REPORT

INTERIM ECOLOGICAL INVESTIGATION REPORT CONTAMINATION PATHWAYS RI/FS

YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

VOLUME I OF II

Steering Committee of the York Oil Superfund Site
Contamination Pathways RI/FS Participation Agreement

January 1994
Revised August 1994

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

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August 18, 1994

de maximis, inc.

AUG 19 1994

RECEIVED

Mr. Arnold Bernas
United States Environmental Protection Agency
26 Federal Plaza, Room 2930
New York, NY 10278

Re: York Oil Contamination Pathways
Interim Ecological Report

File: 688.04 #2

Transmitted Via: *Federal Express*
Pages Sent: *17*

Dear Mr. Bernas:

On behalf of Mr. Bruce Thompson of de maximis, inc., Project Coordinator for the Steering Committee of the York Oil Superfund Site Contamination Pathways Remedial Investigation/Feasibility Study (RI/FS) Participation Agreement, please find enclosed seven copies of the revised Interim Ecological Investigation Report (IEIR) for the York Oil Contamination Pathways RI/FS. The revised IEIR (Volume I of II) contains the complete report text, tables, and figures, as well as the following additional appendices:

- Appendix A, Attachment A-2 - Photo Log;
- Appendix F - Laboratory Procedures Used for Preparation and Analysis of Wetland and Aquatic Fauna; and
- Appendix G - Validated Laboratory Data Summary Forms for Fauna Analyses.

The original IEIR appendices (i.e., Appendices A through E), presented in Volume II of II of the January 1994 IEIR did not require revision and have not been resubmitted.

The IEIR was revised, as necessary, to address comments regarding the report which were offered by the United States Environmental Protection Agency (USEPA) in letters dated April 1, 1994 and July 8, 1994. The USEPA's comments regarding the IEIR are presented below, followed by a brief description of the action undertaken by the Steering Committee to resolve the comments.

Comments on Interim Ecological Investigation Report

Comment 1: The USEPA requests that the laboratory procedures used to prepare and analyze the wetland and aquatic fauna be presented in an appendix.

Resolution: The laboratory procedures used for preparation and analysis of wetland and aquatic fauna are presented in Appendix F of the revised IEIR.

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Comment 2: The USEPA requests that the analytical laboratory data reporting sheets for the fauna analyses be presented in an appendix.

Resolution: The validated laboratory data summary forms for the fauna analyses are presented in Appendix G of the revised IEIR.

***

Comment 3: The USEPA states that Tables 6-1 through 6-4 did not specify whether the results were presented in dry or wet weight.

Resolution: A note was added to Tables 6-1 through 6-4 stating that the results were reported on a wet weight basis.

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Comment 4: The USEPA states that the dismissal of elevated mercury concentrations above background as not site-related is inappropriate.

Resolution: Page 4-9 of the revised IEIR was changed to state that mercury will be evaluated in the RI as a potentially site-related constituent.

***

Comment 5: The USEPA requests the inclusion of total organic carbon (TOC) and grain size information.

Resolution: These data were previously provided to the USEPA and will be included in the Contamination Pathways Characterization Summary (SPCS) Report and the Contamination Pathways Remedial Investigation (CPRI) Report.

***

Comment 6: The USEPA states that the white sucker was not a good choice to replace brown trout as a target species, and that whole fish rather than fillets should have been analyzed for ecological risk assessment purposes. USEPA also raises concerns regarding detection limits specified in Table 6-3.

Resolution: The Steering Committee's response and clarification to these comments were presented in a May 25, 1994 letter from Mr. Gary R. Cameron of Blasland, Bouck & Lee, Inc. (BB&L) to the USEPA (attached), and no further action was required.

***

Comment 7: The USEPA states that the term "biomarker" is used inappropriately in referring to the tissue residue sampling performed at the site.

Resolution: The term "biomarker" was replaced, as necessary, in the revised IEIR with more appropriate wording such as "biota" or "tissue residue analysis."

***

Comment 8: The USEPA states that "several conclusions made in this RI are without adequate support." USEPA states that the report's conclusion that "no chemical-related impacts ... are apparent" should not be made because: 1) low numbers of animals and species were surveyed; 2) PCBs are not acutely toxic; and 3) "there is no quantitative analysis of the data gathered, only an objective opinion based on certain site conditions." USEPA also states that drawing "conclusions would be difficult at this stage because of the difference in the habitats of both the Western and Southern Wetlands and the Reference Wetland, as noted on page 5-4."

Resolution: The Steering Committee's response to this comment was presented in the May 25, 1994 letter from BB&L to the USEPA (attached), and no further action was required.

***

Comment 9: The USEPA questions the IEIR's conclusion regarding the aquatic survey results that show no difference between the background and adjacent aquatic sites. USEPA says that similar habitats should have been selected to minimize habitat differences, and that data should be statistically analyzed in the ecological risk assessment (ERA), and any unsupported conclusions should be deleted from the RI.

Resolution: This comment was addressed in the May 25, 1994 letter from BB&L to the USEPA, and no further action was required.

***

Comment 10: The USEPA notes that only one sample of each small mammal species was collected, thereby limiting the statistical usefulness of the data. The USEPA states that the three small mammal species should not be compared because they represent different trophic levels. The USEPA also questions whether the mortality of specimens impeded estimation of population density. With regard to the "biomarker" sampling, USEPA questions whether the sampling may have depleted the mammal populations to the point that the samples collected were recent immigrants and thus not representative of the area.

Resolution: This comment was addressed in the May 25, 1994 letter, and no further action was required.

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Section 2.2.2 - Primary Aquatic Site

Comment 11: The USEPA requests information concerning streamflow and water depth during August 1993 (the period of low flow) to provide an understanding of seasonal variation in these parameters at the aquatic sites.

Resolution: Section 2.2.2 of the IEIR was revised to present a comparison of the May and August 1993 streamflow and water level depth measurements that were obtained at four locations in Lawrence Brook (Y2-SW01 through Y2-SW04). Table B-1 in Appendix B summarizes the streamflow data from the May and August 1993 surface water sampling activities.

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Section 2.3.1 - Secondary Wetland Areas

Comment 12: The USEPA requests a larger scale figure of the northwest wetland area, including sampling locations and the referenced beaver pond.

Resolution: Figure 2 (Regional Study Area Map) was revised as follows: the scale was changed from 1" = 2,500' to 1" = 1,250"; and the location of the referenced beaver ponds are presented. The sampling locations in the northwest wetland are presented on Figure 4.

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Section 3.2 - Wetland Delineation Results

Comment 13: The USEPA requests clarification regarding relocation of the northwest boundary of the southern wetland.

Resolution: Section 3.2 of the IEIR was revised to describe the rationale used to relocate the northwest boundary of the southern wetland. In addition, a note regarding relocation of this boundary was added to Figure 3 (Wetlands Delineation Map).

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Section 3.3 - Wetland Evaluation Technique Functional Analysis

Comment 14: The USEPA requests a comparative analysis, based on the Wetland Evaluation Technique (WET), of the reference wetland with the western and southern wetlands.

Resolution: Tables 3-1 and 3-2 in the IEIR were revised to provide the comparative analysis requested by the USEPA.

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Figure 3 - Wetlands Delineation Map

Comment 15: The USEPA requests several clarifications and revisions to the Wetland Delineations Map (Figure 3).

Resolution: Figure 3 (Wetlands Delineation Map) was revised to clarify the boundary change referred to under Comment 13 and the site boundary was added to this figure.

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Appendix A

Comment 16: The USEPA requests the inclusion of a photographic log documenting the wetland delineation.

Resolution: The photographs taken during delineation of the wetlands are presented in Appendix A, Attachment A-2 - Photo Log, in the revised IEIR.

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Section 4.1 - Surface Water

Comment 17: The USEPA requests two wording changes in Section 4.1.

Resolution: Section 4.1 of the IEIR was revised so that the initial (April 1993) reference aquatic site location (Y2-SW01) is referred to as the "background location" and the citation for the August 1993 reference sample was changed to Y2-SW01A.

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Section 4.2.1 - Contamination Pathways RI Sediment Data

Comment 18: The USEPA requests additional sediment sampling to further define the extent of PCB contamination in the southern wetland directly across the railroad grade and in Northwest Wetland No. 1. The agency also disputes the elimination of pesticides as site-related constituents, stating that pesticides may be constituents of concern for OU1 that were not detected due to the high dilution factors which generally occurred. Finally, the USEPA suggests minor wording changes throughout this section of the IEIR related to the comparison of background concentrations.

