BOTTOM	5/13/94	280	1000	NA
2EB	84685	TANK 2 EAST END BOTTOM	5/13/94	140	520	NA
2CB	84686	TANK 2 CENTER BOTTOM	5/13/94	420	1500	NA
2WB	84687	TANK 2 WEST END BOTTOM	5/13/94	65	230	NA
3EB	84688	TANK 3 EAST END BOTTOM	5/13/94	<15.0	34	NA
3CB	84689	TANK 3 CENTER BOTTOM	5/13/94	<15.0	<15.0	NA
3WB	84690	TANK 3 WEST END BOTTOM	5/13/94	22	80	NA
4EB	84691	TANK 4 EAST END BOTTOM	5/13/94	1700	6200	NA
4WB	84692	TANK 4 WEST END BOTTOM	5/13/94	2000	7200	NA
1CB	84693	TANK 1 CENTER BOTTOM	5/13/94	NA	NA	<1.0
5EB	84694	TANK 5 EAST BOTTOM	5/13/94	NA	NA	26.7
5WB	84695	TANK 5 WEST BOTTOM	5/13/94	NA	NA	<1.0
EW3	84696	EAST WALL, SAMPLE #3	5/13/94	NA	NA	<1.0
WW3	84697	WEST WALL, SAMPLE #3	5/13/94	NA	NA	<1.0
SW	84698	SOUTH END WALL	5/13/94	NA	NA	<1.0
NW	84814	NORTH END WALL (2)	5/17/94	420	1600	NA
4EB	84815	TANK 4 EAST END BOTTOM	5/17/94	<15.0	<15.0	NA
4WB	84816	TANK 4 WEST END BOTTOM	5/17/94	<15.0	<15.0	NA
WW2	84817	WEST WALL, SAMPLE #2	5/17/94	<15.0	<15.0	NA
WW3	84818	WEST WALL, SAMPLE #3	5/17/94	<15.0	<15.0	NA
1EB	84819	TANK 1 EAST END BOTTOM	5/17/94	85	320	NA
1CB	84820	TANK 1 CENTER BOTTOM	5/17/94	60	230	NA
1WB	84821	TANK 1 WEST END BOTTOM	5/17/94	83	320	NA
SN	84822	STOCKPILE A NORTH	5/17/94	<15.0	48	NA
SC	84823	STOCKPILE B CENTER	5/17/94	<15.0	<15.0	NA
SS	84824	STOCKPILE C SOUTH	5/17/94	<15.0	<15.0	NA
SN	84825	SECOND STOCKPILE A	5/17/94	20	77	NA
SC	84826	SECOND STOCKPILE B	5/17/94	<15.0	<15.0	NA
EW3	84827	EAST WALL, SAMPLE #3	5/17/94	<15.0	<15.0	NA
5EB	84828	TANK 5 EAST END BOTTOM	5/17/94	21	80	NA
2EB	84829	TANK 2 EAST END BOTTOM	5/17/94	<15.0	20	NA
2CB	84830	TANK 2 CENTER BOTTOM	5/17/94	<15.0	51	NA
2WB	84831	TANK 2 WEST END BOTTOM	5/17/94	32	130	NA
NW	85126	NORTH END WALL	5/18/94	<15.0	<15.0 (3)	NA

NOTES:

(1) Samples analyzed for complete Alcohol scan, including:
Acetone, Ethanol, Isopropyl Alcohol, Methanol, Methyl Ethyl Ketone,
n-Butyl Alcohol, Isobutyl Alcohol, 4-Methyl-1,2-pentanone,
n-Propyl Alcohol, and tert-Butyl Alcohol using a Reporting Limit of <1.0 mg/kg.
Ethanol was the only constituent exhibited.

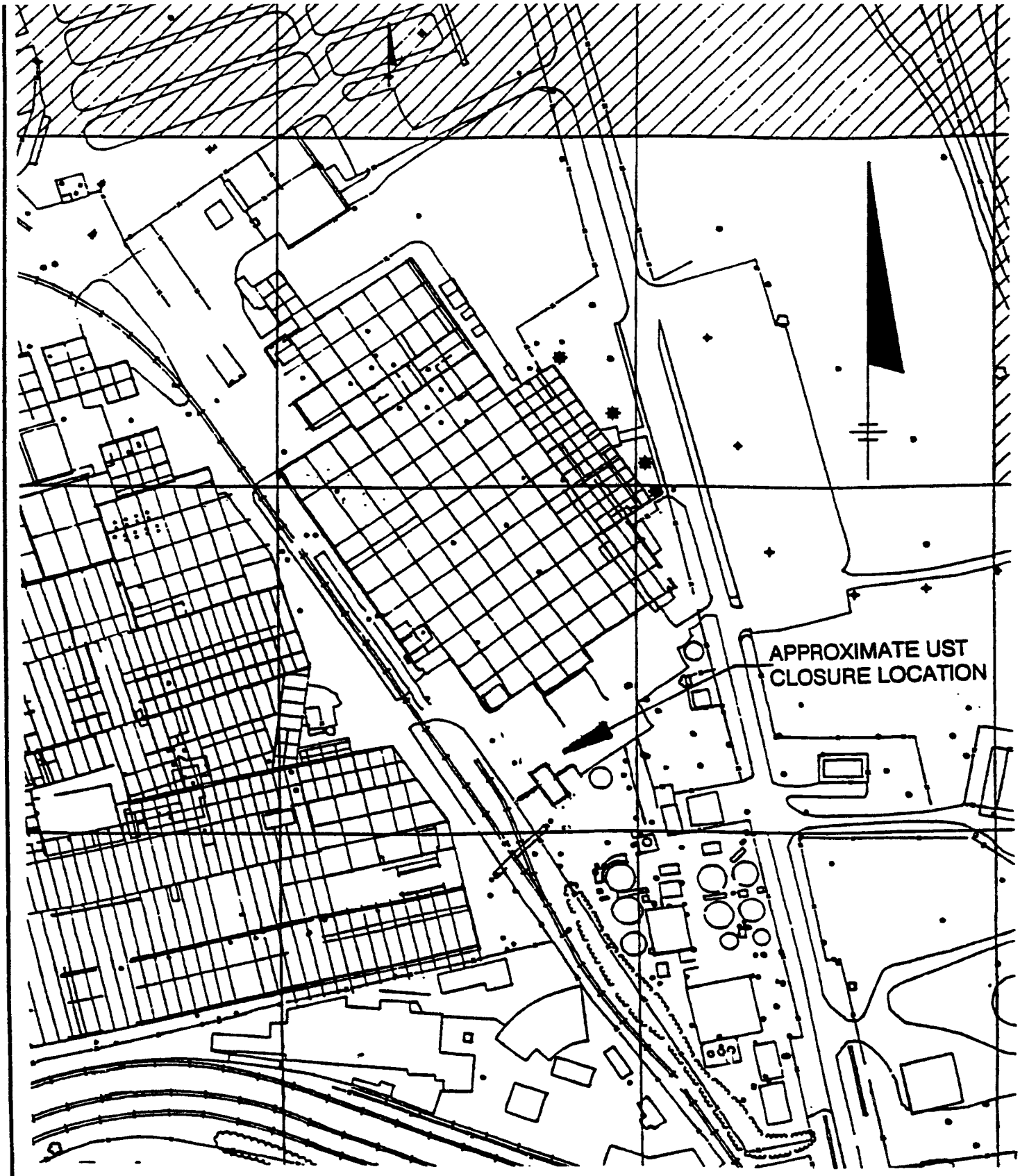
(2) Concentrations are estimated

(3) Concentration was quantified using a diesel fuel standard

LEGEND:

NA = Not Analyzed

RL = Reporting Limit

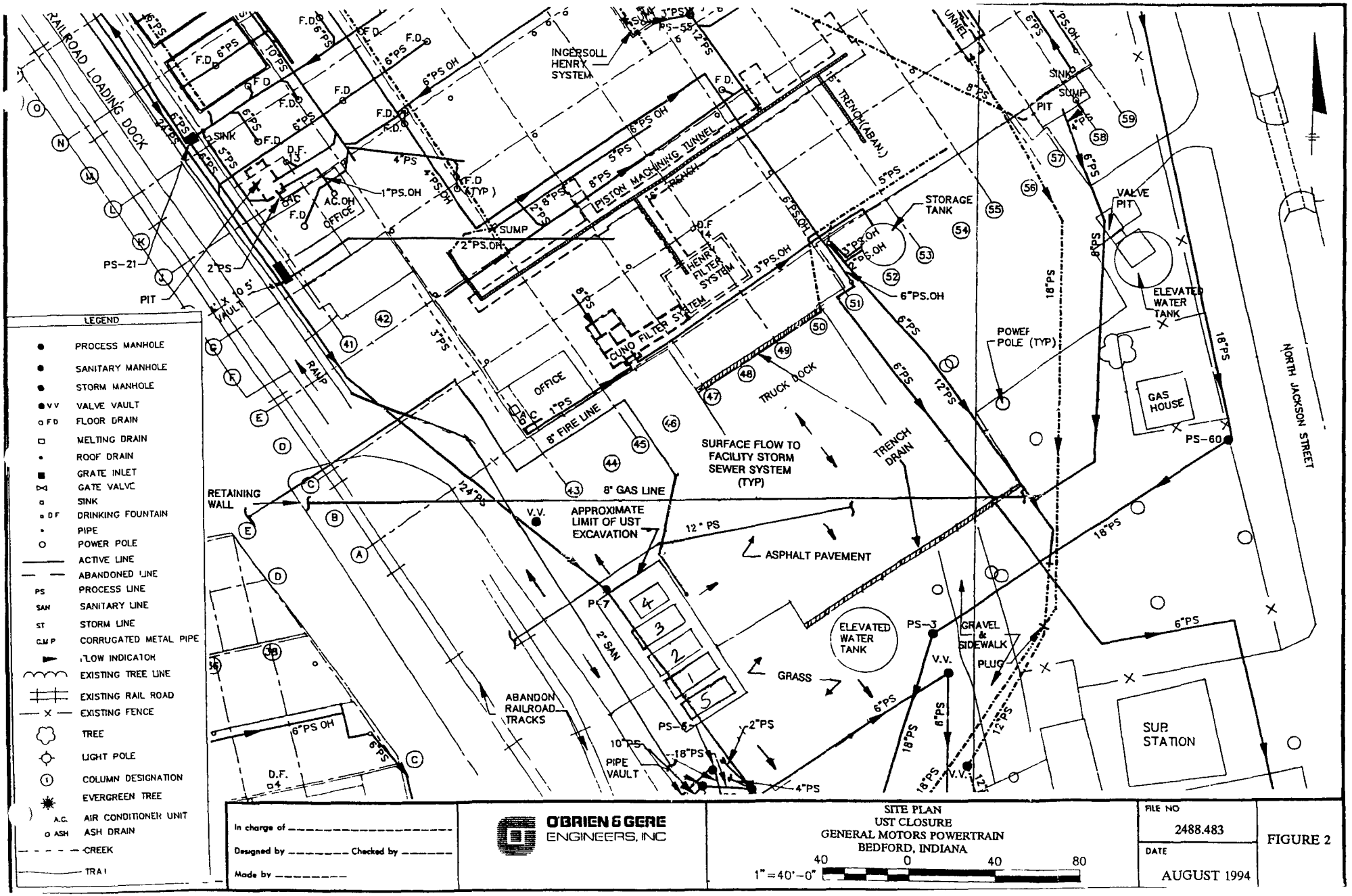


O'BRIEN & GERE
ENGINEERS INC.
Cincinnati, Ohio

LOCATION PLAN
UST CLOSURE
GENERAL MOTORS POWERTRAIN
BEDFORD, INDIANA

SCALE: 1" =200'

FILE NO. 2488.483
DATE AUGUST 1994
DWG. NO. FIGURE 1



In charge of _____

Designed by _____ Checked by _____

Made by _____

O'BRIEN & GERE ENGINEERS, INC

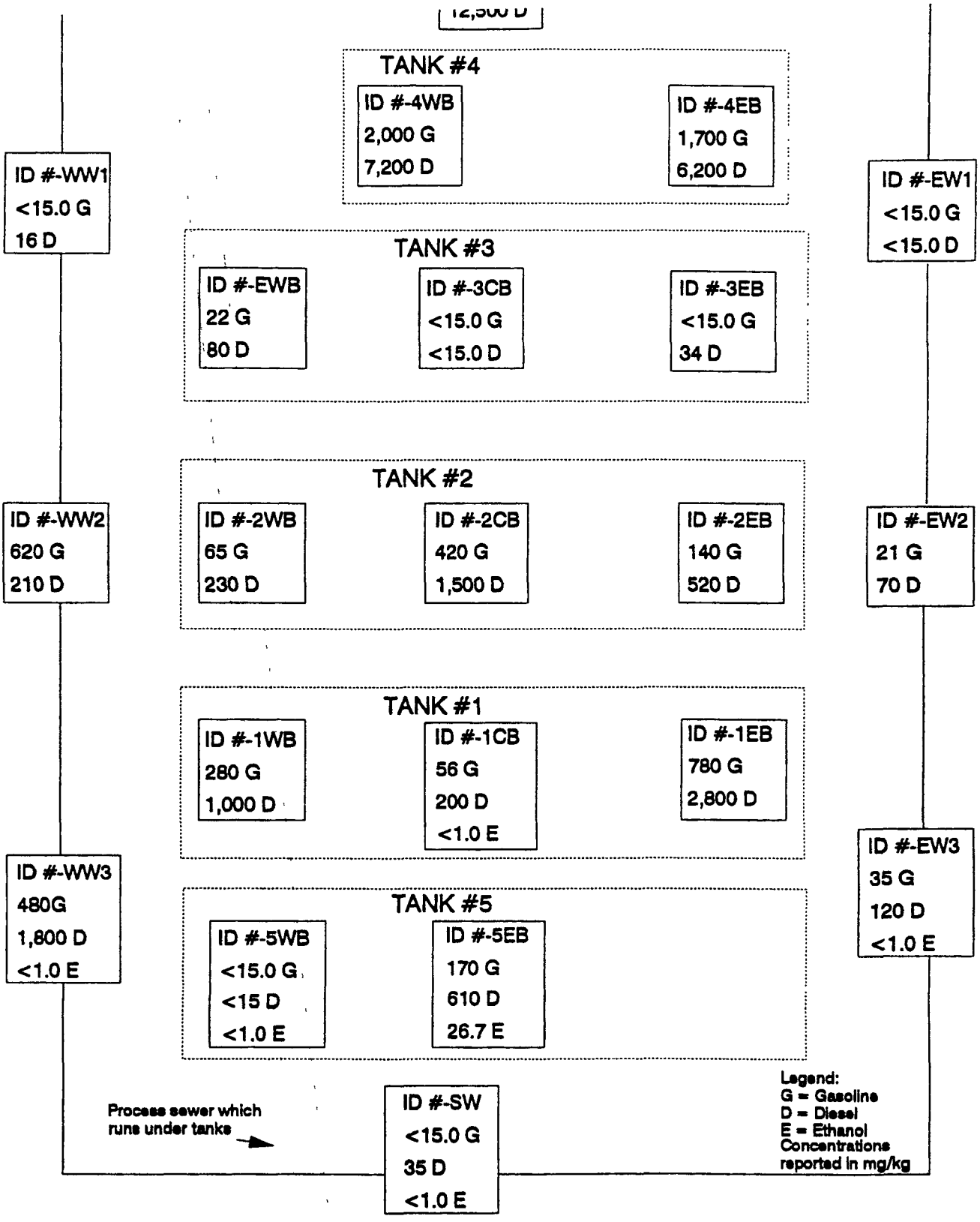
SITE PLAN
UST CLOSURE
GENERAL MOTORS POWERTRAIN
BEDFORD, INDIANA

1"=40'-0" (40 0 40 80)

FILE NO 2488.483

DATE AUGUST 1994

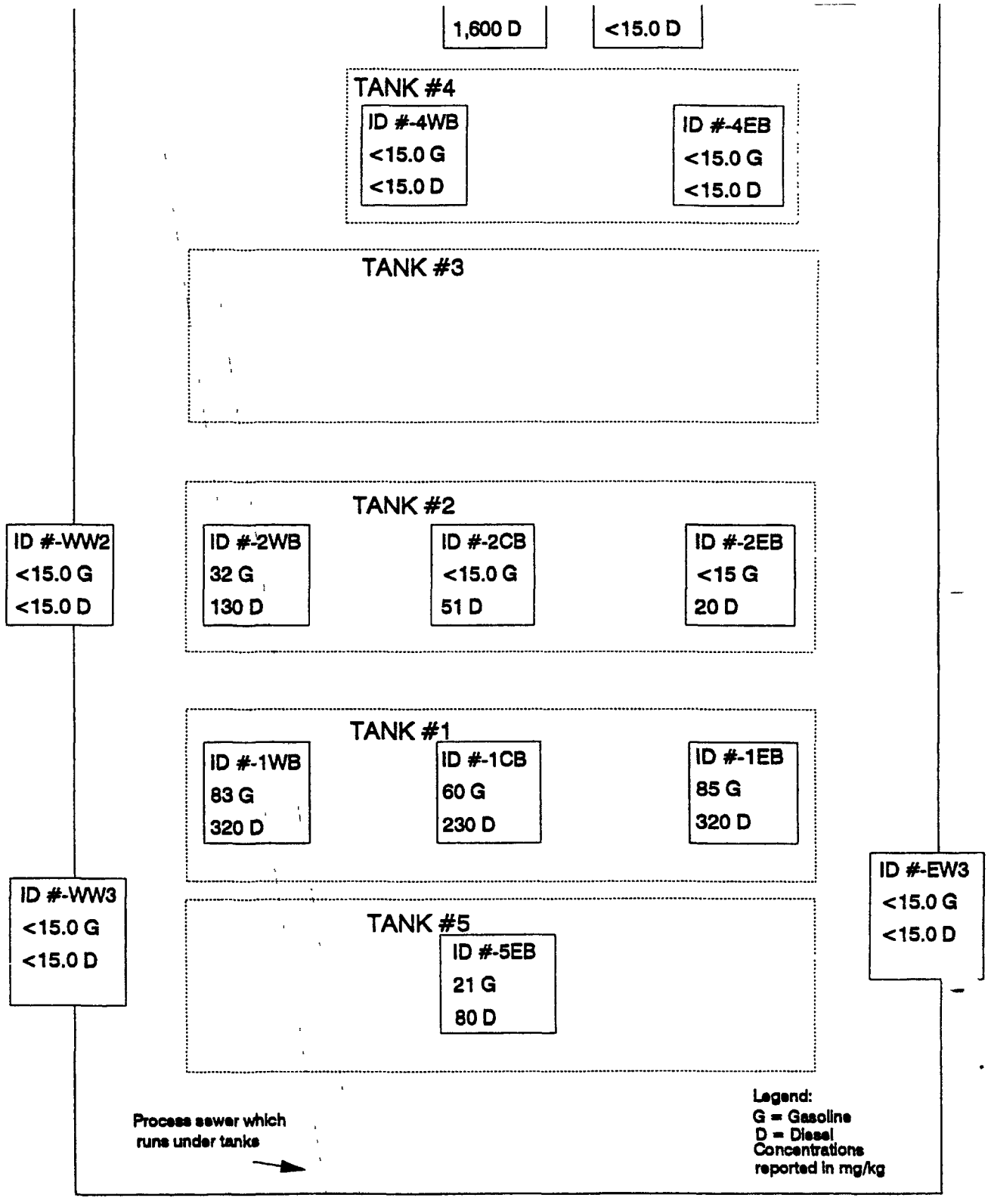
FIGURE 2



O'BRIEN & GERE ENGINEERS INC.
Cincinnati, Ohio

CLOSURE SAMPLE LOCATIONS AND RESULTS
FIRST ROUND
GENERAL MOTORS POWERTRAIN
BEDFORD, INDIANA
SCALE: NOT TO SCALE

FILE NO. 2488.483
DATE AUGUST 1994
DWG. NO. FIGURE 3



O'BRIEN & GERE ENGINEERS INC.
Cincinnati, Ohio

CLOSURE SAMPLE LOCATIONS AND RESULTS
SECOND AND THIRD ROUNDS
GENERAL MOTORS POWERTRAIN
BEDFORD, INDIANA
SCALE: NOT TO SCALE

FILE NO. 2488.483
DATE AUGUST 1994
DWG. NO. FIGURE 4

EXHIBIT 1

UNDERGROUND STORAGE TANK

CLOSURE WORK PLAN

Underground Storage Tank Closure

GM Powertrain
Bedford Plant

May 1994

Work Plan

Underground Storage Tank Closure

GM Powertrain
Bedford, Indiana

May 1994

O'BRIEN & GERE ENGINEERS, INC.

