

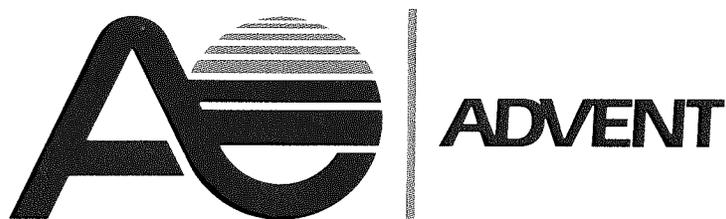
# *Environmental Management Report*

## *Chickasaw Park Lake*

*Presented to*

**City of Louisville  
Office of Health and Environment  
and  
Louisville & Jefferson County  
Metropolitan Parks Department**

*Presented by*



**ADVENT Project 46571  
June 1997**

**Environmental Consulting and Design**





June 30, 1997

City of Louisville  
Office of Health & Environment  
601 W. Jefferson Street  
Louisville, Kentucky 40202-2728

Attention: Dennis Minks  
Technical Operations Manager

Subject: **Environmental Management Report  
Chickasaw Park Lake  
Louisville, Kentucky  
ADVENT Project 46571**

Dear Mr. Minks:

ADVENT is pleased to provide six copies of the *Environmental Management Report of Chickasaw Park Lake*, prepared for the City of Louisville. Our services have been provided based on the scope of work outlined in ADVENT's *Environmental Management Plan of Chickasaw Park Lake* dated January 1997. The attached report includes the background, scope of services, results, and recommendations for the activities performed at the site. The risk assessment of Chickasaw Park Lake was performed by Plexes Environmental Services, LLC. Dr. Mark Klan of Plexes contributed to the sections of the attached report concerning the risk assessment study and associated results.

We appreciate the opportunity to work with you on this project. Please contact us if you have any questions or comments regarding this submittal.

Sincerely,

ADVENT

Handwritten signature of T. Scott Kelly in black ink.

T. Scott Kelly, E.I.T.  
Project Engineer

Handwritten signature of Larry J. Dietsch in black ink.

Larry J. Dietsch, P.E.  
Principal

TSK/LJD:tsk



# Environmental Management Report

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City of Louisville  
Office of Health and Environment  
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: Louisville, Kentucky

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ADVENT Environmental, Inc.

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## EXECUTIVE SUMMARY

ADVENT Environmental, Inc. and Plexes Environmental Services, LLC, have prepared this Environmental Management Report which addresses environmental concerns for the Chickasaw Park Lake. Previous investigations conducted on fish in the lake and sediments collected from the lake identified polychlorinated dibenzo-p-dioxins (dioxins) and polychlorinated dibenzofurans (furans). No information was provided to indicate where the samples were collected, whether the samples were maintained under strict QA/QC protocols, or the discrepancies between constituents found in the fish that were not present in the sediment samples.

Based on the work performed:

- Dioxin and Furan congeners were detected in sediment samples from Chickasaw Park Lake.
- The dioxins may be a source of contamination in fish stocked in the lake.
- Sediment concentrations determined during this characterization were less than background concentrations developed by the USEPA.
- Comparison of sediment concentrations to risk-based screening levels indicate that five of the six samples had total TEQ concentrations below the screening level.
- Further evaluation of the sample which exceeded the screening concentration indicates that the estimated cancer risk level associated with this sediment concentration is still under the KDEP *de minimus* level of  $1 \times 10^{-6}$  level.
- No significant cancer risk is identified associated with fish consumption exposures related to sediment concentrations characterized as part of this risk management activity.
- The lake may be restocked with a recommendation that the catch and release policy be maintained for the purpose of sampling the fish.



## 1.0 INTRODUCTION

At the request of the City of Louisville, through the Louisville & Jefferson County Metropolitan Parks Department and the Office of Health and Environment, ADVENT and Plexes Environmental Services, LLC, developed an Environmental Management Plan to achieve the environmental closure of Chickasaw Park Lake. The goals of the plan were:

- Protect human health and the environment.
- Restore recreational fishing to Chickasaw Park.
- Characterize site conditions and potential health risks as is appropriate to achieve closure.
- Develop remediation alternatives to support the project goals.
- Provide methodology to select an appropriate remediation option.

The purpose of the Environmental Management Plan was to develop the guidelines for preparing this Environmental Management Report which addresses environmental concerns associated with the site and achieving closure. Environmental closure for Chickasaw Park Lake is defined as achieving site conditions which allow recreational fishing at the park. Site characterization and risk assessment was completed to develop the report. ADVENT recommended the process involve a phased approach with preparation of the Environmental Management Report as the deliverable before executing the remedial action selected. The phases were as follows:



- **Phase I** - Review available literature and develop screening levels for sediment. Use these results to determine which phase will be completed next (sampling or remedial action).
- **Phase II** - Collect sediment samples and compare to screening levels. Use the results to determine which phase to complete next (additional sampling or remedial action).
- **Phase III** - Review, select remedial options, and prepare Environmental Management Report.
- **Phase IV** - Execute the preferred remedial option.
- **Phase V** - Conduct on-going monitoring and maintenance as required.



## 2.0 BACKGROUND

Our understanding of the site was developed from active involvement in the Chickasaw Park Lake project, critical evaluation of materials produced by the state, participation in strategic meetings with state, city, and county officials, participation in community meetings involving both the park and the West End Environmental Task Force, review of additional site background materials, discussions with project participants, review of materials associated with similar sites, and Kentucky guidance documents. Our understanding of the site issues is briefly summarized by the following points:

- Investigations conducted on fish in the lake and sediments collected from the lake identified polychlorinated dibenzo-p-dioxins (dioxins) and polychlorinated dibenzofurans (furans). Laboratory data provided to ADVENT from these investigations are included as Appendix A. It is unknown where the samples were collected, or if change of custody and QA/QC protocols were followed. Further, the results of the analysis of fish samples does not correlate to the results found in the sediment sample.
- A risk assessment conducted by the State evaluated consumption of the fish and, based on the dioxin levels in the fish and exposures through regular consumption of the fish from the lake, determined that potential health risks may be present.
- The fish in the lake were destroyed and removed to prevent consumption of the fish and protect human health.
- Several stockholder groups have an active interest in the lake and returning the lake to active fishing.
- Although the focus is currently on the Chickasaw Lake, these issues may also be associated with environmental concerns involving the West End and Jefferson County in general.

The lake is located in Chickasaw Park which was developed in the late 1800's (Figure 1). The lake covers approximately 1.5 acres and is less than 6 feet in depth over most of the



area (Figure 2). It is our understanding that water from the Louisville Water Company is used to maintain the lake elevation. The surrounding properties to the north and east are primarily residential with the west being the Ohio River. The area to the south has been used historically for industrial activities.

The site is underlain by outwash deposits of Wisconsin age. The depth of these deposits ranges throughout the Louisville area up to approximately 130 feet below grade. The bedrock, New Albany Shale, in the area of the site is reported to be approximately 90 feet below grade. Subsurface soils consist of upward fining coarse sands and gravels overlain by finer grain sands, silts, and clays. The finer grain materials extend to approximately 30 feet below grade. Ground-water flow direction is generally toward the Ohio River; however, flood events may change the typical flow.



### 3.0 SITE CHARACTERIZATION AND RISK ASSESSMENT

For conducting the work we recommended a phased approach (Figure 3). The first phase consisted of developing screening levels. Subsequent phases were conducted to further define and delineate the conditions encountered during the first phase, to evaluate potential health risks associated with site conditions, and to prepare remediation recommendations based on the data collected.

#### 3.1 Phase I

Phase I included researching available documents and data bases to identify dioxin and furan concentrations in background fish tissue and lake sediments similar to those at the Park and calculating a screening concentration for site lake sediments. Plexes Environmental Services, LLC, was subcontracted by ADVENT to perform a risk assessment of Chickasaw Park Lake and develop the screening levels for lake sediments. Available published information was used to develop the screening concentrations and characterize typical background conditions.

Comparison to background conditions is normally conducted as part of a risk assessment to assess increases in potential health risks associated with specific site conditions rather than general background or ambient conditions. Dioxins are widely distributed in the environment and may be detected in environmental media and food products. The highest levels have been found in soils, sediments, and biota. Numerous sources of dioxins in the environment have been identified. The USEPA, the Ohio River Valley Sanitation Commission (ORSANCO), and others have conducted extensive reviews on sources, occurrence and background exposures to dioxins. This report provides a summary of background conditions related to sediments and fish tissue.

Dioxins generally have very low water solubility, high octanol-water partition coefficients (high lipid solubility), low vapor pressure and tend to bioaccumulate (USEPA, 1994a).



Dioxins appear to be extremely stable compounds under most environmental conditions and show limited potential for significant leaching or volatilization once sorbed to particulate matter.

Dioxins can enter aquatic systems either by direct discharges or by atmospheric deposition (USEPA, 1994a). The USEPA proposed that the primary mechanism by which dioxins can enter the food chain is through atmospheric deposition. Studies have shown that dioxin congener profiles in lake sediments could be linked to profiles of combustion sources.

Sediment samples from Lake Huron evaluated dioxins as a function of time and profiled the individual congeners (USEPA, 1994b). The investigators determined that there was no appreciable degradation of dioxins in sediments over time. The most abundant dioxins identified were OCDDs and HpCDDs/CDFs. The investigators concluded that the Lake Huron sediment samples reflected atmospheric deposition from combustion of anthropogenic materials.

Additional investigations of sediment samples taken in New York resulted in similar conclusions. Atmospheric deposition appeared to be a major source for dioxins into the aquatic environment. Dioxins at relatively low concentrations (7 ppt) could be identified in sediments dating to the 1860's with OCDD being 98 percent of the dioxins detected. These results were assumed to reflect naturally occurring sources of dioxins. Dioxins were found to increase in the sediment from 1940 to 1980 reaching a concentration of approximately 950 ppt. The USEPA (1994b) determined that, based on the reviewed studies, the sediment mean TEQ level was 3.9 ppt for background conditions in the United States and 34.9 ppt in Europe. The studies reviewed and additional data on sediment background concentrations are presented in Appendix B.

ORSANCO has also conducted investigations into the dioxin content of sediments (ORSANCO, 1997). The studies focused on the Ohio River and tributaries of the river basin. Sampling dates ranged from 1986 to 1993. Earlier samples were taken only for



2,3,7,8-TCDD. Later samples presented dioxin TEQs. Profiles of specific congeners were not available. Sample concentrations ranged from nondetect to over 3,000 ppt TEQ. Most samples were below 300 ppt. Sediment samples taken specifically from the Ohio River ranged from nondetect to 13.5 ppt.

Background conditions of dioxins in fish have also been studied (USEPA, 1994b). Fish generally tend to accumulate the most toxic 2,3,7,8-substituted congeners. Fish concentrations of dioxins are dependent on exposure level, fat content, living habits, and degree of movement. High fat content bottom fish were found to have the highest concentrations. Average TEQ background concentrations in freshwater fish were found to be 0.59 ppt (assuming zero for nondetects) and 1.2 ppt (assuming half the detection limit for nondetects).

ORSANCO (1995) also conducted fish tissue sampling for dioxins in the Ohio River basin. Samples were taken of both whole fish and fillets between 1974 and 1993. Concentrations ranged from nondetect to 56 ppt TCDD. Concentrations detected in samples of fish from the Ohio River ranged from nondetect to 29.9 ppt TCDD.

The next step of the screening level development was to “back-calculate” dioxin levels in fish tissue that represent a *de minimus* health risk. We proposed using a  $1 \times 10^{-6}$  excess cancer risk for the calculations. For carcinogenic health effects, cancer slope factors (CSFs) were used to estimate the risk of developing cancer that corresponds to estimated exposure concentrations. The CSFs for the individual dioxin/furan congeners were developed using toxicity equivalency factors (TEFs) based on 2,3,7,8-TCDD. The use of the TEFs and calculation of toxicity equivalence followed current state and federal guidance. Noncarcinogenic health effects were not evaluated in this assessment.

The calculated fish tissue concentrations were then used to “back-calculate” a screening level for sediment concentrations of dioxins/furans. The methodology used for these calculations followed appropriate state and federal guidance. The calculations used to



determine the sediment screening levels are described in the following section. Additional information on the exposure assessment, toxicology assessment, and risk assessment is included in Appendix B.

## **Development of Risk-Based Screening Levels**

### Calculation of Fish Tissue Dioxin Concentration

General equation of:

Risk = Cancer Potency Factor x Intake of dioxin  
or  
Intake = Risk / Cancer Potency Factor.

Based on KDEP guidance, assume risk level of  $1 \times 10^{-6}$ .  
The Cancer Potency Factor for dioxin is  $0.156 \text{ (ng/Kg-day)}^{-1}$  (USEPA HEAST, 1996).

Therefore:

Intake =  $1 \times 10^{-6} / 0.156 \text{ (ng/Kg-day)}^{-1}$ .  
Intake of dioxin =  $6.41 \times 10^{-6} \text{ ng/Kg-day}$ .

For intake by an adult:  
assume 70 Kg body weight

Intake for adult =  $6.41 \times 10^{-6} \text{ ng/Kg-day} \times 70 \text{ Kg}$ .  
Intake of dioxin for adult equivalent to a  $1 \times 10^{-6}$  cancer risk level =  $4.49 \times 10^{-4} \text{ ng/day}$ .

For fish tissue level:

Fish ingestion rate =  $6.5 \text{ g/day}$  (USEPA, 1994)  
Fish tissue level = intake for adult / fish ingestion rate  
Fish tissue level =  $4.49 \times 10^{-4} \text{ ng/day} / 6.5 \text{ g/day}$ .

Therefore:

Fish tissue level =  $6.91 \times 10^{-5} \text{ ng/g}$  or  $0.0691 \text{ ng dioxin TEQ/Kg fish tissue}$ .

Where:

TEQ = toxicity equivalence using toxicity equivalency factors based on 2,3,7,8-TCDD.



### Calculation of Sediment Concentration

Potential cancer risk is based on uptake of dioxins from the sediment by fish and the risk-based fish tissue concentration.

The general equation presented by USEPA (1993 and 1994c) for estimating fish tissue concentrations as a function of bottom sediments is:

$$\text{Whole fish tissue concentration} = \text{Coc} \times \text{BSAF} \times f(\text{lipid}).$$

Where:

Coc = concentration (TEQ dioxin) contained in the bottom sediment organic carbon fraction (ng/Kg).

BSAF = Biota to Sediment Accumulation Factor, developed by USEPA and based on the relationship of  $\text{BSAF} = \text{Clipid}/\text{Coc}$  and set at 0.09.

$f(\text{lipid})$  = fish lipid fraction, assumed to be 0.07.

To calculate sediment concentration:

$$\text{Coc} = \text{Whole fish tissue concentration} / [\text{BSAF} \times f(\text{lipid})].$$

Using the risk-based fish tissue dioxin concentration previously calculated of 0.0691 ng/Kg,

$$\text{Coc} = 0.0691 \text{ ng/Kg} / (0.09 \times 0.07)$$

$$\text{Coc} = 10.97 \text{ ng/Kg}.$$

Calculation of sediment concentration is based on the general equation of:

$$\text{Coc} = \text{Csed} / \text{OCsed}.$$

Where:

Coc = concentration (TEQ dioxin) contained in the bottom sediment organic carbon fraction (ng/Kg).

Csed = Concentration in sediment

OCsed = organic carbon bottom sediment fraction, unitless and assumed to be 0.03 (USEPA, 1994c).

Therefore:

$$\text{Csed} = \text{Coc} \times \text{OCsed}$$

$$\text{Csed} = 10.97 \text{ ng/Kg} \times 0.03$$

$$\text{Csed} = 0.329 \text{ ng/Kg}.$$

The calculated risk-based sediment concentration for exposures from consumption of fish from Chickasaw Park Lake is 0.329 ng/Kg.



The results of the research and calculated screening level was used to determine which phase of the proposed work would be completed following Phase I. Additional data was required; therefore, sampling was conducted under Phase II.

### **3.2 Phase II**

Six sediment samples were collected from the bottom of the lake as shown in Figure 4. The sample locations were selected to provide a representative sampling of the entire lake bottom. The sediment samples were collected 0 to 0.5 feet below top of sediment using a stainless-steel hand auger. All sample-contacting equipment was decontaminated prior to sample collection. Decontamination procedures included washing with a phosphate-free detergent, rinsing with distilled water, and allowing the equipment to air dry. The samples were containerized in jars provided by Microbac Laboratories, Inc. of Louisville, Kentucky, and placed on ice in a cooler for transportation to the laboratory. The samples were analyzed for dioxins and furans utilizing USEPA SW846 Method 8290 high resolution. Field Sampling Reports are included as Appendix C.

Results of the lake sediment sampling were compared to the risk-based screening concentrations calculated during Phase I. The adequacy of Quality Assurance/Quality Control (QA/QC) procedures followed in generating the analytical data are a key criterion in selecting the data for use in risk assessment. As reported by the laboratory, the QA/QC results met the necessary USEPA parameters. Many of the results were reported as qualified data, indicating that the reported concentrations were estimated. In particular, the results for OCDD were qualified with a "B" due to blank contamination. Because OCDD was the most prevalent congener reported, and at the highest concentration of the reported congeners, further evaluation of the blank contamination and OCDD concentrations was conducted. The method blank concentration of OCDD was reported as 0.41 JQ (an estimated maximum concentration). Because the reported sediment sample concentrations were generally several of orders of magnitude greater than the blank concentration, the blank contamination was not considered to significantly affect the reported results for OCDD. Because of the conservative nature of this assessment, the reported concentrations,



including estimated concentrations, were used in the risk evaluation. Laboratory analysis results and QA/QC data is included in Appendix D.



## 4.0 RESULTS

The analytical results and calculated TEQs for the six sediment samples collected March 27, 1997, are presented in Table 1. As shown in the table, the total TEQs for the individual samples were 0.358 ng/Kg (SS-1), 0.211 ng/Kg (SS-2), 0.130 ng/Kg (SS-3), 0.143 ng/Kg (SS-4), 0.239 ng/Kg (SS-5), and 0.124 ng/Kg (SS-6), respectively. Comparison of these results to the risk-based screening sediment concentration of 0.329 ng/Kg indicates that all but one of the samples are below the screening concentration. The detected concentrations are also below background concentrations for sediments (USEPA, 1994b). Therefore, assessment of the five samples indicate that the sediment dioxin concentrations are not expected to result in fish tissue dioxin concentrations which pose a potential significant human health risk of greater than  $1 \times 10^{-6}$  cancer risk. SS-1 was further evaluated to assess potential health risks.

Because SS-1 dioxin TEQ exceeded the risk-based screening concentration further evaluation was conducted to assess potential health risks associated with this level of dioxins in the sediment. The same general calculations and methodology used to develop the risk-based concentrations presented in the previous section were used to calculate the risk level associate with this sediment concentration.

If the sediment concentration is 0.358 ng/Kg, then to calculate estimated risk levels:

Concentration in fish is estimated as:

$$C_{oc} = C_{sed} / OC_{sed}$$

$$C_{oc} = 0.358 \text{ ng/Kg} / 0.03$$

$$C_{oc} = 11.93 \text{ ng/Kg.}$$



Therefore:

$$C_{\text{fish}} = C_{\text{oc}} \times 0.09 \times 0.07$$

$$C_{\text{fish}} = 11.93 \text{ ng/Kg} \times 0.09 \times 0.07$$

$$C_{\text{fish}} = 0.075 \text{ ng/Kg.}$$

Intake is estimated as:

$$\text{Intake} = \text{fish ingestion rate} \times C_{\text{fish}}$$

$$\text{Intake} = 6.5 \times 10^{-3} \text{ kg/day} \times 0.075 \text{ ng/Kg}$$

$$\text{Intake} = 4.88 \times 10^{-4} \text{ ng/day.}$$

For adult (70 Kg body weight) consumption:

$$\text{Exposure level} = \text{Intake} / \text{body weight}$$

$$\text{Exposure level} = 4.88 \times 10^{-4} \text{ ng/day} / 70 \text{ Kg}$$

$$\text{Exposure level} = 6.96 \times 10^{-6} \text{ ng/Kg-day.}$$

The cancer risk level is estimated as:

$$\text{Risk level} = \text{Cancer Slope Factor} \times \text{Exposure level}$$

$$\text{Risk level} = (0.156 \text{ ng/Kg-day})^{-1} \times 6.96 \times 10^{-6} \text{ ng/Kg-day}$$

$$\text{Risk level} = 1.09 \times 10^{-6}.$$

Therefore the calculated risk level for the highest detected sediment dioxin concentration is  $1.09 \times 10^{-6}$  which is only slightly above the *de minimus* risk level of  $1 \times 10^{-6}$  established by the KDEP.



Evaluation of potential direct exposures to the sediment is accomplished by comparison of the sediment concentrations to another precalculated risk-based concentration. KDEP(1995) and USEPA Region IX (1996) both present a risk-based concentration of 3.8 ng/Kg for residential soil exposures to dioxin. Exposures to residential soil are assumed to be much higher than incidental contact with lake sediments. Because the concentrations of dioxins identified in the sediment samples are much less than this screening level no health risk is identified for direct exposures to the sediment.

### **Uncertainty Analysis**

A number of assumptions and estimated values have been used in the risk assessment that contribute to the level of uncertainty about possible human health risks. Actual lake conditions, sediment concentrations, and organic component of the sediments may be different than that identified. Uptake of dioxins by the fish reflect USEPA estimations based on other aquatic systems and may not reflect actual or future conditions at Chickasaw Park Lake. The amount of fish consumption and exposure parameters may not accurately reflect actual exposure scenarios. The methodology and assumptions used in this assessment were selected based on available state and federal guidance to provide a conservative evaluation of potential health risks associated with dioxins in Chickasaw Park Lake sediments.