Resolution: The proposed sediment sampling activities, as presented in the August 1994 Contamination Pathways Remedial Investigation Field Operations Plan (FOP) - Addendum No. 1 (FOP Addendum), reflect the incorporation of the USEPA's request for additional sediment sampling in the southern wetland and in Northwest Wetland No. 1. Revisions to Section 4.2.1 of the IEIR include appropriate wording changes to clarify the comparison of background concentrations.

***

Section 4.2.2 - Historical Data

Comment 19: The USEPA disputes the use of the 10 ppm action level for OU1.

Resolution: The statement that PCBs exceeded the 10 ppm action limit established for OU1 at only a few locations has been removed from Section 4.2.2.

***

Section 4.2 - Surface Soils

Comment 20: The USEPA states that it is not possible to compare the pesticide concentrations reported along the railroad bed with off-site railroad bed concentrations because data for background sample SS-03 were rejected during data validation and suggests that all samples, including those with rejected analytical data, be included on the summary tables.

Resolution: BB&L will collect one additional surface soil sample from location SS-03 for Target Compound List (TCL) pesticide analysis, as specified in the FOP Addendum. As stated in the May 25, 1994 letter, the results of the additional sampling, as well as the comparison of railroad bed and off-site pesticide concentrations, will be appropriately discussed in the SPCS and CPRI Reports.

***

Section 6.1.1 - Target Species and Analytes

Comment 21: The USEPA notes that terrestrial biota sampling locations are incorrectly referenced as being presented on Figure 10.

Resolution: Page 6-5 of the revised IEIR was changed to correctly refer to Figure 11.

***

Section 6.1.2 - Results and Discussion

Comment 22: The USEPA requests consistent cross-referencing of units between tables and text, clarification of analytical result comparisons between species, and minor wording changes.

Resolution: Revisions to the text throughout Section 6.0 of the IEIR were made to assure consistent units when cross-referencing between tables and text. Wording changes were made on Page 6-7 to avoid the impression that mercury results were being compared for different species. Finally, minor wording changes were made on pages 6-8 and 6-11 in accordance with the USEPA's comments.

***

Section 7.1 - Wetland Areas

Comment 23: The USEPA objects to the word "some" in Section 7.1.

Resolution: Section 7.1 of the IEIR was revised so that the word "some" was replaced by "approximately two-thirds."

***

Comments on Further Field Sampling

Comment 1: The USEPA requests further fish sampling in Lawrence Brook downstream of the unnamed tributary that drains the northwest wetlands. The USEPA notes that low PCB concentrations in fish at the reference aquatic sites indicates the "vulnerability" of fish to accumulate PCBs.

Resolution: As presented in the FOP Addendum (Section 2.3), fish tissue residue sampling will be conducted in Lawrence Brook, downstream of the unnamed tributary that drains the Western, Northwest No. 1 and Northwest No. 2 Wetland, in accordance with the USEPA's request.

***

Comment 2: The USEPA requests additional sampling in Lawrence Brook and wetland areas that were not previously sampled.

Resolution: As presented in the FOP Addendum, additional sediment samples will be collected for laboratory analysis from six depositional areas in the Northwest Wetland No. 1, as well as from six depositional areas in the western portion of the southern wetland. A detailed description of the supplemental sediment sampling and analysis activities was presented in Section 2.1 of the FOP Addendum.

***

Comment 3: The USEPA states that additional ecological sampling may be needed in Northwest Wetland No. 1 depending on the results of the additional sediment sampling that the USEPA requested.

Resolution: As stated in the May 25, 1994 letter, no additional biota sampling and analysis activities should be necessary if concentrations detected in the Northwest Wetland No. 1 are less than those detected in the Western Wetland. If detected concentrations in the Northwest Wetland No. 1 are higher, then the scope for additional biota sampling and analysis activities, if any are warranted, would be determined upon review of the data, with the USEPA's concurrence.

***

Comments 4-5: The USEPA requests additional sampling for PCB concentrations in surface soil and/or sediment samples for PCBs in the Southern Wetland and Northwest Wetland No. 1.

Resolution: See description of the resolution provided above for Comment 2.

***

Comment 6: The USEPA requests resampling of five locations due to incomparability of results with split samples.

Resolution: Due to certain discrepancies in the analytical data obtained during the RI, the following additional sampling and analysis activities will be implemented during the supplemental field investigations associated with the RI for OU2:

- Y2 - SS - 10-01 (SVOCs and PCBs);
- Y2 - SS - 13-01 (SVOCs and PCBs);
- Y2 - SS - 16-01 (SVOCs and PCBs);
- SD - 18 (PCBs); and
- SD - 21 (PCBs).

A description of these supplemental investigation activities to be implemented in OU2, was presented in Section 2.0 of the FOP Addendum.

Please contact Mr. Bruce Thompson of de maximis, inc. at (615) 691-5052 if you have any questions regarding this submittal.

Very truly yours,

BLASLAND, BOUCK & LEE, INC.

Gary R. Cameron
Vice President

cc: York Oil Steering/Technical Committee (1 copy each)
Elena Kissel, Esq., USEPA (1 copy)
Mr. Victor Cordona, NYSDEC (4 copies)
Ms. Claudine Jones, NYSDOH (1 copy)
Mr. Dan Steenberge, NYSDEC (1 copy)
Mr. Bruce Nelson, Malcolm-Pirnie (1 copy)
Mr. Bruce Thompson, de maximis, inc. (1 copy)
Mr. Edward R. Lynch, P.E., Blasland, Bouck & Lee, Inc. (1 copy)
David W. Hohreiter, Ph.D., Blasland, Bouck & Lee, Inc. (1 copy)

Attachment 1

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS
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May 25, 1994

Mr. Arnold Bernas
Western New York Superfund Section 1
Emergency and Remedial Response Division
United States Environmental Protection Agency
26 Federal Plaza, Room 2930
New York, NY 10278

Re: York Oil Contamination Pathways
Interim Ecological Report

File: 688.02 #2

Dear Mr. Bernas:

On behalf of Mr. Mark Valentine of de maximis, inc., Project Coordinator for the Steering Committee of the York Oil Superfund Site Contamination Pathways RI/FS Participation Agreement, we have presented below responses to the comments offered by the United States Environmental Protection Agency (USEPA) in an April 1, 1994 letter regarding the Interim Ecological Investigation Report (IEIR) for the York Oil Contamination Pathways RI/FS.

Comments on Interim Ecological Investigation Report (Attachment 1)

Comments 1-3: USEPA requests clarification or additional information.

Response: The report will be modified as requested.

* * *

Comment 4: USEPA states that the dismissal of elevated mercury concentrations above background as not site-related is inappropriate.

Response: BB&L made a preliminary conclusion with regard to the origin of elevated mercury concentrations in the western wetland, the beaver pond, and the southern wetland. Mercury will be evaluated in the RI as a potentially site-related constituent.

* * *

Comment 5: USEPA requests the inclusion of total organic carbon (TOC) and grain size information.

Response: These data were previously provided to USEPA and will be included in the Contamination Pathways Characterization Summary (CPCS) Report and the Contamination Pathways Remedial Investigation (CPRI) Report.

* * *

Syracuse, NY • Rochester, NY • Islandia, NY • White Plains, NY • Middletown, NY • Cranbury, NJ • Philadelphia, PA • Pittsburgh, PA
Durham, NC • Columbus, OH • Boca Raton, FL • Tampa, FL • Orlando, FL • Miami, FL • Irvine, CA

Comment 6: USEPA states that the white sucker was not a good choice to replace brown trout as a target species, and that whole fish rather than fillets should have been analyzed for ecological risk assessment purposes. USEPA also raises concerns regarding detection limits specified in Table 6-3.

Response: During the floral/faunal survey conducted prior to the fish sampling activities, BB&L observed only a few brown trout and a much larger white sucker population. Although it was recognized that white suckers were not the preferred target species in a letter dated June 28, 1993, BB&L proposed white sucker as a possible substitute species for brown trout in the event that insufficient numbers of brown trout were captured at the sampling locations. This approach was subsequently approved by USEPA.