11590 Century Boulevard
Suite 205
Cincinnati, Ohio 45246

TABLE OF CONTENTS

1.0 NOTIFICATIONS 1

2.0 SURFACE STRUCTURE REMOVAL 1

2.01 AST Removal 1
2.02 Piping Removal 1
2.03 Concrete Removal 2

3.0 UST RELATED ACTIVITIES 2

3.01 Characterization Sampling of Residual Contents 2
3.02 Tank Evacuation 2
3.03 UST Cleaning 3
3.04 UST and Soil Removal 3
3.05 Confirmatory Sampling Within the Excavation 3
3.06 Characterization Sampling of Spoil Soils 4

4.0 SITE RESTORATION 4

5.0 CLOSURE REPORT 4

GM BEDFORD

UST CLOSURE - WORK PLAN

1.0 Notifications

Prior to closure activities, the local fire marshal will be contacted and informed of the proposed activities by GM.

2.0 Surface Structure Removal

Presently, two above ground storage tanks (ASTs) occupy the area directly above the under ground storage tanks (USTs). The ASTs are set in concrete saddles which are located within a concrete containment area.

2.01 AST Removal

GM will drain and remove product present in the ASTs. After the product is removed, the ASTs will be disconnected from associated piping and removed from the concrete saddles.

The ASTs will be cleaned after removal from the concrete saddles. Cleaning fluids will be collected and discharged to the plant sanitary sewer for treatment at the on-site water treatment plant. After the ASTs have been cleaned, they shall be removed off site for disposal.

2.02 Piping Removal

Above ground piping associated with the former ASTs will be cleaned and removed. Any cleaning fluids generated will be collected and discharged to the plant sanitary sewer for treatment at the on-site water treatment plant. Piping will be removed off-site for disposal.

2.03 Concrete Removal

After the ASTs and associated piping have been removed, the concrete saddles, containment structures, and support slab shall be demolished and removed off-site for disposal as a non-regulated material.

3.0 UST Related Activities

Four USTs have been identified through a Ground Penetrating Radar Survey previously conducted. The contents of the tanks are not known at the present time.

3.01 Characterization Sampling of Residual Contents

The contents of the USTs (if product is present), shall be sampled and characterized though laboratory analysis for potential disposal at the on-site water treatment plant.

Characterization shall be accomplished through the collection and submittal of a water sample from each UST for the analysis of Total Petroleum Hydrocarbons (TPH) and other analysis as requested by GM. It is assumed that this analysis shall be conducted on an expedited 24-hour turn around basis to avoid potential conflicts with future field activities.

3.02 Tank Evacuation

After product characterization is complete, the contents of the USTs shall be removed. Liquid contents shall be discharged to the plant sanitary sewer for treatment at the on-site treatment plant or taken off-site for disposal with a tanker truck, dependent upon the results of the characterization analysis.

Sludge removed from the USTs will be containerized, characterized, and placed at an on-site storage location for disposal by GM. Laboratory analysis required for sludge characterization will be determined by the appropriate disposal facility.

3.03 UST Cleaning

The USTs shall be purged with dry ice and powerwashed. Cleaning fluids shall be collected and discharged to the plant sanitary sewer for treatment at the on-site water treatment plant.

3.04 UST and Soil Removal

After the USTs have been cleaned, they shall be excavated, rendered useless by either cutting or puncturing, and taken off-site for disposal.

Soil located in the vicinity of the USTs will be removed. Continuous field screening will be conducted during the excavation activities. Field screening will be performed through the use of a photoionization detector (PID) and sensory methods. The screening will be conducted to evaluate the potential presence of subsurface contamination and establish preliminary excavation limits. However, final excavation limits will be dependent upon the results of confirmatory sampling analysis, discussed in the next section.

Soils which exhibit a concentration of TPH which is greater than the current IDEM action level of 20 parts per million will not be left in place. Excavated material will be stockpiled on plastic sheeting and covered to protect against the elements. Potentially impacted material will be stockpiled separately from non-impacted fill material based on the results of the field screening and confirmatory analysis.

3.05 Confirmatory Sampling Within the Excavation

Samples from natural soil will be taken from the excavation bottom and the sidewalls and will be submitted for the analysis of TPH. The frequency of these samples is as follows:

1) At both ends and middle of each UST (the natural soil is to be sampled at a point 2 feet below the bottom of the excavation); and

2) At every 20 feet of horizontal distance around the entire excavation (sidewall samples will be collected at points approximately one half the distance between the surface level and the bottom of the excavation).

3.06 Characterization Sampling of Spoil Soils

Samples will be collected from stockpiled material at a frequency of 1 per 100 cubic yards of excavated material. Samples from potentially non-impacted material will submitted for the analysis of TPH to evaluate whether the material can be returned to the excavation as backfill. If samples from the stockpiled material exhibit a concentration of TPH which is less than the IDEM action level of 20 ppm, the material will be returned to the excavation as backfill. If the material can not be returned to the excavation as backfill, samples from this material as well as the stockpile of potentially impacted material, will be collected and submitted for chemical analysis to be determined by the disposal facility. It is assumed that the confirmatory analysis will be conducted on an expedited 24-hour turn around basis.

4.0 Site Restoration

At the conclusion of UST and soil removal activities, the excavation will be backfilled with the non-impacted excavated material and compacted. The remainder of the excavation will be backfilled with clean fill and compacted.

5.0 Closure Report

After the field activities have been completed, a closure report will be generated summarizing the UST closure activities. The report will include information on the owner of the USTs, the removal contractor, description of the site (i.e., site history, site maps, etc.), description of the USTs (i.e., tank contents, age, material of construction, etc.), sample results, and miscellaneous closure documentation (i.e., subsurface data, disposal documentation, etc.).

EXHIBIT 2

CHAIN-OF-CUSTODY DOCUMENTATION

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY General Motors Powertrain (Indy Division)
ADDRESS North Jackson ST Bedford Indy 47421
PHONE 812 279 7308 FAX 812 279 7258
PROJECT NAME/LOCATION TANK Removal.
PROJECT NUMBER
PROJECT MANAGER Bill Schoon Maker

REPORT TO: Beth C
INVOICE TO:
P.O. NO.
NET QUOTE NO.

SAMPLED BY (PRINT NAME) Randy Reader
SIGNATURE Randy Reader
(PRINT NAME)
SIGNATURE

DATE	TIME	SAMPLE ID DESCRIPTION	GRAB	COMP	# OF CONTAINERS TYPE	MATRIX	PRESERVED Y/N	ANALYSES: Total Petroleum Hydrocarbons 418.1	BTEX + MTBE 602	METHANOL	COMMENTS
5/9	1500	TANK # 1			1		Y	X			TPH Test
5/9	"	TANK # 1			1						
5/9	"	TANK # 1			1						
5/9	"	TANK # 2			1						
5/9	"	TANK # 2			1						
5/9	"	TANK # 2			1						
5/9	"	TANK # 3			1						
5/9	"	TANK # 3			1						
5/9	"	TANK # 3			1						
5/9	"	TANK # 4			1						
5/9	"	TANK # 4			1		Y				
5/9	"	TANK # 4			1						
5/9	"	TANK # 5			1				X		
5/9	"	# 5			1				X		
5/9	"	# 5			1			X	X		

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT:

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS DATE

RELINQUISHED BY:	DATE/TIME	RECEIVED BY.	RELINQUISHED BY	DATE/TIME	RECEIVED FOR NET BY
R. Reader	5/9/94 1530			5-10-94 09:35	Beth C

METHOD OF SHIPMENT

REMARKS:

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY GM Powertrain CBG Tech
ADDRESS Bedford Plant GM Drive Bedford In 47421
PHONE 812 275-7308 FAX
PROJECT NAME/LOCATION GM Tank Pull
PROJECT NUMBER
PROJECT MANAGER Bill Schoonmaker

REPORT TO: Bill Sch
INVOICE TO:
P.O. NO.
NET QUOTE NO.

SAMPLED BY (PRINT NAME) Randy Reader — SIGNATURE Randy Reader
(PRINT NAME) — SIGNATURE

DATE	TIME	SAMPLE ID DESCRIPTION	GRAB	COMP	# OF CONTAINERS TYPE	MATRIX	PRESERVED Y/N	ANALYSES: TPH & 5-8015M	COMMENTS
5/13	9:30	East End TANK BTM	✓		1			1	TPH GC Volatile Method
	10:30	West End, TANK BTM	✓		1			1	Quantate for Gas +
	9:00	North End wall #1 side	✓		1			1	" "
	10:00	South End Wall #1	✓		1			1	" "
	10:05	East wall #1	✓		1			1	" "
	10:05	East wall #2	✓		1			1	" "
	10:05	East wall #3	✓		1			1	" "
	9:00	West Wall #1	✓		1			1	" "
	9:00	West Wall #2	✓		1			1	" "
	9:00	West Wall #3	✓		1			1	" "
	9:10	Stock Pile A North	✓		1			1	" "
	9:10	Stock Pile B Center	✓		1			1	" "
	9:10	Stock Pile C South	✓		1			1	" "

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT: On I

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS DATE

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME	RECEIVED FOR NET BY
R Reader	5/13 10:01				Mark A. Gray

METHOD OF SHIPMENT

REMARKS:

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY GM Power Train (OBG Tech)
ADDRESS Bedford Plant GM Drive Bedford In 47421
PHONE _____ FAX _____
PROJECT NAME/LOCATION GM TANK pulls
PROJECT NUMBER _____
PROJECT MANAGER _____

REPORT TO: Bill Sch
INVOICE TO: GM
P.O. NO. _____
NET QUOTE NO. _____

SAMPLED BY (PRINT NAME) Randy Reader
SIGNATURE Randy Reader
(PRINT NAME) _____
SIGNATURE _____

DATE	TIME	SAMPLE ID DESCRIPTION	GRAB	COMP	# OF CONTAINERS TYPE	MATRIX	PRESERVED Y/N	ANALYSES: TPH 5-8015M	COMMENTS
5/13	9:25	TANK 1 East End TANK BTm	✓		1			1	TPH GC Volatile Metho for gas +
	9:25	TANK 1 C of TANK BTm	✓					1	"
	9:25	TANK 1 West End of TANK BTm	✓		1			1	"
									"
	10:15	TANK 2 East End of TANK BTM	✓		1			1	TPH GC Volatile Method 5-8
	10:15	TANK 2 C of TANK BTm	✓		1			1	Quantate for gas + D
	10:15	TANK 2 West End of TANK BTm	✓		1			1	" "
									" "
	10:20	TANK 3 EAST End of TANK BTM	✓		1			1	TPH GC Volatile Methor
	10:20	TANK 3 C of TANK BTM	✓		1			1	Quantate for GAS +
	10:20	TANK 3 [redacted] of TANK BTm West End	✓		1			1	" "
	10:25	TANK #4 East End TANK BTM	✓		1			1	TPH GC Volatile. Met
	10:25	TANK #4 West End TANK BTM	✓		1			1	Quantate for Gas + Du

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT: On

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA _____
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS _____ DATE _____

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME	RECEIVED FOR NET BY:
K Reader	5/13 | 11:00AM	---			Mark A. Gray 5-

METHOD OF SHIPMENT

MARKS:

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY GM Powertrain (OBSTech)
ADDRESS Bedford Plant GM Drive Bedford In 47421
PHONE _____ FAX _____
PROJECT NAME/LOCATION _____
PROJECT NUMBER _____
PROJECT MANAGER Bill Schoonmaker

REPORT TO: Bill Schoon
INVOICE TO: GM
P.O. NO. _____
NET QUOTE NO. _____

SAMPLED BY Randy Reader (PRINT NAME) Randy Reader SIGNATURE
(PRINT NAME) SIGNATURE

DATE	TIME	SAMPLE IDENTIFICATION	GRAB	COMP	# OF CONTAINERS TYPE	MATRIX	PRESERVED Y/N	ANALYSES: Ethanol	COMMENTS
5/13	9:15	End Tank #1 BTM 14oz	✓		1			1	Analyses for Etha
"	9:25	Tank #5 East BTM 14oz	✓		1			1	" "
	9:25	Tank #5 West BTM 14oz	✓		1			1	" 1
	9:25	East Wall #3 14oz	✓		1			1	"
	9:00	West Wall #3 14oz	✓		1			1	"
	10:00	South Wall #1 14oz	✓		1			1	"

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT: On

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA _____
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS _____ DATE _____

RELINQUISHED BY	DATE/TIME	RECEIVED BY.	RELINQUISHED BY	DATE/TIME	RECEIVED FOR NET BY
Randy Reader	11:00 5/15				Mark A. Gray

METHOD OF SHIPMENT

REMARKS:

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY GM Powertrain
ADDRESS Bedford In Plant
PHONE _____ FAX _____
PROJECT NAME/LOCATION Tank Pull
PROJECT NUMBER _____
PROJECT MANAGER Bill Schoonmaker

REPORT TO: Bill Sch
INVOICE TO: GM
P.O. NO. _____
NET QUOTE NO. _____

SAMPLED BY
Andy Reader (PRINT NAME) — Randy Reader SIGNATURE
(PRINT NAME) — SIGNATURE

DATE	TIME	SAMPLE ID DESCRIPTION	GRAB	COMP	# OF CONTAINERS / TYPE	MATRIX	PRESERVED Y/N	ANALYSES: 5-8015M Q for Gas Quant	COMMENTS
5/17	7.15	-North End Wall	✓		1		N	✓	TPH GC Volatile Method
		-Tank #4 East End BTM			1			✓	Quantate for Gas + D
		-Tank #4 West End BTM			1			✓	
		West wall # 2			1			✓	
		Westwall #3			1			✓	
		-Tank #1 East End BTM			1			✓	
		-Tank #1 [redacted] Q BTM			1			✓	
		-Tank #1 ~~East~~ West BTM			1			✓	
		Soil Pile A-B-C			3			✓	
		2nd Soil Pile A-B			2			✓	
		East Wall #3			1			✓	
		-Tanks EAST BT			1			✓	
		-Tank # 2 East End BTM	✓		1			✓	
		-Tank # 2 Q BTM	✓		1			✓	
		-Tank # 2 West End BTM	✓		1			✓	

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT: _____

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA _____
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS _____ DATE _____

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY.	DATE/TIME	RECEIVED FOR NET BY
R. Reader	5/17/94 11:35	Bud Day			

METHOD OF SHIPMENT
REMARKS:

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY GM Power TRAIN CBG Tech
ADDRESS GM Drive Bedford In
PHONE 812 279-7308 FAX
PROJECT NAME/LOCATION Tank Pull job
PROJECT NUMBER
PROJECT MANAGER Bill Schoonmaker

REPORT TO: Bill Schoon
INVOICE TO: GM Powe
P.O. NO.
NET QUOTE NO.

SAMPLED BY (PRINT NAME) Randy Reader — SIGNATURE Randy Reader
(PRINT NAME) — SIGNATURE

DATE	TIME	SAMPLE I.D. DESCRIPTION	GRAB	COMP	# OF CONTAINERS TYPE	MATRIX	PRESERVED Y/N	ANALYSES: S-8015 m TPH	COMMENTS
5/18	2:10p	North End Side Wall	✓		1			1	Method S-8015 - Quantate for Gas &

CONDITION OF SAMPLE: BOTTLES INTACT? YES / NO
FIELD FILTERED? YES / NO
COC SEALS PRESENT AND INTACT? YES / NO
VOLATILES FREE OF HEADSPACE? YES / NO
TEMPERATURE UPON RECEIPT:

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS — DATE

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	RELINQUISHED BY:	DATE/TIME	RECEIVED FOR NET BY:
Randy Reader	5/18/94			5/23/94	M. Mattiso

METHOD OF SHIPMENT

REMARKS:

EXHIBIT 3

ANALYTICAL REPORTS

NET® TESTING, INC.
Tel. (317) 842-4261
Fax: (317) 842-4286

ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/12/1994

NET Job Number: 94.01329

Enclosed are the Analytical Results for the following samples submitted to NET, Inc. Indianapolis Division for analysis:

Project Description: GM POWERTRAIN - BEDFORD, IN

Sample Number	Sample Description	Date Taken	Date Received
84506	TANK #1	05/09/1994	05/10/1994
84507	TANK #2	05/09/1994	05/10/1994
84508	TANK #3	05/09/1994	05/10/1994
84509	TANK #4	05/09/1994	05/10/1994
84510	TANK #5	05/09/1994	05/10/1994

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please do not hesitate to call. NET has been pleased to provide these analytical services for you.

Approved By:

Steve Johnson

Steve Johnson
Project Manager

TESTING, INC.
Tel: (317) 842-4261
Fax: (317) 842-4286

KEY TO ABBREVIATIONS

<	Less than; when appearing in the results column indicates the analyte was not detected at or above the reported value.
mg/L	Concentration in units of milligrams of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per million (ppm).
ug/L	Concentration in units of micrograms of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per billion (ppb).
mg/kg	Concentration in units of milligrams of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per million (ppm).
ug/kg	Concentration in units of micrograms of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per billion (ppb).
PQL	Practical Quantitation Limit; the lowest level that can be reliably achieved within specified limits of precision and accuracy under routine conditions.
a	Indicates the sample concentration was quantitated using a diesel fuel standard.
b	Indicates the analyte of interest was also found in the method blank.
d1	Indicates the sample was diluted due to high analyte concentration.
d2	Indicates the sample was diluted due to matrix interference and that the PQL may be elevated.
e	Indicates the reported concentration is estimated.
f	Indicates the sample concentration was quantitated using a fuel oil standard.
g	Indicates the sample concentration was quantitated using a gasoline standard.
h	Indicates the sample was analyzed past holding time.
j	Indicates the reported concentration is below the PQL.
k	Indicates the sample concentration was quantitated using a kerosene standard.
m	Indicates the sample concentration was quantitated using a mineral spirits standard.
o	Indicates the sample concentration was quantitated using a motor oil standard.
q	Indicates the sample concentration was quantitated using a standard provided by the client.
r	Indicates the sample was received past holding time.
s	Indicates the sample concentration was quantitated using a stoddard solvent standard.
u	Indicates the sample was received improperly preserved and/or contained.
TCLP	Indicates the Toxicity Characteristic Leaching Procedure was performed for this analysis.
ICP	Indicates the analysis was performed using Inductively Coupled Plasma Spectroscopy.
GFAA	Indicates the analysis was performed using Graphite Furnace Atomic Absorption Spectroscopy.
%	Percent; To convert ppm to %, divide the result by 10,000. To convert % to ppm, multiply the result by 10,000.
Dry Weight	When indicated, the results are reported on a dry weight basis. The contribution of the moisture content in the sample is subtracted when calculating the concentration of the analyte.

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/12/1994

Sample No.: 84506
Job No.: 94.01329
P.O. NO.: PBS03297

Sample Description: TANK #1
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/09/1994 Date Received: 05/10/1994

Parameter	Result	Units	Analyst/ Date of Analysis	Method Number	Method PQL
VOLATILE - BETX (AQUEOUS)			/		
Benzene	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Ethylbenzene	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Methyl-tert-butyl-ether (MTBE	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Toluene	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Xylenes, Total	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
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Suite 205
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05/12/1994

Sample No.: 84507
Job No.: 94.01329
P.O. NO.: PBS03297

Sample Description: TANK #2
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/09/1994 Date Received: 05/10/1994

Parameter	Result	Units	Analyst/ Date of Analysis	Method Number	Method PQL
VOLATILE - BETX (AQUEOUS)			/		
Benzene	2.6	ug/L	srj / 05/10/1994	S-8020	<1.0
Ethylbenzene	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Methyl-tert-butyl-ether (MTBE	3.3	ug/L	srj / 05/10/1994	S-8020	<1.0
Toluene	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0
Xylenes, Total	<1.0	ug/L	srj / 05/10/1994	S-8020	<1.0

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ANALYTICAL REPORT

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05/12/1994

Sample No.: 84508
Job No.: 94.01329
P.O. NO.: PBS03297

Sample Description: TANK #3
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/09/1994 Date Received: 05/10/1994

Parameter	Result	Units	Analyst/ Date of Analysis	Method Number	Method PQL
VOLATILE - BETX (AQUEOUS)			/		
Benzene	290	ug/L	srj / 05/10/1994	S-8020	<5.
Ethylbenzene	5	ug/L	srj / 05/10/1994	S-8020	<5.
Methyl-tert-butyl-ether (MTBE	19	ug/L	srj / 05/10/1994	S-8020	<5.
Toluene	<5.	ug/L	srj / 05/10/1994	S-8020	<5.
Xylenes, Total	38	ug/L	srj / 05/10/1994	S-8020	<5.