## 5.0 CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusions

Based on the work performed:

- Dioxin and Furan congeners were detected in sediment samples from Chickasaw Park Lake.
- The dioxins may be a source of contamination in fish stocked in the lake.
- Sediment concentrations determined during this characterization were less than background concentrations developed by the USEPA.
- Comparison of sediment concentrations to risk-based screening levels indicate that five of the six samples had total TEQ concentrations below the screening level.
- Further evaluation of the sample which exceeded the screening concentration indicates that the estimated cancer risk level associated with this sediment concentration is still under the KDEP *de minimus* level of  $1 \times 10^{-6}$  level.
- No significant cancer risk is identified associated with fish consumption exposures related to sediment concentrations characterized as part of this risk management activity.

### 5.2 Recommendations

Utilizing the results of the previous phases, a preliminary review was conducted of available remedial options. We reviewed the options based on the following criteria:

- **Protection of Human Health and the Environment**  
This issue is addressed by the risk assessment activities.



- **Attain Media Cleanup Standards**  
The standards is set based on the risk assessment activities and the remedial options reviewed for performance.
- **Comply with Applicable Standards for Management of Waste**  
Any waste materials removed from the site must be addressed.
- **Long Term and Short Term Reliability and Effectiveness**  
The performance aspects of the remedies must be addressed.
- **Implementability**  
The engineering aspects of constructability must be addressed.
- **Cost**  
The ultimate cost of the options should be considered.
- **Public Involvement**  
Public opinion is included in the review assessment.

Using the previously mentioned criteria as a guide, and based on the results of this assessment, the sample results indicate an acceptable risk and no additional remedial activities are necessary. We recommend posting the area as catch and release only and, following restocking, collecting annual fish tissue samples for testing. We recommend testing representative fish before stocking. Fish should be tagged and the tagged fish sampled on an annual basis to confirm any potential uptake. We recommend to continue the annual fish sampling and laboratory analysis until sufficient results are available to warrant cessation of the sampling.



## 6.0 REFERENCES

- ADVENT Environmental, Inc., January 27, 1997. *Environmental Management Plan for Chickasaw Park Lake*: City of Louisville Office of Health and Environment and Louisville & Jefferson County Metropolitan Parks Department, Louisville, Kentucky, 9 pp.
- Kentucky Natural Resources and Environmental Protection Cabinet, Department of Environmental Protection, 1995. (KNRPC, 1995) Documents to Implement Clean-up Provisions of KRS 224.01-400; 401 KAR 100:050 Remedial Options Guidance; Site Characterization Guidance; Risk Assessment Guidance, August 15, 1995.
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- United States Environmental Protection Agency: Estimating Exposure to Dioxin-Like Compounds, Volume II: Properties, Sources, Occurrence and Background Exposures (USEPA, 1994b) ORD EPA/600/8-88/005Cb, June, 1994.
- United States Environmental Protection Agency: Estimating Exposure to Dioxin-Like Compounds, Volume III: Site-Specific Assessment Procedures (USEPA, 1994c) ORD EPA/600/6-88/055Cc, June, 1994.
- United States Environmental Protection Agency: Health Effects Assessment Summary Tables (USEPA HEAST, 1996) USEPA data base containing up-to-date health risk information on chemicals.



TABLES

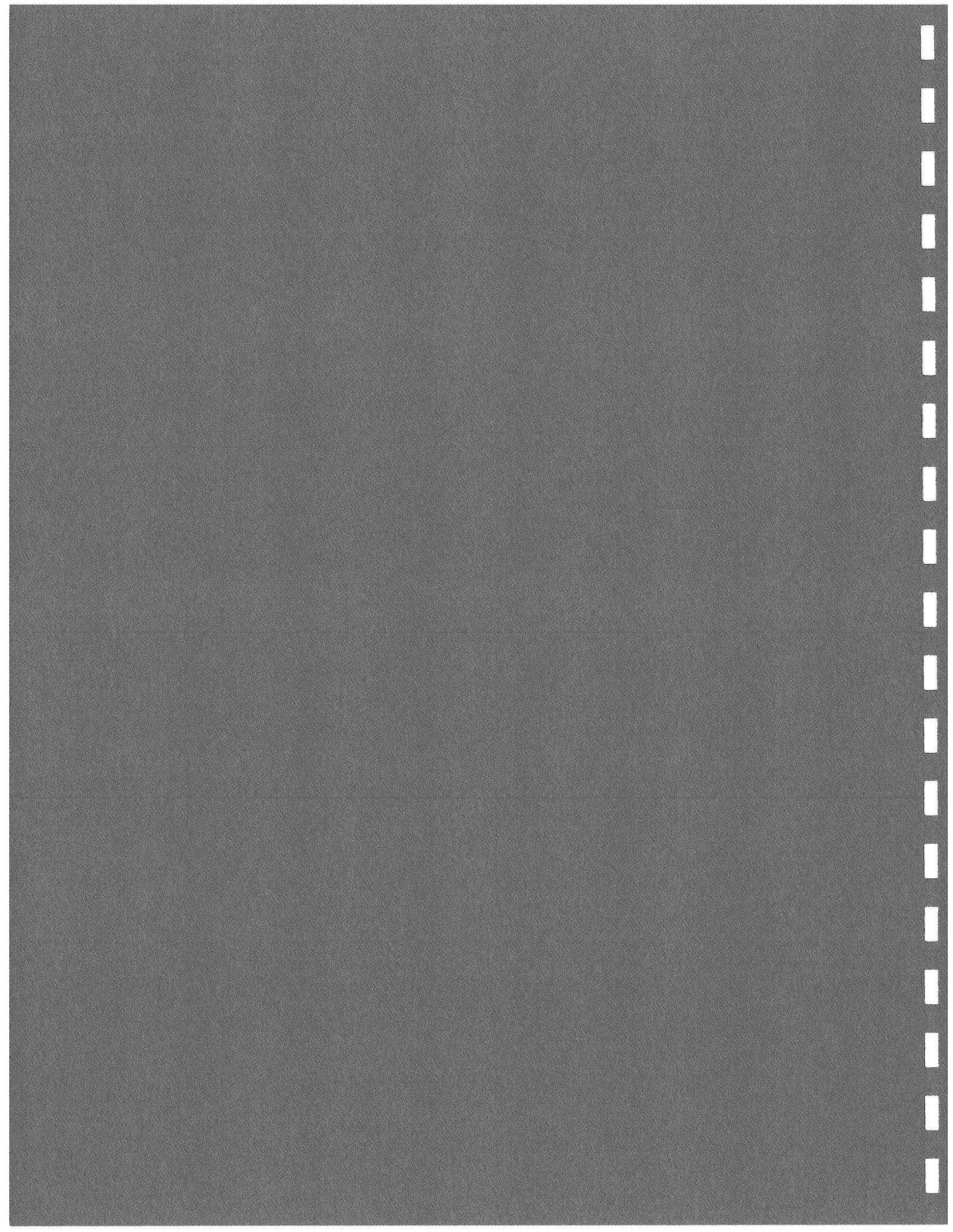


TABLE 1: RESULTS OF LAKE SEDIMENT SAMPLING

Constituent	TEF	C.P. SS-1 3/27/97 (pg/g)	TEQ	C.P. SS-2 3/27/97 (pg/g)	TEQ	C.P. SS-3 3/27/97 (pg/g)	TEQ	C.P. SS-4 3/27/97 (pg/g)	TEQ	C.P. SS-5 3/27/97 (pg/g)	TEQ	C.P. SS-6 3/27/97 (pg/g)	TEQ
	1,2,3,7,8,9 - HxCDD	0.1	0.65 J	0.065	ND	0	0.29 J	0.029	ND	0	ND	0	ND
Total HxCDD	0	4.2 J	0	1.6 J, Q	0	2.1 J	0	0.43 J, Q	0	1.8 J	0	2.0 J	0
1,2,3,4,6,7,8 - HpCDD	0.01	6.3	0.063	2.9 J	0.029	2.0 J	0.02	1.2 J	0.012	3.7 J, Q	0.037	3.2 J	0.032
Total HpCDD	0	16	0	4.2 J	0	4.5 J	0	2.6 J	0	11 Q	0	8.7 J	0
OCDD	0.001	230 B	0.23	160 B	0.16	65 B	0.065	55 B	0.055	140 B	0.14	90 B	0.09
Total TCDF	0	ND	0	ND	0	0.42 J, Q	0	ND	0	ND	0	ND	0
1,2,3,4,7,8 - HxCDF	0.1	ND	0	ND	0	ND	0	0.22 J, Q	0.022	ND	0	ND	0
1,2,3,6,7,8 - HxCDF	0.1	ND	0	ND	0	ND	0	0.18 J, Q	0.018	ND	0	ND	0
2,3,4,6,7,8, - HxCDF	0.1	ND	0	0.22 J, Q	0.022	0.16 J	0.016	0.36 J	0.036	0.56 J, Q	0.056	ND	0.022
Total HxCDF	0	ND	0	0.22 J, Q	0	0.16 J	0	0.75 J, Q	0	0.94 J, Q	0	0.26 J, Q	0
1,2,3,4,6,7,8 - HpCDF	0.01	ND	0	ND	0	0.15 J	0	ND	0	0.48 J	0.0048	0.14 J, Q	0.0014
Total HpCDF	0	ND	0	ND	0	0.15 J	0	ND	0	1.2 J	0	0.42 J, Q	0
OCDF	0.001	0.15 J	0.00015	0.20 J	0.0002	0.10 J	0.0001	0.19 J	0.00019	0.79 J	0.00079	0.17 J	0.00017
Total TEQ			0.358		0.211		0.13		0.143		0.239		0.146

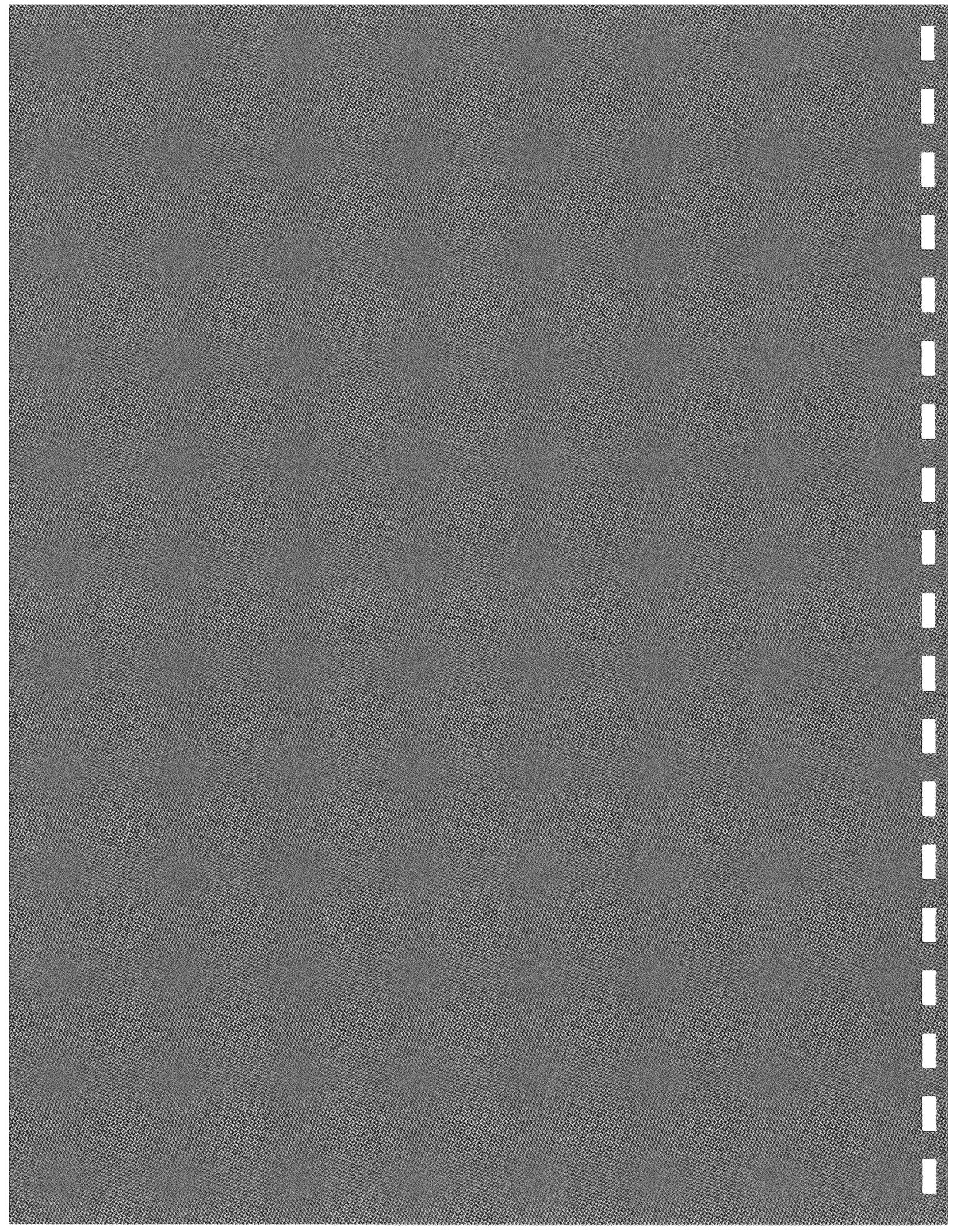
Prepared By: TSK  
Checked By: RHB

Notes:

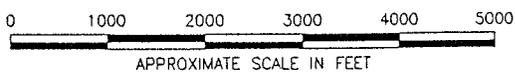
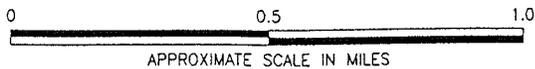
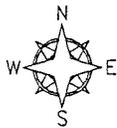
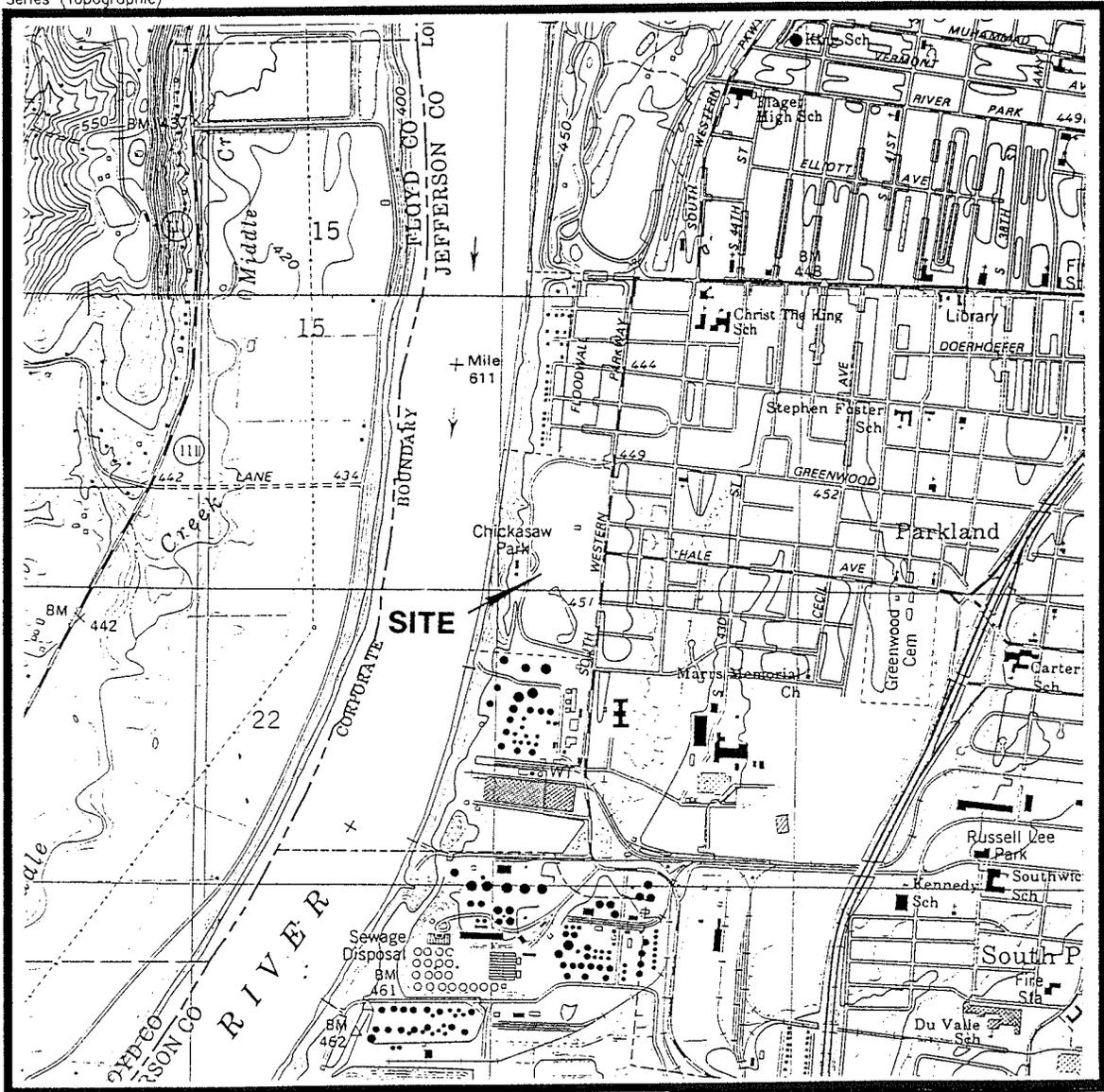
- TEF = toxicity equivalence factor based on 2,3,7,8-TCDD
- TEQ = toxicity equivalence
- pg/g = picogram per gram
- ND = Not Detected at or above the Sample Specific Detection Limit
- J = Estimated result. Result is less than the reporting limit.
- Q = Estimated maximum possible concentration (EMPC).
- B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
- Source: Microbac Laboratories, Inc. - Analytical Services Laboratories Division, Louisville, KY, Laboratory Reports.
- Analytical Method: EPA Method 8290 (Dioxins).



FIGURES



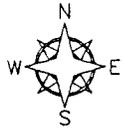
SOURCE:  
 U.S. Geological Survey  
 Louisville West, KY.-IND. Quadrangle (1983) Photorevised 1987 &  
 New Albany, IND.-KY. Quadrangle (1982) Photorevised 1987  
 7.5 Minute Series (Topographic)



REVISION	DESCRIPTION	DATE	APPROVED	MADE
REVISIONS				
	BY	DATE	BY	DATE
DESIGNED:			S.C.C. III	11/04/96
CHECKED:	TSK	06/30/97	CADD FILE:	46571-1 11/04/96
APPROVED:				
PREPARED BY:				
PREPARED FOR:	CHICKASAW PARK			
SITE LOCATION MAP				
SCALE AS SHOWN	PROJECT NUMBER 46571	FIGURE NUMBER 1	REVISION -	