With regard to analysis of fillet samples, the approved Field Operations Plan (FOP) states that fillets are to be analyzed if edible-size fish are collected (page 23, fourth paragraph). This approach is also specified in the USEPA's Work Plan (Ebasco, 1991) (page 114, second paragraph, last sentence): "If consumable fish (e.g., brown trout) are collected, edible fillets will be removed and all analyses conducted on these fillets." The fact that white suckers were edible-size was also clearly stated in the above-referenced letter to USEPA.

Finally, it appears that the reviewer may have misread Table 6-3, where the PCB detection limits are specified in a footnote as 10 to 30 µg/kg, not mg/kg. These detection limits are sufficiently sensitive relative to ecological endpoints of concern.

* * *

Comment 7: USEPA states that the term "biomarker" is used inappropriately in referring to the tissue residue sampling performed at the site.

Response: We agree with USEPA that the use of the term "biomarker" in this context is inappropriate. However, the term was used in the IEIR (and preceding FOP) only to be consistent with the task titles used in USEPA's Work Plan (Ebasco, 1991). Specifically, on page 109, last paragraph under "Biomarker Sampling," the Work Plan states, "Tissue residues provide a 'biomarker' for determining whether bioaccumulation of these contaminants has occurred ...." We agree with USEPA's definition of the term "biomarker," and will revise the IEIR to refer to this task as "Tissue Residue Sampling" as appropriate.

* * *

Comment 8: USEPA states that "several conclusions made in this RI are without adequate support." USEPA states that the report's conclusion that "no chemical-related impacts ... are apparent" should not be made because: 1) low numbers of animals and species were surveyed; 2) PCBs are not acutely toxic; and 3) "there is no quantitative analysis of the data gathered, only an objective opinion based on certain site conditions." USEPA also states that drawing "conclusions would

be difficult at this stage because of the difference in the habitats of both the Western and Southern Wetlands and the Reference Wetland, as noted on page 5-4."

Response: The characterization of the IEIR as a RI is inappropriate. As stated in the FOP, the purpose of the IEIR is to "present results of primary ecological investigation activities and recommendations regarding the need for ecological investigations, if any, to be performed in the secondary areas." (page 23, section 2.5.4). As such, the conclusions stated in the IEIR are made primarily with this objective in mind, i.e., discussing the results of the ecological investigations in the primary areas as they relate to the need for analogous investigations in the secondary areas. In this respect, the statements in the IEIR are accurate as written. As shown by the existing data generated as part of the primary area investigations, no ecological impacts are apparent as would be expected due to the low acute toxicity of PCBs as noted by the USEPA. Since the primary areas do not appear to be ecologically impacted, it is unlikely that the collection of additional data from either the primary or secondary areas will reveal an ecological impact.

With regard to habitat differences among the wetland areas, the Reference Wetland was selected by USEPA in the Work Plan (Ebasco, 1991). Further field reconnaissance by BB&L personnel indicated that, while there were certain differences among the wetlands, the Reference Wetland was sufficiently similar to the others that any contaminant-related impacts, if present, could be detected. This conclusion was implicitly endorsed by USEPA in their approval of both the Work Plan and the FOP. The fact that the sampling program did not detect any significant differences among the wetland areas supports the IEIR's conclusion that no chemical-related impacts were apparent.

* * *

Comment 9: USEPA questions the IEIR's conclusion regarding the aquatic survey results that show no difference between the background and adjacent aquatic sites. USEPA says that similar habitats should have been selected to minimize habitat differences, and that data should be statistically analyzed in the ecological risk assessment (ERA), and any unsupported conclusions should be deleted from the RI.

Response: The reference aquatic site was selected so as to minimize any habitat differences relative to the adjacent aquatic site. In fact, based on BB&L's initial site reconnaissance, the original location of the reference aquatic site (specified in the USEPA's Work Plan) was changed to a location more similar to the adjacent aquatic site. With this in mind, the conclusions of the IEIR are accurate as written. With regard to further quantitative analysis of the data, we do not feel that this will be productive in identifying any site-related impacts because there were no differences in chemical concentrations between the reference and adjacent aquatic sites. For example, PCB concentrations were non-detectable at both locations.

* * *

Comment 10: USEPA notes that only one sample of each small mammal species was collected, thereby limiting the statistical usefulness of the data. USEPA states that the three small mammal species should not be compared because they represent different trophic levels. USEPA also questions whether the mortality of specimens impeded estimation of population density. With regard to the "biomarker" sampling, USEPA questions whether the sampling may have depleted the mammal populations to the point that the samples collected were recent immigrants and thus not representative of the area.

Response: BB&L attempted to implement the FOP as written and collect three samples of one small mammal species at each wetland location. However, as stated in a letter to USEPA dated September 17, 1993, the capture success using the sampling method specified in the USEPA's Work Plan (pitfall traps) was not good. Since a relatively large number of individuals was required to meet sample weight requirements for analyses, BB&L recommended targeting alternative small mammal species. BB&L recommended that one sample of each species be collected from each wetland area thereby insuring that intraspecies comparisons of PCB concentrations among areas could be made (interspecies comparisons were not the focus of the IEIR). USEPA approved the recommended alternative species.

The mortality of specimens captured in the pitfall traps is an artifact of the sampling method specified in the work plan. This did not preclude comparisons of relative population densities among wetland areas on the basis of catch per unit effort of sampling. For practical purposes, the issue of immigration is not significant with regard to the interpretation of these data. The traps sampled only a very small portion of a large study area, and thus any population "depletions" would have been highly localized, and any immigrating replacements would have come from nearby in the study area. The home ranges of the target species are much less than the size of the study areas. Furthermore, the "biomarker" sampling occurred three months after the fauna sampling, and thus these small mammals would have had sufficient time to reach equilibrium with their surroundings and reflect any local conditions. With particular regard to shrews, the USEPA (1993) Wildlife Exposure Factors Handbook notes that shrews have very high metabolic rates and can eat approximately the equivalent of their body weight in food each day. As such, they would rapidly equilibrate with their surroundings.

* * *

Comment 11: USEPA requests information concerning streamflow and water depth during August 1993 (the period of low flow) to provide an understanding of seasonal variation in these parameters at the aquatic sites.

Response: No ecological investigation activities were performed during August 1993, and thus no measurements of streamflow or water depth are available at the aquatic sampling locations. However, surface water sampling was performed August 2-4, 1993 at sampling locations Y2-SW01 through Y2-SW04. Water depth and streamflow measurements were obtained in conjunction with this activity,

which represents the low flow period. This information will be included in the presentation of surface water sampling results in the CPCS and CPRI Reports.

* * *

Comments 12-17: USEPA requests clarifications and/or additional information.

Response: The IEIR will be revised as appropriate.

* * *

Comment 18: USEPA requests additional sediment sampling to further define the extent of PCB contamination in the southern wetland directly across the railroad grade and in Northwest Wetland No. 1. The agency also disputes the elimination of pesticides as site-related constituents, stating that pesticides may be constituents of concern for OU1 which were not detected due to the high dilution factors which generally occurred. Finally, USEPA suggests minor wording changes throughout this section of the IEIR related to the comparison of background concentrations.

Response: Proposed locations for the collection of additional sediment and surface soil samples are shown on Figures 1 and 2, which are intended to serve as an Addendum to the FOP. The additional sediment samples will be collected in accordance with the protocols presented in the FOP and will be analyzed for PCBs. Three additional samples are proposed to be collected from the areas of deepest sediment accumulation in Northwest Wetland No. 1. The purpose of these three additional samples is to define the extent of PCB impacts downstream of sample location SD-24. Also, four additional sediment and one additional surface soil sample locations are proposed at the southern edge of the railroad bed and near the perimeter of the beaver pond in the western portion of the Southern Wetland. The need for further sampling within the Southern Wetland will be determined based on the results of the five proposed additional samples. The results from the additional sampling will be presented in the CPCS and CPRI Reports.

The statement that pesticides were not previously identified as constituents of concern in OU1 is accurate. Nevertheless, based on the bioaccumulation characteristics of the compounds, the site-relatedness of pesticide compounds is not an ecological issue, and BB&L suggests the site-relatedness of pesticides (as well as mercury) be discussed in the CPCS and CPRI Reports.

With regard to USEPA's suggested wording changes, this section of the IEIR will be modified as appropriate.

* * *

Comment 19: USEPA disputes the use of the 10 ppm action level for OU1.