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ANALYTICAL REPORT

Mr. Greg Baryluk
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Suite 205
Cincinnati, OH 45246

05/12/1994

Sample No.: 84509
Job No.: 94.01329
P.O. NO.: PBS03297

Sample Description: TANK #4
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/09/1994 Date Received: 05/10/1994

Parameter	Result		Units	Analyst/ Date of Analysis	Method Number	Method PQL
VOLATILE - BETX (AQUEOUS)				/		
Benzene	14,000		ug/L	srj / 05/10/1994	S-8020	<100
Ethylbenzene	7,400		ug/L	srj / 05/10/1994	S-8020	<100
Methyl-tert-butyl-ether (MTBE	<100		ug/L	srj / 05/10/1994	S-8020	<100
Toluene	16,000		ug/L	srj / 05/10/1994	S-8020	<100
Xylenes, Total	55,000	e	ug/L	srj / 05/10/1994	S-8020	<100

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/12/1994

Sample No.: 84510
Job No.: 94.01329
P.O. NO.: PBS03297

Sample Description: TANK #5
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/09/1994 Date Received: 05/10/1994

Parameter	Result		Units	Analyst/ Date of Analysis
MISC. ALCOHOLS				
Acetone	<150	*	mg/L	maj / 05-11-94
Ethanol	161000		mg/L	maj / 05-11-94
Isopropyl Alcohol	21.3		mg/L	maj / 05-11-94
Methanol	<100	**	mg/L	maj / 05-11-94
Methyl Ethyl Ketone (MEK)	1.5		mg/L	maj / 05-11-94
n-Butyl Alcohol	46.6		mg/L	maj / 05-11-94
Isobutyl Alcohol	22.4		mg/L	maj / 05-11-94
4-Methyl-1,2-pentanone (MIBK)	<1.0		mg/L	maj / 05-11-94
n-Propyl Alcohol	<10.0	**	mg/L	maj / 05-11-94
tert-Butyl Alcohol	<1.0		mg/L	maj / 05-11-94
VOLATILE - BETX (AQUEOUS)				/
Benzene	55		ug/L	srj / 05/10/1994
Ethylbenzene	67		ug/L	srj / 05/10/1994
Methyl-tert-butyl-ether (MTBE	<5.		ug/L	srj / 05/10/1994
Toluene	18		ug/L	srj / 05/10/1994
Xylenes, Total	<5.		ug/L	srj / 05/10/1994

* Reporting limit raised due to process blank exhibiting 1 mg/L.

** Reporting limit raised due to interferences.

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/17/1994

NET Job Number: 94.01382

Enclosed are the Analytical Results for the following samples submitted to NET, Inc. Indianapolis Division for analysis:

Project Description: GM POWERTRAIN - BEDFORD, IN

Sample Number	Sample Description	Date Taken	Date Receive
84669	EAST END TANK 5 BTM	05/13/1994	05/14/1994
84670	WEST END TANK 5 BTM	05/13/1994	05/14/1994
84671	NORTH END WALL #1 SIDE	05/13/1994	05/14/1994
84672	SOUTH END WALL #1 SIDE	05/13/1994	05/14/1994
84673	EAST WALL #1	05/13/1994	05/14/1994
84674	EAST WALL #2	05/13/1994	05/14/1994
84675	EAST WALL #3	05/13/1994	05/14/1994
84676	WEST WALL #1	05/13/1994	05/14/199
84677	WEST WALL #2	05/13/1994	05/14/19
84678	WEST WALL #3	05/13/1994	05/14/1994
84679	STOCKPILE A NORTH	05/13/1994	05/14/1994
84680	STOCKPILE B CENTER	05/13/1994	05/14/1994
84681	STOCKPILE C SOUTH	05/13/1994	05/14/1994
84682	TANK 1 EAST END TANK BTM	05/13/1994	05/14/1994
84683	TANK 1 CL OF TANK BTM	05/13/1994	05/14/1994
84684	TANK 1 WEST END OF TANK BTM	05/13/1994	05/14/1994
84685	TANK 2 EAST END OF TANK BTM	05/13/1994	05/14/19 4
84686	TANK 2 CL OF TANK BTM	05/13/1994	05/14/1 4

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please do not hesitate to call. NET has been pleased to provide these analytical services for you.

Approved By:

Beth Day
Project Manager

® TESTING, INC.
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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382
Page 1

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84669 EAST END TANK 5 BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	170	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	610	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84670 WEST END TANK 5 BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84671 NORTH END WALL #1 SIDE			05/13/1994			
TPH - GC/FID Volatile 8015M	3,400	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	12,500	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84672 SOUTH END WALL #1 SIDE			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	35	d	mg/kg	srj / 05/15/1994	S-8015M	<15.

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84673 EAST WALL #1			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84674 EAST WALL #2			05/13/1994			
TPH - GC/FID Volatile 8015M	21	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	70	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84675 EAST WALL #3			05/13/1994			
TPH - GC/FID Volatile 8015M	35	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	120	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84676 WEST WALL #1			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	16	d	mg/kg	srj / 05/15/1994	S-8015M	<15.

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ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84677 WEST WALL #2			05/13/1994			
TPH - GC/FID Volatile 8015M	620	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	210	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84678 WEST WALL #3			05/13/1994			
TPH - GC/FID Volatile 8015M	480	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	1,800	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84679 STOCKPILE A NORTH			05/13/1994			
TPH - GC/FID Volatile 8015M	160	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	520	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84680 STOCKPILE B CENTER			05/13/1994			
TPH - GC/FID Volatile 8015M	390	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	1,400	d	mg/kg	srj / 05/15/1994	S-8015M	<15.

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ANALYTICAL REPORT

Mr. Greg Baryluk
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11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	POL
84681 STOCKPILE C SOUTH			05/13/1994			
TPH - GC/FID Volatile 8015M	180	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	620	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84682 TANK 1 EAST END TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	780	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	2,800	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84683 TANK 1 CL OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	56	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	200	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84684 TANK 1 WEST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	280	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	1,000	d	mg/kg	srj / 05/15/1994	S-8015M	<15.

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ANALYTICAL REPORT

Mr. Greg Baryluk
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Suite 205
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05/17/1994

NET Job Number: 94.01382

Enclosed are the Analytical Results for the following samples submitted to NET, Inc. Indianapolis Division for analysis:

Project Description: GM POWERTRAIN - BEDFORD, IN

Sample Number	Sample Description	Date Taken	Date Received
84687	TANK 2 WEST END OF TANK BTM	05/13/1994	05/14/1994
84688	TANK 3 EAST END OF TANK BTM	05/13/1994	05/14/1994
84689	TANK 3 CL OF TANK BTM	05/13/1994	05/14/1994
84690	TANK 3 WEST END OF TANK BTM	05/13/1994	05/14/1994
84691	TANK 4 EAST END OF TANK BTM	05/13/1994	05/14/1994
84692	TANK 4 WEST END OF TANK BTM	05/13/1994	05/14/1994
84693	CL OF TANK #1 BTM	05/13/1994	05/14/1994
84694	TANK #5 EAST BTM	05/13/1994	05/14/1994
84695	TANK #5 WEST BTM	05/13/1994	05/14/1994
84696	EAST WALL #3	05/13/1994	05/14/1994
84697	WEST WALL #3	05/13/1994	05/14/1994
84698	SOUTH WALL #1	05/13/1994	05/14/1994

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please do not hesitate to call. NET has been pleased to provide these analytical services for you.

Approved By:

Beth Day

Beth Day
Project Manager

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KEY TO ABBREVIATIONS

<	Less than; when appearing in the results column indicates the analyte was not detected at or above the reported value.
mg/L	Concentration in units of milligrams of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per million (ppm).
ug/L	Concentration in units of micrograms of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per billion (ppb).
mg/kg	Concentration in units of milligrams of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per million (ppm).
ug/kg	Concentration in units of micrograms of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per billion (ppb).
PQL	Practical Quantitation Limit; the lowest level that can be reliably achieved within specified limits of precision and accuracy under routine conditions.
a	Indicates the sample concentration was quantitated using a diesel fuel standard.
b	Indicates the analyte of interest was also found in the method blank.
d1	Indicates the sample was diluted due to high analyte concentration.
d2	Indicates the sample was diluted due to matrix interference and that the PQL may be elevated.
e	Indicates the reported concentration is estimated.
f	Indicates the sample concentration was quantitated using a fuel oil standard.
g	Indicates the sample concentration was quantitated using a gasoline standard.
h	Indicates the sample was analyzed past holding time.
j	Indicates the reported concentration is below the PQL.
k	Indicates the sample concentration was quantitated using a kerosene standard.
m	Indicates the sample concentration was quantitated using a mineral spirits standard.
o	Indicates the sample concentration was quantitated using a motor oil standard.
q	Indicates the sample concentration was quantitated using a standard provided by the client.
r	Indicates the sample was received past holding time.
s	Indicates the sample concentration was quantitated using a stoddard solvent standard.
u	Indicates the sample was received improperly preserved and/or contained.
TCLP	Indicates the Toxicity Characteristic Leaching Procedure was performed for this analysis.
ICP	Indicates the analysis was performed using Inductively Coupled Plasma Spectroscopy.
GFAA	Indicates the analysis was performed using Graphite Furnace Atomic Absorption Spectroscopy.
%	Percent; To convert ppm to %, divide the result by 10,000. To convert % to ppm, multiply the result by 10,000.
Dry Weight	When indicated, the results are reported on a dry weight basis. The contribution of the moisture content in the sample is subtracted when calculating the concentration of the analyte.

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05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84685 TANK 2 EAST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	140	g	mg/kg	srj / 05/15/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	520	d	mg/kg	srj / 05/15/1994	S-8015M	<15.
84686 TANK 2 CL OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	420	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	1,500	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84687 TANK 2 WEST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	65	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	230	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84688 TANK 3 EAST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	34	d	mg/kg	srj / 05/14/1994	S-8015M	<15.

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05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84689 TANK 3 CL OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84690 TANK 3 WEST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	22	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	80	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84691 TANK 4 EAST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	1,700	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	6,200	d	mg/kg	srj / 05/14/1994	S-8015M	<15.
84692 TANK 4 WEST END OF TANK BTM			05/13/1994			
TPH - GC/FID Volatile 8015M	2,000	g	mg/kg	srj / 05/14/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	7,200	d	mg/kg	srj / 05/14/1994	S-8015M	<15.

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P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results	Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84693 CL OF TANK #1 BTM		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
84694 TANK #5 EAST BTM		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	26.7	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0

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P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results	Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84695 TANK #5 WEST BTM		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
84696 EAST WALL #3		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0

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05/17/1994

P.O. NO.: PBS03297
Job No.: 94.01382

Date Received: 05/14/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results	Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84697 WEST WALL #3		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
84698 SOUTH WALL #1		05/13/1994			
MISC. ALCOHOLS					
Acetone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Ethanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isopropyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methanol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Methyl Ethyl Ketone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
Isobutyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
4-Methyl-1,2-pentanone	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
n-Propyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0
tert-Butyl Alcohol	<1.0	mg/kg	bgm / 05/16/1994	NET-GC	<1.0

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ANALYTICAL REPORT

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05/18/1994

NET Job Number: 94.01409

Enclosed are the Analytical Results for the following samples submitted to NET, Inc. Indianapolis Division for analysis:

Project Description: GM POWERTRAIN - BEDFORD, IN

Sample Number	Sample Description	Date Taken	Date Received
84814	NORTH END WALL	05/17/1994	05/17/1994
84815	TANK #4 EAST END BTM	05/17/1994	05/17/1994
84816	TANK #4 WEST END BTM	05/17/1994	05/17/1994
84817	WEST WALL #2	05/17/1994	05/17/1994
84818	WEST WALL #3	05/17/1994	05/17/1994
84819	TANK #1 EAST END BTM	05/17/1994	05/17/1994
84820	TANK #1 CL BTM	05/17/1994	05/17/1994
84821	TANK #1 WEST END BTM	05/17/1994	05/17/1994
84822	SOIL PILE A	05/17/1994	05/17/19
84823	SOIL PILE B	05/17/1994	05/17/19
84824	SOIL PILE C	05/17/1994	05/17/1994
84825	2ND SOIL PILE A	05/17/1994	05/17/1994
84826	2ND SOIL PILE B	05/17/1994	05/17/1994
84827	EAST WALL #3	05/17/1994	05/17/1994
84828	TANK 5 EAST BT	05/17/1994	05/17/1994
84829	TANK #2 EAST END BTM	05/17/1994	05/17/1994
84830	TANK #2 CL BTM	05/17/1994	05/17/1994
84831	TANK #2 WEST END BTM	05/17/1994	05/17/1 4

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please do not hesitate to call. NET has been pleased to provide these analytical services for you.

Approved By:

Beth Day
Project Manager

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KEY TO ABBREVIATIONS

<	Less than; when appearing in the results column indicates the analyte was not detected at or above the reported value.
mg/L	Concentration in units of milligrams of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per million (ppm).
ug/L	Concentration in units of micrograms of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per billion (ppb).
mg/kg	Concentration in units of milligrams of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per million (ppm).
ug/kg	Concentration in units of micrograms of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per billion (ppb).
PQL	Practical Quantitation Limit; the lowest level that can be reliably achieved within specified limits of precision and accuracy under routine conditions.
a	Indicates the sample concentration was quantitated using a diesel fuel standard.
b	Indicates the analyte of interest was also found in the method blank.
d1	Indicates the sample was diluted due to high analyte concentration.
d2	Indicates the sample was diluted due to matrix interference and that the PQL may be elevated.
e	Indicates the reported concentration is estimated.
f	Indicates the sample concentration was quantitated using a fuel oil standard.
g	Indicates the sample concentration was quantitated using a gasoline standard.
h	Indicates the sample was analyzed past holding time.
j	Indicates the reported concentration is below the PQL.
k	Indicates the sample concentration was quantitated using a kerosene standard.
m	Indicates the sample concentration was quantitated using a mineral spirits standard.
o	Indicates the sample concentration was quantitated using a motor oil standard.
q	Indicates the sample concentration was quantitated using a standard provided by the client.
r	Indicates the sample was received past holding time.
s	Indicates the sample concentration was quantitated using a stoddard solvent standard.
u	Indicates the sample was received improperly preserved and/or contained.
TCLP	Indicates the Toxicity Characteristic Leaching Procedure was performed for this analysis.
ICP	Indicates the analysis was performed using Inductively Coupled Plasma Spectroscopy.
GFAA	Indicates the analysis was performed using Graphite Furnace Atomic Absorption Spectroscopy.
%	Percent; To convert ppm to %, divide the result by 10,000. To convert % to ppm, multiply the result by 10,000.
Dry Weight	When indicated, the results are reported on a dry weight basis. The contribution of the moisture content in the sample is subtracted when calculating the concentration of the analyte.

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05/18/1994

P.O. NO.: PBS03297
Job No.: 94.01409
Page 1

Date Received: 05/17/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84814 NORTH END WALL			05/17/1994			
TPH - GC/FID Volatile 8015M	420	g,e	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	1,600	d,e	mg/kg	srj / 05/17/1994	S-8015M	<15.
84815 TANK #4 EAST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84816 TANK #4 WEST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84817 WEST WALL #2			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.

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05/18/1994

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Job No.: 94.01409

Date Received: 05/17/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84818 WEST WALL #3			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84819 TANK #1 EAST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	85	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	320	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84820 TANK #1 CL BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	60	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	230	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84821 TANK #1 WEST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	83	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	320	d	mg/kg	srj / 05/17/1994	S-8015M	<15.

TESTING, INC.
Tel: (317) 842-4261
Fax: (317) 842-4286

ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/18/1994

P.O. NO.: PBS03297
Job No.: 94.01409

Date Received: 05/17/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84822 SOIL PILE A			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	48	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84823 SOIL PILE B			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84824 SOIL PILE C			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84825 2ND SOIL PILE A			05/17/1994			
TPH - GC/FID Volatile 8015M	20	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	77	d	mg/kg	srj / 05/17/1994	S-8015M	<15.

TESTING, INC.
Tel: (317) 842-4261
Fax: (317) 842-4286

ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/18/1994

P.O. NO.: PBS03297
Job No.: 94.01409

Date Received: 05/17/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84826 2ND SOIL PILE B			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84827 EAST WALL #3			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84828 TANK 5 EAST BT			05/17/1994			
TPH - GC/FID Volatile 8015M	21	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	80	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84829 TANK #2 EAST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	20	d	mg/kg	srj / 05/17/1994	S-8015M	<15.

TESTING, INC.
Tel: (317) 842-4261
Fax: (317) 842-4286

ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/18/1994

P.O. NO.: PBS03297
Job No.: 94.01409
Page 5

Date Received: 05/17/1994
Job Description: GM POWERTRAIN - BEDFORD, IN

Sample Number / Sample I.D. Parameters	Results		Sample Date/ Units	Analyst & Date Analyzed	Method	PQL
84830 TANK #2 CL BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	51	d	mg/kg	srj / 05/17/1994	S-8015M	<15.
84831 TANK #2 WEST END BTM			05/17/1994			
TPH - GC/FID Volatile 8015M	32	g	mg/kg	srj / 05/17/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	130	d	mg/kg	srj / 05/17/1994	S-8015M	<15.

ENVIRONMENTAL TESTING, INC.

Tel: (317) 842-4261
Fax: (317) 842-4286

ANALYTICAL REPORT

Mr. Greg Baryluk
O'BRIEN & GERE
11590 Century Blvd.
Suite 205
Cincinnati, OH 45246

05/25/1994

Sample No.: 85126
Job No.: 94.01511
P.O. NO.: PBS03297

Sample Description: NORTH END SIDE WALL
Job Description: GM POWERTRAIN - BEDFORD, IN

Date Taken: 05/18/1994 Date Received: 05/23/1994

Parameters	Results		Units	Analyst/ Date of Analysis	Method Number	Method PQL
TPH - GC/FID Volatile 8015M	<15	g	mg/kg	rla / 05/24/1994	S-8015M	<15.
TPH - GC/FID Volatile 8015M	<15	a	mg/kg	srj / 05/24/1994	S-8015M	<15.

Beth Day
Project Manager

RECEIVED
MAY 31 1994
O'BRIEN & GERE
CINCINNATI

® TESTING, INC.

Tel: (317) 842-4261
Fax: (317) 842-4286

KEY TO ABBREVIATIONS

<	Less than; when appearing in the results column indicates the analyte was not detected at or above the reported value.
mg/L	Concentration in units of milligrams of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per million (ppm).
ug/L	Concentration in units of micrograms of analyte per Liter of sample. Measurement used for aqueous samples. Can also be expressed as parts per billion (ppb).
mg/kg	Concentration in units of milligrams of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per million (ppm).
ug/kg	Concentration in units of micrograms of analyte per kilogram of sample. Measurement used for non-aqueous samples. Can also be expressed as parts per billion (ppb).
PQL	Practical Quantitation Limit; the lowest level that can be reliably achieved within specified limits of precision and accuracy under routine conditions.
a	Indicates the sample concentration was quantitated using a diesel fuel standard.
b	Indicates the analyte of interest was also found in the method blank.
d1	Indicates the sample was diluted due to high analyte concentration.
d2	Indicates the sample was diluted due to matrix interference and that the PQL may be elevated.
e	Indicates the reported concentration is estimated.
f	Indicates the sample concentration was quantitated using a fuel oil standard.
g	Indicates the sample concentration was quantitated using a gasoline standard.
h	Indicates the sample was analyzed past holding time.
j	Indicates the reported concentration is below the PQL.
k	Indicates the sample concentration was quantitated using a kerosene standard.
m	Indicates the sample concentration was quantitated using a mineral spirits standard.
o	Indicates the sample concentration was quantitated using a motor oil standard.
q	Indicates the sample concentration was quantitated using a standard provided by the clier*
r	Indicates the sample was received past holding time.
s	Indicates the sample concentration was quantitated using a stoddard solvent standard.
u	Indicates the sample was received improperly preserved and/or contained.
TCLP	Indicates the Toxicity Characteristic Leaching Procedure was performed for this analysis.
ICP	Indicates the analysis was performed using Inductively Coupled Plasma Spectroscopy.
GFAA	Indicates the analysis was performed using Graphite Furnace Atomic Absorption Spectroscopy.
%	Percent; To convert ppm to %, divide the result by 10,000. To convert % to ppm, multiply the result by 10,000.
Dry Weight	When indicated, the results are reported on a dry weight basis. The contribution of the moisture content in the sample is subtracted when calculating the concentration of the analyte

EXHIBIT 4

DISPOSAL MANIFESTS

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division
Mailing Address: N Jackson St, Bedford, IN 47421
Technical Contact: Wm. Schoonmaker
Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris
Certification Number: 21236
Expiration Date: 15 Jan

Description of Waste: concrete debris from plant [redacted] roads and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge.