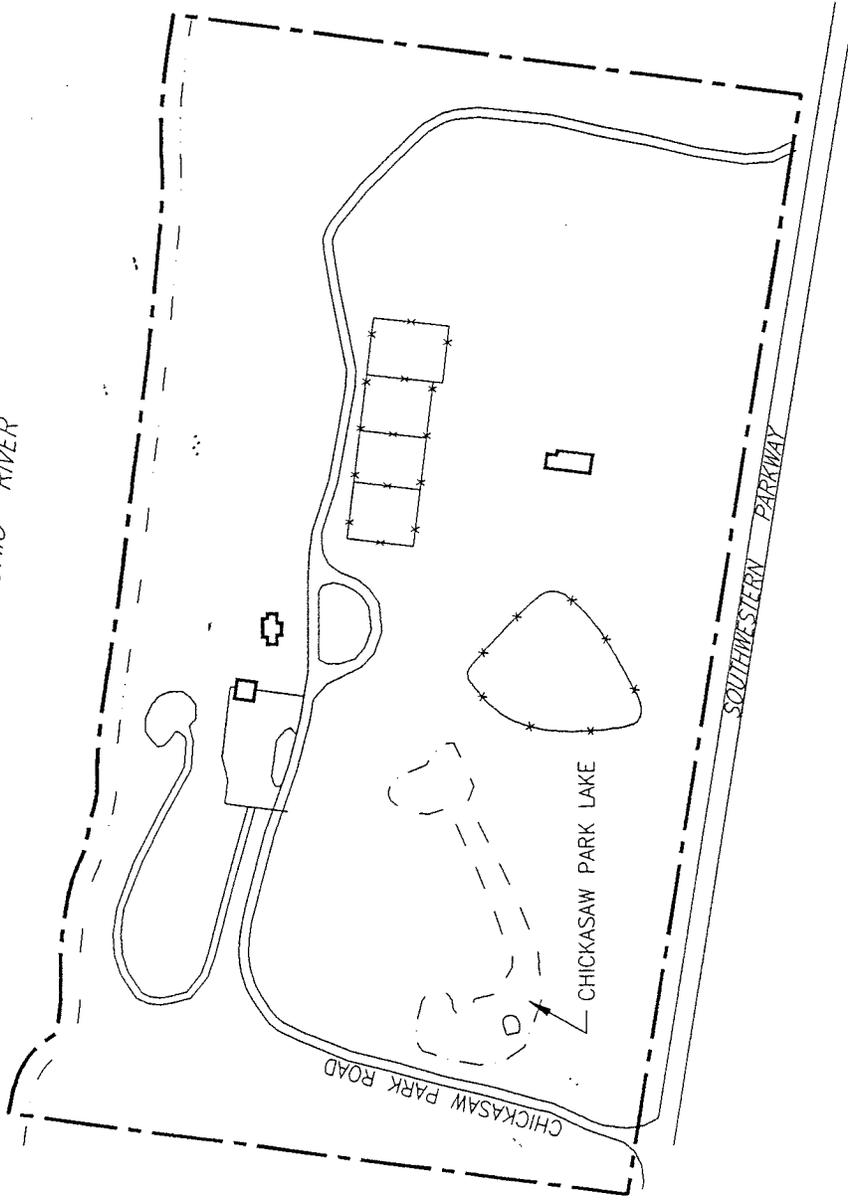


SOURCE:  
Base Map Provided By:  
City of Louisville & LOJIC



LEGEND

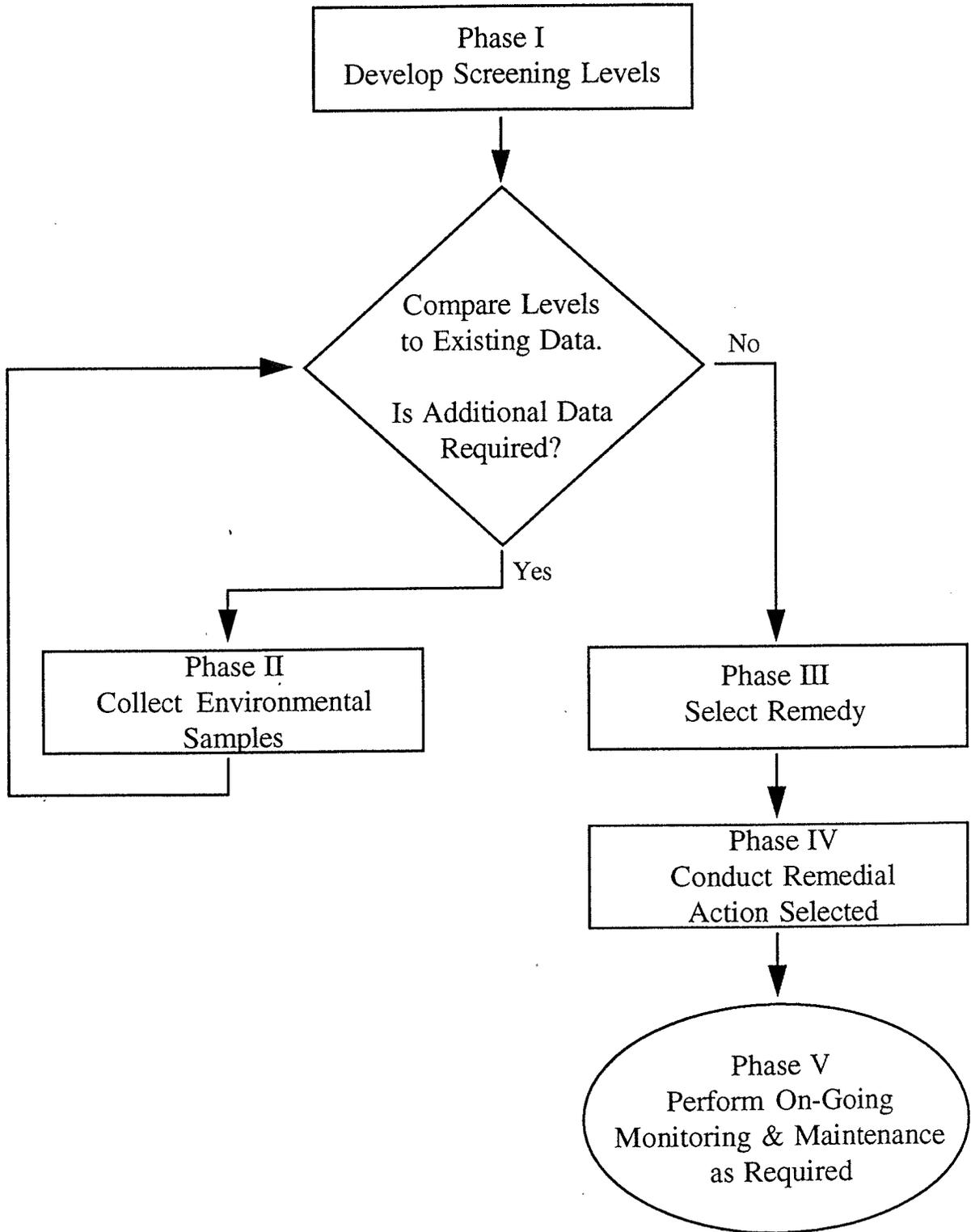
- \*—\*—\*—\*— FENCING
- - - - - PARK BOUNDARY



REVISION	DESCRIPTION	DATE	APPROVED	MADE
REVISIONS				
DESIGNED:	BY	DATE	DRAWN:	BY
CHECKED:	TSK	06/30/97	S.C.C. III	11/04/96
APPROVED:			CADD FILE:	96-0355 11/06/96
PREPARED BY:				
PREPARED FOR: CITY OF LOUISVILLE OFFICE OF HEALTH AND ENVIRONMENT & LOUISVILLE & JEFFERSON CO. METRO PARKS				
CHICKASAW PARK LAKE SITE PLAN				
SCALE NO	SCALE	PROJECT NUMBER	FIGURE NUMBER	REVISION
		46571	2	-

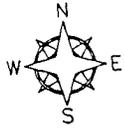


**Figure 3**  
**ENVIRONMENTAL MANAGEMENT**  
**FLOW CHART**





SOURCE:  
Base Map Provided By:  
City of Louisville & LOJIC

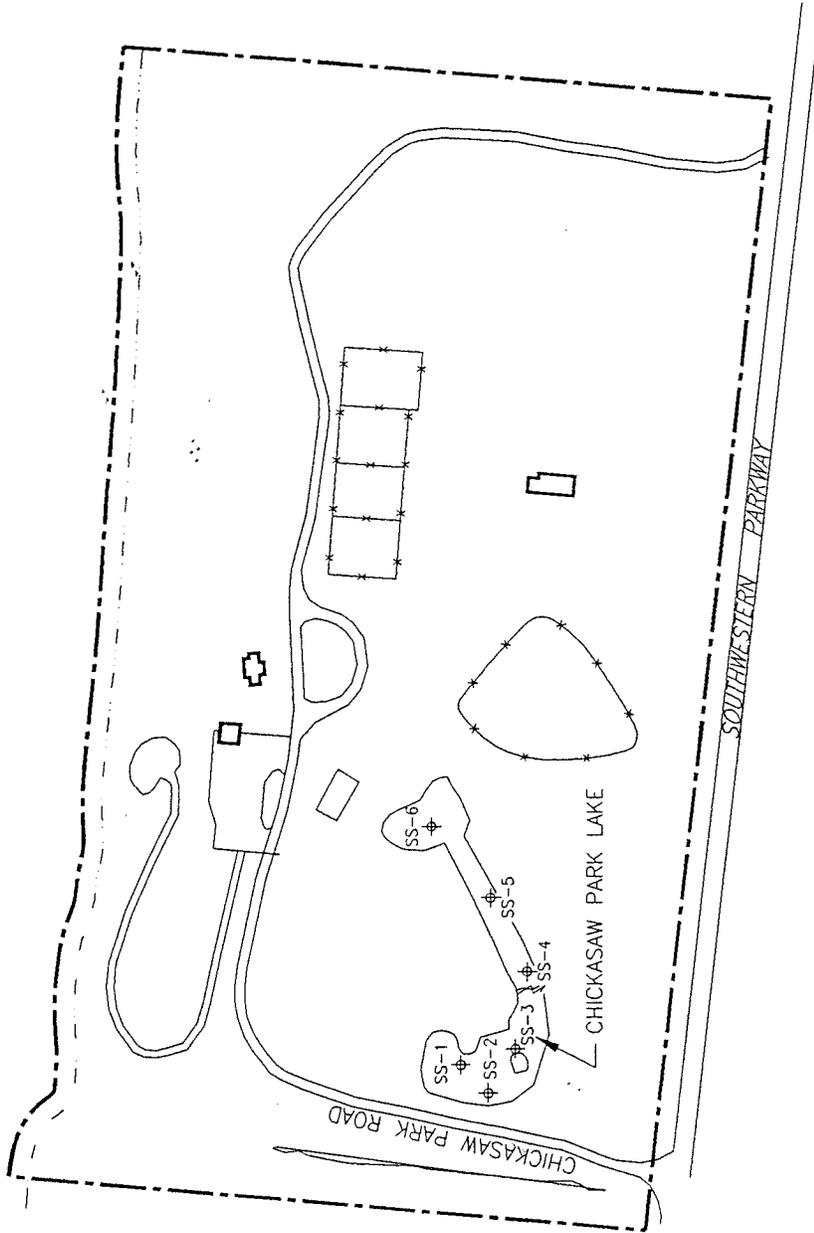


**LEGEND**

--- PARK BOUNDARY

-x-x- FENCE

⊕ LAKE SEDIMENT SAMPLING LOCATION



REVISION	DESCRIPTION	DATE	APPROVED	MADE
REVISIONS				
	BY	DATE	BY	DATE
			S.C.C. III	01/17/96
	DESIGNED:		DRAWN:	
	CHECKED: TSK	06/10/97	CADD FILE:	97-0165 05/05/97
	APPROVED:			



PREPARED BY:

FOR:

CHICKASAW PARK  
LOUISVILLE, KENTUCKY

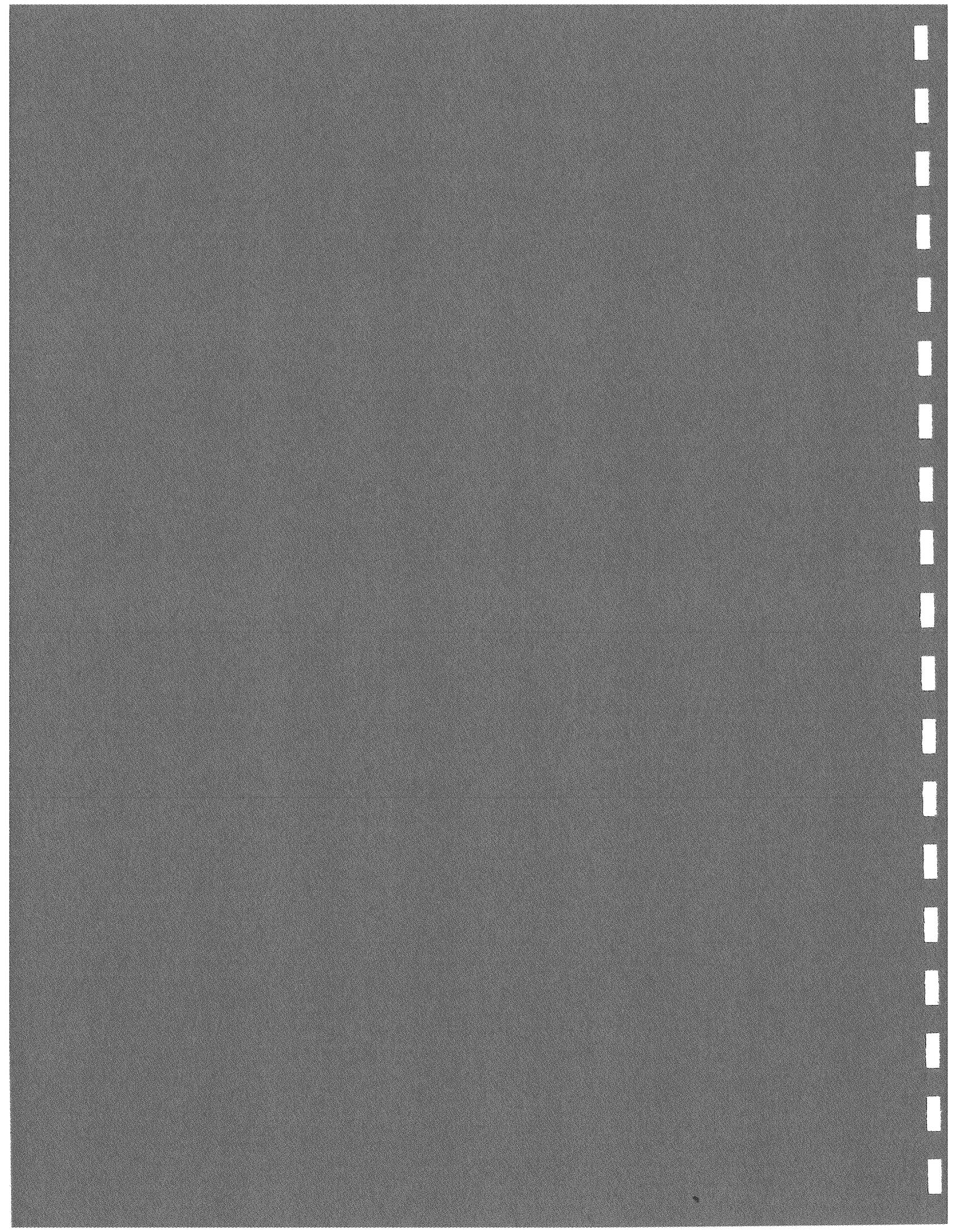
SITE PLAN SHOWING  
LAKE SEDIMENT SAMPLE LOCATIONS

SCALE AS SHOWN	PROJECT NUMBER 46571	FIGURE NUMBER 4	REVISION --
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APPENDIX A

LABORATORY DATA FROM PREVIOUS  
INVESTIGATIONS





# LETTER OF TRANSMITTAL

TO: - LARRY DIETSCH, PE ADVENT - MARK KLAN, PhD PIEXIS	FROM: DENNIS MINKS	DESCRIPTION: CHICKASAW PARK LAKE
ATTN:	ATTN:	

WE ARE SENDING YOU THE FOLLOWING ITEMS:

- ATTACHED  UNDER SEPARATE COVER VIA \_\_\_\_\_
- DRAWINGS  SPECIFICATIONS  PRINTS  SAMPLES
- CHANGE ORDER  BROCHURES/PHOTOS  CORRESPONDENCE
- OTHER FAX (32 PAGES TOTAL)

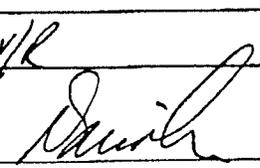
COPIES	DOC NO	DATE	DESCRIPTION

THESE ARE TRANSMITTED AS CHECKED BELOW:

- FOR APPROVAL  APPROVED AS SUBMITTED  RESUBMIT \_\_\_\_\_ COPIES FOR APPROVAL
- FOR YOUR USE  APPROVED AS NOTED  SUBMIT \_\_\_\_\_ COPIES FOR DISTRIBUTION
- AS REQUESTED  RETURN FOR CORRECTIONS  RETURN \_\_\_\_\_ CORRECTED PRINTS
- FOR REVIEW AND COMMENT  OTHER \_\_\_\_\_
- PRINTS RETURNED AFTER LOAN TO US  FOR BIDS DUE: \_\_\_\_\_

REMARKS: PER YOUR REQUEST, THIS IS ALL OF THE ANALYTICAL DATA ASSOCIATED WITH FISH TISSUE FOR CHICKASAW PARK LAKE

SHOULD YOU HAVE ANY QUESTIONS, PLEASE CALL.

COPIES TO: \_\_\_\_\_ SIGNED: DM 



EPA SAMPLE NO.  
N/A

1DFA  
PCDD/PCDF SAMPLE DATA SUMMARY

Lab Name:	PACE INC.	Case No.:	IL1655
Contract:	IL1655	SDG No.:	N/A
Lab Code:	IN-049	SAS No.:	N/A
Matrix:	FISH	Lab Sample ID:	LCS-1608/1655
Sample wt/vol:	10.05	Lab File ID:	SAM1004A101
Water Sample Prep:	Sep Funnel	Date Received:	22-SEP-95
Conc. Extract Vol.:	20 ul	Date Extracted:	25-SEP-95
Injection Volume:	2 ul	Date Analyzed:	04-OCT-95
GC Column ID:	DB-5	Dilution Factor:	N/A
% Solids:	N/A	Concentration Units:	pg/g

ANALYTE	PEAK RT	ION RATIO	SELECTED IONS	CONCENTRATION	EMPC	EDL
2378-TCDD	30:4	0.74	320/322	19.53		
2378-TCDF	28:44	0.80	304/306	21.13		
12378-PeCDF	35:4	1.51	340/342	51.43		
12378-PeCDD	36:11	1.52	356/358	50.15		
23478-PeCDF	35:48	1.46	340/342	50.01		
123478-HxCDF	39:2	1.27	374/376	50.54		
123678-HxCDF	39:10	1.25	374/376	52.01		
123478-HxCDD	39:57	1.25	390/392	54.52		
123678-HxCDD	40:3	1.29	390/392	51.83		
123789-HxCDD	40:27	1.27	390/392	53.18		
234678-HxCDF	39:48	1.32	374/376	51.71		
123789-HxCDF	40:46	1.27	374/376	51.84		
1234678-HpCDF	42:58	1.05	408/410	52.41		
1234678-HpCDD	44:24	1.00	424/426	48.77		
1234789-HpCDF	45:5	1.01	408/410	52.73		
OCDD	49:41	0.88	458/460	102.21		
OCDF	49:56	0.91	442/444	107.76		

INTERNAL STANDARDS	PEAK RT	ION RATIO	SELECTED IONS	ION RATIO LIMITS	% REC	RECOVERY LIMITS
13C-2378-TCDF	28:42	0.79	316/318	0.65-0.89	83.64	40-135%
13C-2378-TCDD	30:2	0.75	332/334	0.65-0.89	71.30	40-135%
13C-12378-PeCDF	35:2	1.52	352/354	1.32-1.78	88.95	40-135%
13C-12378-PeCDD	36:9	1.54	368/370	1.32-1.78	86.27	40-135%
13C-123478-HxCDF	39:2	0.53	384/386	0.43-0.59	90.33	40-135%
13C-123678-HxCDD	40:2	1.37	402/404	1.05-1.43	84.66	40-135%
13C-1234678-HpCDF	42:57	0.45	420/422	0.37-0.51	81.54	40-135%
13C-1234678-HpCDD	44:23	1.03	436/438	0.88-1.20	81.68	40-135%
13C-OCDD	49:40	0.89	470/472	0.76-1.01	69.48	40-135%

NOTE: Concentrations, EMPC's, and EDL's are calculated on a wet weight basis.  
"J" = Estimated value. Value is below Lower Method Calib. Limit (LMCL).



EPA SAMPLE NO.  
N/A

1DFA  
PCDD/PCDF SAMPLE DATA SUMMARY

Lab Name: PACE INC. Case No.: IL1655  
 Contract: IL1655 SDG No.: N/A  
 Lab Code: IN-049 SAS No.: N/A  
 Matrix: FISH Lab Sample ID: LCSD-1608/1655  
 Sample wt/vol: 10.05 Lab File ID: SAM1004A111  
 Water Sample Prep: Sep Funnel Date Received: 22-SEP-95  
 Conc. Extract Vol.: 20 ul Date Extracted: 25-SEP-95  
 Injection Volume: 2 ul Date Analyzed: 04-OCT-95  
 GC Column ID: DB-5 Dilution Factor: N/A  
 % Solids: N/A Concentration Units: pg/g

ANALYTE	PEAK RT	ION RATIO	SELECTED IONS	CONCENTRATION	EMPC	EDL
2378-TCDD	30: 2	0.76	320/322	20.39		
2378-TCDF	28:42	0.79	304/306	21.79		
12378-PeCDF	35: 3	1.53	340/342	52.05		
12378-PeCDD	36:10	1.50	356/358	51.08		
23478-PeCDF	35:48	1.50	340/342	51.40		
123478-HxCDF	39: 2	1.34	374/376	51.02		
123678-HxCDF	39: 9	1.23	374/376	51.67		
123478-HxCDD	39:56	1.29	390/392	52.50		
123678-HxCDD	40: 3	1.33	390/392	56.68		
123789-HxCDD	40:27	1.36	390/392	50.66		
234678-HxCDF	39:48	1.21	374/376	51.63		
123789-HxCDF	40:46	1.29	374/376	50.06		
1234678-HpCDF	42:57	0.99	408/410	49.95		
1234678-HpCDD	44:24	1.07	424/426	48.94		
1234789-HpCDF	45: 5	1.05	408/410	50.44		
OCDD	49:40	0.90	458/460	102.78		
OCDF	49:56	0.86	442/444	108.65		

INTERNAL STANDARDS	PEAK RT	ION RATIO	SELECTED IONS	ION RATIO LIMITS	% REC	RECOVERY LIMITS
13C-2378-TCDF	28:41	0.81	316/318	0.65-0.89	89.71	40-135%
13C-2378-TCDD	30: 0	0.77	332/334	0.65-0.89	75.89	40-135%
13C-12378-PeCDF	35: 2	1.54	352/354	1.32-1.78	92.96	40-135%
13C-12378-PeCDD	36: 9	1.54	368/370	1.32-1.78	89.02	40-135%
13C-123478-HxCDF	39: 1	0.52	384/386	0.43-0.59	97.41	40-135%
13C-123678-HxCDD	40: 2	1.32	402/404	1.05-1.43	92.55	40-135%
13C-1234678-HpCDF	42:57	0.45	420/422	0.37-0.51	90.57	40-135%
13C-1234678-HpCDD	44:23	1.03	436/438	0.88-1.20	86.73	40-135%
13C-OCDD	49:40	0.86	470/472	0.76-1.01	72.87	40-135%

NOTE: Concentrations, EMPC's, and EDL's are calculated on a wet weight basis.  
 "J" = Estimated value. Value is below Lower Method Calib. Limit (LMCL).