Response: BB&L used the 10 ppm action level only as a point of comparison given the obvious connection of OU2 to OU1. Soil action levels for OU2 will be discussed in the RI/FS.

* * *

Comment 20: USEPA states that it is not possible to compare the pesticide concentrations reported along the railroad bed with off-site railroad bed concentrations because data for background sample SS-03 were rejected during data validation and suggests that all samples, including those with rejected analytical data, be included on the summary tables.

Response: BB&L will collect an additional soil sample from location SS-03 for pesticide analysis in conjunction with the additional sampling discussed below. The results of the additional sampling, as well as the comparison of railroad bed and off-site pesticide concentrations, will be appropriately discussed in the CPCS and CPRI Reports.

* * *

Comments 21-23: USEPA generally requests wording changes or clarification.

Response: The report will be modified as appropriate.

* * *

Comments On Further Field Sampling

Comment 1: USEPA requests further fish sampling in Lawrence Brook downstream of the unnamed tributary that drains the northwest wetlands. USEPA notes that low PCB concentrations in fish at the reference aquatic sites indicates the "vulnerability" of fish to accumulate PCBs.

Response: The detection of low PCB concentrations in fish at the reference site indicates the ubiquitous nature of PCBs and demonstrates that PCB concentrations of these magnitudes are not site-related. With regard to further sampling in the identified area of Lawrence Brook, PCB concentrations were non-detectable in soils/sediments in these locations and upgradient of these locations, and there is no reason to suspect significant accumulation relative to background levels. Additional sampling would be appropriate if sediment in this area exhibited the highest concentrations of all areas sampled; because the analytical results of samples from this area are comparable to data from sediments in other areas, additional sampling of fish from this area does not appear warranted.

* * *

Comment 2: USEPA requests additional sampling in Lawrence Brook and wetland areas that were not previously sampled.

Response: Sediment samples were collected from Lawrence Brook, as well as wetland areas, for grain size and TOC analysis. The data generated from these samples confirms that the samples collected within Lawrence Brook were, in fact, collected from depositional areas. This grain size and TOC data will be presented in the CPCS and CPRI reports. Additional sampling is proposed in Northwest Wetland No. 1 and the northwest portion of the Southern Wetland. The additional sampling is discussed in the response to Comments 4 and 5 below.

* * *

Comment 3: USEPA states that additional ecological sampling may be needed in Northwest Wetland No. 1 depending on the results of the additional sediment sampling that USEPA requested.

Response: No additional ecological sampling should be necessary if concentrations detected in Northwest Wetland No. 1 are less than those in the Western Wetland. No significant ecological effects were seen in the western wetland where the highest concentrations were detected, and thus none would be expected in Northwest Wetland No. 1 unless higher chemical concentrations are present.

* * *

Comments 4-5: USEPA requests additional sampling for PCB concentrations in surface soil and/or sediment samples for PCBs in the Southern Wetland and Northwest Wetland No. 1.

Response: Proposed locations for the collection of additional sediment and surface soil samples are shown on Figures 1 and 2, which are intended to serve as an Addendum to the FOP. The additional sediment samples will be collected in accordance with the protocols presented in the FOP and will be analyzed for PCBs. Three additional samples are proposed to be collected from the areas of deepest sediment accumulation in Northwest Wetland No. 1. The purpose of these three additional samples is to define the extent of PCB impacts downstream of sample location SD-24. Also, four additional sediment and one additional surface soil sample locations are proposed at the southern edge of the railroad bed and near the perimeter of the Beaver Pond in the western portion of the southern wetland. The need for further sampling within the Southern Wetland will be determined based on the results of the five proposed additional samples. The results from the additional sampling will be presented in the CPCS and CPRI Reports.

* * *

Comment 6: USEPA requests resampling of five locations due to incomparability of results with split samples.

Response: BB&L has reviewed Malcolm Pirnie's letter of February 16, 1994 regarding the comparability of split sample results. It should be noted that the data presented by BB&L and Malcolm Pirnie were generated and validated using similar

procedures (i.e., CLP protocols). Each set of data has also been accepted as valid, with the assigned qualifications. Therefore, although the data from the analysis of select split samples are not comparable, both sets of data can be considered acceptable pursuant to CLP. One specific exception, however, is the contention that the metals data for surface water is inadequate. The data clearly show that it is Malcolm Pirnie's own duplicates which fall outside acceptable ranges.

With respect to the remainder of the samples, certain discrepancies were found to be significant enough to warrant the following additional sampling and analysis:

- Y2 - SS - 10-01 (SVOCs and PCBs);
- Y2 - SS - 13-01 (SVOCs and PCBs);
- Y2 - SS - 16-01 (SVOCs and PCBs);
- SD - 18 (PCBs); and
- SD - 21 (PCBs).

The results from the additional sampling will be presented in the CPSC Report.

In addition, the overall RI/FS project schedule has been updated to reflect the current project status, including the additional sampling activities proposed herein. The revised project schedule proposes implementing the additional sampling activities during the final week of June 1994.

We look forward to discussing the proposed modifications to the IEIR and the additional sampling activities discussed above. Please contact Mr. Bruce Thompson of de maximis, inc. at (615) 691-5052 if you have any questions.

Very truly yours,

BLASLAND, BOUCK & LEE, INC.

Gary R. Cameron

Gary R. Cameron
Vice President

GRC/dmd
3494359F

cc: York Oil Steering/Technical Committee (1 copy each)
Elena Kissel, Esq., USDOJ (1 copy)
Mr. Victor Cordona, NYSDEC (4 copies)
Ms. Claudine Jones, NYSDOH (1 copy)
Mr. Dan Steenberge, NYSDEC (1 copy)
Mr. Mark Valentine, de maximis, inc. (1 copy)
Mr. Edward R. Lynch, P.E., Blasland, Bouck & Lee, Inc. (1 copy)
David W. Hohreiter, Ph.D., Blasland, Bouck & Lee, Inc. (1 copy)

Report

Interim Ecological Investigation Report Contamination Pathways RI/FS

York Oil Superfund Site
Moira, New York

Volume I of II

Steering Committee of the York Oil Superfund Site
Contamination Pathways RI/FS Participation Agreement

January 1994
Revised August 1994

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Executive Summary

Overview of Results

In summary, the Interim Ecological Investigation Report concludes the following:

- The primary aquatic and wetland sites support similar floral and faunal communities. There were no ecological differences between near site and reference area communities that were attributable to the site.
- Analytical results of surface water and biota tissue residue analysis revealed no significant differences between the adjacent and reference aquatic sites. These results combined with those of the flora/fauna survey, demonstrates that there are not site-related aquatic impacts.
- Wetland biota sampling and tissue residue analysis indicated similarly low levels of pesticides, mercury and arsenic in fauna from each of the primary wetland areas, including the reference wetland, which indicates that these compounds are not attributable to the site. Arsenic and mercury were detected at generally similar concentrations in surface soil and sediment samples from each of the primary wetlands, including the reference wetland. Slightly elevated concentrations of pesticides were detected in the western wetland relative to the southern and reference wetlands. Pesticides were not previously identified as constituents of concern for OU1, and the western wetlands is bordered to the north by active agricultural fields and to the south by the abandoned railroad grade, both likely sources of pesticides. Pesticides, arsenic and mercury are, therefore, not considered to be site related compounds.
- PCBs and lead were detected in biota samples from the western wetland at concentrations greater than were detected in the southern or reference wetland samples. However, as stated above, no differences between wetland area floral and faunal communities attributable to site contamination were observed.
- PCBs and lead were detected in surface soils and sediments in the western wetland at concentration greater than were detected in the southern and reference wetlands. These compounds are likely to be attributable to the site. Consistent with previous investigation, the samples with the highest concentrations were detected within and just outside of the 1000 foot by 200 foot western extension of OU1. PCBs and lead were detected at low levels in samples from the southern portion (closest to

the western wetlands) of northwestern wetland #1. Samples collected further downgradient in northwestern wetland #1 and from the other secondary areas did not contain detectable levels of PCBs, and contained lead at background concentrations.