~~Wilbur B. Fields~~ R G SIMMERMAN — R G Simmerman — 5/9/94

Name(print or type) — Signature — Date(MM/DD/YY)

TRANSPORTER INFORMATION

Company Name: ~~Rumpke~~ RS HANNA TRUCKING Mail Address: ~~10795 Hughes Road Cincinnati, OH 45247~~ 750 N COUNTY ROAD BEDFORD, IN

Keith Lutz — 5-9-

Driver's Signature — Date(MM/DD/

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill
OPP Number: 36-1
Amount: 15 yds

Authorized Signature — 5-9-94 — Date(MM DD/Y

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility respon (Generator responsibility for special waste disposal), all special was notification. As stated in each of these respective cites, the generat notification for each load of special waste to be disposed of and the special waste with the information provided. The solid waste dispos such time as certification of post-closure is deemed acceptable for th

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and repo commissioner a quarterly report which includes the origin of the soi originated outside of Indiana. The origin of the waste must be provi by percent, the composition of a mixed load. Therefore, the county special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly rep special waste. If you have any questions regarding this matter, plea

lity for special waste disposal) and 329 IAC 2-21-16 elivered for disposal shall be accompanied by a disposa nust provide the disposal facility with a written disposa d waste disposal facility operator shall check each load facility shall also maintain the disposal notifications u ite.

), all solid waste disposal facilities shall submit to the waste compiled by county, or by state if the waste to the facility by the hauler and the hauler must estim d/or the state of origin is now required information on th

which is required from all solid waste facilities that rec ntact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division Technical Contact: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421 Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris Certification Number: 21236 Expiration Date: 15 Jan

Description of Waste: [redacted] concrete debris from plant [redacted] roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge.

R. Hutchinso R. Hutchinson 5-10-94

Name(print or type) Signature Date(MM/DD/Y

TRANSPORTER INFORMATION

Company Name: Rumpke Mailing Address: 10795 Hughes Road Cincinnati, OH 45247

5-10-94

Driver's Signature Date(MM/DD/Y

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill OPP Number: 36-1 Amount: 15 yds.

5-10-94

Authorized Signature Date(MM/DD/

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility respo... oility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special wa... delivered for disposal shall be accompanied by a dispos notification. As stated in each of these respective cites, the genera... must provide the disposal facility with a written dispos notification for each load of special waste to be disposed of and the ... lid waste disposal facility operator shall check each load special waste with the information provided. The solid waste dispo... facility shall also maintain the disposal notifications u such time as certification of post-closure is deemed acceptable for u... site.

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and rep... n), all solid waste disposal facilities shall submit to the commissioner a quarterly report which includes the origin of the sc... l waste compiled by county, or by state if the waste originated outside of Indiana. The origin of the waste must be provi... d to the facility by the hauler and the hauler must estim by percent, the composition of a mixed load. Therefore, the county ... d/or the state of origin is now required information on t special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly rep... , which is required from all solid waste facilities that rec special waste. If you have any questions regarding this matter, plea... ontact this office at 317/232-4473.

SPECIAL WASTE DISP SAL NOTIFICATION

GENERATOR I ORMATION

Company Name: GM Powertrain Division
Mailing Address: N Jackson St, Bedford, IN G 47421

nical Contact: Wm. Schoonmaker
ator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICAT (INFORMATION

Waste Name: Concrete Debris [redacted]
Certification Nu .: 21236
Expiration Date: 15 Jan

Description of Waste: [redacted] concrete debris from plant [redacted] adways and floors

I Hereby certify that the above information is true and accurate to oest of my knowledge.

Walter L. Bivens
Name(print or type)

R. Hutchinson 5-1-9
Signature Date(MM/DD/YY

TRANSPORTER I ORMATION

Company Name: ~~Burnplex~~ HANNA
Mail Address: ~~18795 Hughes Road Cincinnati, OH 45247~~

[signature]
Driver's Signature

5-10-9
Date(MM/DD/

DISPOSAL SITE IN ORMATION

Site Name: Rumpke Medora Landfill
OPP Nu r: 36-1
Amount: 15 yds.

Authorized Signa

5-10-9
Date(MM YY

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility respon lity for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special was elivered for disposal shall be accompanied by a disposa notification. As stated in each of these respective cites, the generat ust provide the disposal facility with a written disposal notification for each load of special waste to be disposed of and the d waste disposal facility operator shall check each load special waste with the information provided. The solid waste dispos facility shall also maintain the disposal notifications un such time as certification of post-closure is deemed acceptable for th e.

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The quarterly report, however, does not replace the monthly rep which is required from all solid waste facilities that rec special waste. If you have any questions regarding this matter, pleas ntact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division
Mailing Address: N Jackson St, Bedford, IN 47421
Tecnical Contact: Wm. Schoonmaker
Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris [redacted]
Certification Number: 21236
Expiration Date: 15 Jan

Description of Waste: [redacted] concrete debris from plant roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge.

R. Hutchinson
Name(print or type)

R. Hutchinson Comp T
Signature

5-10-
Date(MM/DD/

TRANSPORTER INFORMATION

Company Name: Rumpke
Mailing Address: 10795 Hughes Road Cincinnati, OH 45247

Driver's Signature

5-10-94
Date(MM/DD/

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill
OPP Number: 36-1
Amount: 15 yds.

Authorized Signature

5-10-94
Date(MM/DD

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility respo[nsibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special wa[ste delivered for disposal shall be accompanied by a dispo]sal notification. As stated in each of these respective cites, the generat[or must provide the disposal facility with a written dispo]sal notification for each load of special waste to be disposed of and th[e solid waste disposal facility operator shall check each loa]d special waste with the information provided. The solid waste disp[osal facility shall also maintain the disposal notifications] such time as certification of post-closure is deemed acceptable for [its site.

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and re[ports), all solid waste disposal facilities shall submit to the] commissioner a quarterly report which includes the origin of the [solid waste compiled by county, or by state if the waste] originated outside of Indiana. The origin of the waste must be pro[vided to the facility by the hauler and the hauler must esti]by percent, the composition of a mixed load. Therefore, the count[y and/or the state of origin is now required information on] special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly r[eport which is required from all solid waste facilities that re]special waste. If you have any questions regarding this matter, pl[ease contact this office at 317/232-4473.]

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division
Technical Contact: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421
Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris
Certification Number: 21236
Expiration Date: 15 Jan

Description of Waste: concrete debris from plan[illegible] roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge.

~~William L. Fiest~~ R. Hutchins 5-10-9[illegible]

Name(print or type) Signature Date(MM/DD/Y[illegible])

TRANSPORTER INFORMATION

Company Name: ~~Rumpke~~ Hanna
Mailing Address: ~~10795 Hughes Road Cincinnati, OH 45247~~

[illegible] 5-10

Driver's Signature Date(MM/DD/Y[illegible])

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill
OPP Number: 36-1
Amount: 15 yds.

[illegible] 5-10 9[illegible]

Authorized Signature Date(MM/DD

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility respo[illegible]ibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special wa[illegible]s delivered for disposal shall be accompanied by a disposa[illegible] notification. As stated in each of these respective cites, the genera[illegible]r must provide the disposal facility with a written disposa[illegible] notification for each load of special waste to be disposed of and the [illegible]olid waste disposal facility operator shall check each load[illegible] special waste with the information provided. The solid waste dispo[illegible]l facility shall also maintain the disposal notifications [illegible] such time as certification of post-closure is deemed acceptable for t[illegible]s site.

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and re[illegible]rts), all solid waste disposal facilities shall submit to the commissioner a quarterly report which includes the origin of the s[illegible]d waste compiled by county, or by state if the waste originated outside of Indiana. The origin of the waste must be prov[illegible]ed to the facility by the hauler and the hauler must esti[illegible] by percent, the composition of a mixed load. Therefore, the county [illegible]and/or the state of origin is now required information on special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly re[illegible]t which is required from all solid waste facilities that re[illegible] special waste. If you have any questions regarding this matter, ple[illegible]ontact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division Tecnical Connec: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421 Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris Certification Number: 21236 Expiration Date: 15 Ja

Description of Waste: [redacted]
concrete debris from plant roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge. R. Hutchinson

~~Wilbur L. Fields~~ R. Hutchinson 5-12-9
Name(print or type) Signature Date(MM/DD/Y

TRANSPORTER INFORMATION

Company Name: Rumpke Mailing Address: 10795 Hughes Road Cincinnati, OH 45247

Gerald Rarely. 05/12/96
Driver's Signature Date(MM/DD/Y

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill OPP Number: 36-1 Amount: 15 yd

[signature] 05/12/96
Authorized Signature Date(MM/DD

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility responsibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special waste delivered for disposal shall be accompanied by a disposal notification. As stated in each of these respective cites, the generator must provide the disposal facility with a written disposal notification for each load of special waste to be disposed of and the solid waste disposal facility operator shall check each load of special waste with the information provided. The solid waste disposal facility shall also maintain the disposal notifications until such time as certification of post-closure is deemed acceptable for the site.

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and reports), all solid waste disposal facilities shall submit to the commissioner a quarterly report which includes the origin of the solid waste compiled by county, or by state if the waste originated outside of Indiana. The origin of the waste must be provided to the facility by the hauler and the hauler must estimate by percent, the composition of a mixed load. Therefore, the county and/or the state of origin is now required information on the special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly report which is required from all solid waste facilities that receive special waste. If you have any questions regarding this matter, please contact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division Tecnical Contact: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421 Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris Certification Number: 21236 Expiration Date: 15 Jan

Description of Waste: concrete debris from plant roadways and floors

R. Hutchinson

I Hereby certify that the above information is true and accurate to the best of my knowledge.

Name(print or type) Signature Date(MM/DD/YY)

TRANSPORTER INFORMATION

Company Name: HANNA Mailing Address: 10795 Hughes Road Cincinnati, OH 45247

Driver's Signature Date(MM/DD/YY) 5-10-

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill OPP Number: 36-1 Amount: 15 yds

Authorized Signature Date(MM/DD/

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility responsibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special waste delivered for disposal shall be accompanied by a disposa notification. As stated in each of these respective cites, the generator must provide the disposal facility with a written disposa notification for each load of special waste to be disposed of and the solid waste disposal facility operator shall check each load special waste with the information provided. The solid waste disposal facility shall also maintain the disposal notifications u such time as certification of post-closure is deemed acceptable for the site.

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The quarterly report, however, does not replace the monthly report which is required from all solid waste facilities that rec special waste. If you have any questions regarding this matter, please contact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division Technical Contact: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421 Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris Certification Number: 21236 Expiration Date: 15 Jan

Description of Waste: concrete debris from plant roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge.

~~Willard D. Fields~~ R. Hutchinson GrPT 5-10-94

Name(print or type) Signature Date(MM/DD/YY

TRANSPORTER INFORMATION

Company Name: ~~Rumpke~~ HANNA Mailing Address: ~~10795 Hughes Road Cincinnati, OH 45247~~

Driver's Signature 5-10-94
Date(MM/DD/YY

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill OPP Number: 36-1 Amount: 15yd.

Authorized Signature 5-10-94
Date(MM/DD/Y

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility responsibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special waste delivered for disposal shall be accompanied by a disposal notification. As stated in each of these respective cites, the generator must provide the disposal facility with a written disposal notification for each load of special waste to be disposed of and the solid waste disposal facility operator shall check each load c special waste with the information provided. The solid waste disposal facility shall also maintain the disposal notifications unt such time as certification of post-closure is deemed acceptable for the site.

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The quarterly report, however, does not replace the monthly report which is required from all solid waste facilities that recei special waste. If you have any questions regarding this matter, please contact this office at 317/232-4473.

SPECIAL WASTE DISPOSAL NOTIFICATION

GENERATOR INFORMATION

Company Name: GM Powertrain Division Technical Contact: Wm. Schoonmaker
Mailing Address: N Jackson St, Bedford, IN 47421 Generator Location: N. Jackson St Bedford, IN

Emergency Response Phone Number: 812 279 7200

WASTE CERTIFICATION INFORMATION

Waste Name: Concrete Debris Certification Number: 21236 Expiration Date: 15 Jan

Description of Waste: concrete debris from plant roadways and floors

I Hereby certify that the above information is true and accurate to the best of my knowledge. R. Hutchinson

~~Wilbur L. Fields~~ R. Hutchinson 5-12-9
Name(print or type) Signature Date(MM/DD/YY

TRANSPORTER INFORMATION

Company Name: ~~Rumpke~~ Hanna Mailing Address: ~~10795 Hughes Road Cincinnati, OH 45251~~

Driver's Signature 5/12/94
Date(MM/DD/Y

DISPOSAL SITE INFORMATION

Site Name: Rumpke Medora Landfill OPP Number: 36-1 Amount: 15 yd

Authorized Signature 05/12/94
Date(MM/DD

Pursuant to Solid Waste Rule 329 IAC 2-21-15 (Facility responsibility for special waste disposal) and 329 IAC 2-21-16 (Generator responsibility for special waste disposal), all special waste delivered for disposal shall be accompanied by a disposal notification. As stated in each of these respective cites, the generator must provide the disposal facility with a written disposal notification for each load of special waste to be disposed of and the solid waste disposal facility operator shall check each load special waste with the information provided. The solid waste disposal facility shall also maintain the disposal notifications until such time as certification of post-closure is deemed acceptable for the site.

Pursuant to Solid Waste Rule 329 IAC 2-14-8 (Records and reports), all solid waste disposal facilities shall submit to the commissioner a quarterly report which includes the origin of the solid waste compiled by county, or by state if the waste originated outside of Indiana. The origin of the waste must be provided to the facility by the hauler and the hauler must estimate by percent, the composition of a mixed load. Therefore, the county and/or the state of origin is now required information on the special waste disposal notification (see above).

The quarterly report, however, does not replace the monthly report which is required from all solid waste facilities that receive special waste. If you have any questions regarding this matter, please contact this office at 317/232-4473.

Incorporated

Date: 5-12-94

To Whom It May Concern:

Hoosier Equipment Service, Inc. certifies that tank number(s) 1940027 A BC has (have) been properly purged and cleaned in accordance with the guidelines established in API Bulletin #1604. Tank number(s) 1940027 ABC contain(s) no sludge or hazardous residues and has (have) been disposed of at BEDFORD RECYCLING located at "H" STREET BEDFORD INDIANA.

Substance stored in tank - [X] unleaded gasoline [ ] leaded gasoline [X] diesel [ ] motor oil [ ] kerosene [ ] other substances _____.

This tank is to be cut up and processed as scrap steel.

RECEIVED
JUN 16 1994
O'BRIEN & GERE
CINCINNATI

8014 W. Thompson Rd.
Indianapolis, IN 46241
(317) 631-5000/(317) 856-2751

(Name of Contractor) HOOSIER EQUIPMENT

Certifies that the tank/tanks listed below, which were removed from (Owners Name and Location of Tank) GENERAL MOTORS FOUNDARY BEDFORD INDIANA, have been purged in accordance with API Bulletin 1604 and

1. the tank never contained leaded gasoline or,
2. the tank has been cleaned in accordance with API Bulletin 2015 and 2015 A and any interior surfaces which might have been in contact with sludge have been cleaned to bare metal in accordance with API 2202 .

Assigned Tank No. (NO. TO BE PRINTED ON ACTUAL TANKS)	Tank Size	Tank Contents
1. 1940027 A	120'X21FT 12K	DIESEL ✓ 42980
2. 1940027 B	120'X21FT 12K	DIESEL ✓ 42720
3. 1940027 C	120' X21 FT 12K	DIESEL ✓ 43180
4. ~~1940027 D~~	~~96"X~~	GAS DSE TO BE 5/13/94
5. ~~1940027 E~~	~~96"X~~	

Signed by: (Acting Agent For Contractor) [signature]

Title: PROJECT MANAGER Date: 5/12/94

BEDFORD RECYCLING [illegible], INC., certifies that the above listed tanks are being purchased for remelting purposes only, and to the best of our knowledge meet all State and Federal requirements for cleaning.

Signed by: [signature]

Title: Office Mgr. Date: 5/12/94

Date: 5/13/94

To Whom It May Concern:

Hoosier Equipment Service, Inc. certifies that tank number(s) 1940027 D & E has (have) been properly purged and cleaned in accordance with the guidelines established in API Bulletin #1604. Tank number(s) 1940027 D & E contain(s) no sludge or hazardous residues and has (have) been disposed of at BEDFORD RECYCLING located at "H" STREET BEDFORD INDIANA.

Substance stored in tank - [X] unleaded gasoline [ ] leaded gasoline [ ] diesel [ ] motor oil [ ] kerosene [X] other substances ALCOHOL/SOLVENT.

8014 W. Thompson Rd.
Indianapolis, IN 46241
(317) 631-5000/(317) 856-2751

(Name of Contractor) HOOSIER EQUIPMENT

Certifies that the tank/tanks listed below, which were removed from (Owners Name and Location of Tank) GENERAL MOTORS FOUNDARY BEDFORD INDIANA, have been purged in accordance with API Bulletin 1604 and

1. the tank never contained leaded gasoline or,
2. the tank has been cleaned in accordance with API Bulletin 2015 and 2015 A and any interior surfaces which might have been in contact with sludge have been cleaned to bare metal in accordance with API 2202 .

Assigned Tank No. (NO. TO BE PRINTED ON ACTUAL TANKS)	Tank Size	Tank Contents
1. 1940027 D	(96"X20FT) 7500gal	GASOLINE
2. 1940027 E	(120"X21F) 12000 ~~(120"X20F) 7500~~ gal	ALCOHOL/SOLVENT
3.		
4.		

Signed by: (Acting Agent For Contractor) R Frank

Title: PROJECT MANAGER Date: 5/13/94

BEDFORD RECYCLING ~~INDUSTRIES, INC.~~, certifies that the above listed tanks are being purchased for remelting purposes only, and to the best of our knowledge meet all State and Federal requirements for cleaning.

Signed by: R Frank

Title: Office Mgr Date: 5/13/94

Date 10/1

In Collect on Delivery shipments the letters COD must appear before consignee's name as otherwise provided in Item 620 Sec. 1

TO:
Consignee ENVIRO Solve
Street 5600 Mass Ave
City Indpls State IN Zip Code

FROM:
Shipper GM Piston PLT
Street 105 GM Drive
City Bedford State In Zip Code 474
24 hr. Emergency Contact Tel. No 1-800-886-7

Route

Vehicle Number 4

No. of Units & Container Type	HM	BASIC DESCRIPTION Proper Shipping Name, Hazard Class, Identification Number (UN or NA), Packing Group, per 172.101, 172.202, 172.203	TOTAL QUANTITY (Weight, Volume, Gallons, etc.)	WEIGHT (Subject to Correction)	RATE	CHAR (For C Use C
15 dms X		Gasoline 3 UN1203 PG II	825gal			
1 dm		Empty Drum				

PLACARDS TENDERED: YES ☒ NO ☐ FLAM

REMIT COD TO ADDRESS

Note — Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding
$ _____ per _____

I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled and are in all respects in proper condition for transport by [illegible] Rule 49 Highway ☒ Water [DELETE NON-APPLICABLE MODE OF TRANSPORT] according to applicable international and national governmental regulations

_____ Signature

COD Amt. $

COD FEE. PREPAID ☐ COLLECT ☐ $

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
_____ (Signature of Consignor)

TOTAL CHARGES $

FREIGHT CHARGES
☐ Adjust PREPAID charges when date of sale is changed
Check box if charges are to be collected

RECEIVED subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading the property described above in apparent good order except as noted (contents and condition of contents of packages unknown) marked consigned and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination and as to each party at any time interested in all or any said property, that every service to be performed hereunder shall be subject to all the bill of lading terms and conditions on the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

SHIPPER Ulm Schwomeyer

CARRIER Enviro-Solve

PER Bob Copple

DATE

Permanent post-office address of shipper

STYLE F60 LABELMASTER, An American Labelmark Co., Chicago, IL 60646 800/621-5808

PRINTED ON RECYCLED PAPER USING SOYBEAN INK
printed with SOY INK

15 x $100.00
1 x $25.00

EnviroSolve
environmental management, inc.

DATE: 6-14-94 TIME: 1:30

CUSTOMER: GM Piston PLT

ADDRESS: 105 GM Drive

GENERATOR: Hoosier Eq

ADDRESS: _____

TRUCK NUMBER: 4

LANDFILL: _____ TICKET NO: 1050

DESCRIPTION: 55 Non Haz Non Reg UST Sludge
- Flam Pnt. -
1 alt

DRUMS QUANTITY: _____

DELIVERY ONLY

15 YD	ASBESTOS	SLUDGE	TRASH
20 YD	ASBESTOS	SLUDGE	TRASH
30 YD	ASBESTOS	SLUDGE	TRASH
40 YD	ASBESTOS	SLUDGE	TRASH
42 YD	ASBESTOS	SLUDGE	TRASH

DRIVER: Rob Copp

I hereby authorize EnviroSolve to deliver and/or pickup this container. It is understood that all invoices are to be paid in full within 30 days of this ticket date.