EPA SAMPLE NO.  
N/A

1DFB

## PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

Lab Name:	PACE INC.	Case No.:	IL1655
Contract:	IL1655	SDG No.:	N/A
Lab Code:	IN-049	SAS No.:	N/A
Matrix:	FISH	Lab Sample ID:	MB-1608/1655
Sample wt/vol:	10.02	Lab File ID:	SAM1004A041
Water Sample Prep:	Sep Funnel	Date Received:	22-SEP-95
Conc. Extract Vol.:	20 ul	Date Extracted:	25-SEP-95
Injection Volume:	2 ul	Date Analyzed:	04-OCT-95
GC Column ID:	DB-5	Dilution Factor:	N/A
% Solids:	N/A	Concentration Units:	pg/g

ANALYTE	CONCENTRATION	TOXICITY EQUIVALENCE FACTOR	TEF-ADJUSTED CONCENTRATION
2378-TCDD	0.00	1.0	0.0000
2378-TCDF	0.00	0.1	0.0000
12378-PeCDF	0.00	0.05	0.0000
12378-PeCDD	0.00	0.5	0.0000
23478-PeCDF	0.00	0.5	0.0000
123478-HxCDF	0.00	0.1	0.0000
123678-HxCDF	0.00	0.1	0.0000
123478-HxCDD	0.00	0.1	0.0000
123678-HxCDD	0.00	0.1	0.0000
123789-HxCDD	0.00	0.1	0.0000
234678-HxCDF	0.00	0.1	0.0000
123789-HxCDF	0.00	0.1	0.0000
1234678-HpCDF	0.17	0.01	0.0017
1234678-HpCDD	0.00	0.01	0.0000
1234789-HpCDF	0.00	0.01	0.0000
OCDD	0.00	0.001	0.0000
OCDF	0.00	0.001	0.0000
		TOTAL	0.0017

NOTE: Do NOT include EMPC or EDL values in the TEF-adjusted concentration.



EPA SAMPLE NO.  
DX-0011DFB  
PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

Lab Name:	PACE INC.	Case No.:	IL1655
Contract:	IL1655	SDG No.:	N/A
Lab Code:	IN-049	SAS No.:	N/A
Matrix:	FISH	Lab Sample ID:	IL1655-1
Sample wt/vol:	10.03	Lab File ID:	SAM1004A091
Water Sample Prep:	Sep Funnel	Date Received:	22-SEP-95
Conc. Extract Vol.:	20 ul	Date Extracted:	25-SEP-95
Injection Volume:	2 ul	Date Analyzed:	04-OCT-95
GC Column ID:	DB-5	Dilution Factor:	N/A
% Solids:	N/A	Concentration Units:	pg/g

ANALYTE	CONCENTRATION	TOXICITY EQUIVALENCE FACTOR	TEF-ADJUSTED CONCENTRATION
2378-TCDD	5.41	1.0	5.4088
2378-TCDF	2.46	0.1	0.2457
12378-PeCDF	9.16	0.05	0.4581
12378-PeCDD	3.23	0.5	1.6170
23478-PeCDF	2.56	0.5	1.2781
123478-HxCDF	2.90	0.1	0.2896
123678-HxCDF	2.98	0.1	0.2982
123478-HxCDD	0.00	0.1	0.0000
123678-HxCDD	6.42	0.1	0.6415
123789-HxCDD	0.00	0.1	0.0000
234678-HxCDF	0.00	0.1	0.0000
123789-HxCDF	39.91	0.1	3.9911
1234678-HpCDF	67.98	0.01	0.6798
1234678-HpCDD	15.19	0.01	0.1519
1234789-HpCDF	0.00	0.01	0.0000
OCDD	57.60	0.001	0.0576
OCDF	0.00	0.001	0.0000
		TOTAL	15.1174

NOTE: Do NOT include EMPC or EDL values in the TEF-adjusted concentration.



EPA SAMPLE NO.  
N/A1DFB  
PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

Lab Name:	PACE INC.	Case No.:	IL1655
Contract:	IL1655	SDG No.:	N/A
Lab Code:	IN-049	SAS No.:	N/A
Matrix:	FISH	Lab Sample ID:	LCS-1608/1655
Sample wt/vol:	10.05	Lab File ID:	SAM1004A101
Water Sample Prep:	Sep Funnel	Date Received:	22-SEP-95
Conc. Extract Vol.:	20 ul	Date Extracted:	25-SEP-95
Injection Volume:	2 ul	Date Analyzed:	04-OCT-95
GC Column ID:	DB-5	Dilution Factor:	N/A
% Solids:	N/A	Concentration Units:	pg/g

ANALYTE	CONCENTRATION	TOXICITY EQUIVALENCE FACTOR	TEF-ADJUSTED CONCENTRATION
2378-TCDD	19.53	1.0	19.5319
2378-TCDF	21.13	0.1	2.1129
12378-PeCDF	51.43	0.05	2.5715
12378-PeCDD	50.15	0.5	25.0770
23478-PeCDF	50.01	0.5	25.0032
123478-HxCDF	50.54	0.1	5.0535
123678-HxCDF	52.01	0.1	5.2007
123478-HxCDD	54.52	0.1	5.4521
123678-HxCDD	51.83	0.1	5.1826
123789-HxCDD	53.18	0.1	5.3175
234678-HxCDF	51.71	0.1	5.1710
123789-HxCDF	51.84	0.1	5.1841
1234678-HpCDF	52.41	0.01	0.5241
1234678-HpCDD	48.77	0.01	0.4877
1234789-HpCDF	52.73	0.01	0.5273
OCDD	102.21	0.001	0.1022
OCDF	107.76	0.001	0.1078
		TOTAL	112.6071

NOTE: Do NOT include EMPC or EDL values in the TEF-adjusted concentration.



EPA SAMPLE NO.  
N/A

1DFB  
PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

Lab Name:	PACE INC.	Case No.:	IL1655
Contract:	IL1655	SDG No.:	N/A
Lab Code:	IN-049	SAS No.:	N/A
Matrix:	FISH	Lab Sample ID:	LCS D-1608/1655
Sample wt/vol:	10.05	Lab File ID:	SAM1004A111
Water Sample Prep:	Sep Funnel	Date Received:	22-SEP-95
Conc. Extract Vol.:	20 ul	Date Extracted:	25-SEP-95
Injection Volume:	2 ul	Date Analyzed:	04-OCT-95
GC Column ID:	DB-5	Dilution Factor:	N/A
% Solids:	N/A	Concentration Units:	pg/g

ANALYTE	CONCENTRATION	TOXICITY EQUIVALENCE FACTOR	TEF-ADJUSTED CONCENTRATION
2378-TCDD	20.39	1.0	20.3891
2378-TCDF	21.79	0.1	2.1791
12378-PeCDF	52.05	0.05	2.6023
12378-PeCDD	51.08	0.5	25.5410
23478-PeCDF	51.40	0.5	25.7008
123478-HxCDF	51.02	0.1	5.1016
123678-HxCDF	51.67	0.1	5.1671
123478-HxCDD	52.50	0.1	5.2504
123678-HxCDD	56.68	0.1	5.6680
123789-HxCDD	50.66	0.1	5.0656
234678-HxCDF	51.63	0.1	5.1629
123789-HxCDF	50.06	0.1	5.0059
1234678-HpCDF	49.95	0.01	0.4995
1234678-HpCDD	48.94	0.01	0.4894
1234789-HpCDF	50.44	0.01	0.5044
OCDD	102.78	0.001	0.1028
OCDF	108.65	0.001	0.1087
TOTAL			114.5384

NOTE: Do NOT include EMPC or EDL values in the TEF-adjusted concentration.



C E R T I F I C A T E O F A N A L Y S I S

Service Location HERITAGE ENVIRONMENTAL SERVICES, INC. COMMERCIAL LABORATORY OPERATIONS 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	Received 21-SEP-95	Project 3564	Lab ID A354840
	Complete 26-OCT-95	PO Number BP005481**	
	Printed 26-OCT-95	Sampled 10-AUG-95	

Report To  JIM MITCHELL - DEPT. FOR ENVIR. SERVICE KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECT 150 SOWER BLVD. FRANKFORT, KY 40601	Bill To  KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECT 14 REILLY ROAD FRANKFORT, KY 40601
--	--

Sample Description  SAMPLE I.D.: DX-001 SAMPLE DESCRIPTION: FISH TISSUE SDG NUMBER: 3564-92195
--

**POLYCHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS SW846-8280**  
 ANALYSE DATE: 26-OCT-95      VENDOR: PACELABS (FORMERLY COAST TO COAST)

Parameter	Result	Det. Limit	Units
2,3,7,8-TCDD	5.41		pg/g
2,3,7,8-TETRACHLORODIBENZOFURAN	2.46		pg/g
1,2,3,7,8-PENTACHLORODIBENZOFURAN	9.16		pg/g
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	3.23		pg/g
2,3,4,7,8-PENTACHLORODIBENZOFURAN	2.56		pg/g
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	2.90		pg/g
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	2.98		pg/g
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	BDL	20.17	pg/g
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	6.42		pg/g
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	*		pg/g
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	BDL	31.98	pg/g
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	39.91		pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67.98		pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	15.19		pg/g
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	BDL	0.62	pg/g
OCTACHLORODIBENZODIOXIN	57.60		pg/g
OCTACHLORODIBENZOFURAN	BDL	3.37	pg/g

\* 123789 HxCDD result is Estimated Maximum Potential Concentration (EMPC).  
 123478-HxCDD detection limit is estimated.

Sample Comments  * See Note for Parameter BDL Below Detection Limit  This Certificate shall not be reproduced, except in full, without the written approval of the lab.  Additional copies of this report sent to: MIKE MILLS - FNV SUPERVISOR, KENTUCKY DIV. OF WATER
---



HERITAGE ENVIRONMENTAL SERVICES, INC.

Lab Sample ID: A354840

Sample Comments

14 REILLY ROAD, FRANKFORT, KY 40601

As indicated, some testing was performed at the following locations:  
PACE LABS (FORMERLY COAST TO COAST)  
7726 MOLLER ROAD, INDIANAPOLIS, IN 46268







## REPORT OF LABORATORY ANALYSIS

### PCDD/PCDF INVENTORY SHEET

*Method 8290*

IL1655

Inventory

Case Narrative

#### PCDD/PCDF FORMS:

- 1DFA Sample Data Summary (Form I PCDD 1)
- 1DFB Toxicity Equivalence Summary (Form I PCDD-2)
- 2DF Total Homologue Concentration Summary (Form II PCDD)
- 3DFA Spiked Sample Summary (Form III PCDD-1)
- 3DFC Spike Duplicate Sample Summary (Form III PCDD-1)
- 4DF Method Blank Summary
- 5DFA Window Defining Summary
- 5DFB Chromatographic Resolution Summary
- 5DFC Analytical Sequence Summary
- 6DFA Initial Calibration Response Factor Summary (Form VI PCDD-1)
- 6DFB Initial Calibration Ion Abundance Ratio Summary (Form VI PCDD-2)
- 7DFA Continuing Calibration Summary (Form VII PCDD-1)
- 7DFB Continuing Calibration Summary (Form VII PCDD-2)

#### Raw Data & Chromatograms:

- Sample Chromatograms
- QC Sample Chromatograms
- Routine Calibrations
- Window Def. Mix & Initial Cal. (10/02, VG #1)

#### Other Documents:

- Sample Extract/Tracking Record
- Chain of Custody





## REPORT OF LABORATORY ANALYSIS

### CASE NARRATIVE IL1655

One fish sample was received on September 22, 1995 and identified as IL1655-1. This sample was prepared, extracted and analyzed according to USEPA Method 8290, Revision 0, November, 1990. The analysis included a method blank, a lab control sample (LCS) and a lab control sample duplicate (LCSD).

Before extraction, both field and QC samples were spiked with 1000 pg of labeled <sup>13</sup>C<sub>12</sub> Tetra-Penta chlorinated dibenzo-p-dioxins and dibenzofurans, 2500 pg of labeled <sup>13</sup>C<sub>12</sub> Hexa-Hepta chlorinated dibenzo-p-dioxins and dibenzofurans, and 5000 pg of labeled <sup>13</sup>C<sub>12</sub> Octachloro-dibenzo-p-dioxin, for a total of nine internal standards. A total of seventeen native dioxin and furan isomers were analyzed. In addition, the lab control samples were spiked with 200 pg of tetra dioxin/furan, 500 pg of penta-hepta dioxins/furans, and 1000 pg of octa dioxin/furan.

The verification solution used for the daily calibration check was CS-3. It contains 10 pg/ul of native tetra dioxin/furan isomers, 25 pg/ul of native penta-hepta dioxin/furan isomers and 50 pg/ul of native octa dioxin/furan isomers. The <sup>13</sup>C<sub>12</sub> labeled compounds are at a concentration of 50 pg/ul for tetra-penta dioxin/furan, 125 pg/ul for hexa-hepta dioxin/furan, and 250 pg/ul for octa dioxin.

Cleanup steps imposed were: acid/base back extraction, silica/alumina column chromatography and carbon/celite column chromatography, prior to analysis on VG Autospec #1 HRMS. Sample IL1655-1 exhibited numerous diphenyl ether interferences and subsequently were not subtracted from the "totals" concentrations.

A summarized data report, which follows this narrative, lists the concentration in picograms per gram of all seventeen native analytes, estimated maximum possible concentration (EMPC) or the estimated detection limit (EDL), and percent recovery of the nine labeled internal standards. The reported concentrations listed on Form 1DFA which have a "J" flag extension are less than the Lower Method Calibration Limit (LMCL) and should be considered as estimated values. Levels below the LMCL are an extrapolation of the calibration curve with no documentation of linearity or accuracy. The sample receipt and condition information may be found on the chain-of-custody.

Hopefully, this brief narrative will answer any questions which may arise during your review of this data. However, if you do encounter any questions, please contact your project manager at your convenience.

Analyst: DGE

October 5, 1995

A handwritten signature in black ink, appearing to be the initials "DGE", is written over the typed name and date.



1DFA  
PCDD/PCDF SAMPLE DATA SUMMARY

EPA SAMPLE NO.  
N/A

Lab Name: PACE INC. Case No.: IL1655  
 Contract: IL1655 SDG No.: N/A  
 Lab Code: IN-049 SAS No.: N/A  
 Matrix: FISH Lab Sample ID: MB-1608/1655  
 Sample wt/vol: 10.02 Lab File ID: SAM1004A041  
 Water Sample Prep: Sep Funnel Date Received: 22-SEP-95  
 Conc. Extract Vol.: 20 ul Date Extracted: 25-SEP-95  
 Injection Volume: 2 ul Date Analyzed: 04-OCT-95  
 GC Column ID: DB-5 Dilution Factor: N/A  
 % Solids: N/A Concentration Units: pg/g

ANALYTE	PEAK RT	ION RATIO	SELECTED IONS	CONCENTRATION	EMPC	EDL
2378-TCDD	30: 3		320/322	ND		0.44
2378-TCDF	28:41		304/306	ND		0.29
12378-PeCDF	35: 4		340/342	ND		0.13
12378-PeCDD	36:10		356/358	ND		0.21
23478-PeCDF	35:48		340/342	ND		0.13
23478-HxCDF	39: 3		374/376	ND		0.09
123678-HxCDF	39:10		374/376	ND		0.08
123478-HxCDD	39:56		390/392	ND		0.12
123678-HxCDD	40: 2		390/392	ND		0.10
123789-HxCDD	40:24		390/392	ND		0.11
234678-HxCDF	39:45		374/376	ND		0.10
123789-HxCDF	40:43		374/376	ND		0.12
234678-HpCDF	42:57	0.91	408/410	0.17 J		
1234678-HpCDD	44:23		424/426	ND	0.33	0.88
1234789-HpCDF	45: 4		408/410	ND		0.05
OCDD	49:41		458/460	ND	1.19	
OCDF	49:58		442/444	ND		0.42

INTERNAL STANDARDS	PEAK RT	ION RATIO	SELECTED IONS	ION RATIO LIMITS	% REC	RECOVERY LIMITS
13C-2378-TCDF	28:40	0.78	316/318	0.65-0.89	84.85	40-135%
13C-2378-TCDD	30: 2	0.78	332/334	0.65-0.89	81.33	40-135%
13C-12378-PeCDF	35: 2	1.52	352/354	1.32-1.78	98.58	40-135%
13C-12378-PeCDD	36: 9	1.58	368/370	1.32-1.78	96.70	40-135%
13C-123478-HxCDF	39: 1	0.52	384/386	0.43-0.59	89.79	40-135%
13C-123678-HxCDD	40: 1	1.29	402/404	1.05-1.43	91.39	40-135%
13C-1234678-HpCDF	42:56	0.45	420/422	0.37-0.51	89.23	40-135%
13C-1234678-HpCDD	44:23	1.03	436/438	0.88-1.20	91.30	40-135%
13C-OCDD	49:39	0.88	470/472	0.76-1.01	91.03	40-135%

NOTE: Concentrations, EMPC's, and EDL's are calculated on a wet weight basis.  
 "J" = Estimated value Value is below Lower Method Calib Limit (LMCL)



1DFA  
PCDD/PCDF SAMPLE DATA SUMMARY

EPA SAMPLE NO.  
DX-001

Lab Name: PACE INC. Case No.: IL1655  
 Contract: IL1655 SDG No.: N/A  
 Lab Code: IN-049 SAS No.: N/A  
 Matrix: FISH Lab Sample ID: IL1655-1  
 Sample wt/vol: 10.03 Lab File ID: SAM1004A091  
 Water Sample Prep: Sep Funnel Date Received: 22-SEP-95  
 Conc. Extract Vol.: 20 ul Date Extracted: 25-SEP-95  
 Injection Volume: 2 ul Date Analyzed: 04-OCT-95  
 GC Column ID: DB-5 Dilution Factor: N/A  
 % Solids: N/A Concentration Units: pg/g

ANALYTE	PEAK RT	ION RATIO	SELECTED IONS	CONCENTRATION	EMPC	EDL
2378-TCDD	30:4	0.74	320/322	5.41		
2378-TCDF	28:44	0.74	304/306	2.46		
12378-PeCDF	35:3	1.54	340/342	9.16		
12378-PeCDD	36:11	1.56	356/358	3.23		
23478-PeCDF	35:48	1.52	340/342	2.56		
23478-HxCDF	39:6	1.40	374/376	2.90		
123678-HxCDF	39:12	1.41	374/376	2.98		
23478-HxCDD	39:54		390/392	ND		20.17
23678-HxCDD	40:5	1.08	390/392	6.42		
123789-HxCDD	40:30		390/392	ND	1.59	
234678-HxCDF	39:50		374/376	ND		31.98
23789-HxCDF	40:47	1.31	374/376	39.91		
234678-HpCDF	43:33	1.14	408/410	67.98		
1234678-HpCDD	44:32	1.00	424/426	15.19		
234789-HpCDF	45:40		408/410	ND		0.62
OCDD	49:42	0.77	458/460	57.60		
OCDF	49:57		442/444	ND		3.37

INTERNAL STANDARDS	PEAK RT	ION RATIO	SELECTED IONS	ION RATIO LIMITS	% REC	RECOVERY LIMITS
13C-2378-TCDF	28:41	0.80	316/318	0.65-0.89	85.01	40-135%
13C-2378-TCDD	30:0	0.77	332/334	0.65-0.89	76.60	40-135%
13C-12378-PeCDF	35:3	1.50	352/354	1.32-1.78	85.36	40-135%
13C-12378-PeCDD	36:10	1.53	368/370	1.32-1.78	76.64	40-135%
13C-123478-HxCDF	39:3	0.54	384/386	0.43-0.59	96.14	40-135%
13C-123678-HxCDD	40:4	1.34	402/404	1.05-1.43	80.27	40-135%
13C-1234678-HpCDF	43:33	0.45	420/422	0.37-0.51	63.11	40-135%
13C-1234678-HpCDD	44:32	1.04	436/438	0.88-1.20	64.28	40-135%
13C-OCDD	49:41	0.87	470/472	0.76-1.01	49.23	40-135%

NOTE: Concentrations, EMPC's, and EDL's are calculated on a wet weight basis.  
 ".J." = Estimated value Value is below Lower Method Calib. Limit (LMCL).



# CERTIFICATE OF ANALYSIS

P.1/2

Serv Location <b>HERITAGE COMMERCIAL</b> 7901 W. INDIANAPOLIS (317)243-06	Location <b>ENVIRONMENTAL SERVICES, INC.</b> LABORATORY OPERATIONS RIS ST. S, IN 46231 06	Received	Project	Lab ID
		15-DEC-95	3564	A36295
		Complete	PO Number	
21-FEB-96	BPO05481**			
Printed	Sampled			
23-FEB-96	10-AUG-95			

Report To <b>MIKE MILLS - FRY SUPERVISOR</b> KENTUCKY DIV. OF WATER 14 REILLY ROAD FRANKFORT, KY 40601	Bill To KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECT 14 REILLY ROAD FRANKFORT, KY 40601
--	--

Client ID: DX-002 Sample Description: FISH TISSUE Crappie SDG M BER: 3564-121895
--

Parameter	Result	Det. Limit	Units
2,3,7,8-TCDD	BDL	0.63	pg/g
1,2,3,7,8-PEN	BDL	4.66	pg/g
2,3,4,7,8-PEN	BDL	4.72	pg/g
1,2,3,6,7,8-HI	BDL	0.63	pg/g
1,2,3,4,7,8-HI	BDL	0.95	pg/g
1,2,3,5,7,8-HE	BDL	0.95	pg/g
2,3,4,6,7,8-HE	BDL	0.72	pg/g
1,2,3,4,6,7,8-HE	BDL	1.09	pg/g
1,2,3,4,7,8,9-HI	BDL	1.51	pg/g
1,2,3,4,7,8,9-HI	BDL	5.34	pg/g
OCTACHLORODIBEN	BDL		
MINIMUM POTENTIAL CONCENTRATION.			

\* See Note 1  
BDL Below Detection Limit

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Additional copies of this report sent to: JIM MITCHELL - D

**Fax Transmittal Memo**

# of Pages <u>2</u>	
To: <u>Paw Wood</u>	From: <u>Mike Mills</u>
Co: <u>Ombud</u>	Co.: <u>Water</u>
Dept.:	Phone #
Fax #	Fax #



HERITAGE ENVIRONMENTAL SERVICES, INC.