- Based on the absence of ecological differences or differences in biota sampling results between the reference and adjacent aquatic sites, plus the fact that secondary aquatic sites have similar or lower levels of chemical constituents in surface water and sediments, no additional ecological investigation of secondary aquatic areas is warranted.
- The absence of flora/fauna community differences between the reference, western, and southern wetlands indicates that additional flora/fauna surveys of secondary wetlands, which have similar or lower chemical concentrations in soil and sediments, are not warranted.
- Limited PCB and lead bioaccumulation was observed in western wetland biota. However, this bioaccummulation occurred in an area where elevated PCB and level concentrations were observed in soils and sediments. Soil sediment sampling of secondary wetlands area revealed much lower PCB and lead levels. Therefore, further biota sampling in secondary wetland areas would not yield useful data and is therefore not necessary.

Purpose

This report presents results of the ecological investigation (EI) performed by Blasland, Bouck & Lee, Inc. (BB&L), as part of the Contamination Pathways Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit 2 (OU2) of the York Oil Superfund Site. The EI included wetlands identification and delineation, a detailed flora/fauna survey, and biota sampling and tissue residue analysis. Initial ecological investigation activities focused on those wetland areas and aquatic sites nearest Operable Unit 1 (OU1), which were more likely to have been affected by former OU1 operations. The initial ecological investigation results for these areas are compared with those from reference areas to determine if any ecological differences are apparent, and if so, whether any such differences are potentially attributable to site-related chemicals of interest. The purpose of this Interim Ecological Investigation Report is: 1) to determine if any

chemical-related ecological impacts are observed in those areas in OU2 nearest OU1; and, if so 2) to determine the need to perform additional ecological investigation activities in areas more distant from OU1.

Background

The York Oil Superfund Site is located approximately one mile northwest of the Hamlet of Moira, in Franklin County, New York. The site has been divided into two operable units: OU1, which consists of approximately 17 acres and includes land previously owned by the former York Oil Company, which reportedly operated an oil washing/recycling facility, as well as a 1,000 ft. by 200 ft. strip of land extending to the west; and OU2, which consists of potential pathways of contaminant migration from OU1.

During previous investigations of OU1 by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) and their contractors, including Erdman, Anthony, Associates, the presence of various organic and inorganic contaminants were identified, including polychlorinated biphenyls (PCBs). An RI/FS for OU1 was completed for NYSDEC by Erdman, Anthony, Associates (August 1985). A draft Supplemental FS was also prepared by the same contractor in November 1987. A Record of Decision (ROD) was issued by the USEPA in February 1988 and specified remedial measures for OU1. Negotiations for the implementation of the OU1 ROD are ongoing.

In order to determine whether there are any off-site issues related to the site that are not currently addressed by OU1, the Contamination Pathways RI/FS is being conducted for OU2. The overall objective of the Contamination Pathways RI/FS, of which the EI is a part, are to: 1) determine the nature and extent of contamination, and any threat to the public health, welfare, and environment caused by a release of site-related chemicals of interest in OU2; and 2) determine and evaluate alternatives for remedial action, if necessary. The Contamination Pathways RI/FS, which is being conducted under a Consent Order, includes the investigation of surface water, sediment, surface soil, subsurface soil, and ground water. Another component of the Contamination Pathways RI/FS is the EI, which includes wetlands delineation, detailed

flora/fauna surveys, and biota sampling in wetland areas and aquatic sites near OU1, and in reference (background) areas.

The OU2 areas potentially subject to ecological investigation activities have been divided into "primary" and "secondary" areas. The primary areas are those wetlands and aquatic areas closest to the OU1 site, which are more likely to have been affected by past operations at OU1, as well as reference locations. The need for additional ecological and chemical investigation activities at more distant "secondary" areas is the subject of this report and is to be determined based on the ecological and chemical investigation results from primary areas and chemical concentrations in secondary areas, including surface water, sediment, and surface soil.

The primary wetland areas are identified as the western, southern, and reference (background) wetlands. The primary aquatic sites are identified as the adjacent aquatic site and reference (background) aquatic site. The two more distant secondary wetland areas are identified as northwest wetlands No. 1 and No. 2, located at progressively greater distances from OU1 than the western and southern wetlands. The two secondary aquatic sites consist of the aquatic sites along Lawrence Brook at the boundary of northwest wetland No. 2, and at its junction with Deer River, located at progressively greater distances downstream from OU1.

This Interim Ecological Investigation Report presents the results of the initial ecological investigation activities for the primary areas. It includes an assessment of the potential ecological impacts and recommendations concerning the need for additional ecological investigations in secondary areas.

Scope

Investigation activities conducted as part of this EI include the following:

- An initial site reconnaissance consisting of an inspection of all identified primary and secondary aquatic and wetland areas to discern the general ecological qualities of each area.

- Identification and delineation of the southern and western wetlands, as specified in the FOP. Wetland boundaries were delineated based on evaluation of soils, hydrology, and vegetation. In addition, a qualitative evaluation of the resource/functional value of the reference, southern, and western wetlands was performed.
- Contamination Pathways RI activities consisting of surface water, sediment, and surface soil sampling in OU1 and OU2, including the primary and secondary areas, in support of the EI. (Data summaries are provided in Section 4 of this report.)
- Detailed flora and fauna surveys of the primary aquatic areas and wetlands, which include reference areas. Specifically, the flora survey consisted of identifying plant species and comparing vegetative community composition among primary areas. The fauna survey consisted of identifying terrestrial species (primarily small mammals and soil macroinvertebrates), aquatic species (primarily fish and benthic macroinvertebrates), and comparing community composition between the potentially impacted areas and the reference areas.
- Biota sampling, including sampling and analysis of target terrestrial and aquatic species to determine the extent, if any, of contaminant bioaccumulation. Target species and parameters were identified based on a review of Contamination Pathways RI data for sediment, surface soil, surface water, and fauna survey results, as specified in the FOP and approved by the USEPA. Target terrestrial species consisted of small mammals, green frogs, and earthworms. Target aquatic species consisted of white suckers and fantail darters. Selected parameters for tissue residue analysis were PCBs/pesticides, lead, mercury, and arsenic.

Summary and Conclusions

Detailed conclusions from the wetlands delineation, flora/fauna surveys, and biota sampling are presented in Sections 3, 5, and 6 of this report. An overview of results and general conclusions, based on these investigations, is presented below.

Wetlands Identification and Delineation

As specified in the approved FOP, only the western and southern wetlands were formally delineated. The western wetland consists of approximately 17.2 acres of mostly wooded wet habitat. Within the western wetland there is a beaver dam and surface water channel, which drains northwest from OU1. The southern wetland, delineated as described in Section 3, consists of approximately 82.4 acres and contains two upland islands. Beaver activity is evident in the western portion of the southern wetland. Drainage from the southern wetland is eastward towards Lawrence Brook, and northwestward into the western wetland.

Flora/Fauna Survey

The results of the initial site reconnaissance and wetland flora/fauna surveys indicate a general similarity among the primary wetland areas (western, southern, and reference). All of the primary wetlands provide moderate- to high-quality habitat for wildlife. Vegetative community composition in the western and southern wetlands was influenced by beaver activity, including beaver dams, which affected surface hydrology and soil saturation conditions. No such activity was apparent in the reference wetland. Slight differences in vegetative community composition of the western and southern wetlands relative to the reference wetland were attributable to this factor. Elevated concentrations of PCBs [less than 1,000 to 58,000 micrograms per kilogram (ug/kg)] and other chemicals of interest were observed, primarily in sediment samples, only in limited areas of the western wetlands. No effects on vegetative community composition were apparent in these areas.

Small mammals collected during the terrestrial fauna survey represent species typically found in wooded wet habitats. In general, the small mammal community in the three primary wetland areas appears similar (i.e., same dominant species, similar population densities). Slight differences in species composition and population density are most likely due to habitat differences among the three primary areas. The soil macroinvertebrate communities of the three wetland communities were also quite similar. No significant differences in small mammal or macroinvertebrate community composition of the southern or western wetland relative to the reference wetland were apparent.

Based on the general similarity in flora/fauna survey results in the western and southern wetlands relative to the reference wetland, and the generally low levels of chemicals detected in the western and southern wetland, no chemical-related impacts on flora/fauna community composition are apparent.

The results of the fish and aquatic macroinvertebrate surveys indicate generally similar aquatic fauna communities (species composition and relative species abundance) at both the adjacent and reference aquatic sites. This result is expected based on the generally low or non-detectable chemical concentrations detected in surface water and sediment of the adjacent site relative to those in the reference site.