AUTHORIZED SIGNATURE: Ruth Solomon

SECTION RESERVED FOR SOIL DISPOSAL MANIFESTS

TECHNICAL SERVICES

RE: UST Removal

FILE: C28801

CC: J. F. Rauscht

TO:

NAO Disbursements - Warren South
Powertrain Casting Operations
P.O. Box 2000
Flint, MI 48555-2000

TERMS - NET 30 DAYS
1½% Monthly late payment charge on all outstanding balances due
Payment Due: 07/24/94

DESCRIPTION OF SERVICES	AMOUNT DUE
RE: Demolition of Above Ground Tank Farm (Concrete Containment with 2 - 5,000 Gallon Tanks), and Subsequent Excavation and Disposal of 4 - 10,000 Gallon USTs (Diesel Fuel). As Per PO #PBS03632 Dated April 18, 1994. Services Beyond the Original Scope of Work, as per Attached.	
Additional Analytical Work (Soil & Water Samples) by O'Brien and Gere Engineers.	$ 5,492.50
Additional Sub-Contract Costs Incurred due to 5th Tank Removal, Transportation & Disposal of Concrete Debris to Medora Landfill, Removal & Disposal of Tank Liquids, Removal & Disposal of Tank Sludge, & Contaminated Soil Excavation & Replacement With Clean Fill.	$ 23,381.
10% Profit & 10% Overhead on Sub-Contract Costs.	$ 4,676.30
OBG Technical Services Supervision/Management	$ 3,050.00
Mini-Rac Site Survey Meter Rental (Soil Screening)	$ 567.00
TOTAL AMOUNT DUE THIS INVOICE	$ 37,167.30

PROCESSED
JUN 28 1994
OBG TECHNICAL SERVICES
RBJ

Robert C. Cheeseman, Vice President

REMIT TO: OBG TECHNICAL SERVICES, INC.
PO BOX 2682
SYRACUSE NY 13220-2682

arkway/East Syracuse, NY 13057
100

APPENDIX G.41

NOVEMBER 22, 1977 ANALYTICAL RESULTS

ANATECH SERVICES, INC.

828 Phoenix Dr. Ann Arbor, Mich. 48104 313-973-1270

ANALYTICAL REPORT

ANALYSIS FOR PCB * 1250/1500 ACRE

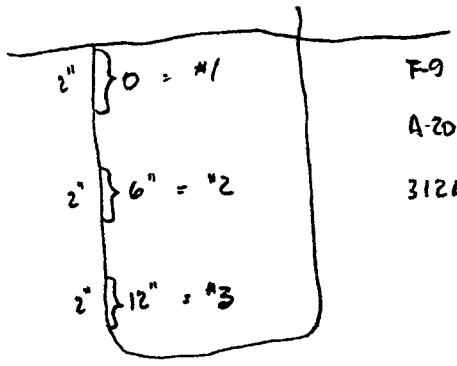
CLIENT Office of the General Counsel
GM Building
3044 West Grand Blvd.
Detroit, Michigan 48202
Attn: Dave Graves

RECEIVED November 23, 1977

DESCRIPTION Various samples as indicated below

ID NOS. As indicated below

METHOD "Manual of Analytical Methods for the Analysis of Pesticide Residues in Human and Environmental Samples"



F-9 60% 1242
A-200 30% 1254
312A 60% 1242

2.5 FEDERAL F:D STD.

RESULTS

Sample ID	PCB(ppm)* whole weight	fat weight
(Milk-bottles)		
#1 11-22-77 AM	0.013	3.43**
#2 11-27-77 AM	0.012	1.76**
Heifer 2 Eartag 17 11-21 PM - new cow	0.073	5.20**
#4 Big White Cow 11-21 PM	0.192	3.37
#4 11-22-77 AM	0.044	1.92
#3 Black 11-21 PM	0.097	8.07**
#3 11-22-77 AM	0.022	5.49**
Heifer 1 11-21-77 PM - NEW Cow	0.109	5.77
(Milk-bags)		
1 11-21 PM	0.094	4.97**
2 11-21 PM	0.054	3.35**
3 11-21 PM	0.043	6.28**
4 11-21 PM	0.032	2.99**

Need 3% min. butter fat level to obtain reliable PCB analysis

Results continued on second sheet

* As Arochlor 1254

**Butter fat level so low as to make fat weight determination unreliable

Signed Richard R Rinkel Date 12-8-77

by and for ANATECH SERVICES, INC.

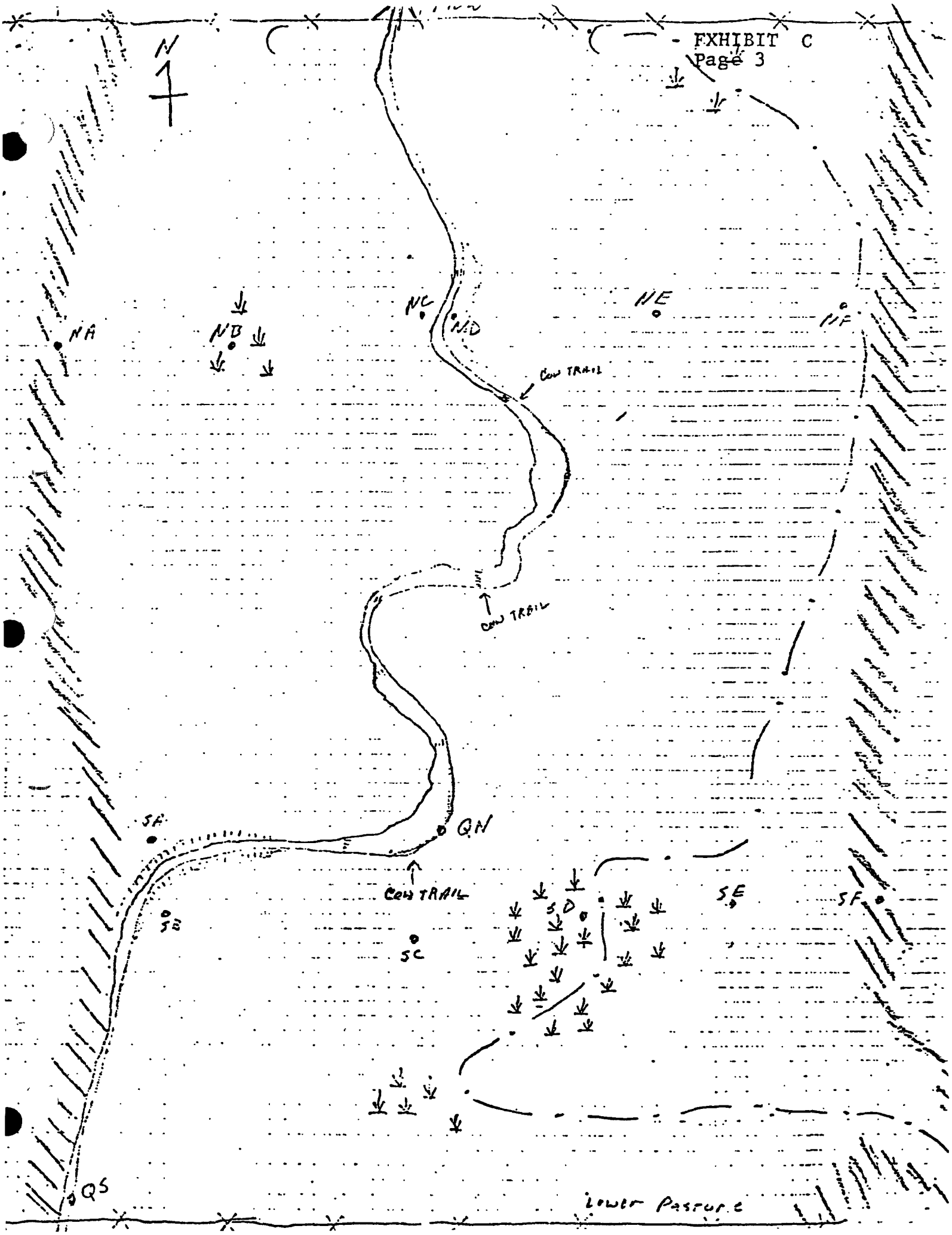
Code nos. 77-2-191,192

SAMPLES REPR COMPOSITE SAMPLING THROUGHOUT ENTIRE NOTED AREAS.

	ID	PCB(ppm)*
(Grass)		
West Side CFD	1248/1254	6.24
CTR CFD	1248/1254	0.202
East Side	1248/1254	0.571
(Sediments)		
QS	1242	825.95
QN	1242	17.09
(Soils)		
NA 1	1248/1254	0.019
NA 2	" "	0.066
NA 3	" "	0.037
NB 1	" "	25.49
NB 2	" "	1.04
NB 3	" "	0.065
NC 1	" "	33.52
NC 2	" "	2.86
NC 3	" "	0.009
ND 1	" "	65.32
ND 2	" "	119
ND 3	" "	220
NE 1	" "	10.63
NE 2	" "	0.048
NE 3	" "	0.063
NF 1	" "	3.01
NF 2	" "	0.036
NF 3	" "	0.009
SA 1	" "	7.85
SA 2	" "	0.116
SA 3	" "	0.080
SB 1	" "	8.80
SB 2	" "	0.056
SB 3	" "	0.131
SC 1	" "	10.48
SC 2	" "	0.064
SC 3	" "	0.121
SD 1	" "	14.41
SD 2	" "	0.295
SD 3	" "	0.126
SE 1	" "	0.635
SE 2	" "	0.181
SE 3	" "	0.131
SF 1	" "	0.011
SF 2	" "	<0.001
SF 3	" "	0.025
Silage	" "	0.032
Silage scrapings top	" "	0.009
Ground corn (M'BRIDE'S CORN)	" "	0.059

Soil 1
1/1 .606
1/2 .049
1/3 .036

* As Arochlor 1248


N
NA
NB
NC
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Cow TRAIL
Cow TRAIL
QN
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SB
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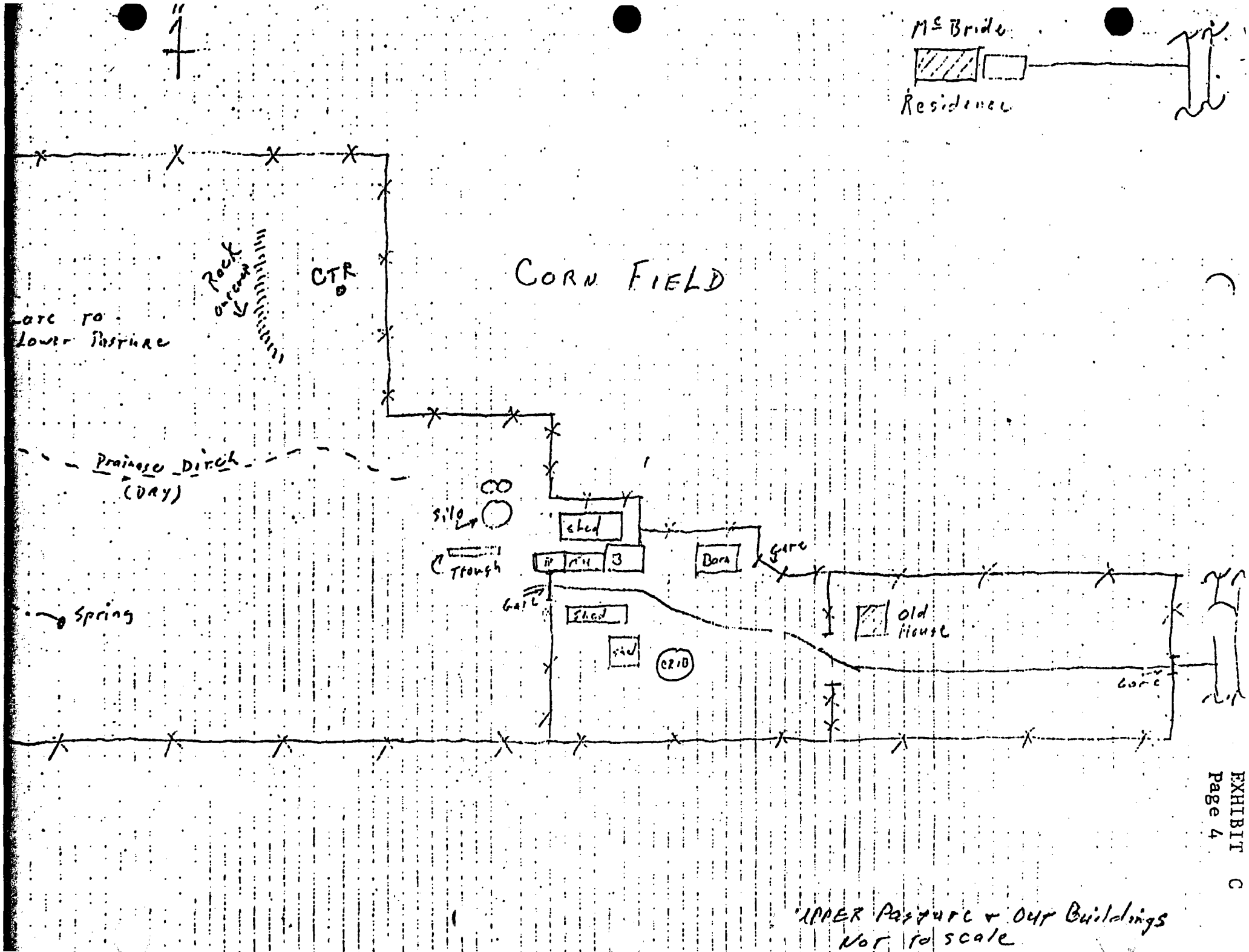
Cow TRAIL
QS
Lower Pasture



UPPER Pasture & Our Buildings
Not to scale

EXHIBIT C
Page 4

Pleasant Run
Ditch
Ditch
Lower Pasture
Upper Pasture
Spring
Fence Lines (Approximate)
not to scale
Residence
County Rd

APPENDIX G.42

CDM REPORT DATED JUNE 22, 1978

6/22/78

CAMP DRESSER & McKEE INC.
Environmental Sciences Division

Rec'd 6-27-78

The Determination of Concentrations of Polychlorinated Biphenyls in the Milk and Adipose Tissue of Certain Cattle

To

Barnes, Hickam, Pantzer and Boyd

From

CDM/ENVIRONMENTAL SCIENCES DIVISION
6132 W. Fond du Lac Ave.
Milwaukee, Wisconsin 53218

CDM
environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & McKEE INC.
6132 West Fond du Lac Avenue
Milwaukee Wisconsin 53218
414 461-9500

June 22, 1978

Mr. Bryan Tabler, Attorney
Barnes, Hickam, Pantzer and Boyd
1313 Merchants Bank Building
Indianapolis, IN 46204

Dear Mr. Tabler:

Enclosed is the revised Analytical Services Report regarding the analysis of polychlorinated biphenyls (PCB's) in cattle milk and tissue biopsy samples obtained from the McBride farm on March 20, 1978. This report incorporates revisions to the May 26, 1978 report due to reassignment of PCB concentration values for standards.

During a quality control check, we observed what appeared to be degradation in the original Aroclor 1254 standard 09C. Therefore we puchased a new Aroclor standard 09C" whose chromatographic peak area values have been used to recalculate sample PCB concentrations, e.g.:

$$\text{Reported Concentration Value} \times \frac{(09C \text{ Peak Area Measured } 6/14)}{(09C'' \text{ Peak Area Measured } 6/14)}$$

= Recalculation Concentration Value.

If you have any questions, please give me or Dr. Mark Cherwin (Chemistry Laboratory Manager) a call.

Sincerely,

CDM ENVIRONMENTAL SCIENCES DIVISION

Daniel F. Buss
Program Manager

DFB/jm

Table of Contents

1. Samples

   a. General Information

   b. Sample Identification

2. Analytical Results

   a. Tissue

   b. Milk

   c. Additional Samples

3. Procedures Employed

   a. Tissue

   b. Milk

   c. Confirmatory Procedures

4. Gas Chromatograph Operating Conditions

5. Discussion

   a. Sample Handling

   b. Procedures

   c. Gas Chromatographic Interpretation

   d. Results

Appendix I: Shrader Analytical & Consulting Laboratories, Inc. Analytical Results

1. Samples

   a. General Information

      Client: Barnes, Hickam, Pantzer, and Boyd
      1313 Merchants Bank Building
      Indianapolis, Indiana 46204

      Attn: Bryan G. Tabler

      Date: May 26, 1978

      Project No.: 78-1062

      Date Received: March 21, 1978

      No. of Samples: Tissue: 15
      Milk: 21

b. Sample Identification

CDM Sample #	Ear Tag #	Age (yrs.)	Date Fresh	Type Milk Per Milking (gal.)	Description	Time on Lower Pasture (yrs.)
1 Tissue	1				Calf	
1A	2				Calf; insufficient sample	
2	3				Calf	
3	4				Calf	
4	5				Calf	
5	6				Calf	
6	7				Milker #106; "Bones"	
7	8				Milker #113; "Heifer with sawed off horns"	
8	9				Non-milker	
9	10				Milker #108, pregnant; "White Fleenor cow, dry"	
10	11				Non-milker	
11	12	4	7 1/2 mo. preg.		Non-milker "Embree in Williams"	2
12	13	4			Non-milker "Johnsons-Heltonville"	2
13	14				Young bull yearling	
14	15	9			Non-milker - "Mitchells"	5-6
15	16	6			Non-milker	4
16 Milk	-	6	11/4/77	2.5/3	Milker #101; "Three-spot"	5
17	-	7	10/24/77	3	Milker #102; "Chain 19"	5
18	-	2.5	10/77	Raised calf	Milker #103; "#10"	No-Pur. fall '77
19	-	4	10/77	4+	Milker #104; "White heifer from Mitchell"	2
20	-	5	11/77	4+	Milker #105; "Cow we raised"	4
21	7	4	11/77	3-4	Milker #106; "Bones"	2
22	-	4	11/77	3-4	Milker #107; "Black three-teat"	2
23	10	6	Due 4/16/78	5-6	Milker #108, pregnant; "White Fleenor cow, dry"	4
24	-	2.5	12/1/77	2/2.5	Milker #109; "Frosty"	No-Pur. fall '77
25	-	3	12/77	2/2.5	Milker #110; "Old ear tag #1077"	1
26	-	4	1/78	2-3	Milker #111; "Black horned cow we raised - has calf in barn"	3
27	-	2.5	1/78	2/2.5	Milker #112; "Old ear tag #725"	No-Pur. fall '77
28	8	2.5	12/77	3	Milker #113; "Heifer with sawed off horns"	No-Pur. fall '77
29	-	6	2/78	4-5	Milker #114; "Black Fleenor cow"	4
30	-	2.5	1/78	3	Milker #115; "Small black & white heifer"	No-Pur. fall '77
31	-	7	1/78	3-4	Milker #116; "Holmes heifer"	6
32	-	4	1/78	3+	Milker #117; "Old yellow ear tag #25"	2
33	-	4	12/77	3+	Milker #118; "Old white ear tag #15"	1 1/2
34	-	5	12/77	2.5/3	Milker #119; "Old black ear tag #25"	1
35	-	7	11/77	3-4	Milker #120; "White big-bag cow raised calf in main barn"	6
36	-	2.5	12/77	2+	Milker #121; "Wild heifer from B. Blackburns"	No-Pur. fall '77

Additional historical data has been supplied by T.A. Appold as follows.

The first six calves listed, as well as all the yearlings, were never exposed to the lower pasture area. Typically, all the yearlings were in the 700-800 lb. weight range. The cows were all fed silage. hay and ground feed, whereas the yearlings were fed hay and ground feed only. The six cows purchased in the fall of 1977 (as indicated), came from the Blackburn farm.

2. Analytical Results

a. Tissue

CDM Sample No.	Sample Weight for Extraction (g)	Fat weight for analysis (g)	% Fat	PCB mg/kg*
1	(Sample lost during transfer of extract)			
2	11.0999	2.2836	20.6	0.46
3	6.7006	0.0909	1.37	9.4
4	12.3612	0.1251	1.01	<5.2
5	3.7670	0.0077	0.20	<84.
6	15.3169	0.4391	2.87	4.6
7	5.6464	0.0128	0.227	<5.1
8	18.5487	1.8344	9.89	4.5
9	18.0890	3.7701	20.8	1.5
10	11.9067	0.6458	5.42	0.44
11	3.0945	0.1811	5.85	12.0
12	9.1937	0.1465	1.59	8.8
13	3.8833	0.1268	3.27	6.4
14	17.2011	0.4451	2.59	7.9
15	8.6762	0.8359	9.63	3.2

PPM

* Fat weight basis, as Aroclor 1254.