Sample ID: A362952 DX-002

150 SOWER RD., FRANKFORT, KY 40601

Sample Comments

As indicated, some testing was performed at the following locations:  
CORE LABS (FORMERLY PACE) (FORMERLY COAST-TO-  
7726 HOLLAND ROAD, INDIANAPOLIS, IN 46268

Approved :

Brendal Byers



HERITAGE ENVIRONMENTAL SERVICES, INC.

Sample ID: A362952 DX-002

Sample Comments

150 SOWER BLVD., FRANKFORT, KY 40601

As indicated, some testing was performed at the following locations:  
CORE LABS (FORMERLY PACE) (FORMERLY COAST-TO-  
7726 MOLLER ROAD, INDIANAPOLIS, IN 46268

Approved :

Brendal Byer



### CERTIFICATE OF ANALYSIS

Service Location HERITAGE ENVIRONMENTAL SERVICES, INC. COMMERCIAL LABORATORY OPERATIONS 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	Received	Project	Lab ID
	15-DEC-95	3564	A362953
	Complete	PO Number	
	21-FEB-96	BP005481**	
	Printed	Sampled	
	22-FEB-96	14-DEC-95	

Report To  MIKE MILLS - FNV SUPERVISOR KENTUCKY DIV. OF WATER 14 REILLY ROAD FRANKFORT, KY 40601	Bill To  KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECT 14 REILLY ROAD FRANKFORT, KY 40601
---	--

CLIENT ID: DX-003 SAMPLE DESCRIPTION: SEDIMENT SDG NUMBER: 3564-121895	Sample Description
--	--------------------

POLYCHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS SW846-8280 <small>Analysis Date: 24-JAN-96 Vendor: CORE LABS (FORMERLY PAGE) (FORMERLY COAST-TO-)</small>			
Parameter	Result	Det. Limit	Units
2,3,7,8-TCDD	BDL	0.45	pg/g
2,3,7,8-TETRACHLORODIBENZOFURAN	*	0.60	pg/g
1,2,3,7,8-PENTACHLORODIBENZOFURAN	EST 0.98		pg/g
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	BDL	2.57	pg/g
2,3,4,7,8-PENTACHLORODIBENZOFURAN	BDL	2.08	pg/g
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	EST 1.54		pg/g
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	*	0.33	pg/g
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	EST 0.39		pg/g
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	EST 1.23		pg/g
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	EST 2.04		pg/g
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	*	0.23	pg/g
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	BDL	3.60	pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	5.02		pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	42.40		pg/g
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	BDL	2.84	pg/g
OCTACHLORODIBENZODIOXIN	1933.70		pg/g
OCTACHLORODIBENZOFURAN	*	6.45	pg/g

\* = ESTIMATED MAXIMUM POTENTIAL CONCENTRATION

Sample Comments AMENDED REPORT TO CORRECT REPORTING UNITS, 22-FEB-96 GAB. WE APOLOGIZE FOR THE ERROR.
* See Note for Parameter BDL Below Detection Limit EST Estimated Value
This Certificate shall not be reproduced, except in full,



MAY 01 '97 03:02PM

P.18

without the written approval of the lab.

Additional copies of this report sent to:  
JIM MITCHELL - DEPT. FOR ENVIR. SERVICES, KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECTION  
150 SOWER BLVD., FRANKFORT, KY 40601

As indicated, some testing was performed at the following locations:  
CORE LABS (FORMERLY PACE) (FORMERLY COAST-TO-  
7726 MOLLER ROAD, INDIANAPOLIS, IN 46268

Approved :





HERITAGE ENVIRONMENTAL SERVICES, INC.

Sample ID: A362954 DX-004

Sample Comments

150 SOWER BLVD., FRANKFORT, KY 40601

As indicated, some testing was performed at the following locations:  
CORE LABS (FORMERLY PACE) (FORMERLY COAST-TO-  
7726 MOLLER ROAD, INDIANAPOLIS, IN 46268

Approved :

Brendal Byer



PHILLIP J. SHEPHERD  
SECRETARY



BRERETON C. JONES  
GOVERNOR

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR ENVIRONMENTAL PROTECTION  
DIVISION OF ENVIRONMENTAL SERVICES  
100 SOWER BOULEVARD  
SUITE 104  
FRANKFORT, KY 40601

RECEIVED  
NOV 16 1995

October 4, 1995

Division of Environmental Services  
Report Number: A20-01309  
Sample Number: 9502740

To: Division of Water  
Frankfort Office Park  
Frankfort, Kentucky 40601

Re: Chickasaw Park

Attn: Michael Mills

County: Jefferson

Facility:

Collected by: Michael Mills

Date: 08/10/95 Time: 1300

Delivered by: Karen Smathers

Date: 08/17/95 Time: 0940

Received by: Polly Baker

Date: 08/17/95 Time: 0940

Sample Matrix: Tissue

Collection Method: Grab

Sample Identification: Crappie fillet from Chickasaw Park pond

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Arsenic	ND @ 0.150 mg/Kg
Cadmium	0.019 mg/Kg
Lead	ND @ 0.160 mg/Kg
Mercury	0.429 mg/Kg
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.010 mg/Kg
Hexachlorobenzene	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, alpha isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, beta isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, gamma isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, delta isomer	ND @ 0.010 mg/Kg
Heptachlor	ND @ 0.010 mg/Kg
Aldrin	ND @ 0.010 mg/Kg
Chlorpyrifos	ND @ 0.010 mg/Kg
Heptachlor epoxide	ND @ 0.010 mg/Kg
Oxychlordane	ND @ 0.010 mg/Kg
trans-Chlordane	ND @ 0.010 mg/Kg
cis-Chlordane	ND @ 0.010 mg/Kg
trans-Nonachlor	ND @ 0.010 mg/Kg
alpha-Chlordene	ND @ 0.010 mg/Kg
Chlordene	ND @ 0.010 mg/Kg
gamma-Chlordene	ND @ 0.010 mg/Kg



October 4, 1995

Report Number: A20-01309

Page 2 of 2

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
cis-Nonachlor	ND @ 0.010 mg/Kg
Technical Chlordane	ND @ 0.010 mg/Kg
o,p'-DDE	ND @ 0.010 mg/Kg
p,p'-DDE	ND @ 0.010 mg/Kg
Dieldrin	ND @ 0.010 mg/Kg
Endrin	ND @ 0.010 mg/Kg
o,p'-DDD	ND @ 0.010 mg/Kg
p,p'-DDD	ND @ 0.010 mg/Kg
o,p'-DDT	ND @ 0.010 mg/Kg
p,p'-DDT	ND @ 0.010 mg/Kg
Total DDT	ND @ 0.010 mg/Kg
Methoxychlor	ND @ 0.010 mg/Kg
Mirex	ND @ 0.010 mg/Kg
Endosulfan I	ND @ 0.010 mg/Kg
Endosulfan II	ND @ 0.010 mg/Kg
Endosulfan sulfate	ND @ 0.010 mg/Kg
Endrin aldehyde	ND @ 0.010 mg/Kg
Endrin ketone	ND @ 0.010 mg/Kg
Toxaphene	ND @ 0.050 mg/Kg
Atrazine	ND @ 0.100 mg/Kg
Alachlor	ND @ 0.050 mg/Kg
Aroclor 1016	ND @ 0.050 mg/Kg
Aroclor 1221	ND @ 0.100 mg/Kg
Aroclor 1232	ND @ 0.100 mg/Kg
Aroclor 1242	ND @ 0.050 mg/Kg
Aroclor 1248	ND @ 0.050 mg/Kg
Aroclor 1254	ND @ 0.050 mg/Kg
Aroclor 1260	ND @ 0.050 mg/Kg
Aroclor 1262	ND @ 0.050 mg/Kg
Aroclor 1268	ND @ 0.050 mg/Kg

ND = Not Detected

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.

*William E. Davis*  
 \_\_\_\_\_  
 William E. Davis, Director  
 Division of Environmental Services



PHILLIP J. SHEPHERD  
SECRETARY



BRERETON C. JONES  
GOVERNOR

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR ENVIRONMENTAL PROTECTION  
DIVISION OF ENVIRONMENTAL SERVICES  
100 SOWER BOULEVARD  
SUITE 104  
FRANKFORT, KY 40601

October 4, 1995  
Division of Environmental Services  
Report Number: A20-01310  
Sample Number: 9502741

To: Division of Water  
Frankfort Office Park  
Frankfort, Kentucky 40601

Re: Chickasaw Park

Attn: Michael Mills

County: Jefferson

Facility:

Collected by: Michael Mills

Date: 08/10/95 Time: 1300

Delivered by: Karen Smathers

Date: 08/17/95 Time: 0940

Received by: Polly Baker

Date: 08/17/95 Time: 0940

Sample Matrix: Tissue

Collection Method: Grab

Sample Identification: Carp fillet from Chickasaw Park pond

REPORT OF ANALYSIS

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
Arsenic	ND @ 0.150 mg/Kg
Cadmium	ND @ 0.012 mg/Kg
Lead	ND @ 0.160 mg/Kg
Mercury	0.055 mg/Kg
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.050 mg/Kg
Hexachlorobenzene	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, alpha isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, beta isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, gamma isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, delta isomer	ND @ 0.025 mg/Kg
Heptachlor	ND @ 0.025 mg/Kg
Aldrin	ND @ 0.025 mg/Kg
Chlorpyrifos	ND @ 0.025 mg/Kg
Heptachlor epoxide	ND @ 0.025 mg/Kg
Oxychlorane	ND @ 0.025 mg/Kg
trans-Chlordane	ND @ 0.025 mg/Kg
cis-Chlordane	ND @ 0.025 mg/Kg
trans-Nonachlor	ND @ 0.025 mg/Kg
alpha-Chlordene	ND @ 0.025 mg/Kg
Chlordene	ND @ 0.025 mg/Kg
gamma-Chlordene	ND @ 0.025 mg/Kg



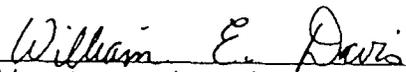
October 4, 1995  
 Report Number: A20-01310  
 Page 2 of 2

TOTAL CONSTITUENTSCONCENTRATION

cis-Nonachlor	ND @ 0.025 mg/Kg
Technical Chlordane	ND @ 0.025 mg/Kg
o,p'-DDE	ND @ 0.025 mg/Kg
p,p'-DDE	ND @ 0.025 mg/Kg
Dieldrin	ND @ 0.025 mg/Kg
Endrin	ND @ 0.025 mg/Kg
o,p'-DDD	ND @ 0.025 mg/Kg
p,p'-DDD	ND @ 0.025 mg/Kg
o,p'-DDT	ND @ 0.025 mg/Kg
p,p'-DDT	ND @ 0.025 mg/Kg
Total DDT	ND @ 0.025 mg/Kg
Methoxychlor	ND @ 0.025 mg/Kg
Mirex	ND @ 0.025 mg/Kg
Endosulfan I	ND @ 0.025 mg/Kg
Endosulfan II	ND @ 0.025 mg/Kg
Endosulfan sulfate	ND @ 0.025 mg/Kg
Endrin aldehyde	ND @ 0.025 mg/Kg
Endrin ketone	ND @ 0.025 mg/Kg
Toxaphene	ND @ 0.250 mg/Kg
Atrazine	ND @ 0.500 mg/Kg
Alachlor	ND @ 0.250 mg/Kg
Aroclor 1016	ND @ 0.250 mg/Kg
Aroclor 1221	ND @ 0.500 mg/Kg
Aroclor 1232	ND @ 0.500 mg/Kg
Aroclor 1242	ND @ 0.250 mg/Kg
Aroclor 1248	ND @ 0.250 mg/Kg
Aroclor 1254	ND @ 0.250 mg/Kg
Aroclor 1260	0.532 mg/Kg
Aroclor 1262	ND @ 0.250 mg/Kg
Aroclor 1268	ND @ 0.250 mg/Kg

ND = Not Detected

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.

  
 William E. Davis, Director  
 Division of Environmental Services





# CITY OF LOUISVILLE

DEPARTMENT OF PUBLIC HEALTH & SAFETY  
OFFICE OF HEALTH AND THE ENVIRONMENT  
601 W. Jefferson Street • Louisville, KY 40202-2728  
(502) 574-3271 • FAX (502) 574-1389

JERRY E. ABRAMSON  
MAYOR

BONNIE K. BIEMER  
ADMINISTRATOR

FAX (502) 574-1389

DATE: 12/18/95

TO: Mark Klan  
CITY: \_\_\_\_\_  
FAX#: \_\_\_\_\_

COMPANY: PLEXES  
STATE: \_\_\_\_\_  
NUMBER OF PAGES: 13

FROM: Dennis Minks

COMMENTS: Mark - The attached info includes fish tissue sample analysis and Dr. Westerman's calculations.

Please review and provide an analysis of the information provided.

Provide a cost estimate of the project prior to initiating the requested work.

*[Handwritten signature]*





**CERTIFICATE OF ANALYSIS**

Service Location HERITAGE ENVIRONMENTAL SERVICES, INC. COMMERCIAL LABORATORY OPERATIONS 7901 W. MORRIS ST. INDIANAPOLIS, IN 46231 (317)243-8305	Received 21-SEP-95	Project 3564	Lab ID A354840
	Complete 26-OCT-95	PO Number BP005481**	
	Printed 26-OCT-95	Sampled 10-AUG-95	

Report To  MIKE MILLS - FNV SUPERVISOR KENTUCKY DIV. OF WATER 14 REILLY ROAD FRANKFORT, KY 40601	Bill To  KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECT 14 REILLY ROAD FRANKFORT, KY 40601
---	--

Sample Description  
 SAMPLE I.D.: DX-001  
 SAMPLE DESCRIPTION: FISH TISSUE  
 SDG NUMBER: 3564-92195

**POLYCHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS SW846-8280**

Parameter	Result	Det. Limit	Units
2,3,7,8-TCDD	5.41		pg/g
2,3,7,8-TETRACHLORODIBENZOFURAN	2.46		pg/g
1,2,3,7,8-PENTACHLORODIBENZOFURAN	9.16		pg/g
1,2,3,7,8-PENTACHLORODIBENZODIOXIN	3.23		pg/g
2,3,4,7,8-PENTACHLORODIBENZOFURAN	2.56		pg/g
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	2.90		pg/g
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	2.98		pg/g
1,2,3,4,7,8-HEXACHLORODIBENZODIOXIN	BDL	20.17	pg/g
1,2,3,6,7,8-HEXACHLORODIBENZODIOXIN	6.42		pg/g
1,2,3,7,8,9-HEXACHLORODIBENZODIOXIN	*		pg/g
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	BDL	31.98	pg/g
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	39.91		pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67.98		pg/g
1,2,3,4,6,7,8-HEPTACHLORODIBENZODIOXIN	15.19		pg/g
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	BDL	0.62	pg/g
OCTACHLORODIBENZODIOXIN	57.60		pg/g
OCTACHLORODIBENZOFURAN	BDL	3.37	pg/g

\* 123789 HxCDD result is Estimated Maximum Potential Concentration (EMPC).  
 123478-HxCDD detection limit is estimated.

Sample Comments

\* See Note for Parameter  
 BDL Below Detection Limit

This Certificate shall not be reproduced, except in full, without the written approval of the lab.

Additional copies of this report sent to:  
 JIM MITCHELL - DEPT. FOR ENVIR. SERVICES, KENTUCKY DEPT. FOR ENVIRONMENTAL PROTECTION



**HERITAGE ENVIRONMENTAL SERVICES, INC.**

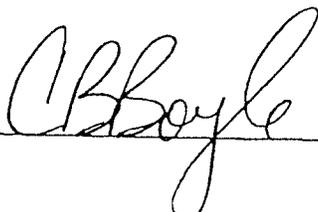
**Lab Sample ID: A354840**

Sample Comments

150 SOWER BLVD., FRANKFORT, KY 40601

As indicated, some testing was performed at the following locations:  
PACE LABS (FORMERLY COAST TO COAST)  
7726 MOLLER ROAD, INDIANAPOLIS, IN 46268

Approved :





PHILLIP J. SHEPHERD  
SECRETARY



BRERETON C. JONES  
GOVERNOR

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR ENVIRONMENTAL PROTECTION  
DIVISION OF ENVIRONMENTAL SERVICES  
100 SOWER BOULEVARD  
SUITE 104  
FRANKFORT, KY 40601

October 4, 1995

Division of Environmental Services  
Report Number: A20-01310  
Sample Number: 9502741

To: Division of Water  
Frankfort Office Park  
Frankfort, Kentucky 40601

Re: Chickasaw Park

Attn: Michael Mills

County: Jefferson

Facility:

Collected by: Michael Mills

Date: 08/10/95 Time: 1300

Delivered by: Karen Smathers

Date: 08/17/95 Time: 0940

Received by: Polly Baker

Date: 08/17/95 Time: 0940

Sample Matrix: Tissue

Collection Method: Grab

Sample Identification: Carp fillet from Chickasaw Park pond

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Arsenic	ND @ 0.150 mg/Kg
Cadmium	ND @ 0.012 mg/Kg
Lead	ND @ 0.160 mg/Kg
Mercury	0.055 mg/Kg
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.050 mg/Kg
Hexachlorobenzene	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, alpha isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, beta isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, gamma isomer	ND @ 0.025 mg/Kg
Hexachlorocyclohexane, delta isomer	ND @ 0.025 mg/Kg
Heptachlor	ND @ 0.025 mg/Kg
Aldrin	ND @ 0.025 mg/Kg
Chlorpyrifos	ND @ 0.025 mg/Kg
Heptachlor epoxide	ND @ 0.025 mg/Kg
Oxychlorane	ND @ 0.025 mg/Kg
trans-Chlordane	ND @ 0.025 mg/Kg
cis-Chlordane	ND @ 0.025 mg/Kg
trans-Nonachlor	ND @ 0.025 mg/Kg
alpha-Chlordene	ND @ 0.025 mg/Kg
Chlordene	ND @ 0.025 mg/Kg
gamma-Chlordene	ND @ 0.025 mg/Kg



PHILLIP J. SHEPHERD  
SECRETARY



BRERETON C. JONES  
GOVERNOR

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR ENVIRONMENTAL PROTECTION  
DIVISION OF ENVIRONMENTAL SERVICES  
100 SOWER BOULEVARD  
SUITE 104  
FRANKFORT, KY 40601

October 4, 1995

Division of Environmental Services  
Report Number: A20-01309  
Sample Number: 9502740

To: Division of Water  
Frankfort Office Park  
Frankfort, Kentucky 40601

Re: Chickasaw Park

Attn: Michael Mills

County: Jefferson

Facility:

Collected by: Michael Mills

Date: 08/10/95 Time: 1300

Delivered by: Karen Smathers

Date: 08/17/95 Time: 0940

Received by: Polly Baker

Date: 08/17/95 Time: 0940

Sample Matrix: Tissue

Collection Method: Grab

Sample Identification: Crappie fillet from Chickasaw Park pond

REPORT OF ANALYSIS

TOTAL CONSTITUENTS

CONCENTRATION

Arsenic	ND @ 0.150 mg/Kg
Cadmium	0.019 mg/Kg
Lead	ND @ 0.160 mg/Kg
Mercury	0.429 mg/Kg
1,2,3,4,5,5-Hexachloro-1,3-cyclopentadiene	ND @ 0.010 mg/Kg
Hexachlorobenzene	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, alpha isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, beta isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, gamma isomer	ND @ 0.010 mg/Kg
Hexachlorocyclohexane, delta isomer	ND @ 0.010 mg/Kg
Heptachlor	ND @ 0.010 mg/Kg
Aldrin	ND @ 0.010 mg/Kg
Chlorpyrifos	ND @ 0.010 mg/Kg
Heptachlor epoxide	ND @ 0.010 mg/Kg
Oxychlordane	ND @ 0.010 mg/Kg
trans-Chlordane	ND @ 0.010 mg/Kg
cis-Chlordane	ND @ 0.010 mg/Kg
trans-Nonachlor	ND @ 0.010 mg/Kg
alpha-Chlordene	ND @ 0.010 mg/Kg
Chlordene	ND @ 0.010 mg/Kg
gamma-Chlordene	ND @ 0.010 mg/Kg



October 4, 1995

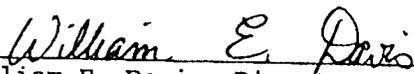
Report Number: A20-01309

Page 2 of 2

<u>TOTAL CONSTITUENTS</u>	<u>CONCENTRATION</u>
cis-Nonachlor	ND @ 0.010 mg/Kg
Technical Chlordane	ND @ 0.010 mg/Kg
o,p'-DDE	ND @ 0.010 mg/Kg
p,p'-DDE	ND @ 0.010 mg/Kg
Dieldrin	ND @ 0.010 mg/Kg
Endrin	ND @ 0.010 mg/Kg
o,p'-DDD	ND @ 0.010 mg/Kg
p,p'-DDD	ND @ 0.010 mg/Kg
o,p'-DDT	ND @ 0.010 mg/Kg
p,p'-DDT	ND @ 0.010 mg/Kg
Total DDT	ND @ 0.010 mg/Kg
Methoxychlor	ND @ 0.010 mg/Kg
Mirex	ND @ 0.010 mg/Kg
Endosulfan I	ND @ 0.010 mg/Kg
Endosulfan II	ND @ 0.010 mg/Kg
Endosulfan sulfate	ND @ 0.010 mg/Kg
Endrin aldehyde	ND @ 0.010 mg/Kg
Endrin ketone	ND @ 0.010 mg/Kg
Toxaphene	ND @ 0.050 mg/Kg
Atrazine	ND @ 0.100 mg/Kg
Alachlor	ND @ 0.050 mg/Kg
Aroclor 1016	ND @ 0.050 mg/Kg
Aroclor 1221	ND @ 0.100 mg/Kg
Aroclor 1232	ND @ 0.100 mg/Kg
Aroclor 1242	ND @ 0.050 mg/Kg
Aroclor 1248	ND @ 0.050 mg/Kg
Aroclor 1254	ND @ 0.050 mg/Kg
Aroclor 1260	ND @ 0.050 mg/Kg
Aroclor 1262	ND @ 0.050 mg/Kg
Aroclor 1268	ND @ 0.050 mg/Kg

ND = Not Detected

This report has been prepared and reviewed by personnel within the Division of Environmental Services. It has been approved for release.