Biota Sampling

- **Terrestrial Tissue Residue Results**

Terrestrial tissue residue results indicate low, but detectable, PCB concentrations in biota in the western wetland relative to the reference wetland. PCBs were detected in soil and sediment samples from certain locations in the western wetland at concentrations from less than 1,000 to approximately 58,000 ug/kg. PCB concentrations in biota samples from the western wetland were on the order 1,000 ug/kg or less, indicating a low level of bioaccumulation in the target species in this area. PCB concentrations in biota from the southern and reference wetland were all non-detectable, with the exception of a low-level (230 ug/kg) concentration observed in one masked shrew sample collected from the southern wetland. However, this sample was collected near the boundary between the southern and western wetlands, and these shrews could easily travel back and forth between the two areas. This fact, coupled with the lack of detectable PCB concentrations in surface soil and sediment in the southern wetland, indicates that there is minimal, if any, PCB bioaccumulation by biota in this area.

Pesticides in terrestrial species were generally non-detectable or in the low ug/kg range from all three areas, including background areas, except one short-tail shrew sample from the western wetland

(41 ug/kg). Surface and sediment pesticide results from the western wetland are slightly elevated compared to the reference wetland. However, the western wetland is located in an area between the abandoned railroad bed and an area of active agricultural and residential use which may be potential sources of pesticides.

Lead concentrations were generally similar in biota from the southern and western wetland relative to the reference wetland. Only one earthworm and one green frog sample, both from the western wetland, indicated slightly elevated lead concentrations [13.7J and 10.5J milligrams per kilogram (mg/kg), respectively] relative to the reference wetland (0.73J to 2.3J mg/kg and non-detected (ND) to 0.14J mg/kg, respectively). (The J notation indicates the concentration is estimated). Elevated lead concentrations were also detected in surface soil and sediment from the western wetland relative to the reference wetland. Only one earthworm sample from the southern wetland had elevated lead levels (11.4J mg/kg) relative to the reference wetland (0.73J to 2.3J mg/kg). Arsenic concentrations were generally similar in biota from the southern and western wetlands relative to the reference wetland. However, the same earthworm sample from the southern wetland that showed elevated lead levels also had elevated arsenic levels (3.1 mg/kg) relative to the reference wetland earthworm samples (0.19J to 0.43J mg/kg). Surface soil and sediment results for arsenic were similar to background results, with the exception of slightly elevated arsenic concentrations in surface soil samples, primarily from outside of the wetland areas. Tissue residue analytical results for mercury showed similar concentrations in samples from all three primary wetland areas. Mercury concentrations were 0.03 to 0.16 mg/kg in reference wetland biota samples, compared with 0.02J to 0.24 mg/kg in western wetland biota samples and 0.02J to 0.13 mg/kg in southern wetland biota samples. Surface soil results indicated only one detection of mercury, in an area unrelated to wetland areas. Sediment results indicated slightly elevated mercury results in the western and southern wetlands compared to the reference wetland. With the few noted exceptions, concentrations of inorganic analytes were similar in biota samples from the western and southern wetlands relative to the reference wetland.

The terrestrial tissue residue results demonstrate the following: 1) tissue concentrations of the target analytes are generally similar at the southern wetland and reference wetland, as are surface soil and sediment concentrations, 2) PCB and lead concentrations in some biota samples from the western wetland are elevated relative to the reference wetland, as are PCB and lead concentrations in some surface soil and sediment samples, and 3) Pesticide concentrations in biota are generally low or non detectable in all three primary areas, while concentrations in surface soil and sediment samples appear to be slightly elevated in the western wetland; and 4) tissue residue concentrations of arsenic and mercury are not elevated in biota samples for the western wetland relative to the reference wetland. These results, combined with the fact that surface soil and sediment chemical concentrations at the secondary wetlands (northwestern wetland No. 1 and 2) are much less than the western wetland and comparable to the southern wetland, indicate that no biota sampling in the secondary areas is necessary.

- **Aquatic Tissue Residue Results**

Aquatic tissue residue results indicate generally low levels of organic and inorganic compounds in biota from both the adjacent and reference aquatic sites. PCBs were non-detectable in all white sucker fillet samples from both the reference and adjacent aquatic sites. PCB concentrations in whole-body composite fantail darter samples were non-detectable or slightly above detection limits at both the reference (ND to 62 ug/kg) and adjacent (54 to 68 ug/kg) aquatic sites. Similarly, 4,4'-DDE concentrations were non-detectable in all white sucker fillet samples from both locations and were slightly above detection limits in darter samples from the reference (4.6 to 7 ug/kg) and adjacent (5.6 to 6.8 ug/kg) aquatic sites. No other pesticides were detected in the aquatic biota samples. The similarity in tissue residue results from the two locations, combined with the fact that surface water and sediment analytical results indicated generally non-detectable PCB and low pesticide concentrations, leads to the conclusion that there are no site-related impacts on aquatic biota.

Similarly, inorganic chemical concentrations in biota were comparable between the reference and adjacent aquatic sites. Mercury concentrations in fish samples were 0.12 to 0.19 mg/kg at the

reference aquatic site and 0.12 to 0.29 mg/kg at the adjacent aquatic site. Arsenic and lead concentrations were generally non-detectable or, if detected, only slightly greater than detection limits (qualified as estimated) in samples from both areas. Once again, these results are corroborated by sediment and surface water data that indicate generally similar levels at the two aquatic sites.

The aquatic tissue residue results demonstrate the following: 1) tissue residue concentrations of the target analytes are similar at the adjacent and reference aquatic sites, as are sediment and surface water concentrations, and 2) no site-related impacts on aquatic biota are apparent. These results, combined with the fact that sediment and surface water chemical concentrations for the selected tissue residue analysis parameters (i.e., PCBs/pesticides, lead, mercury, and arsenic) at the secondary aquatic sites are also non-detectable, or, in the case of inorganics, not significantly elevated when compared to background, indicate that no further sampling in the secondary areas is necessary.

Recommendations

- **Wetlands**

The results of the surface water, sediment, and surface soil sampling, the flora/fauna survey, and the biota sampling and analysis indicate that additional ecological investigation activities are not necessary in the secondary wetland areas (northwest wetlands No. 1 and No. 2). Sampling results indicated low or non-detectable concentrations of PCBs and other potentially site-related chemicals in the secondary areas. In isolated instances where concentrations were detected in the secondary northwest wetland No. 1, the levels are significantly lower than those detected in the western wetland. PCBs were only detected at low levels at two locations in northwest wetland No. 1, directly downstream of the western wetland. PCBs were not detected in northwest wetland No. 2. Since the flora/fauna survey indicated no detectable ecological impacts in the western wetland, which had higher levels of PCBs than the secondary wetlands, no further flora/fauna surveys are needed in the secondary wetlands. Similarly, biota sampling results indicated no significant bioaccumulation in the southern wetland areas relative to the reference wetland and, thus, further biota sampling of the secondary wetland areas that have

similar or lower chemical concentrations in soil and sediment is unlikely to provide useful data and is unnecessary.

- **Aquatic Sites**

The results of sampling of surface water and sediment from the primary and secondary aquatic sites indicated similarly low or non-detectable chemical concentrations at all locations. The results of the flora/fauna survey in the primary aquatic sites indicated no difference in community composition between the adjacent and reference aquatic sites. The results of biota sampling indicated low or non-detectable chemical levels in fish samples from both the reference and adjacent aquatic sites. No difference in tissue residue levels between the adjacent and reference aquatic sites was observed. Because no significant ecological impacts or chemical bioaccumulation were identified in the primary aquatic sites and because surface water and sediment data for the secondary aquatic sites generally show even lower (i.e., non-detectable) concentrations than the adjacent aquatic site, no additional flora/fauna surveys or biota sampling and analysis is recommended for the secondary aquatic sites.

Introduction

Section 1 - Introduction

1.1 Purpose and Scope

This report presents results of the ecological investigation (EI) performed as part of the Contamination Pathways Remedial Investigation/Feasibility Study (CPRI/FS) for OU2 of the York Oil Superfund Site. The EI, which included wetlands delineation, a detailed flora/fauna survey, and biomarker sampling, was performed in the wetland areas and aquatic sites nearest OU1, as well as in reference (background) locations for comparison purposes. The areas closest to OU1, which are more likely to have been affected by the former OU1 operations, were investigated and evaluated prior to initiating ecological investigations at more distant areas. The evaluation of potential ecological effects in areas near the site relative to reference areas is to provide the basis for determining the need for additional ecological investigations in the more distant areas.