2. Analytical Results
(continued)

b. Milk

CDM Sample No.	Sample Weight for Extraction (g)	Fat Weight for Analysis (g)	% Fat	PCB mg/kg*
16	102.6	1.0	0.98	1.2
17	106.4	0.9	0.85	1.5
18	98.4	3.6	3.7	2.0
19	104.5	7.4	7.1	0.94
20	106.6	5.2	4.9	5.6
21	103.7	3.2	3.1	1.7
22	99.5	0.7	0.7	2.1
23	99.6	2.1	2.1	0.98
24	102.5	5.3	5.2	0.29
25	101.1	5.5	5.4	0.90
26	98.4	2.0	2.0	1.3
27	101.3	7.8	7.7	1.1
28	100.7	4.5	4.5	0.81
29	104.6	1.6	1.5	2.0
30	105.3	6.9	6.6	1.6
31	101.3	0.7	0.7	4.5
32	101.8	5.2	5.1	4.3
33	103.6	3.6	3.4	0.79
34	107.1	4.1	3.8	2.4
35	105.9	8.1	7.6	1.8
36	101.0	2.0	2.0	1.5

* Fat weight basis, as Aroclor 1254.

c. Additional Samples

Replicates

-9R	4.421	3.182	71.97	1.1
-18R	106.0	3.8	3.6	1.4

Blanks

Blank-milk	-	-	-	Negligible
Blank-tissue	-	-	-	Negligible

% Recovery				% Recovery
-9	4.893	2.447	50.0	101.1
-24	102.6	4.9	4.8	101.1

3. Procedures Employed

a. Milk

Determination of Fat in Milk
(Roese - Gottlieb Method)

Reference: Official Methods of Analysis, AOAC, 12th Edition, 1975.

b. Tissue & Milk

Analysis of Adipose Tissue for Polychlorinated Biphenyls

References: EPA, Analysis of Pesticide Residues in Human and Environmental Samples, 1977.

Reynolds, Lincoln M., "Polychlorobiphenyls (PCB's) and their Interference with Pesticide Residue Analysis", Bull. Environ. Contam. and Tox., 1969, Vol. 4, No. 3.

c. Confirmatory Procedures - Tissue & Milk

1. Micro Scale Alkali Treatment for Use in Pesticide Residue Confirmation and Sample Cleanup

References: EPA, Analysis of Pesticide Residues in Human and Environmental Samples, 1977.

Law, LeRoy M. and Goerlitz, Donald F., "Microcolumn Chromatographic Cleanup for the Analysis of Pesticides in Water", JAOAC, Vol. 53, No. 6, 1970.

Reynolds, Lincoln M., Polychloro-biphenyls (PCB's) and their Interference with Pesticide Residue Analysis", Bull. Environ. Contam & Tax., Vol. 4, No. 3, 1969.

2. Quantitative Perchlorination of Polychlorinated Biphenyls as a Method for Confirmatory Residue Measurement and Identification.

Reference: Analytical Methodology for Poly-chlorinated Biphenyls, Food and Drug Administration, 1973.

4. Gas Chromatograph Operating Conditions

All analyses were performed with a Perkin-Elmer Model 900 Gas Chromatograph equipped with a tritium source electron capture detector and a Perkin-Elmer Model 56 strip chart recorder. All blanks, standards, and samples were analyzed under the following conditions:

Carrier Gas:	95% Argon/5% Methane
Flow Rate:	70 ml/min.
Column Composition:	1.5% OV17/1.95% QF1
Column Substrate:	80/100 Chromosorb WHP
Column Dimensions:	Glass, 6ft. x 4 mm. I.D.
Column Temperature:	190°C, Isothermal
Injector Temperature:	200°C
Manifold Temperature:	200°C
Detector Temperature:	195°C
Detector Polarity:	B
Attenuation:	x 8
Amplification:	x 1
Chart Speed:	10 mm/min.
Sample Size:	1-8 µl

The following conditions were employed as a confirmatory analysis:

Column Composition: 5% SP2401
(equivalent to 5% OV210)

All other conditions were as listed above.

5. Discussion

a. Sample Handling

Both tissue and milk samples were frozen upon arrival at CDM and remained in this state until the analyses were carried out. Samples can be held in this fashion for periods of up to one month according to EPA procedures.

b. Procedures

A general description of the procedure used in the analysis of adipose tissue is as follows. A sample of tissue is dried and macerated with sodium sulfate and the fat is isolated by repetitive extractions with hexane. The percent fat is determined by evaporating the solvent and weighing the fat extract, then calculating from the tissue weight. The PCB's are then extracted from the fat with acetonitrile and partitioned back into hexane by aqueous dilution of the acetonitrile. The final hexane extract is concentrated to 5ml and transferred to a florisil column for cleanup via hexane elution. The eluate is concentrated to a suitable volume and analyzed by gas chromotography.

A general description of the procedures used in the analysis of milk are as follows. A well mixed sample of milk is weighed out and triple extracted with suitable organic solvents.

The solvent portions are washed and transferred to a tared flask, evaporated and reweighed for the percent fat calculation. The fat is then worked up as in the tissue procedure.

The Micro Scale Alkali Treatment procedure used to confirm the presence of PCB's can be summarized as follows. The stability of PCB to alkali permits the use of alkaline hydrolysis as a test for confirming the identity of PCB residues. At the same time, the conversion of certain pesticides to their olefins via alkali treatment provides a means of removing some interferences from the quantitative measurement of PCB's. Alkaline hydrolysis also provides an additional cleanup for many sample types, since it saponifies fats. A concentrated extract or cleaned up extract is treated with potassium hydroxide to effect dehydrochlorination. The alkali stable compounds are then extracted with hexane and eluted on a florisil micro column.

The perchlorination of PCB's as a confirmatory method can be summarized as follows. The perchlorination procedure for derivatization of PCB is a technique whereby commercial multicomponent preparations (Aroclors) are converted to a single derivative, decachlorobiphenyl. Aroclors contain only partially chlorinated biphenyl rings. This procedure converts any biphenyl ring present in the sample to a fully (saturated) chlorinated biphenyl ring: Decachlorobiphenyl. Cleaned up sample extracts containing PCB residues are reacted with antimony pentachloride in the presence of chloroform to form decachlorobiphenyl. The derivative is extracted with hexane, washed, and concentrated for gas chromotographic analysis using a 2 ft. stainless steel column.

c. Gas Chromatographic Interpretation

As mentioned above, commercial PCB mixtures (Aroclors) consist of biphenyl rings chlorinated to various degrees (isomers). In the analysis of animal-source PCB residues the complete pattern of PCB isomers for a particular Aroclor does not exist. Thus, only a small percentage of isomers remain after animal ingestion and subsequent metabolic degradation. This was confirmed in the analysis of both the tissue and milk samples. Only three of the more stable PCB isomers were found in the sample extracts. They were identified as part of the Aroclor 1254 mixture. The other 15 isomers of Aroclor 1254 were not identifiable due to degredation. The three isomers found in the samples were confirmed as being part of the Aroclor 1254 mixture by gas chromatographic introduction using a second column.

The presence of PCB isomers in the sample was further confirmed using alkali treatment. The three suspected isomers were stable under alkali treatment, as is characteristic of PCB's. The derivatization procedure also confirmed the presence of PCB's, since decachlorobiphenyl was formed from the sample extracts.

The presence of PCB isomers in a milk sample extract was confimed via GC/MS analysis at Shrader Analytical Laboratories. Mass Spectroscopy (MS) offers positive identification of the components of a sample extract via measurement of the components' mass fragmentation pattern. Two samples were sent to Shrader: 78-1062-32, a milk sample extract; and 78-1062-S, a standard mixture of Aroclor 1254. Both were found to contain tetra- and pentachlorobiphenyl isomers, components of the Aroclor 1254 mixture.

d. Results

Results are expressed as mg PCB/kg of fat or parts per million on a fat weight basis, as Aroclor 1254.

Percent recovery figures indicate a high level of efficiency in procedural and instrumental methodology.

Data for the blanks indicate low levels of contaminant introduction, through reagents, glassware, etc., incorporated in the procedures.

Variation of the detection limit for those samples where PCB was not detected [i.e. results labeled "less than" (>)], is due to the low levels of fat extracted from these samples.

Appendix I

Shrader Analytical & Consulting Laboratories, Inc.
Analytical Results

Shrader Analytical & CONSULTING LABORATORIES, INC.
MASS SPECTROMETRY, GAS CHROMATOGRAPHY, ELEMENTAL ANALYSES

3450 LOVETT AVENUE • DETROIT, MICHIGAN 48210

894-4440
894-4441

ANALYTICAL RESULTS May 4, 1978

CUSTOMER : CDM (NEVILLE)

SAMPLE NO. : 78 - 1062 - S and - 32

ANALYSIS : GC/MS

RESULTS : The above samples were analyzed by GC/MS to determine the presence of polychlorinated biphenyl. The analysis was performed on a 6' 3% SE 30 column programmed from 180-350° at 10°/min.

Sample S produced barely detectable ions whose retention times, mass, mass defect and isotope intensity ratios identified as tetrachlora and pentachlorobiphenyl. Interfering hydracarbon ions prevented positive identification of suspected trichlorobiphenyl ions.

Sample 32 produced clear spectra of tetrachloro and pentachlorobiphenyl, of intensity similar to that of a 50ng standard (sample vol. = 10ul). The enclosed mass chromatogtam identifies the somposition of the major GC peaks.

We regret the loss of samples 9 and 30 and e inconvenience this has caused you.

John A. Defever

Sample 78-1062-32
Time
Scan#
Total ion current
Tetrachloro
Pentachloro
2.33
3.24
4.16
5.46
5.57
6.40

Shrader Analytical & CONSULTING LABORATORIES, INC.
MASS SPECTROMETRY, GAS CHROMATOGRAPHY, ELEMENTAL ANALYSES

3450 LOVETT AVENUE • DETROIT, MICHIGAN 48210

894-4440
894-4441

Run Name: 32 Scan No: 81, 92

Customer: CDM

Sample No: 78-1062-32

Conditions: 6' x 2mm, 3% SE30
180-350 C @ 10°/min

32 86 03-MAY-78 1. 1

MASS	% INT MOD.	ABS INT
204	4.31	27
205	7.19	45
206	2.24	14
207	100.00	626
208	19.97	125
209	16.45	103
210	4.47	28
211	3.51	22
212	2.40	15
217	4.79	30
218	2.88	18
219	2.08	13
220	21.09	132
221	7.19	45
222	14.86	93
223	3.35	21
224	2.88	18
229	2.24	14
230	1.92	12
231	1.92	12
249	2.56	16
251	2.40	15
252	1.92	12
255	2.08	13
256	2.88	18
258	2.72	17
265	3.83	24
267	7.03	44
273	1.92	12
276	1.92	12
277	23.96	150
278	9.27	58
279	5.75	36
281	19.81	124
282	7.03	44
283	3.35	21
286	2.56	16
290	24.28	152
291	3.83	24
292	34.98	219
293	4.31	27
294	15.81	99
295	2.08	13
296	3.35	21
327	2.24	14
342	5.43	34
356	7.51	47
357	1.92	12

32 92 03-MAY-78 2. 1

MASS	% INT MOL.	ABS INT
204	2.74	18
205	10.20	67
207	100.00	657
208	19.33	127
209	15.37	101
210	3.04	20
211	3.96	26
213	2.28	15
215	2.44	16
217	3.81	25
218	3.20	21
219	2.89	19
220	7.31	48
221	6.24	41
222	6.39	42
223	3.04	20
225	2.59	17
229	2.44	16
231	2.44	16
233	3.20	21
249	2.28	15
251	2.44	16
252	2.13	14
254	16.89	111
255	4.11	27
256	19.48	128
257	2.74	18
258	7.00	46
265	3.65	24
266	1.98	13
267	5.94	39
277	21.92	144
278	5.63	37
279	6.85	45
281	20.09	132
282	5.94	39
283	3.35	22
289	4.72	31
290	7.91	52
291	7.15	47
292	11.42	75
293	5.63	37
294	6.24	41
324	17.05	112
325	4.72	31
326	29.53	194
327	5.18	34
328	19.18	126
329	4.72	31
330	5.63	37
341	3.50	23
355	7.31	48

Shrader Analytical & CONSULTING LABORATORIES, INC.
MASS SPECTROMETRY, GAS CHROMATOGRAPHY, ELEMENTAL ANALYSES

3450 LOVETT AVENUE • DETROIT, MICHIGAN 48210

894-4440
894-4441

Run Name: 5 Scan No: 164-94

Customer: CDM

Sample No: 5

Conditions: 6' x 2mm, 3% SE30
180-350 C @ 10°/min

S 64 03-MAY-78 1. 1

MASS	ABS INT	
280.0	6	
280.9	84	
282.0	28	
283.0	17	
284.1	20	
285.0	7	
286.1	16	
287.2	8	
288.1	13	
289.8	4	←
290.1	11	Tetra-chlorobiphenyl
291.2	6	
291.8	9	←
292.2	14	
293.2	9	
294.2	5	
295.1	8	
300.0	7	
300.2	6	
302.2	5	
315.4	6	

APPENDIX G.43

USDA LETTER DATED APRIL 6, 1978

UNITED STATES DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION

FEDERAL RESEARCH
NORTHEASTERN REGION
BELTSVILLE AGRICULTURAL RESEARCH CENTER
BELTSVILLE, MARYLAND 20705

EXHIBIT G

GENERAL COUNSEL
D. Graves

April 6, 1978

Mr. David W. Graves, Jr.
Office of General Counsel
General Motors Corporation
General Motors Building
Detroit, Michigan 48202

Dear Mr. Graves:

As agreed in our recent conversations, this letter provides my suggestions on possible uses of the lower 20 acres and the soil sampling necessary to evaluate the upper 80 acres of the McBride farm. My suggestions are strictly based on the likelihood of unacceptable PCB residues and I have not considered the agronomic or soil characteristics necessary for the production of a given crop.

The lower 20 acres should not be used as pasture by any class of livestock or used to produce forage crops for animals. These crops would include alfalfa, clovers or grass used as hay or silage, and corn for silage. Also, leafy or root vegetables for human consumption should not be grown on this land.

Grain crops such as corn, wheat, oats, barley, and soybeans can be grown without significant PCB residues. However, the straw should not be used for animal feed or bedding. All classes of fruit and nut trees could also be grown.

I have divided the upper 80 acres into four areas for evaluating soil PCB levels. These areas were selected because of their differing past histories and possible future uses. They have been designated A, B, C, and D on the copy of the farm map you supplied. I should note that some of the features of the upper pasture on the map do not agree with my memory but the following descriptions should indicate my intent:

Area A: The part of the upper pasture adjacent to the buildings that is completely denuded of grass because of the heavy animal traffic. For convenience, it is the area behind the barn bounded by fence on the east.

Area B: The southwest part of the upper pasture that is fenced off from the rest of the upper pasture. This includes the old pig area.

Area C: The remainder of the upper pasture that lies beyond are A between the corn field and the stream from the spring.

Area D: The cornfield.

The wooded areas do not require sampling. Although cows may use these areas for shade during hot weather, the chances of soil residues are much less than any other area and there is little likelihood that cows will find feed in the area.

The sampling sites within an area should be selected by laying out a grid system. Core samples are then taken at each of grid intersections and composited to provide a single sample for the entire area. Four replicate composite samples should be obtained from each area.

The grid lines should be laid out at approximately equal intervals but they do not have to be located precisely. I would consider "eyeball" estimates using distinctive boundry features sufficient for locating a sampling point. The four replicate cores can then be randomly taken within a 10-20 foot radius of this point.

The number grid lines and sampling points for each area are as follows:

Area A: 4 X 4 with 16 points

Area B: 3 X 3 with 9 points

Area C: 3 X 3 with 9 points

Area D: 4 X 5. Because of the unevenness of the bounderies, the number of sampling points will be somewhat less than 20.

The core samples should be taken to an approximate depth of 3 inches. It is not practical to go to an exact depth. The largest diameter core sample readily available should be used.

Before analysis the composite samples should be passed through a 2 mm sieve and thoroughly mixed. Any recognized analytical method can be used and I will make specific suggestions if requested. The soils should be analyzed as received and not dried to avoid possible loss of the residue by volatilization. In addition to the concentration of residue, the following information should be reported for each composite sample: (1) number of cores (2) diameter of the cores (3) total weight, and (4) the dry matter content.

I feel it would be a good idea if the individual doing the soil sampling contacted me to discuss the details of my suggestions. This would eliminate the possibility of misunderstandings about my intent.

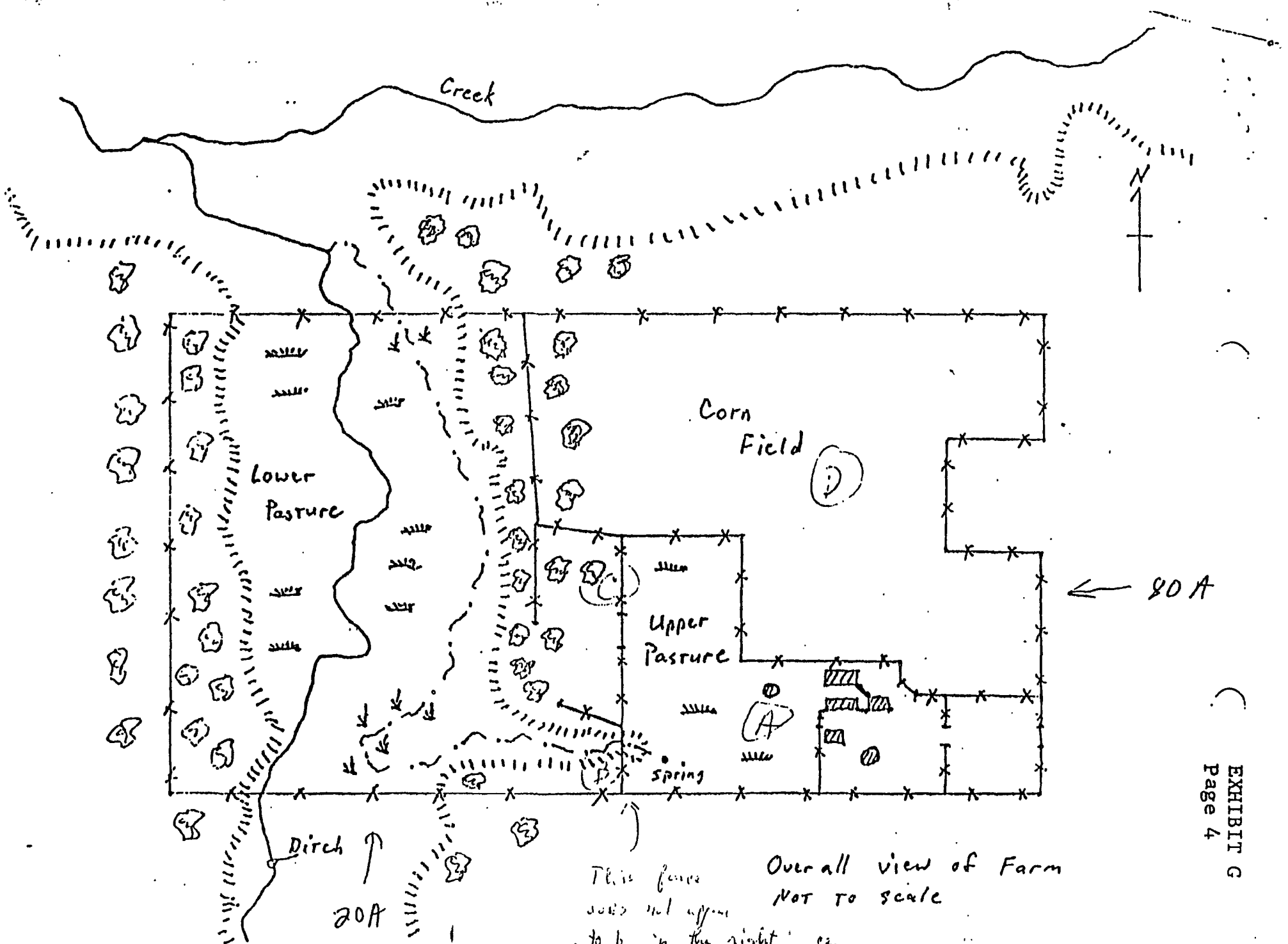
Feel free to contact me if there are any questions pertaining to the above suggestions.

Sincerely,

George F Fries

George F. Fries, Animal Scientist
Pesticide Degradation Laboratory
Agricultural Environmental
Quality Institute

Enclosure



Overall view of Farm
NOT TO SCALE

EXHIBIT G
Page 4

APPENDIX G.44

CDM REPORT DATED JUNE 29, 1978

The Determination of Concentrations of Polychlorinated Biphenyls in Soil Samples at the McBride Farm

To

Barnes, Hickam, Pantzer, & Boyd

Prepared By

Camp Dresser & McKee Inc.
Environmental Sciences Division
6132 W. Fond du Lac Avenue
Milwaukee, Wisconsin 53218
(414) 461-9500

environmental engineers, scientists,
planners, & management consultants

CAMP DRESSER & McKEE INC.
Environmental Sciences Division

6132 West Fond du Lac Avenue
Milwaukee, Wisconsin 53218
414 461-9500

June 29, 1978

Mr. Bryan Tabler Attorney
Barnes, Hickam, Pantzer & Boyd
1313 Merchants Bank Building
Indianapolis, Indiana 46204

Dear Mr. Tabler,

Enclosed are three copies of the Analytical Services Report regarding the analyses of polychlorinated biphenyls (PCB's) in soil samples obtained from the McBride farm on April 26, 1978. Please distribute these reports to the appropriate parties.