  
 William E. Davis, Director  
 Division of Environmental Services

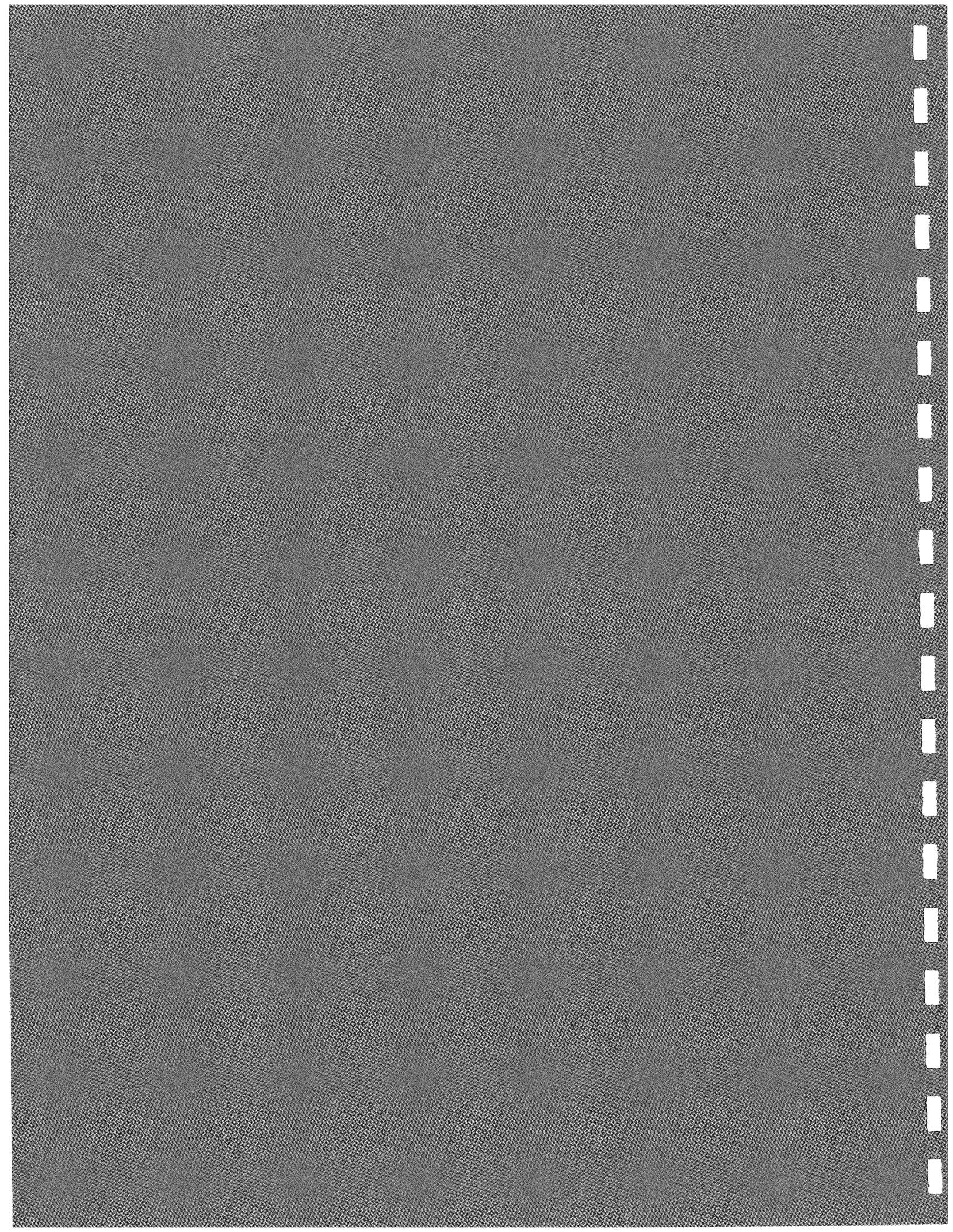






APPENDIX B

RISK ASSESSMENT PARAMETERS



## **APPENDIX B - RISK ASSESSMENT PARAMETERS**

### **Identification of Contaminants of Concern**

Contaminants of concern (COCs) for this risk assessment have been selected as dioxin and furans. This is based on historical sampling, previous evaluations, regulatory and community concerns, and current sampling results. The individual dioxin and furan congeners detected in the current sediment samples are presented in Table 1. As shown in the Table, no 2,3,7,8-TCDD was detected in the samples. The predominant detected congener was OCDD. COCs, other than the detected dioxin/furan congeners, were not evaluated as part of this assessment.

### **Exposure Assessment**

The predominant types of receptor populations considered in this assessment are nearby residents who fish in the lake. Exposures to both adults and children through consumption of fish from the lake and incidental contact with lake sediments are considered to be possible. Because exposures are assumed to result from consumption of fish, the rate of consumption (grams/day) for children versus adults are assumed to be proportional to increases in body weight from child to adult. Also, the cancer risk level from exposure to dioxins is averaged over a lifetime of exposure and does not reflect acute or subchronic exposures to children. Therefore, the precalculated risk-based concentrations are appropriate for both children and adults. The ingestion rate is assumed to be 6.5 g/day based on USEPA (1994a) estimates of fish consumption. The actual level of fish consumption from Chickasaw Lake is expected to be much less.

Current sediment conditions are used to estimate potential dioxin concentrations in fish tissue and possible exposure levels to people. Fish tend to accumulate dioxins as a function of sediment concentrations, type of dioxin congeners present, and fat content of the fish.



The uptake of dioxins appear to occur at a lower level than that of PCBs (USEPA, 1994). USEPA guidance (1994c) was used to estimate concentrations of dioxins in fish tissue as a result of the concentrations in sediment. The methodology and calculations for this estimation are presented in the Development of Risk-Based Screening Levels section of this assessment.

### **Toxicity Assessment**

Currently, there is much debate on the actual carcinogenic potency and toxicity of dioxins. Because of the uncertainty involved in the toxicity assessment of dioxins and furans, this assessment uses the current Cancer Slope Factor (CSF) for 2,3,7,8-TCDD presented in HEAST of  $0.156 \text{ (ng/Kg-day)}^{-1}$ . For carcinogenic health effects, CSFs estimate the risk of developing cancer that corresponds to estimated exposure concentration. The concentrations of the individual dioxin/furan congeners are converted to toxicity equivalences (TEQs) using toxicity equivalency factors (TEFs) based on 2,3,7,8-TCDD. The use of the TEFs and calculation of TEQs follows current state and federal guidance. The CSF for 2,3,7,8-TCDD is then used for all of the converted TEQs of the other dioxin congeners. Noncarcinogenic health effects were not evaluated in this assessment.

### **Risk Characterization**

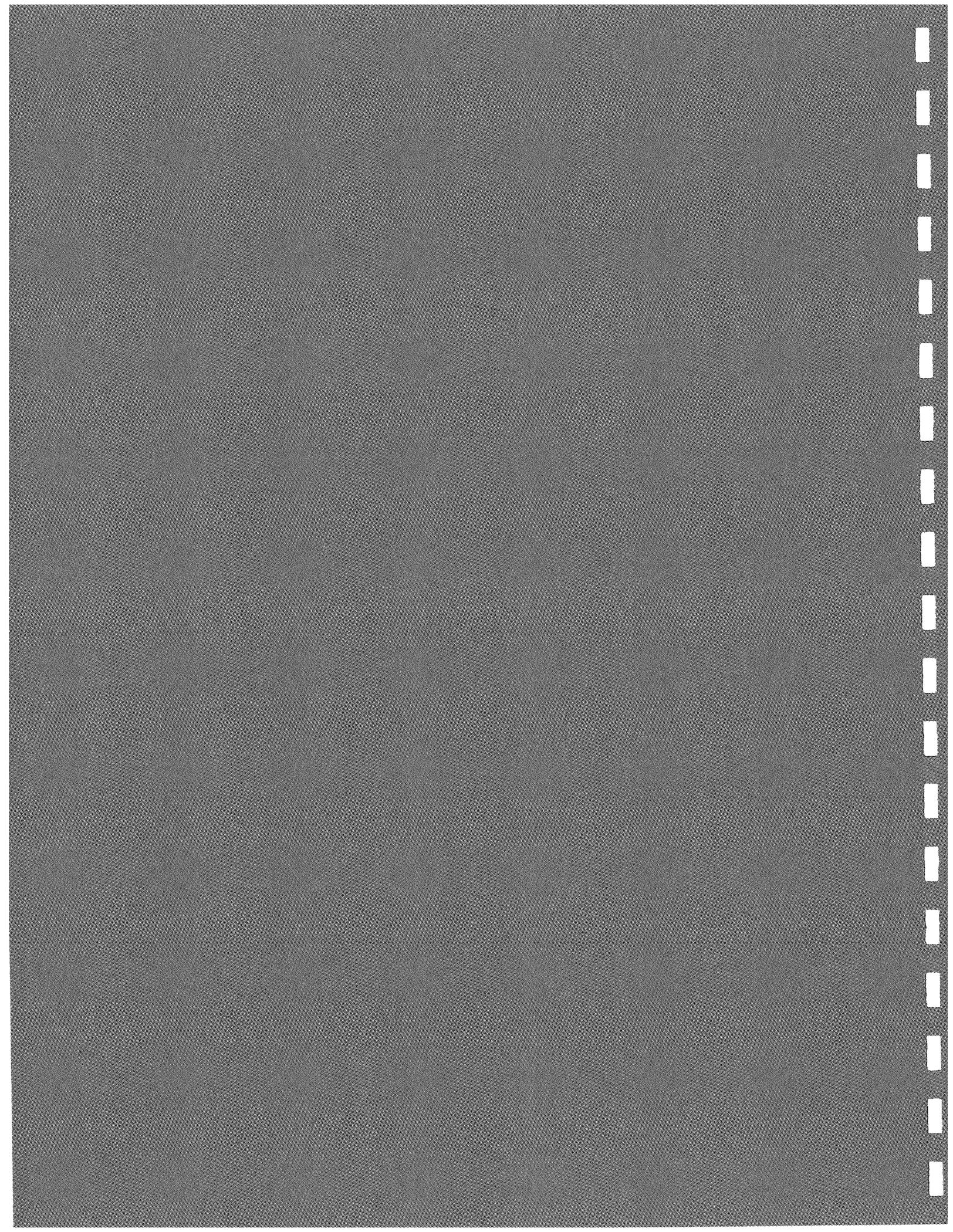
The purpose of the risk characterization step is to combine the exposure and toxicity estimates into an integrated expression of human health risk. The risk characterization for the lake sediments follows guidance provided by the KDEP if different from USEPA guidance for risk characterization. The initial phase of the risk characterization developed risk-based screening levels. The risk characterization uses acceptable risk levels determined by the KDEP.



Carcinogenic risk is expressed as the upper-bound excess probability of an individual developing cancer over their lifetime following exposure to a given chemical concentration for a specified period of time. Carcinogenic risk estimates are computed by multiplying the chronic daily intake prorated over a lifetime of exposure by the CSF for each carcinogen of interest. Cancer risks associated with current conditions have been characterized.



APPENDIX C  
FIELD SAMPLING REPORTS







**FIELD SAMPLING REPORT**



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-1  
DATE 3-27-97 TIME 1120

**SAMPLING INFORMATION**

SAMPLE ID. NUMBER: SS-1 HAZARDOUS?:  YES  NO  UNKNOWN

**SOIL SAMPLING DATA :**

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL stainless steel hand auger, spoon  
TIME: 1120 SAMPLING DEPTH 0-0.5 ft  
SAMPLE DESCRIPTION Gray, silty CLAY

**WELL SAMPLING DATA :**

SAMPLING DATE: - PURGE METHOD & MATERIALS -  
TIME: - VOLUME OF WATER IN WELL AND SAND PACK -  
VOLUME OF WATER PURGED -  
PURGE DATE - START TIME - END TIME -  
SAMPLER TYPE & MATERIALS -  
SAMPLE DESCRIPTION -  
TOTAL WELL DEPTH - DEPTH TO GROUND WATER -

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4 0 1/2	2	-	-	8290

**FIELD MEASUREMENTS**

PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (µm/cm)		-			
TIME		-			
DATE		-			

**GENERAL INFORMATION**

WEATHER Sunny AIR TEMP. 60° F  
SAMPLES COLLECTED BY TSK, AHL  
SPECIAL HANDLING \_\_\_\_\_  
MODE OF SHIPMENT  CAR/TRUCK  BUS  PLANE  COMM. VEH.  
COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)  
analyze sediment sample from pond for dioxins/furans







# FIELD SAMPLING REPORT



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-2  
DATE 3-27-97 TIME 1130

## SAMPLING INFORMATION

SAMPLE ID. NUMBER: SS-2 HAZARDOUS?: YES  NO  UNKNOWN

### SOIL SAMPLING DATA:

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL Stainless steel hand auger, spoon  
TIME: 1130 SAMPLING DEPTH 0-0.5 ft  
SAMPLE DESCRIPTION Gray, silty, CLAY, organics

### WELL SAMPLING DATA:

PURGE METHOD & MATERIALS \_\_\_\_\_  
SAMPLING DATE: \_\_\_\_\_ VOLUME OF WATER IN WELL AND SAND PACK \_\_\_\_\_  
TIME: \_\_\_\_\_ VOLUME OF WATER PURGED \_\_\_\_\_  
PURGE DATE \_\_\_\_\_ START TIME \_\_\_\_\_ END TIME \_\_\_\_\_  
SAMPLER TYPE & MATERIALS \_\_\_\_\_  
SAMPLE DESCRIPTION \_\_\_\_\_  
TOTAL WELL DEPTH \_\_\_\_\_ DEPTH TO GROUND WATER \_\_\_\_\_

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4oz	2	-	-	8290

## FIELD MEASUREMENTS

PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (µm/cm)		-			
TIME		-			
DATE		-			

## GENERAL INFORMATION

WEATHER sunny AIR TEMP. 60°F  
SAMPLES COLLECTED BY TSK, AHL  
SPECIAL HANDLING \_\_\_\_\_  
MODE OF SHIPMENT  CAR/TRUCK  BUS  PLANE  COMM. VEH.

COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)  
Sediment sample from pond  
analyze for dioxins/furans







**FIELD SAMPLING REPORT**



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-3  
DATE 3-27-97 TIME 1145

**SAMPLING INFORMATION**

SAMPLE ID. NUMBER: SS-3 HAZARDOUS?: YES \_\_\_ NO  UNKNOWN

**SOIL SAMPLING DATA :**

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL Stainless steel hand auger, spoon  
TIME: 1145 SAMPLING DEPTH 0-0.5 ft  
SAMPLE DESCRIPTION Gray, silty CLAY, organics

**WELL SAMPLING DATA :**

SAMPLING DATE: \_\_\_\_\_ PURGE METHOD & MATERIALS \_\_\_\_\_  
TIME: \_\_\_\_\_ VOLUME OF WATER IN WELL AND SAND PACK \_\_\_\_\_  
VOLUME OF WATER PURGED \_\_\_\_\_  
PURGE DATE \_\_\_\_\_ START TIME \_\_\_\_\_ END TIME \_\_\_\_\_  
SAMPLER TYPE & MATERIALS \_\_\_\_\_  
SAMPLE DESCRIPTION \_\_\_\_\_  
TOTAL WELL DEPTH \_\_\_\_\_ DEPTH TO GROUND WATER \_\_\_\_\_

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4oz	2	-	-	8290

**FIELD MEASUREMENTS**

PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (um/cm)		-			
TIME		-			
DATE		-			

**GENERAL INFORMATION**

WEATHER Sunny AIR TEMP. 60°F

SAMPLES COLLECTED BY TSK, AHL

SPECIAL HANDLING \_\_\_\_\_

MODE OF SHIPMENT  CAR/TRUCK \_\_\_\_\_ BUS \_\_\_\_\_ PLANE \_\_\_\_\_ COMM. VEH.

COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)  
pund Sediment. Sample  
dioxins/furans







**FIELD SAMPLING REPORT**



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-4  
DATE 3-27-97 TIME 1220

**SAMPLING INFORMATION**

SAMPLE ID. NUMBER: SS-4 HAZARDOUS?:  YES  NO  UNKNOWN

**SOIL SAMPLING DATA :**

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL: Stainless steel hand auger, Spoon  
TIME: 1220 SAMPLING DEPTH: 0-0.5 ft  
SAMPLE DESCRIPTION: Gay, silty, CLAY, organic

**WELL SAMPLING DATA :**

PURGE METHOD & MATERIALS: \_\_\_\_\_  
SAMPLING DATE: \_\_\_\_\_ VOLUME OF WATER IN WELL AND SAND PACK: \_\_\_\_\_  
TIME: \_\_\_\_\_ VOLUME OF WATER PURGED: \_\_\_\_\_  
PURGE DATE: \_\_\_\_\_ START TIME: \_\_\_\_\_ END TIME: \_\_\_\_\_  
SAMPLER TYPE & MATERIALS: \_\_\_\_\_  
SAMPLE DESCRIPTION: \_\_\_\_\_  
TOTAL WELL DEPTH: \_\_\_\_\_ DEPTH TO GROUND WATER: \_\_\_\_\_

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4oz	2	-	-	8290

**FIELD MEASUREMENTS**

PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (um/cm)		-			
TIME		-			
DATE		-			

**GENERAL INFORMATION**

WEATHER Sunny AIR TEMP. 65°F

SAMPLES COLLECTED BY AHL, TSK

SPECIAL HANDLING \_\_\_\_\_

MODE OF SHIPMENT  CAR/TRUCK  BUS  PLANE  COMM. VEH.

COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)

pond sediment sample  
dioxins/furans







**FIELD SAMPLING REPORT**



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-5  
DATE 3-27-97 TIME 1235

**SAMPLING INFORMATION**

SAMPLE ID. NUMBER: SS-5 HAZARDOUS?:  YES  NO  UNKNOWN

**SOIL SAMPLING DATA :**

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL stainless steel hand auger, spoon  
TIME: 1235 SAMPLING DEPTH 0-0.5 ft  
SAMPLE DESCRIPTION Gray, silty CLAY

**WELL SAMPLING DATA :**

PURGE METHOD & MATERIALS \_\_\_\_\_  
SAMPLING DATE: \_\_\_\_\_ VOLUME OF WATER IN WELL AND SAND PACK \_\_\_\_\_  
TIME: \_\_\_\_\_ VOLUME OF WATER PURGED \_\_\_\_\_  
PURGE DATE \_\_\_\_\_ START TIME \_\_\_\_\_ END TIME \_\_\_\_\_  
SAMPLER TYPE & MATERIALS \_\_\_\_\_  
SAMPLE DESCRIPTION \_\_\_\_\_  
TOTAL WELL DEPTH \_\_\_\_\_ DEPTH TO GROUND WATER \_\_\_\_\_

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4 oz	2	-	-	8290

**FIELD MEASUREMENTS**

PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (um/cm)		-			
TIME		-			
DATE		-			

**GENERAL INFORMATION**

WEATHER Sunny AIR TEMP. 65°F

SAMPLES COLLECTED BY AHL, TSK

SPECIAL HANDLING \_\_\_\_\_

MODE OF SHIPMENT  CAR/TRUCK  BUS  PLANE  COMMER. VEH.

COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)

pond sediment sample  
dioxins, Curans







**FIELD SAMPLING REPORT**



303 NORTH HURSTBOURNE PARKWAY  
SUITE 250  
LOUISVILLE, KENTUCKY 40222

JOB NUMBER 46571  
JOB NAME Chickasaw Park  
SAMPLING POINT (LOCATION) SS-6  
DATE 3-27-97 TIME 1245

**SAMPLING INFORMATION**

SAMPLE ID. NUMBER: SS-6 HAZARDOUS?: YES  NO  UNKNOWN

**SOIL SAMPLING DATA :**

SAMPLING DATE: 3-27-97 SAMPLER TYPE & MATERIAL Stainless steel hand auger, spoon  
TIME: 1245 SAMPLING DEPTH 0-0.5 ft.  
SAMPLE DESCRIPTION Gray, silty CLAY

**WELL SAMPLING DATA :**

PURGE METHOD & MATERIALS -  
SAMPLING DATE: - VOLUME OF WATER IN WELL AND SAND PACK -  
TIME: - VOLUME OF WATER PURGED -  
PURGE DATE - START TIME - END TIME -  
SAMPLER TYPE & MATERIALS -  
SAMPLE DESCRIPTION -  
TOTAL WELL DEPTH - DEPTH TO GROUND WATER -

CONTAINER		NUMBER	PRESERVATIVE/ PREPARATION	FILTERING	COMMENTS
TYPE	VOLUME				
glass	4 oz	2	-	-	8290

**FIELD MEASUREMENTS**

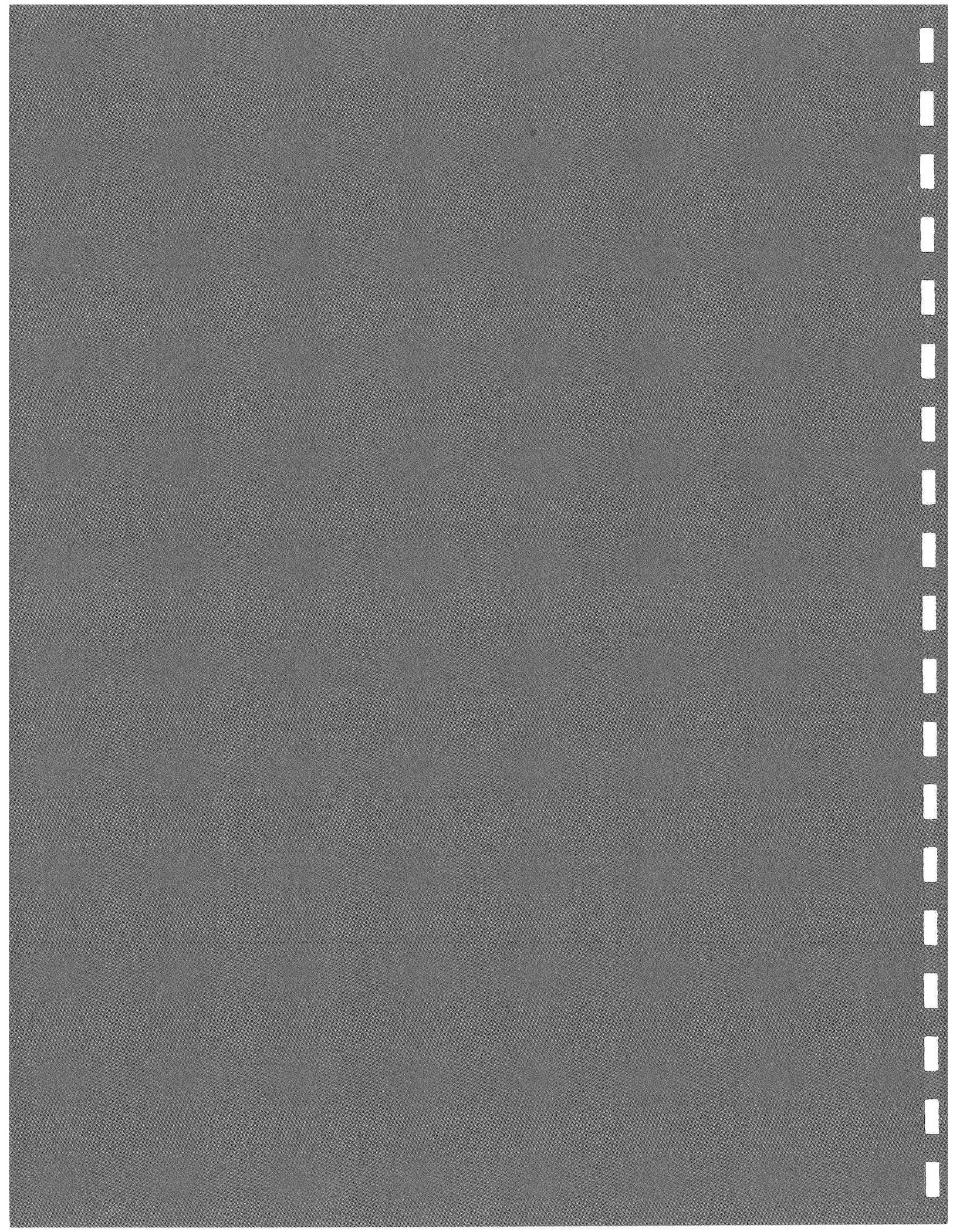
PARAMETER	EQUIPMENT ID.	1st READING	2nd READING	3rd READING	4th READING
pH (STD UNITS)		-			
TEMP (°C)		-			
SPEC. COND (µm/cm)		-			
TIME		-			
DATE		-			

**GENERAL INFORMATION**

WEATHER Sunny AIR TEMP. 65°F  
 SAMPLES COLLECTED BY AHL, TSK  
 SPECIAL HANDLING \_\_\_\_\_  
 MODE OF SHIPMENT  CAR/TRUCK \_\_\_\_\_ BUS \_\_\_\_\_ PLANE \_\_\_\_\_ COMM. VEH.  
 COMMENTS (CALIBRATIONS, FIELD MODIFICATIONS, INSTRUMENT PROBLEMS)  
pond sediment sample  
diox./furan



APPENDIX D  
LABORATORY DATA FROM THIS  
ASSESSMENT



Microbac Laboratories, Inc.  
Analytical Services Laboratory Div.  
3323 Gilmore Industrial Blvd.  
Louisville, KY 40213  
PHONE: (502)-962-6400 FAX: (502)-962-6411

Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222

ATT: SCOTT KELLY

RECEIVED MAY 05 1997

Reference:

Project # : ADVENT  
Location : KY  
Samples Recv'd : Mar 27, 1997  
Qty of Samples : 6

Enclosed are the results of the tests requested. The samples were analyzed utilizing the appropriate EPA approved methods. Where EPA allows alternate methods, the Best Available Technology was used.

ASLI performs their services with reasonable care and diligence normal to the analytical testing laboratory industry. QA/QC results met the necessary EPA parameters before your testing began. In the unlikely event of an error, ASLI's sole responsibility is to re-perform the testing at its own expense. All associated Quality Control information will be maintained at ASLI. A copy of this data can be forwarded upon request. Record retention is conditional upon payment of invoice.

It has been a pleasure serving you. If there are any questions concerning the results or ASLI's policies, please feel free to contact me.

Sincerely;





Project: Microbac Laboratories  
Quanterra Lot Number: H7D010108  
Date: April 22, 1997

## Project Narrative

Six (6) samples were received on 01-Apr-97 for the analysis of total tetra through octa (Cl<sub>4</sub>-Cl<sub>8</sub>) dioxin and furan homologs. The samples and the blank were spiked with an internal standard mixture containing 1.0 ng each of <sup>13</sup>C-TCDD, <sup>13</sup>C-TCDF, <sup>13</sup>C-PeCDD, <sup>13</sup>C-PeCDF, <sup>13</sup>C-HxCDD, <sup>13</sup>C-HxCDF, <sup>13</sup>C-HpCDD, <sup>13</sup>C-HpCDF and 2.0 ng of <sup>13</sup>C-OCDD. The samples and the blank were analyzed using the EPA reference method described in RCRA SW-846, Method 8290. Extracts were analyzed by GC/MS operating in the selected ion monitoring mode for enhanced sensitivity. The results reported herein are applicable to the samples submitted for analysis only. It is recommended that if this report is reproduced, it is reproduced in its entirety.

Samples ADV173A and ADV173 exhibited the 2,3,7,8-TCDF internal standard recoveries that were less than 40%. We believe the low internal standard recovery was a matrix effect since the blank and laboratory control sample had acceptable internal standard recoveries. However, the 10:1 signal to noise criteria was met and the data is reported as is as.

**Sample Preparation - Solid** A 10 (wet weight) gram aliquot of each sample and 10 grams of quartz sand (for the blank) were weighed into separate Soxhlet thimbles. The samples and the blank were spiked with the internal standard mixture, followed by a Soxhlet extraction with toluene for sixteen hours. The resulting extracts were filtered into a KD flask and the volume reduced to approximately 1 ml.

**Sample Cleanup** -The sample and the blank extracts were cleaned up using dual column chromatography consisting of an acid-modified silica gel column followed by a neutral alumina column to aid in the removal of chemical interferences. Final extracts were concentrated to near dryness and raised to 20 µl with 2.0 ng <sup>13</sup>C-1,2,3,4-TCDD and 2.0 ng <sup>13</sup>C-1,2,3,7,8,9-HxCDD which were used as recovery standards.

**Total Dioxin and Furan Analysis** - The samples and the blanks were analyzed for total dioxin and furan homologs from Cl<sub>4</sub>-Cl<sub>8</sub>. The standard analyzed each shift consisted of:

<u>Dioxins</u>	<u>Dibenzofurans</u>
<sup>13</sup> C-2,3,7,8-TCDD	<sup>13</sup> C-2,3,7,8-TCDF
<sup>13</sup> C-1,2,3,4-TCDD	<sup>13</sup> C-1,2,3,7,8-PeCDF
<sup>13</sup> C-1,2,3,7,8-PeCDD	<sup>13</sup> C-1,2,3,4,7,8-HxCDF
<sup>13</sup> C-1,2,3,6,7,8-HxCDD	<sup>13</sup> C-1,2,3,4,6,7,8-HpCDF
<sup>13</sup> C-1,2,3,7,8,9-HxCDD	2,3,7,8-TCDF
<sup>13</sup> C-1,2,3,4,6,7,8-HpCDD	1,2,3,7,8-PeCDF
<sup>13</sup> C-OCDD	2,3,4,7,8-PeCDF
2,3,7,8-TCDD	1,2,3,4,7,8-HxCDF
1,2,3,7,8-PeCDD	1,2,3,6,7,8-HxCDF
1,2,3,4,7,8-HxCDD	2,3,4,6,7,8-HxCDF
1,2,3,6,7,8-HxCDD	1,2,3,7,8,9-HxCDF
1,2,3,7,8,9-HxCDD	1,2,3,4,6,7,8-HpCDF
1,2,3,4,6,7,8-HpCDD	1,2,3,4,7,8,9-HpCDF
OCDD	OCDF



Project: Microbac Laboratories  
Quanterra Lot Number: H7D010108  
Date: April 22, 1997

## Project Narrative

Response factors were calculated for each compound in the standard relative to its  $^{13}\text{C}$  labeled homolog. Native OCDF is calculated against  $^{13}\text{C}$ -OCDD. A five-point calibration plot was analyzed. The mean response factors obtained from this five-point calibration were used for all subsequent calculations. The daily calibration standards, analyzed on the same day as the samples, met the method criteria for all native analytes.

The extracts were analyzed using HRGC/HRMS scanning in the selected ion monitoring mode for enhanced sensitivity. The column used for the analysis was a 60 m DB-5 type fused silica capillary column.

**Totals** - The results for the totals analysis are reported in pg/g for the solid samples and pg/L for the water with the total amount of each homologous group calculated. For any homologous series of dioxins or furans that contain more than one 2,3,7,8-substituted isomer, the total result for that series is the sum of the individual 2,3,7,8-substituted isomers (calculated using their specific Response Factors) and all other non-2,3,7,8-substituted isomers (calculated using the average Response Factor of the individual 2,3,7,8-substituted isomers in that homologous series).

**Detection Limits** - When an analyte is not detected, a sample specific detection limit is calculated for that analyte. This is done by first determining the GC/MS peak height of the noise or interferent in the expected region of the analyte signal. This value is multiplied by the number 2.5 which serves as a safety factor. The 2.5 safety factor is disregarded if the noise present in the analyte region is a result of chemical interferences. The resulting signal response value is then used to estimate the minimum detectable analyte amount. The result is the estimated sample detection limit.

**QA/QC** - Routine laboratory QA/QC was followed. Recoveries for the internal standards for each sample are presented with the sample analysis data.



**METHOD / ANALYST SUMMARY**

H7D010108

<u>ANALYTICAL METHOD</u>	<u>ANALYST</u>	<u>ANALYST ID</u>
SW846 8290	David I. Thal	012944
SW846 8290	Mellisa A. Skertich	010265

**References:**

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.



Microbac Laboratories, Inc.  
Analytical Services Laboratory Div.  
3323 Gilmore Industrial Blvd.  
Louisville, KY 40213  
PHONE: (502)-962-6400 FAX: (502)-962-6411

PAGE : 2

Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

Received from: Advent Environmental, Inc.

Project #: ADVENT

Site Location: KY

Taken on : Mar 27, 1997

Type: SOLID

Preservation: ICE

ASLI ID #: ADV0173A

Time: 11:20

Customer ID #: C.P. SS-1

Container: GLASS

Date sample received: Mar 27, 1997

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Analyst: PP Method: 8290 / DIOXIN / FURAN

METHOD 8290

SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By: 

DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173A C.P. SS-1

Dioxins

Lot-Sample #....: H7D010108-001    Work Order #....: C8V20101    Matrix.....: SOLID  
 Date Sampled....: 03/27/97    Date Received...: 04/01/97  
 Prep Date.....: 04/03/97    Analysis Date...: 04/17/97  
 Prep Batch #....: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.39	pg/g	SW846 8290
Total TCDD	ND	0.86	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.75	pg/g	SW846 8290
Total PeCDD	ND	0.75	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.37	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.39	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	0.65 J		pg/g	SW846 8290
Total HxCDD	4.2 J		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	6.3		pg/g	SW846 8290
Total HpCDD	16		pg/g	SW846 8290
OCDD	230 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.29	pg/g	SW846 8290
Total TCDF	ND	1.0	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.44	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.42	pg/g	SW846 8290
Total PeCDF	ND	0.43	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.41	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.36	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	ND	0.41	pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.48	pg/g	SW846 8290
Total HxCDF	ND	0.41	pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	ND	0.29	pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.25	pg/g	SW846 8290
Total HpCDF	ND	0.32	pg/g	SW846 8290
OCDF	0.15 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	48	(40 - 135)
13C-1,2,3,7,8-PeCDD	53	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	50	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	60	(40 - 135)
13C-OCDD	61	(40 - 135)
13C-2,3,7,8-TCDF	34 *	(40 - 135)
13C-1,2,3,7,8-PeCDF	65	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	55	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	48	(40 - 135)

NOTE(S) :

J Estimated result. Result is less than the reporting limit.

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.

\* Surrogate recovery is outside stated control limits.



Microbac Laboratories, Inc.  
Analytical Services Laboratory Div.  
3323 Gilmore Industrial Blvd.  
Louisville, KY 40213  
PHONE: (502)-962-6400 FAX: (502)-962-6411

Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

PAGE : 3

Received from: Advent Environmental, Inc.  
Project #: ADVENT  
Site Location: KY  
Taken on : Mar 27, 1997                      Time: 11:30  
Type: SOLID                                      Customer ID #: C.P. SS-2  
Preservation: ICE                                Container: GLASS  
ASLI ID #: ADV0173B                            Date sample received: Mar 27, 1997

---

Analyst: PP    Method: 8290    / DIOXIN / FURAN                      METHOD 8290

SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By: JK                      DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173B C.P. SS-2

Dioxins

Lot-Sample #...: H7D010108-002      Work Order #...: C8V23101      Matrix.....: SOLID  
 Date Sampled...: 03/27/97      Date Received...: 04/01/97  
 Prep Date.....: 04/03/97      Analysis Date...: 04/18/97  
 Prep Batch #...: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.43	pg/g	SW846 8290
Total TCDD	ND	1.6	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	1.1	pg/g	SW846 8290
Total PeCDD	ND	1.1	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.82	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.77	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	ND	0.73	pg/g	SW846 8290
Total HxCDD	1.6 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	2.9 J		pg/g	SW846 8290
Total HpCDD	4.2 J		pg/g	SW846 8290
OCDD	160 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.94	pg/g	SW846 8290
Total TCDF	ND	1.5	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.50	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.47	pg/g	SW846 8290
Total PeCDF	ND	0.49	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.31	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.28	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	0.22 J,Q		pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.41	pg/g	SW846 8290
Total HxCDF	0.22 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	ND	0.44	pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.54	pg/g	SW846 8290
Total HpCDF	ND	0.48	pg/g	SW846 8290
OCDF	0.20 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	50	(40 - 135)
13C-1,2,3,7,8-PeCDD	53	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	54	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	68	(40 - 135)
13C-OCDD	65	(40 - 135)
13C-2,3,7,8-TCDF	30 *	(40 - 135)
13C-1,2,3,7,8-PeCDF	67	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	60	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	54	(40 - 135)

NOTE(S) :

- J Estimated result. Result is less than the reporting limit.
- Q Estimated maximum possible concentration (EMPC).
- B Method blank contamination. The associated method blank contains the target analyte at a reportable level.
- \* Surrogate recovery is outside stated control limits.



Microbac Laboratories, Inc.  
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3323 Gilmore Industrial Blvd.  
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PHONE: (502)-962-6400 FAX: (502)-962-6411

Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

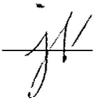
PAGE : 4

Received from: Advent Environmental, Inc.  
Project #: ADVENT  
Site Location: KY  
Taken on : Mar 27, 1997 Time: 11:45  
Type: SOLID Customer ID #: C.P. SS-3  
Preservation: ICE Container: GLASS  
ASLI ID #: ADV0173C Date sample received: Mar 27, 1997

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Analyst: PP Method: 8290 / DIOXIN / FURAN METHOD 8290  
SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By:  DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173C C.P. SS-3

Dioxins

Lot-Sample #...: H7D010108-003    Work Order #...: C8V24101    Matrix.....: SOLID  
 Date Sampled...: 03/27/97    Date Received...: 04/01/97  
 Prep Date.....: 04/03/97    Analysis Date...: 04/18/97  
 Prep Batch #...: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.40	pg/g	SW846 8290
Total TCDD	ND	0.74	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.39	pg/g	SW846 8290
Total PeCDD	ND	0.39	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.18	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.34	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	0.29 J		pg/g	SW846 8290
Total HxCDD	2.1 J		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	2.0 J		pg/g	SW846 8290
Total HpCDD	4.5 J		pg/g	SW846 8290
OCDD	65 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.22	pg/g	SW846 8290
Total TCDF	0.42 J, Q		pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.33	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.31	pg/g	SW846 8290
Total PeCDF	ND	0.32	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.19	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.17	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	0.16 J		pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.18	pg/g	SW846 8290
Total HxCDF	0.16 J		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	0.15 J		pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.14	pg/g	SW846 8290
Total HpCDF	0.15 J		pg/g	SW846 8290
OCDF	0.10 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	58	(40 - 135)
13C-1,2,3,7,8-PeCDD	65	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	58	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	71	(40 - 135)
13C-OCDD	73	(40 - 135)
13C-2,3,7,8-TCDF	46	(40 - 135)
13C-1,2,3,7,8-PeCDF	66	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	59	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	55	(40 - 135)

NOTE(S) :

- J Estimated result. Result is less than the reporting limit.
- B Method blank contamination. The associated method blank contains the target analyte at a reportable level.
- Q Estimated maximum possible concentration (EMPC).



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Analytical Services Laboratory Div.  
3323 Gilmore Industrial Blvd.  
Louisville, KY 40213  
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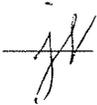
Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

Received from: Advent Environmental, Inc.  
Project #: ADVENT  
Site Location: KY  
Taken on : Mar 27, 1997                      Time: 12:20  
Type: SOLID                                      Customer ID #: C.P. SS-4  
Preservation: ICE                                Container: GLASS  
ASLI ID #: ADV0173D                            Date sample received: Mar 27, 1997

---

Analyst: PP    Method: 8290    / DIOXIN / FURAN                      METHOD 8290  
SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By:  DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173D C.P. SS-4

Dioxins

Lot-Sample #...: H7D010108-004 Work Order #...: C8V25101 Matrix.....: SOLID  
 Date Sampled...: 03/27/97 Date Received...: 04/01/97  
 Prep Date.....: 04/03/97 Analysis Date...: 04/18/97  
 Prep Batch #...: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	1.1	pg/g	SW846 8290
Total TCDD	ND	1.1	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.92	pg/g	SW846 8290
Total PeCDD	ND	0.92	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.66	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.62	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	ND	5.9	pg/g	SW846 8290
Total HxCDD	0.43 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	1.2 J		pg/g	SW846 8290
Total HpCDD	2.6 J		pg/g	SW846 8290
OCDD	55 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	1.1	pg/g	SW846 8290
Total TCDF	ND	1.1	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.83	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.79	pg/g	SW846 8290
Total PeCDF	ND	0.81	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	0.22 J,Q		pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	0.18 J,Q		pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	0.36 J		pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	4.4	pg/g	SW846 8290
Total HxCDF	0.75 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	ND	4.8	pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.38	pg/g	SW846 8290
Total HpCDF	ND	0.52	pg/g	SW846 8290
OCDF	0.19 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	73	(40 - 135)
13C-1,2,3,7,8-PeCDD	77	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	69	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	74	(40 - 135)
13C-OCDD	68	(40 - 135)
13C-2,3,7,8-TCDF	53	(40 - 135)
13C-1,2,3,7,8-PeCDF	79	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	67	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	62	(40 - 135)

NOTE (S) :

- J Estimated result. Result is less than the reporting limit.
- Q Estimated maximum possible concentration (EMPC).
- B Method blank contamination. The associated method blank contains the target analyte at a reportable level.



Microbac Laboratories, Inc.  
Analytical Services Laboratory Div.  
3323 Gilmore Industrial Blvd.  
Louisville, KY 40213  
PHONE: (502)-962-6400 FAX: (502)-962-6411

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Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

Received from: Advent Environmental, Inc.  
Project #: ADVENT  
Site Location: KY  
Taken on : Mar 27, 1997                      Time: 12:35  
Type: SOLID                                      Customer ID #: C.P. SS-5  
Preservation: ICE                                Container: GLASS  
ASLI ID #: ADV0173E                            Date sample received: Mar 27, 1997

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Analyst: PP    Method: 8290    / DIOXIN / FURAN                      METHOD 8290  
SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By:  DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173E C.P. SS-5

Dioxins

Lot-Sample #....: H7D010108-005    Work Order #....: C8V26101    Matrix.....: SOLID  
 Date Sampled....: 03/27/97    Date Received...: 04/01/97  
 Prep Date.....: 04/03/97    Analysis Date...: 04/18/97  
 Prep Batch #....: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.44	pg/g	SW846 8290
Total TCDD	ND	0.62	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.49	pg/g	SW846 8290
Total PeCDD	ND	0.49	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.71	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.66	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	ND	0.63	pg/g	SW846 8290
Total HxCDD	1.8 J		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	3.7 J,Q		pg/g	SW846 8290
Total HpCDD	11 Q		pg/g	SW846 8290
OCDD	140 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.28	pg/g	SW846 8290
Total TCDF	ND	0.58	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.82	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.77	pg/g	SW846 8290
Total PeCDF	ND	0.80	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.28	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.25	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	0.56 J,Q		pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.15	pg/g	SW846 8290
Total HxCDF	0.94 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	0.48 J		pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.23	pg/g	SW846 8290
Total HpCDF	1.2 J		pg/g	SW846 8290
OCDF	0.79 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	63	(40 - 135)
13C-1,2,3,7,8-PeCDD	71	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	61	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	67	(40 - 135)
13C-OCDD	71	(40 - 135)
13C-2,3,7,8-TCDF	52	(40 - 135)
13C-1,2,3,7,8-PeCDF	68	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	59	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	53	(40 - 135)

NOTE(S) :

J Estimated result. Result is less than the reporting limit.