The EI is one component of the CPRI/FS. Other components include the collection of surface water, sediment, surface soil, subsurface soil, and ground-water data to characterize the nature and extent of contamination in connection with OU2. Data developed for the media that have the greatest influence on terrestrial and aquatic ecological communities (i.e., surface water, sediment, and surface soil) are evaluated in conjunction with the information developed during the EI to assess potential environmental impacts.

In general, all media investigated as part of the Contamination Pathways RI/FS were analyzed for full Target Compound List and Target Analyte List (TCL/TAL) parameters, along with select supplemental parameters. However, this Interim Ecological Investigation Report focuses only on potential ecological effects and, therefore, those parameters which may bioaccumulate. The biota parameters were selected following a review of all media data and in conjunction with the USEPA. The selected parameters were PCBs/pesticides, arsenic, lead, and mercury, as discussed in Section 6. Therefore, the discussion of media results in this report will focus on these parameters only. However, only those data from the media relevant to the evaluation of bioaccumulation are discussed (i.e., surface water, sediments, surface soil). A full discussion of all media data will be presented in the Contamination Pathways Characterization Summary Report and the RI report.

1.2 Background

This section presents a brief description of the York Oil Superfund Site, including the site proper (OU1) and off-site areas considered potential pathways of contaminant migration (OU2).

1.2.1 Operable Unit 1

OU1 of the York Oil Superfund Site, the "site proper", is located approximately one mile northwest of the Hamlet of Moira in Franklin County, New York (Figure 1). OU1, which includes the source of contamination, comprises approximately 17 acres and includes the fenced-in portion of land previously owned by the former York Oil Company, Inc., and the adjacent strip of land (approximately 1,000 feet by 200 feet) located to the west of the fenced portion on the north side of the abandoned railroad bed (Figure 2). Significant features near the site proper include the Town of Moira Garage north of the site, and the abandoned Milk House property east of the site.

The site proper was reportedly operated as an oil washing and recycling facility. Oily sludges resulting from the process were placed into one of three unlined lagoons at the site.

Previous investigations of OU1, including select off-site areas, were completed and documented in an August 1985 RI/FS by Erdman, Anthony, Associates. Additional field investigations and remedial action alternative analyses were performed and documented in a November 1987 addendum to the FS by Erdman, Anthony, Associates.

The USEPA's ROD for OU1, issued in February 1988, identifies various organic and inorganic contaminants at the site proper, including PCBs. The ROD for OU1 specified source control as the recommended remedial action, including: excavation of approximately 30,000 cubic yards of contaminated soils, followed by solidification and on-site disposal; installation of deep draw-down wells to collect a sinking contaminant plume and installation of shallow dewatering wells to collect contaminated ground water and oil during excavation; on-site treatment of the collected ground water and subsequent discharge of the treated ground water; off-site thermal treatment of contaminated oils;

and cleaning and demolition of the empty storage tank. The ROD for OU1 has not yet been implemented.

1.2.2 Operable Unit 2

There are no defined spatial limits for OU2. The Contamination Pathways RI/FS addresses the extent of contaminant migration from OU1 and, therefore, focuses primarily on areas outside of OU1. OU2 is considered to include potential pathways of migration from OU1 and includes adjacent soils, wetlands, and streams, including Lawrence Brook (Figure 2).

1.3 Field Operations Plan Ecological Investigation Requirements

1.3.1 General

As specified in the Field Operations Plan (FOP) for the site (BBL, 1993) and the preceding RI Work Plan (Ebasco, 1991), the objectives of the EI are to provide information and data to assess both aquatic and terrestrial environmental impacts, if any. The EI includes the following components:

- Wetlands identification and delineation - This effort includes the identification of areas containing hydric soils and/or hydrophytic plant communities; detailed boundary delineation of the southern and western wetlands; and a qualitative evaluation of the resource/functional value of the delineated wetlands.
- Flora and fauna surveys - This effort includes a detailed flora and fauna survey of the reference (background) and adjacent aquatic sites, and the reference (background), southern, and western wetlands.
- Biota sampling and tissue residue analysis - This effort includes the sampling and analysis of target species to determine the extent of bioaccumulation, if any, of site-related contaminants in terrestrial and aquatic organisms.

The EI was preceded by an initial site reconnaissance, as well as by the surface water, surface soil, and sediment sampling activities described in the FOP. The initial site reconnaissance, an additional activity not specified in the RI Work Plan prepared by Ebasco, consisted of an inspection of all

identified aquatic and terrestrial areas that may be subject to wetland identification and delineation, flora/fauna surveys, and biota sampling. These areas included those described as "primary" and "secondary", as discussed below. The purpose of the initial site reconnaissance was to discern the general qualities of all potential areas of ecological investigation in terms of physical characteristics, general habitat type and quality, and general floral and faunal species composition, to ensure comparability of data from all ecological areas.

Ecological investigation activities conducted subsequent to the initial site reconnaissance began with investigation of "primary" areas, including reference areas and those areas closest to the site proper (Figure 2). These latter areas would be most likely to have experienced impacts, if any, related to OU1. The investigation of these primary areas provided an indication of whether or not any site-related impacts have occurred and the data has been used to determine if investigation of the more distant "secondary" areas is necessary.

1.3.2 Primary Areas

The primary aquatic sampling locations near the site are the reference (background) aquatic site and adjacent aquatic site (Figure 2). Primary terrestrial locations are the reference (background) wetland and the southern and western wetlands (Figure 2). These areas were subject to wetlands identification and delineation, flora/fauna surveys, and biota sampling, as described below and in the FOP.

1.3.3 Secondary Areas

The secondary aquatic sites are more distant from OU1 and consist of two aquatic sites along Lawrence Brook, one at the boundary of the northwest No. 2 wetland and the other at its junction with Deer River (Figure 2). Secondary terrestrial sites include northwest wetland No. 1 and northwest wetland No. 2 (Figure 2), located further northwest of OU1 along the unnamed northwestward-flowing drainage way that eventually discharges to Lawrence Brook.

As specified in the FOP, additional ecological investigation activities in the secondary aquatic and terrestrial sites are contingent on the results of the initial site reconnaissance, the Contamination Pathways RI soil/sediment sampling activities that were conducted in all identified aquatic and terrestrial areas (both primary and secondary areas), and the results of the EI conducted in the primary areas. The results of the EI for the primary areas and the need for ecological investigation activities in the secondary areas are addressed in this Interim Ecological Investigation Report.

Initial Site Reconnaissance

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Section 2 - Initial Site Reconnaissance

2.1 General

In accordance with the FOP, BB&L performed an initial site reconnaissance for all terrestrial and aquatic sites in the primary and secondary areas that might be subject to ecological investigations. As a prelude to field activities, United States Geological Survey (USGS) topographic quadrangle maps (Brushton, North Lawrence), National Wetland Inventory (NWI) maps, NYSDEC Freshwater Wetlands Maps, and information from the Natural Heritage Program were reviewed. Subsequently, BB&L biologists and ecologists performed the initial site reconnaissance in April 1993 to discern the general qualities of the potential ecological investigation areas in terms of physical characteristics, general habitat types and quality, and general flora/fauna species composition. The results of this initial site reconnaissance, including descriptions of the general ecology, land use, and character of lands in the vicinity of the site, are presented in this section.

Since vegetative composition data were gathered during both the wetland delineation and flora survey of the primary areas, this report presents more detailed information for the primary areas than for the secondary areas. Full-scale surveys were not conducted in the secondary areas as per the FOP, but an initial reconnaissance was conducted in the secondary areas to ascertain their general characteristics.

The United States Fish and Wildlife Service (USFWS) NWI map-depicted classifications for subject wetlands as determined via aerial photograph interpretation are presented in Table 2-1. Summaries of the vegetative species observed in the primary and secondary wetland areas are presented in Table 2-2. Area-specific vegetation summary tables are referenced and provided in appropriate report sections and appendices.

2.2 Initial Site Reconnaissance of Primary Areas

This section presents a discussion of the initial site reconnaissance of the primary wetland and aquatic areas.