If there are any questions regarding this report, please contact us.

Sincerely,

Camp Dresser & McKee Inc.
Environmental Sciences Division

Daniel F. Buss
Program Manager

Mark G. Cherwin, Ph.D.
Chemistry Laboratory Manager

DFB/kt

Table of Contents

1. Samples

   a. General Information

   b. Sample Identification and Collection Information

2. Analytical Results

   a. Soil Samples

   b. Additional Samples

3. Procedures Employed

   a. Percent Dry Weight

   b. Extraction and Cleanup of Soil Samples

4. Gas Chromatograph Operating Conditions

5. Discussion

   a. Sample Handling

   b. Procedures

   c. Gas Chromatographic Interpretation

   d. Results

Appendix I: Shrader Analytical & Consulting Laboratories, Inc. Analytical Results

1. Samples

   a. General Information

      Client: Barnes, Hickam, Pantzer, and Boyd

      1313 Merchants Bank Building

      Indianapolis, Indiana 46204

      Attn: Bryan G. Tabler

      Date: June 28, 1978

      Project No.: 78-1070

      Date Received: April 27, 1978

      No. of Samples: Soil: 16

b. Sample Identification and Collection Information

Soil samples were collected during April 26, 1978 from the McBride farm for determining concentrations of PCB's. The McBride soil study was based upon the sampling design outlined in Dr. George Fries' April 6, 1978 letter to Mr. David W. Graves attorney.

Samples were collected from four areas and the relationship of these areas is presented in Figure 1. These sampling areas were:

(1) Area A (Figure 2) - The part of the upper pasture adjacent to the buildings that was generally denuded of grass because of the heavy animal traffic and the area behind the barn bounded by the fence on the east;

(2) Area B (Figure 3) - The southwest part of the upper pasture that was fenced off from the rest of the upper pasture which included the old pig area;

(3) Area C (Figure 4) - The portion of the upper pasture that lies beyond Area A and bounding to the North and South Area B;

(4) Area D (Figure 5) - The cornfield.

In each area four replicate composite samples were collected. The number of cores composing the composite samples for the areas, sample weight before and after sieving are presented in Table 1. The sampling sites within an area were selected by laying out a grid system. Four replicate cores were collected randomly within a 20 ft. radius of each grid intersection point. Core samples were then taken with a two inch corer to a depth of approximately three inches. Each core was individually wrapped in aluminum foil, placed in the proper burlap bag and immediately placed in an ice chest. Samples were transported back to the CDM-Milwaukee laboratory and stored in a refrigerator. Each composite sample was sieved through a 2 mm sieve and thoroughly mixed prior to analysis.

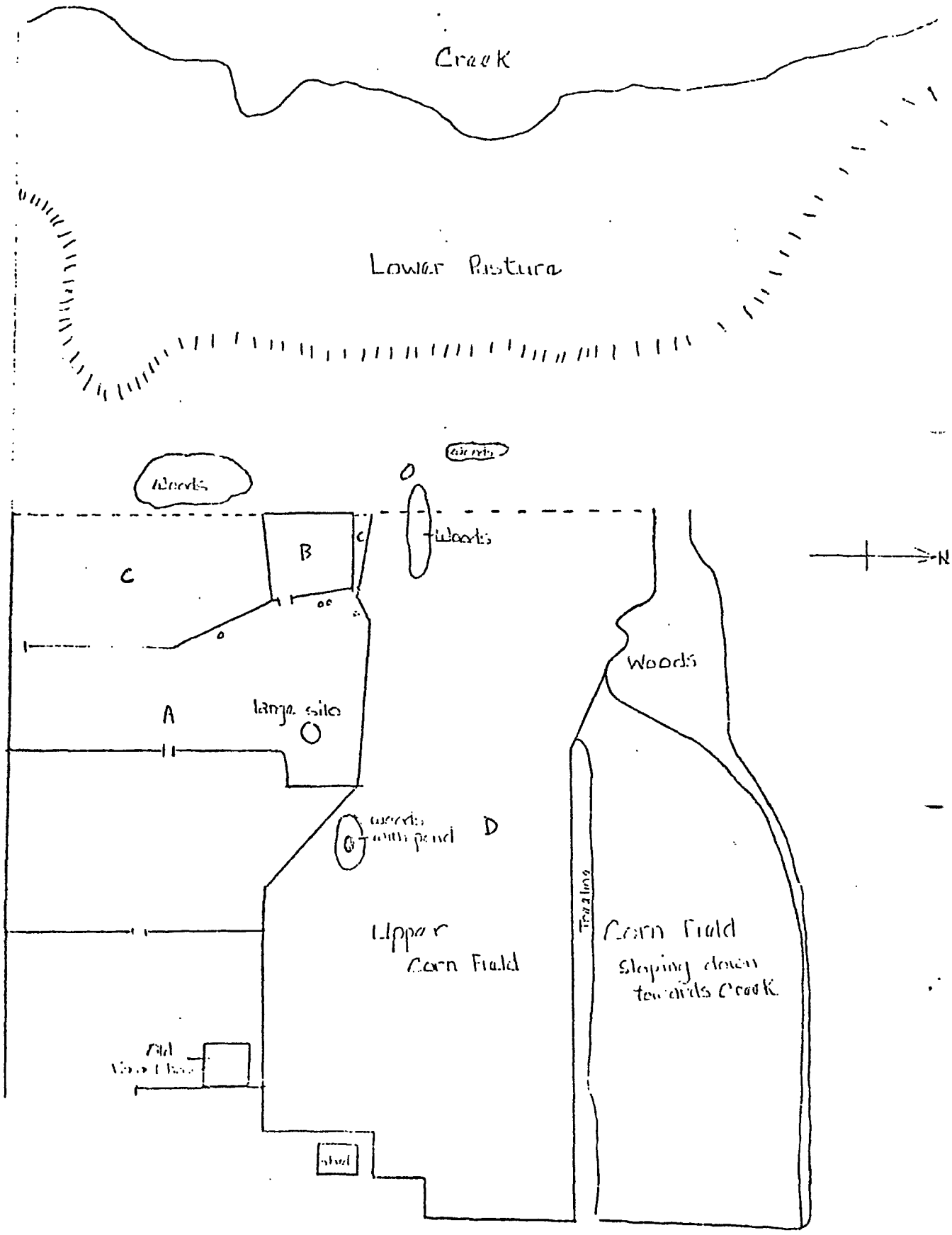


Figure 1 Areas sampled on the McBride Farm

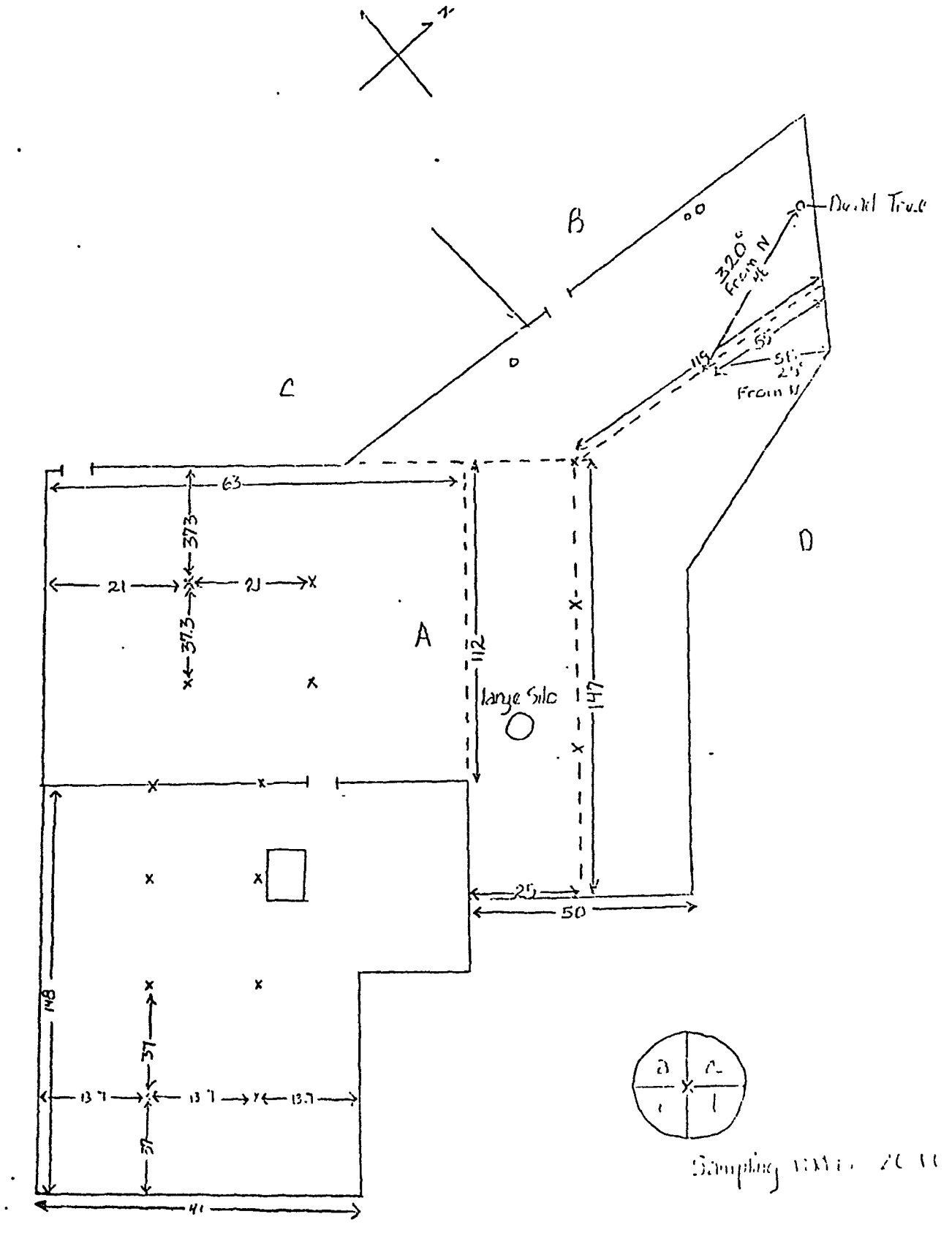


Figure 2 Area A

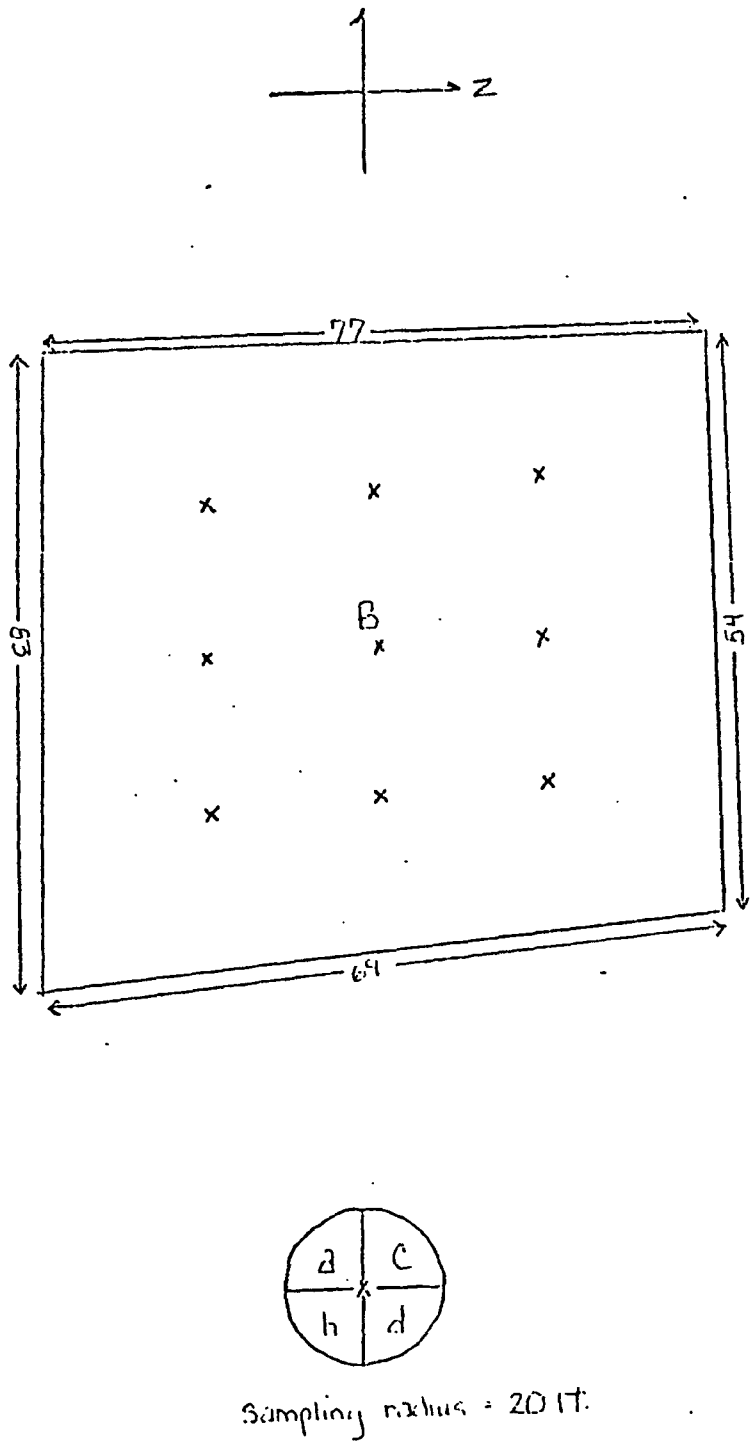
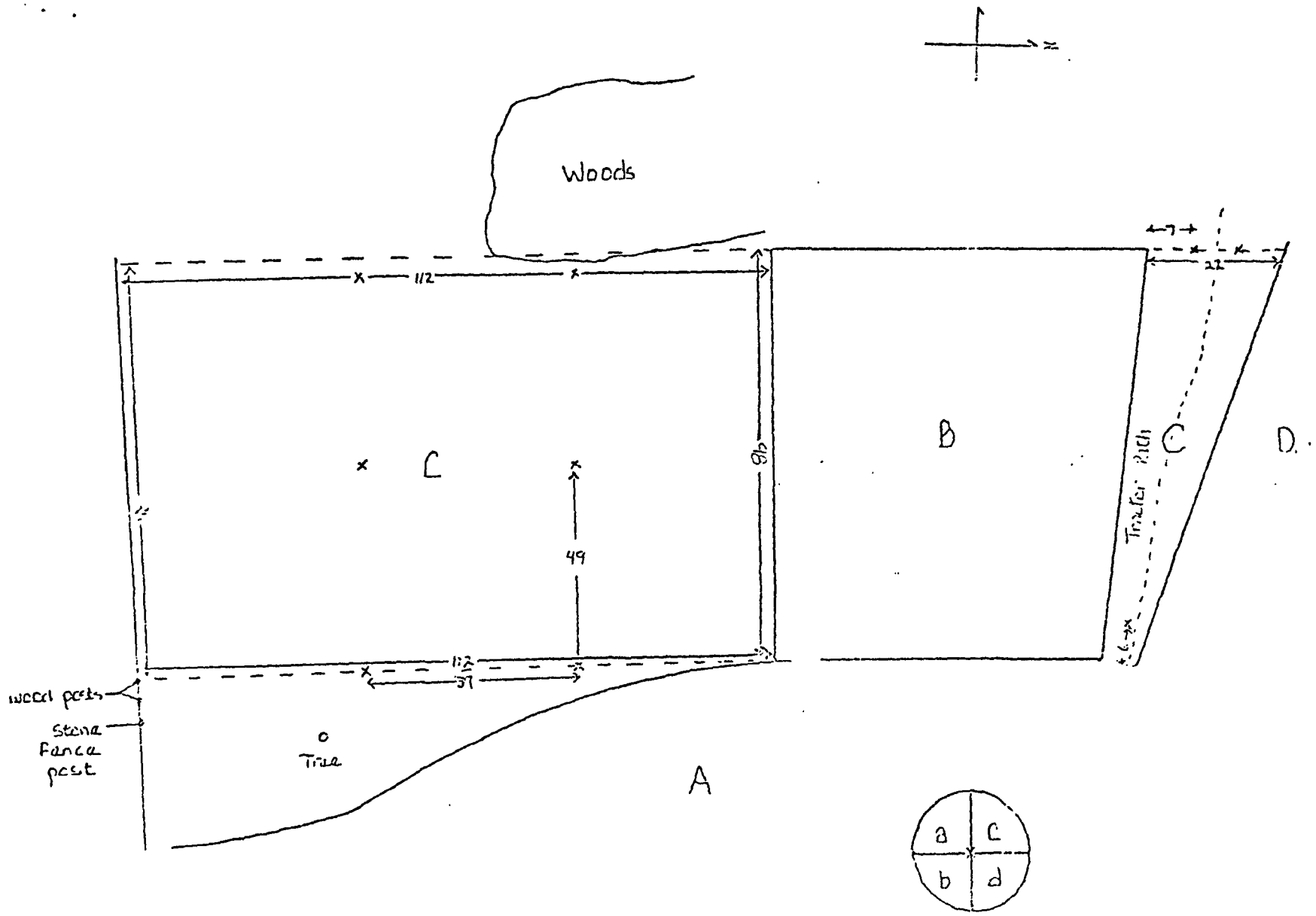


Figure 3 Area B

Figure 4 Area C



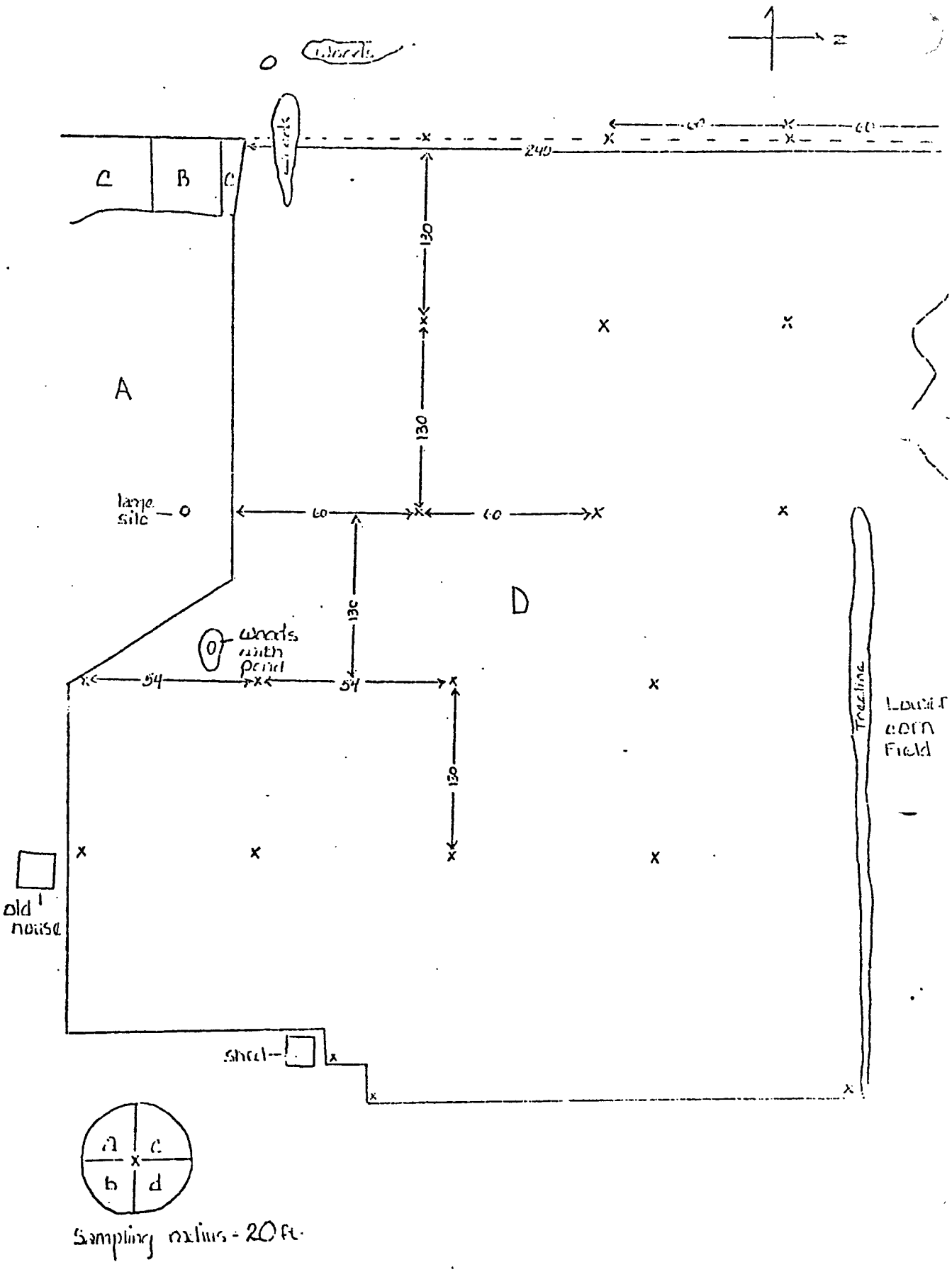


Figure 5 Area D

SOIL SAMPLE DATA FORM

Table 1

ample umber	Number of Cores	Core Diameter	Sample Weight * Before Sieving	Sample Weight After Sieving
A-a	16		8 lb. 4 oz.	7 lb. 14 oz.
A-b	16		7 lb. 10 oz.	7 lb. 6 oz.
A-c	16		8 lb. 5 oz.	7 lb. 14 oz.
A-d	16		7 lb. 9 oz.	7 lb. 4 oz.
B-a	9		5 lb. 7 oz.	5 lb. 3 oz.
-b	9		4 lb. 14 oz.	4 lb. 10 oz.
	9		5 lb. 2 oz.	4 lb. 14 oz.
	9		5 lb. 5 oz.	5 lb. 1 oz.
-a	9		5 lb. 6 oz.	5 lb.
-b	9		5 lb. 7 oz.	5 lb. 4 oz.
-c	9		5 lb. 10 oz.	5 lb. 7 oz.
-d	9		5 lb. 11 oz.	5 lb. 5 oz.
-a	19		10 lb. 11 oz.	9 lb. 15 oz.
-b	19		10 lb. 4 oz.	10 lb.