Q Estimated maximum possible concentration (EMPC).

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.



Microbac Laboratories, Inc.  
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PAGE : 7

Advent Environmental, Inc.  
303 N. Hurstbourne Ln., Ste. 250  
Louisville, KY 40222  
ATT: SCOTT KELLY  
Ref: results of requested analysis  
Sample information:

Received from: Advent Environmental, Inc.  
Project #: ADVENT  
Site Location: KY  
Taken on : Mar 27, 1997                      Time: 12:45  
Type: SOLID                                      Customer ID #: C.P. SS-6  
Preservation: ICE                                Container: GLASS  
ASLI ID #: ADV0173F                            Date sample received: Mar 27, 1997

---

Analyst: PP    Method: 8290    / DIOXIN / FURAN                      METHOD 8290  
SEE ATTACHED

\*\*\*\*\* Tested : 4/01/97 \*\*\*\*\*

Reviewed By: JK                      DATE: 4/22/97



MICROBAC LABORATORIES, INC.

Client Sample ID: ADV173F C.P. SS-6

Dioxins

Lot-Sample #....: H7D010108-006 Work Order #....: C8V27101 Matrix.....: SOLID  
 Date Sampled....: 03/27/97 Date Received...: 04/01/97  
 Prep Date.....: 04/03/97 Analysis Date...: 04/18/97  
 Prep Batch #....: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.34	pg/g	SW846 8290
Total TCDD	ND	1.1	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.66	pg/g	SW846 8290
Total PeCDD	ND	0.66	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.60	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.56	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	ND	0.53	pg/g	SW846 8290
Total HxCDD	2.0 J		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	3.2 J		pg/g	SW846 8290
Total HpCDD	8.7 J		pg/g	SW846 8290
OCDD	90 B		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.32	pg/g	SW846 8290
Total TCDF	ND	0.57	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.35	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.33	pg/g	SW846 8290
Total PeCDF	ND	0.34	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.30	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.26	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	ND	0.70	pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.18	pg/g	SW846 8290
Total HxCDF	0.26 J,Q		pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	0.14 J,Q		pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.17	pg/g	SW846 8290
Total HpCDF	0.42 J,Q		pg/g	SW846 8290
OCDF	0.17 J		pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	86	(40 - 135)
13C-1,2,3,7,8-PeCDD	92	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	89	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	102	(40 - 135)
13C-OCDD	102	(40 - 135)
13C-2,3,7,8-TCDF	74	(40 - 135)
13C-1,2,3,7,8-PeCDF	102	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	82	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	85	(40 - 135)

NOTE (S) :

- J Estimated result. Result is less than the reporting limit.
- B Method blank contamination. The associated method blank contains the target analyte at a reportable level.
- Q Estimated maximum possible concentration (EMPC).



METHOD BLANK REPORT

Dioxins

Client Lot #...: H7D010108      Work Order #...: C8W1G101      Matrix.....: SOLID  
 MB Lot-Sample #: H7D030000-141  
 Prep Date.....: 04/03/97  
 Analysis Date...: 04/14/97      Prep Batch #...: 7093141  
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION		
		LIMIT	UNITS	METHOD
2,3,7,8-TCDD	ND	0.61	pg/g	SW846 8290
Total TCDD	ND	0.97	pg/g	SW846 8290
1,2,3,7,8-PeCDD	ND	0.71	pg/g	SW846 8290
Total PeCDD	ND	0.71	pg/g	SW846 8290
1,2,3,4,7,8-HxCDD	ND	0.75	pg/g	SW846 8290
1,2,3,6,7,8-HxCDD	ND	0.70	pg/g	SW846 8290
1,2,3,7,8,9-HxCDD	ND	0.66	pg/g	SW846 8290
Total HxCDD	ND	0.70	pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDD	ND	0.64	pg/g	SW846 8290
Total HpCDD	ND	0.64	pg/g	SW846 8290
OCDD	0.41 J,Q		pg/g	SW846 8290
2,3,7,8-TCDF	ND	0.39	pg/g	SW846 8290
Total TCDF	ND	0.72	pg/g	SW846 8290
1,2,3,7,8-PeCDF	ND	0.42	pg/g	SW846 8290
2,3,4,7,8-PeCDF	ND	0.40	pg/g	SW846 8290
Total PeCDF	ND	0.41	pg/g	SW846 8290
1,2,3,4,7,8-HxCDF	ND	0.42	pg/g	SW846 8290
1,2,3,6,7,8-HxCDF	ND	0.37	pg/g	SW846 8290
2,3,4,6,7,8-HxCDF	ND	0.41	pg/g	SW846 8290
1,2,3,7,8,9-HxCDF	ND	0.49	pg/g	SW846 8290
Total HxCDF	ND	0.42	pg/g	SW846 8290
1,2,3,4,6,7,8-HpCDF	ND	0.34	pg/g	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	0.41	pg/g	SW846 8290
Total HpCDF	ND	0.37	pg/g	SW846 8290
OCDF	ND	0.50	pg/g	SW846 8290

INTERNAL STANDARDS	PERCENT	RECOVERY
	RECOVERY	LIMITS
13C-2,3,7,8-TCDD	62	(40 - 135)
13C-1,2,3,7,8-PeCDD	68	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	62	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	65	(40 - 135)
13C-OCDD	59	(40 - 135)
13C-2,3,7,8-TCDF	48	(40 - 135)
13C-1,2,3,7,8-PeCDF	70	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	58	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	56	(40 - 135)

NOTE(S) :

Calculations are performed before rounding to avoid round-off errors in calculated results.

J Estimated result. Result is less than the reporting limit.

Q Estimated maximum possible concentration (EMPC).



LABORATORY CONTROL SAMPLE DATA REPORT

Dioxins

Client Lot #...: H7D010108      Work Order #...: C8W1G102      Matrix.....: SOLID  
 LCS Lot-Sample#: H7D030000-141  
 Prep Date.....: 04/03/97      Analysis Date...: 04/17/97  
 Prep Batch #...: 7093141  
 Dilution Factor: 1

<u>PARAMETER</u>	<u>SPIKE AMOUNT</u>	<u>MEASURED AMOUNT</u>	<u>UNITS</u>	<u>PERCENT RECOVERY</u>	<u>METHOD</u>
2,3,7,8-TCDD	20	19	pg/g	96	SW846 8290
1,2,3,7,8-PeCDD	100	110	pg/g	106	SW846 8290
1,2,3,4,7,8-HxCDD	100	100	pg/g	102	SW846 8290
1,2,3,6,7,8-HxCDD	100	100	pg/g	105	SW846 8290
1,2,3,7,8,9-HxCDD	100	110	pg/g	106	SW846 8290
1,2,3,4,6,7,8-HpCDD	100	93	pg/g	93	SW846 8290
OCDD	200	180 B	pg/g	88	SW846 8290
2,3,7,8-TCDF	20	20	pg/g	102	SW846 8290
1,2,3,7,8-PeCDF	100	96	pg/g	96	SW846 8290
2,3,4,7,8-PeCDF	100	83	pg/g	83	SW846 8290
1,2,3,4,7,8-HxCDF	100	100	pg/g	102	SW846 8290
1,2,3,6,7,8-HxCDF	100	100	pg/g	101	SW846 8290
2,3,4,6,7,8-HxCDF	100	100	pg/g	100	SW846 8290
1,2,3,7,8,9-HxCDF	100	110	pg/g	110	SW846 8290
1,2,3,4,6,7,8-HpCDF	100	110	pg/g	111	SW846 8290
1,2,3,4,7,8,9-HpCDF	100	100	pg/g	105	SW846 8290
OCDF	200	150	pg/g	76	SW846 8290

<u>INTERNAL STANDARD</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	65	(40 - 135)
13C-1,2,3,7,8-PeCDD	75	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	67	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	80	(40 - 135)
13C-OCDD	87	(40 - 135)
13C-2,3,7,8-TCDF	53	(40 - 135)
13C-1,2,3,7,8-PeCDF	78	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	63	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	66	(40 - 135)

**NOTE (S) :**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.



LABORATORY CONTROL SAMPLE EVALUATION REPORT

Dioxins

Client Lot #...: H7D010108      Work Order #...: C8W1G102      Matrix.....: SOLID  
 LCS Lot-Sample#: H7D030000-141  
 Prep Date.....: 04/03/97      Analysis Date...: 04/17/97  
 Prep Batch #...: 7093141  
 Dilution Factor: 1

<u>PARAMETER</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>	<u>METHOD</u>
2,3,7,8-TCDD	96	(60 - 140)	SW846 8290
1,2,3,7,8-PeCDD	106	(60 - 140)	SW846 8290
1,2,3,4,7,8-HxCDD	102	(60 - 140)	SW846 8290
1,2,3,6,7,8-HxCDD	105	(60 - 140)	SW846 8290
1,2,3,7,8,9-HxCDD	106	(60 - 140)	SW846 8290
1,2,3,4,6,7,8-HpCDD	93	(60 - 140)	SW846 8290
OCDD	88 B	(60 - 140)	SW846 8290
2,3,7,8-TCDF	102	(60 - 140)	SW846 8290
1,2,3,7,8-PeCDF	96	(60 - 140)	SW846 8290
2,3,4,7,8-PeCDF	83	(60 - 140)	SW846 8290
1,2,3,4,7,8-HxCDF	102	(60 - 140)	SW846 8290
1,2,3,6,7,8-HxCDF	101	(60 - 140)	SW846 8290
2,3,4,6,7,8-HxCDF	100	(60 - 140)	SW846 8290
1,2,3,7,8,9-HxCDF	110	(60 - 140)	SW846 8290
1,2,3,4,6,7,8-HpCDF	111	(60 - 140)	SW846 8290
1,2,3,4,7,8,9-HpCDF	105	(60 - 140)	SW846 8290
OCDF	76	(60 - 140)	SW846 8290

<u>INTERNAL STANDARD</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	65	(40 - 135)
13C-1,2,3,7,8-PeCDD	75	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	67	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	80	(40 - 135)
13C-OCDD	87	(40 - 135)
13C-2,3,7,8-TCDF	53	(40 - 135)
13C-1,2,3,7,8-PeCDF	78	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	63	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	66	(40 - 135)

**NOTE (S) :**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.



MATRIX SPIKE SAMPLE DATA REPORT

Dioxins

Client Lot #...: H7D010108      Work Order #...: C8M76102-MS      Matrix.....: BIOLOGIC  
 MS Lot-Sample #: H7C190114-001      C8M76103-MSD  
 Date Sampled...: 03/18/97      Date Received...: 03/19/97  
 Prep Date.....: 03/20/97      Analysis Date...: 03/31/97  
 Prep Batch #...: 7079133  
 Dilution Factor: 1

PARAMETER	SAMPLE SPIKE MEASRD			UNITS	PERCENT		METHOD
	AMOUNT	AMT	AMOUNT		RECOVERY	RPD	
2,3,7,8-TCDD	ND	200	180	pg	92		SW846 8290
	ND	200	190	pg	96	4.2	SW846 8290
1,2,3,7,8-PeCDD	2.4	1000	1000	pg	101		SW846 8290
	2.4	1000	1000	pg	104	2.9	SW846 8290
1,2,3,4,7,8-HxCDD	3.4	1000	1000	pg	105		SW846 8290
	3.4	1000	1000	pg	105	0.0	SW846 8290
1,2,3,6,7,8-HxCDD	5.3	1000	1000	pg	99		SW846 8290
	5.3	1000	1000	pg	100	0.99	SW846 8290
1,2,3,7,8,9-HxCDD	5.3	1000	990	pg	98		SW846 8290
	5.3	1000	1000	pg	101	3.0	SW846 8290
1,2,3,4,6,7,8-HpCDD	43	1000	920 B	pg	88		SW846 8290
	43	1000	930 B	pg	89	1.2	SW846 8290
OCDD	260	2000	1900 B	pg	84		SW846 8290
	260	2000	1900 B	pg	82	1.6	SW846 8290
2,3,7,8-TCDF		200	200	pg	102		SW846 8290
		200	200	pg	98	4.0	SW846 8290
1,2,3,7,8-PeCDF	ND	1000	910	pg	91		SW846 8290
	ND	1000	940	pg	94	3.6	SW846 8290
2,3,4,7,8-PeCDF	ND	1000	840	pg	84		SW846 8290
	ND	1000	890	pg	89	5.4	SW846 8290
1,2,3,4,7,8-HxCDF	2.7	1000	930	pg	93		SW846 8290
	2.7	1000	960	pg	96	2.7	SW846 8290
1,2,3,6,7,8-HxCDF	ND	1000	810	pg	81		SW846 8290
	ND	1000	870	pg	87	7.1	SW846 8290
2,3,4,6,7,8-HxCDF	2.7	1000	890 B	pg	89		SW846 8290
	2.7	1000	900 B	pg	89	0.44	SW846 8290
1,2,3,7,8,9-HxCDF	ND	1000	940	pg	94		SW846 8290
	ND	1000	980	pg	98	4.5	SW846 8290
1,2,3,4,6,7,8-HpCDF	10	1000	960	pg	95		SW846 8290
	10	1000	1000	pg	103	7.8	SW846 8290
1,2,3,4,7,8,9-HpCDF	ND	1000	1000	pg	101		SW846 8290
	ND	1000	1100	pg	112	10	SW846 8290
OCDF	11	2000	1600	pg	77		SW846 8290
	11	2000	1800	pg	88	14	SW846 8290

(Continued on next page)



MATRIX SPIKE SAMPLE DATA REPORT

Dioxins

Client Lot #...: H7D010108  
 MS Lot-Sample #: H7C190114-001

Work Order #...: C8M76102-MS  
 C8M76103-MSD

Matrix.....: BIOLOGIC

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	70	(40 - 135)
	75	(40 - 135)
13C-1,2,3,7,8-PeCDD	83	(40 - 135)
	90	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	67	(40 - 135)
	73	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	83	(40 - 135)
	88	(40 - 135)
13C-OCDD	89	(40 - 135)
	82	(40 - 135)
13C-2,3,7,8-TCDF	55	(40 - 135)
	60	(40 - 135)
13C-1,2,3,7,8-PeCDF	84	(40 - 135)
	89	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	67	(40 - 135)
	73	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	71	(40 - 135)
	71	(40 - 135)

**NOTE (S) :**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

B Method blank contamination. The associated method blank contains the target analyte at a reportable level.



MATRIX SPIKE SAMPLE EVALUATION REPORT

Dioxins

Client Lot #...: H7D010108      Work Order #...: C8M76102-MS      Matrix.....: BIOLOGIC  
 MS Lot-Sample #: H7C190114-001      C8M76103-MSD  
 Date Sampled...: 03/18/97      Date Received...: 03/19/97  
 Prep Date.....: 03/20/97      Analysis Date...: 03/31/97  
 Prep Batch #...: 7079133  
 Dilution Factor: 1

PARAMETER	PERCENT	RECOVERY	RPD	RPD	METHOD
	RECOVERY	LIMITS		LIMITS	
2,3,7,8-TCDD	92	(60 - 140)	4.2	(0-50)	SW846 8290
	96	(60 - 140)			SW846 8290
1,2,3,7,8-PeCDD	101	(60 - 140)	2.9	(0-50)	SW846 8290
	104	(60 - 140)			SW846 8290
1,2,3,4,7,8-HxCDD	105	(60 - 140)	0.0	(0-50)	SW846 8290
	105	(60 - 140)			SW846 8290
1,2,3,6,7,8-HxCDD	99	(60 - 140)	0.99	(0-50)	SW846 8290
	100	(60 - 140)			SW846 8290
1,2,3,7,8,9-HxCDD	98	(60 - 140)	3.0	(0-50)	SW846 8290
	101	(60 - 140)			SW846 8290
1,2,3,4,6,7,8-HpCDD	88 B	(60 - 140)	1.2	(0-50)	SW846 8290
	89 B	(60 - 140)			SW846 8290
OCDD	84 B	(60 - 140)	1.6	(0-50)	SW846 8290
	82 B	(60 - 140)			SW846 8290
2,3,7,8-TCDF	102	(60 - 140)	4.0	(0-50)	SW846 8290
	98	(60 - 140)			SW846 8290
1,2,3,7,8-PeCDF	91	(60 - 140)	3.6	(0-50)	SW846 8290
	94	(60 - 140)			SW846 8290
2,3,4,7,8-PeCDF	84	(60 - 140)	5.4	(0-50)	SW846 8290
	89	(60 - 140)			SW846 8290
1,2,3,4,7,8-HxCDF	93	(60 - 140)	2.7	(0-50)	SW846 8290
	96	(60 - 140)			SW846 8290
1,2,3,6,7,8-HxCDF	81	(60 - 140)	7.1	(0-50)	SW846 8290
	87	(60 - 140)			SW846 8290
2,3,4,6,7,8-HxCDF	89 B	(60 - 140)	0.44	(0-50)	SW846 8290
	89 B	(60 - 140)			SW846 8290
1,2,3,7,8,9-HxCDF	94	(60 - 140)	4.5	(0-50)	SW846 8290
	98	(60 - 140)			SW846 8290
1,2,3,4,6,7,8-HpCDF	95	(60 - 140)	7.8	(0-50)	SW846 8290
	103	(60 - 140)			SW846 8290
1,2,3,4,7,8,9-HpCDF	101	(60 - 140)	10	(0-50)	SW846 8290
	112	(60 - 140)			SW846 8290
OCDF	77	(60 - 140)	14	(0-50)	SW846 8290
	88	(60 - 140)			SW846 8290

(Continued on next page)



MATRIX SPIKE SAMPLE EVALUATION REPORT

Dioxins

Client Lot #...: H7D010108  
MS Lot-Sample #: H7C190114-001

Work Order #...: C8M76102-MS  
C8M76103-MSD

Matrix.....: BIOLOGIC

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	70	(40 - 135)
	75	(40 - 135)
13C-1,2,3,7,8-PeCDD	83	(40 - 135)
	90	(40 - 135)
13C-1,2,3,6,7,8-HxCDD	67	(40 - 135)
	73	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDD	83	(40 - 135)
	88	(40 - 135)
13C-OCDD	89	(40 - 135)
	82	(40 - 135)
13C-2,3,7,8-TCDF	55	(40 - 135)
	60	(40 - 135)
13C-1,2,3,7,8-PeCDF	84	(40 - 135)
	89	(40 - 135)
13C-1,2,3,4,7,8-HxCDF	67	(40 - 135)
	73	(40 - 135)
13C-1,2,3,4,6,7,8-HpCDF	71	(40 - 135)
	71	(40 - 135)

**NOTE (S) :**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Bold print denotes control parameters

**B** Method blank contamination. The associated method blank contains the target analyte at a reportable level.



ADVENT 73

A: 2 E: 2  
B: 2 F: 2  
C: 2 D: 2

# CHAIN OF CUSTODY RECORD

Microbac Laboratories, Inc. / Ker  
1121 W. Broadway Louisville, KY



LAB ID	SAMPLE NO	SAMPLE DESCRIPTION / LOCATION		COLLECTED DATE	TIME	COMP	SAMPLE TYPE	MATRIX	NO. OF CONTAINERS	CONTAINER TYPE / PRESERVATIVE	ANALYSES REQUESTED
		Temp. °C	Temp. °C								
		Sediment Sample 1		3-27-97	1120		X	Solid	2	4oz glass	8290 - Dioxins / Furans
	C.P. SS-1	"	"	3-27-97	1130		X	Solid	2	"	"
	C.P. SS-2	"	"	3-27-97	1145		X	Solid	2	"	"
	C.P. SS-3	"	"	3-27-97	1220		X	Solid	2	"	"
	C.P. SS-4	"	"	3-27-97	1235		X	Solid	2	"	"
	C.P. SS-5	"	"	3-27-97	1245		X	Solid	2	"	"
	C.P. SS-6	"	"	3-27-97			X	Solid	2	"	"

PROJECT / LOCATION: **Chickasaw Park**  
 SEND REPORT TO: **Scott Kelly / ADVENT**  
**303 W. Hurstbourne Pkwy**  
**Suite 250**  
**Lou., Ky 40222**  
 PHONE (502) 429-8001  
 Method of Shipment:  
 CLIENT NAME: **ADVENT**  
 WATER COMPOSITE SAMPLING DATA:  
 AUTOMATIC \_\_\_\_\_  
 DISCRETE \_\_\_\_\_  
 BEGIN: \_\_\_\_\_ END: \_\_\_\_\_  
 DATE: \_\_\_\_\_ DATE: \_\_\_\_\_  
 TIME: \_\_\_\_\_ TIME: \_\_\_\_\_  
 CONTINUOUS \_\_\_\_\_  
 FLOW PROPORTIONED \_\_\_\_\_  
 FLOW INTERVAL \_\_\_\_\_  
 FLOW M/S / Sample \_\_\_\_\_  
 # samples \_\_\_\_\_

Comments or Special Hazards:

Relinquished by (Signature)	Date	Time	Received by (Signature)	Date	Time
<i>T. Scott Kelly</i>	3/27/97	1350	<i>Jessica Schmiedel</i>	2/27	1:50
Relinquished by (Signature)	3		Received by (Signature)	4	
Relinquished by (Signature)	5		Received by (Signature)	6	
Relinquished by (Signature)	7		Received by (Signature)	8	