alyst Greg Vogel

Does not include weight of burlap bag, aluminum foil or waste

SOIL SAMPLE DATA FORM

ample umber	Number of Cores	Core Diameter	Sample Weight * Before Sieving	Sample Weight After Sieving
D-c	19		10 lb. 9 oz.	10 lb. 1 oz.
D-d	19		10 lb. 6 oz.	10 lb. 2 oz.

alyst Greg Vogel

Does not include weight of burlap bag, aluminum foil or waste

2. Analytical Results
   a. Soil Samples

CDM Sample No.	Wet Sample Weight Extracted (g)	Percent Dry Weight	PCB mg/kg* ppm
A - a	100	74.76	0.22
A - b	100	72.55	0.33
A - c	100	74.02	0.19
A - d	100	74.18	0.26
B - a	100	75.33	<0.066
B - b	100	73.97	0.078
B - c	100	75.02	<0.067
B - d	100	79.82	0.044
C - a	100	81.31	0.11
C - b	100	81.20	0.34
C - c	100	80.79	0.052
C - d	100	80.53	0.11
D - a	100	81.29	<0.062
D - b	100	84.36	<0.059
D - c	100	81.89	<0.061
D - d	100	81.46	<0.061

* Dry weight basis, as Aroclor 1248

   b. Additional Samples

Blank			
78-1070 - Blk	-	-	Negligible

3. Procedures Employed
   a. Percent Dry Weight
      Determination of Percent Dry Weight
      APHA Standard Methods, 14th ed., 1975, pp. 96-98.
      EPA Chemistry Laboratory Manual - Bottom Sediments, 1969, pp. 85-86.

   b. Extraction and Cleanup of Soil Samples
      Pretreatment of Sediment for the Determination of Pesticide Residues and/or Polychlorinated Biphenyls

EPA, Great Lakes Region Committee on Analytical Methods, Chemistry Laboratory Manual: Bottom Sediments, 1969.

EPA, Analysis of Pesticide Residues in Human and Environmental Samples, 1972.

EPA, "Method for Polychlorinated Biphenyls (PCB's) in Industrial Effluents," 1973.

EPA, "Method for Organochlorine Pesticides in Industrial Effluents," 1973.

EPA, "Method for Organophosphorus Pesticides in Industrial Effluents," 1973.

FDA, Pesticide Analytical Manual, Vol. I, 1971.

Pionke, H.B., Chesters, and Armstrong, "Extraction of Chlorinated Hydrocarbon Insecticides from Soils," Agronomy Journal, 1968, Vol. 60.

Saha, J.G., "Comparison of Several Methods for Extracting Chlordane Residues from Soil," J.A.O.A.C., 1971, Vol. 54.

Reynolds, L.M., "Polychlorobiphenyls (PCB's) and their Interference with Pesticide Residue Analysis," Bull. Envi. Cont. & Taxl, 1969, Vol. 4, No. 3.

4 . Gas Chromatograph Operating Conditions

All analyses were performed with a Perkin-Elmer Model 900 Gas Chromatograph equipped with a tritium source electron capture detector and a Perkin-Elmer Model 56 strip chart recorder. All blanks, standards, and samples were analyzed under the following conditions:

Carrier Gas:	95% Argon/5% Methane
Flow Rate:	70 ml/min.
Column Composition:	1.5% OVI7/1.95% QF1
Column Substrate:	80/100 Chromosorb WHP
Column Dimensions:	Glass, 6 ft. x 4 mm. I.D.
Column Temperature:	190°C, Isothermal
Injector Temperature:	220°C
Manifold Temperature:	200° C
Detector Temperature:	195° C
Detector Polarity:	B
Attenuation:	X 8
Amplification:	X 1
Chart Speed:	10 mm/min.
Sample Size:	1-8 ul

The following conditions were employed as a confirmatory analysis:

Column Composition: 5% SP2401
(equivalent to 5% OV210)

All other conditions were as listed above.

5. Discussion

a. Sample Handling

Soil samples were refrigerated at 4° C upon arrival at CDM and remained in this state until they were sieved and analyzed.

b. Procedures

A general description of the procedures employed in the analysis of PCB's in soils is as follows. PCB's adsorbed on particulate matter may be desorbed by continuous soxhlet extraction with suitable organic solvents. Thus, one hundred grams of wet sediment is weighed out for extraction; a separate ten gram portion is weighed out, dried at 104°C and reweighed for the percent dry weight determination. The 100 g sample is then dried with anhydrous magnesium sulfate, transferred to a soxhlet extractor and extracted for 18 hours with 1:1 acetone-hexane. The extract is then concentrated and transferred to a florisil column and eluted with 200 ml of hexane. The eluate is then concentrated to 10 ml for gas chromatographic analysis, using fresh PCB standards for qualitative and quantitative purposes.

c. Gas Chromatographic Interpretation

Commercial PCB mixtures (Aroclors) consist of biphenyl rings chlorinated to various degrees (isomers). In the analysis of soil-source PCB residues, the complete pattern of PCB isomers, for a particular Aroclor, often is not visible. In such cases, only a small percentage of isomers are used to identify and quantify the particular Aroclor present. This was the case in the analysis of the McBride soil samples. Only five of the more stable PCB isomers were found in the sample extracts. They were identified as part of the Aroclor 1248 mixture. The other 10 isomers of Aroclor 1248 were not identifiable due to contaminant interference and degradation. The five isomers found in the samples were confirmed as being part of the Aroclor 1248 mixture by gas chromatographic introduction using a second column. Thus a perfect match was not made between Aroclor 1248 and the soil extracts, but this Aroclor mixture most closely resembled these extracts.

The presence of PCB isomers in a soil sample extract was confirmed via GC/MS analysis at Shrader Analytical Laboratories. Mass Spectroscopy (MS) offers positive identification of the components of a sample extract via measurement of the components' mass fragmentation pattern. One sample was sent to Shrader: 78-1070-A-B . This sample was found to contain the tetrachlorobiphenyl isomer, a component of the Aroclor 1248 mixture.

Appendix I

Shrader Analytical & Consulting Laboratories, Inc.
Analytical Results

Shrader Analytical & CONSULTING LABORATORIES, INC.
MASS SPECTROMETRY, GAS CHROMATOGRAPHY, ELEMENTAL ANALYSES

3460 LOVETT AVENUE • DETROIT, MICHIGAN 48210

894-4440
894-4441

June 19, 1978

ANALYTICAL RESULTS

CUSTOMER : CDM - Environmental Science Div.

SAMPLE NO. : 78-1070-A-B

ANALYSIS : GC/MS

RESULTS : The sample was injected onto a 6' 3% SE-30 column, temperature programmed from 180°C to 350°C at 10°C/minute. Tetrachlorobiphenyl was detected in the sample. No other PCB isomers were found.

Scan	Ions	Compound
37	290, 292, 294	Tetrachlorobiphenyl
72	279, 167	Dioctyl phthalate

Conclusion: The PCB present in the sample is from an Aroclor more chlorinated than Aroclor 1242.

Terry Cullum

Terry Cullum

Shrader Analytical & CONSULTING LABORATORIES, INC.
MASS SPECTROMETRY, GAS CHROMATOGRAPHY, ELEMENTAL ANALYSES

3450 LOVETT AVENUE • DETROIT, MICHIGAN 48210

894-4440
894-4441

Run Name: 3883B Scan No: 37 & 72

Customer: CDH-Environmental Science Division

Sample No: 78-1070-A-B

Conditions: 6' 3% SE-30

180°C to 350°C at 10°C/min

30 cc/min

MASS	% INT REL.	ABS INT
150	21.95	27
151	32.52	40
152	19.51	24
153	20.33	25
155	14.63	18
157	17.07	21
158	10.57	13
159	18.70	23
161	13.01	16
162	10.57	13
163	16.26	20
165	22.76	28
166	12.20	15
167	13.82	17
168	9.76	12
169	21.14	26
170	9.76	12
171	16.26	20
173	14.63	18
174	10.57	13
175	12.20	15
176	12.20	15
177	17.07	21
178	26.02	32
179	18.70	23
181	9.76	12
183	16.26	20
189	21.95	27
190	9.76	12
191	27.64	34
192	11.39	14
193	14.63	18
195	13.01	16
200	26.83	33
201	20.33	25
202	100.00	123
203	29.27	36
204	12.20	15
205	17.07	21
206	36.59	45
207	45.53	56
208	13.01	16
209	13.01	16
213	10.57	13
220	16.26	20
222	14.63	18
223	13.01	16
233	12.20	15
250	4.88	6
252	3.25	4
253	5.69	7
254	4.07	5
255	4.07	5
259	4.07	5
267	5.69	7

MASS	% INT NOR.	ABS INT
269	4.07	5
272	4.07	5
274	6.50	8
277	4.07	5
281	13.01	16
282	5.69	7
288	4.07	5
290	27.64	34
291	4.07	5
292	26.02	32
293	4.07	5
294	11.38	14

MASS	% INT NOM.	ABS INT.
150	32.54	613
167	100.00	1884
207	10.14	191
250	0.48	9
251	0.37	7
252	0.21	4
252	0.32	6
253	0.74	14
254	0.21	4
254	0.27	5
255	0.53	10
256	0.37	7
257	0.64	12
258	0.27	5
259	0.37	7
260	0.37	7
261	0.48	9
262	0.90	17
263	0.48	9
264	0.27	5
265	0.90	17
266	0.27	5
267	1.33	25
267	0.53	10
268	0.27	5
269	0.42	8
270	0.37	7
271	0.37	7
272	0.42	8
273	0.27	5
275	0.37	7
276	0.37	7
277	0.58	11
278	0.48	9
279	13.06	260
279	0.21	4
280	2.76	52
281	4.25	80
282	1.06	20
283	0.74	14
284	0.21	4
285	0.37	7
288	0.27	5
294	0.21	4
295	0.37	7

MAY 25, 2001

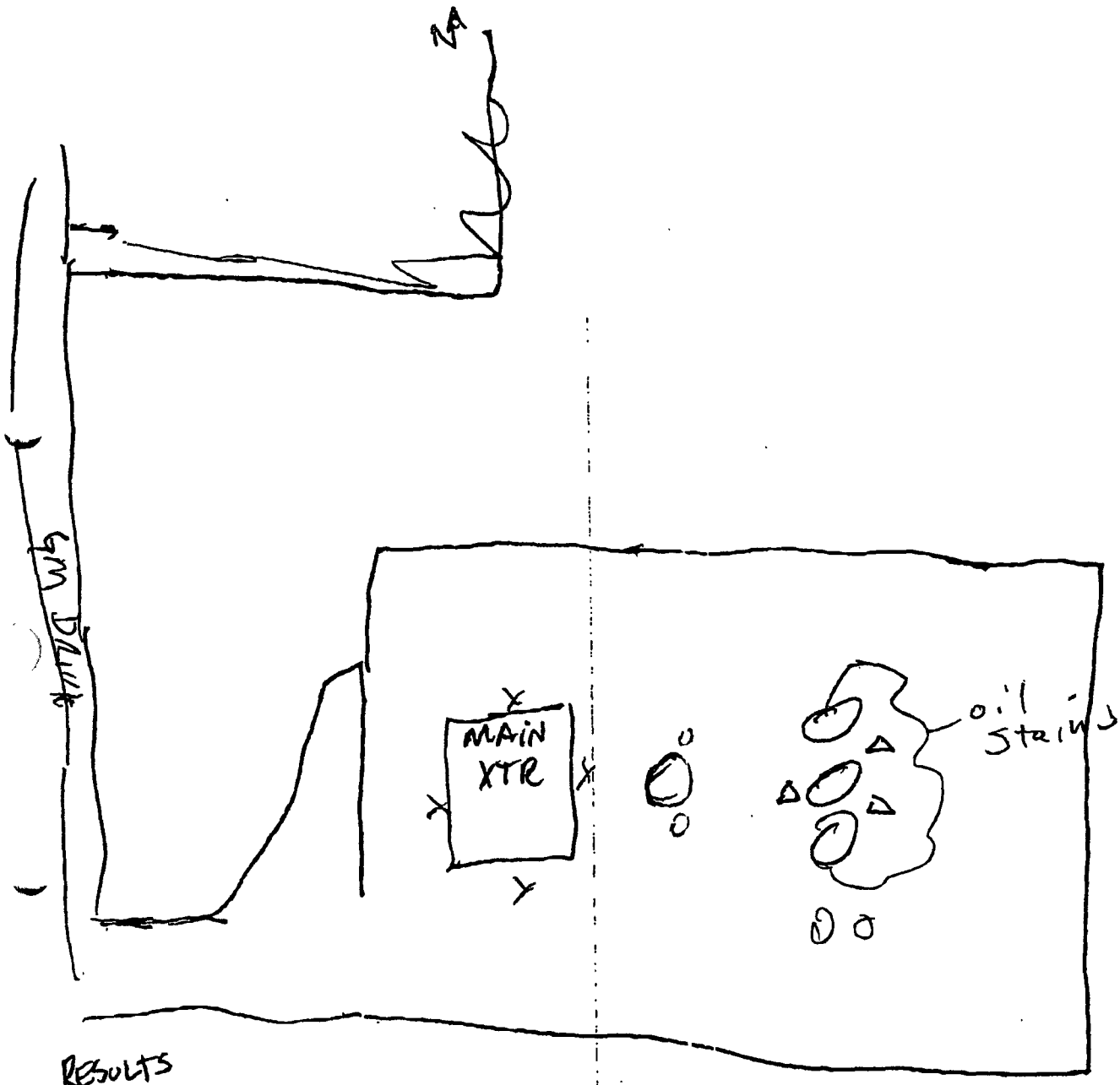
APPENDIX G.45

CINERGY REPORT

Sampling Notes

BEDFORD Jackson St. SUB 11/96

N



RESULTS

2.9 X - EP 907A

BDL o - EP 908A Composite samples

BDL Δ - EP 909A

Extensive oil contamination on east end of main.

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	02-JUN-94	86	A313060
	Complete 07-JUN-94	PO Number VERBAL TIM HAYES	
	Printed 08-JUN-94	Sampled 01-JUN-94 11:40	

Report To

TIM HAYES
PSI ENERGY, INC. (PSI)
1000 EAST MAIN STREET
PLAINFIELD, IN 46168

Bill To

MARTY LOY
PSI ENERGY, INC. (PSI)
1000 EAST MAIN STREET
PLAINFIELD, IN 46168

JUN

Sample Description

SAMPLE ID: EP909A
DESCRIPTION: BEDFORD JACKSON ST SUB

PCB SONICATION EXTRACTION SW846-3550

Analyst: T. BELL Analysis Date: 02-JUN-94 Test: P231.2.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10.08		Grams
FINAL VOLUME	100		mL

POLYCHLORINATED BIPHENYES (PCBS) SW846-8080

Analyst: D. WILLIAMS Analysis Date: 07-JUN-94 Instrument: GC/E.C Test: 0301.2.0

Prep: PCB SONICATION EXTRACTION SW846-3550 P231.2.0

Parameter	Result	Det. Limit	Units
PCB AROCHLOR 1016	BDL	1.0	mg/kg
PCB AROCHLOR 1221	BDL	5.0	mg/kg
PCB AROCHLOR 1232	BDL	1.0	mg/kg
PCB AROCHLOR 1242	BDL	1.0	mg/kg
PCB AROCHLOR 1248	BDL	1.0	mg/kg
PCB AROCHLOR 1254	BDL	1.0	mg/kg
PCB AROCHLOR 1260	BDL	1.0	mg/kg
PCB AROCHLOR 1262	BDL	1.0	mg/kg

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 19531.

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1000 EAST MAIN STREET, PLAINFIELD, IN 46168

Quality Assurance Officer: _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	02-JUN-94	86	A313059
	Complete 07-JUN-94	PO Number VERBAL TIM HAYES	
	Printed 08-JUN-94	Sampled 01-JUN-94 11:35	

Report To	Bill To
TIM HAYES PSI ENERGY, INC. (PSI) 1000 EAST MAIN STREET PLAINFIELD, IN 46168	MARTY LOY PSI ENERGY, INC. (PSI) 1000 EAST MAIN STREET PLAINFIELD, IN 46168

Sample Description

SAMPLE ID: EP908A
DESCRIPTION: BEDFORD JACKSON ST SUB

PCB SONICATION EXTRACTION SW846-3550
Analyst: B BELL Analysis Date: 03-JUN-94 Test: P231-1.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10.02		Grams
FINAL VOLUME	100		mL

POLYCHLORINATED BIPHENYLS (PCBS) SW846-8080
Analyst: D WILLIAMS Analysis Date: 07-JUN-94 Instrument: GC/ECD Test: 0501-Z.0
Prep: PCB SONICATION EXTRACTION SW846-3550 P231.1.0

Parameter	Result	Det. Limit	Units
PCB AROCHLOR 1016	BDL	1.0	mg/kg
PCB AROCHLOR 1221	BDL	5.0	mg/kg
PCB AROCHLOR 1232	BDL	1.0	mg/kg
PCB AROCHLOR 1242	BDL	1.0	mg/kg
PCB AROCHLOR 1248	BDL	1.0	mg/kg
PCB AROCHLOR 1254	BDL	1.0	mg/kg
PCB AROCHLOR 1260	BDL	1.0	mg/kg
PCB AROCHLOR 1262	BDL	1.0	mg/kg

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 19531.

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1000 EAST MAIN STREET, PLAINFIELD, IN 46168

Quality Assurance Officer: _____

CERTIFICATE OF ANALYSIS

Service Location	Received	Project	Lab ID
HERITAGE LABORATORIES, INC. 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	02-JUN-94	86	A3130
	Complete: 07-JUN-94	PO Number: VERBAL TIM HAYES	
	Printed: 08-JUN-94	Sampled: 01-JUN-94 11:30	

Report To	Bill To
TIM HAYES PSI ENERGY, INC. (PSI) 1000 EAST MAIN STREET PLAINFIELD, IN 46168	MARTY LOY PSI ENERGY, INC. (PSI) 1000 EAST MAIN STREET PLAINFIELD, IN 46168

Sample Description

SAMPLE ID: EP907A
DESCRIPTION: BEDFORD JACKSON ST SUB

PCB SONICATION EXTRACTION SW846-3550
Analyst: P BECK Analysis Date: 03-JUN-94 Test: PZSI-1.0

Parameter	Result	Det. Limit	Units
INITIAL WEIGHT OR VOLUME	10.16		Grams
FINAL VOLUME	100		mL

POLYCHLORINATED BIPHENYLS (PCBS) SW846-8080
Analyst: G WISEMAN Analysis Date: 07-JUN-94 Instrument: HC/ECD Test: 0301.2.0
Prep: PCB SONICATION EXTRACTION SW846-3550 PZSI-1.0

Parameter	Result	Det. Limit	Units
PCB AROCHLOR 1016	BDL	1.0	mg/kg
PCB AROCHLOR 1221	BDL	5.0	mg/kg
PCB AROCHLOR 1232	BDL	1.0	mg/kg
PCB AROCHLOR 1242	BDL	1.0	mg/kg
PCB AROCHLOR 1248	BDL	1.0	mg/kg
PCB AROCHLOR 1254	BDL	1.0	mg/kg
PCB AROCHLOR 1260	2.9	1.0	mg/kg
PCB AROCHLOR 1262	BDL	1.0	mg/kg

Sample Comments

BDL Below Detection Limit

Sample chain of custody number 19531.

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1000 EAST MAIN STREET, PLAINFIELD, IN 46168

Quality Assurance Officer: _____