2.2.1 Primary Wetland Areas

The primary wetland areas consist of the reference (background), western, and southern wetlands (Figure 2). In general, these wetlands are typical northern-hardwood-wooded wet habitats. The

dominant vegetation in the primary wetlands is broad-leaved deciduous forest and scrub-shrub, and some needle-leaved evergreens exist in each of the primary wetlands. Dominant tree species include red maple, gray birch, and American elm. The shrub layer is dominated by red maple, sugar maple, gray birch, and American elm. Herbaceous vegetation varies depending on the canopy cover and hydrologic regime, but predominant species include sensitive fern, cinnamon fern, trout lily, and trillium.

Reference (Background) Wetland

The reference (background) wetland is located south of Route 11 and north of Alberg Road (Figure 2). The reference wetland, which is surrounded by raised-elevation hillocks, functions as a catchment basin for runoff. The reference wetland is primarily a deciduous-hemlock-wooded wet-forest community type, but unlike the southern and western wetlands, it does not support a primary stream channel or apparent beaver activities. The USFWS NWI map classifies the reference wetland as a palustrine, broad-leaved deciduous forest ecological system with seasonal saturation (PFO1E).

Western Wetland

The western wetland is located west of OU1 and between the abandoned railroad tracks and North Lawrence Road (Figure 2). Agricultural fields are located northeast of the western wetland. The wetland configuration is roughly rectangular, with centrally-located standing-water and a small stream channel. A larch forest forms the eastern boundary at the standing water line of the western wetland. Evidence of beaver activity in the western wetland is apparent. Several dams and beaver-harvested trees were observed in the western wetland, especially in the southern portion. The USFWS NWI map classifies the western wetland as a palustrine broad-leaved deciduous scrub-shrub ecological system with seasonal saturation (PSS1E).

Southern Wetland

The southern wetland, located immediately south of, and adjacent to the abandoned railroad bed and Mill Road, extends to the edge of Lawrence Brook north of Route 11 (Figure 2). The western extent

of the southern wetland is defined by a topographic divide. There is evidence of beaver activity at the western boundary of the southern wetland. Two areas of uplands are located within the interior of the southern wetland. The majority of the drainage from the southern wetland flows east-southeast towards Lawrence Brook. A smaller portion of the southern wetland (i.e., the northwestern portion west of the two upland islands) drains northward and is hydraulically connected to the western wetland through a stone culvert under the railroad bed. The southern and eastern edge of the southern wetland is delineated by the Lawrence Brook channel, a tributary channel, and backwater areas.

The terrain has typical floodplain characteristics and high watermarks, such as leaf litter and bank scours are readily apparent. The southern edge of the southern wetland has hummocks and snags from consistent inundation.

The community association in the wetland may be categorized as a wooded wet deciduous forest with upland islands. The USFWS NWI map classifies the southern wetland as a palustrine, broad-leaved deciduous forest ecological system with seasonal saturation (PFO1E).

2.2.2 Primary Aquatic Sites

The primary aquatic sites are the reference (background) aquatic site and the adjacent aquatic site (Figure 2).

Reference (Background) Aquatic Site

The original reference aquatic site, specified in the FOP, was located immediately upstream of the Route 11 bridge. However, it was relocated based on the initial site reconnaissance that indicated significant differences in stream morphology and substrate type relative to the adjacent aquatic site. The final reference (background) aquatic site is located approximately one mile farther upstream and contains both riffle and pool areas that are somewhat more comparable to the adjacent aquatic site. The reference aquatic site exhibits moderately well-developed stream morphology, with abundant

riffles, runs, and pools. The substrate is predominantly cobbles and gravel in the riffle areas, and sand in the slower pools.

The portion of the reference (background) aquatic site sampled during the fauna survey consists of a shallow, well-developed riffle area that broadens into a moderately deep pool with steep undercut banks. A high undercut bank borders most of the brook on the east, while the west bank is moderately sloped, with few abrupt drop-offs. Within this general area, Lawrence Brook functions as a boundary between the scrub-shrub vegetation of a fallow farm field along the west bank, and a mature northern hardwood forest along the east bank. Canopy coverage over the stream channel is approximately 10 to 25 percent. The stream width was approximately 9 meters at the upstream (riffle) and downstream (pool) boundaries of the aquatic fauna sampling location. Stream flow and water level depth in Lawrence Brook are seasonally variable and also reflect short-term precipitation events. Minimum/maximum stream depths recorded in May 1993 (during a period of high flow) were 0.6/1.2 meters (pool) and 0.2/0.5 meters (riffle).

Stream flow and water level depth measurements were also obtained at four locations (Y2-SW01 through Y2-SW04) in Lawrence Brook during August 1993. These measurements indicated decreases in stream width ranging from 5 to 42 percent from the measurements made during May 1993. Water level depth measurements at these four locations indicated similar decreases, ranging from 0 to 53 percent. The August 1993 calculated flows at these four locations decreased an average of 89 percent from the May 1993 calculations, indicating a seasonal flow variation in Lawrence Brook. Table B-1 in Appendix B summarizes the stream flow data from the May 1993 and August 1993 surface water sampling activities.

Adjacent Aquatic Site

The adjacent aquatic site is located approximately 0.5 mile east of the site proper and begins immediately adjacent to the North Lawrence Road bridge (Figure 2). The adjacent aquatic site exhibits less complex stream morphology, with relatively fewer riffles and pools than the reference

(background) aquatic site. The substrate is predominantly cobble and gravel with some deposition of sand and muck in the lower reaches.

The portion of the adjacent aquatic site sampled during the aquatic fauna survey consists of a pooled area that narrows into a set of riffles at the downstream end. This reach of Lawrence Brook is high-banked and bordered on both sides by a mixed hardwood forest. Canopy coverage over the channel where sampling was conducted is approximately 50 percent. Stream widths at the sampling location were approximately 12 meters at the upstream (pool) boundary, and approximately 9 meters at the downstream (riffle) boundary. Minimum/maximum stream depths recorded in May 1993 were 0.6/1.1 meters (pool) and 0.3/0.8 meters (riffle), respectively.

2.3 *Initial Site Reconnaissance of Secondary Areas*

This section presents a discussion of the initial site reconnaissance of the wetland and aquatic sites in the secondary areas.

2.3.1 Secondary Wetland Areas

The secondary wetland areas consist of northwest wetland No. 1 and northwest wetland No. 2, which are downstream of OU1.

Northwest Wetland No. 1

Northwest wetland No. 1 is located northwest of the western wetland, between North Lawrence Road and Savage Road (Figure 2). A drainage channel flows through this wetland from the south to the northwest, and the hydrologic regime of the wetland is controlled by a well-established beaver dam that has caused the formation of an approximately 5- to 6-acre pond (Figure 2). An emergent marsh community with saturated soil conditions extends from this large, standing-water area. The eastern edge of northwest wetland No. 1 consists of a mixed-forest upland of evergreen and deciduous hardwoods. Fallow agricultural fields are located along the western perimeter. Northwest wetland No. 1 contains dense thickets of speckled alder. The USFWS NWI map classifies northwest wetland

No. 1 as a palustrine, broad-leaved deciduous forest ecological system with seasonal saturation (PFO1E).

Northwest Wetland No. 2

Northwest wetland No. 2, located farther to the northwest, is approximately 0.2 miles east of the boundary between Franklin and St. Lawrence Counties (Figure 2). Northwest wetland No. 2 is just south of Lawrence Brook and is drained by a stream channel, which is tributary to Lawrence Brook. The southeastern edge of this roughly triangular wetland is adjacent to farm fields, while the remaining extent of the general wetland perimeter consists of upland forest. The wetland is densely vegetated, primarily with woody plants and shrubs. Species observed include speckled alder, willow, raspberry, meadowsweet, and wild grape. The USFWS NWI map classifies northwest No. 2 as a palustrine, broad-leaved deciduous forest ecological system with seasonal saturation (PFO1E).

2.3.2 Secondary Aquatic Sites

The secondary aquatic sites consist of Lawrence Brook, adjacent to northwest wetland No. 2, and Lawrence Brook, near the brook's junction with Deer River.

Aquatic Site at Wetland Boundary

The aquatic site at the wetland boundary is characterized by poorly developed stream morphology with a substrate consisting predominantly of sand and silt. This section of the stream is relatively wide and the flow is much slower than that in the primary aquatic sites; here the stream is moderately deep, with steep undercut banks.

Aquatic Site Near Junction with Deer River

The secondary aquatic site at the junction of Deer River is relatively narrow and possesses moderately well-developed stream morphology, with several large pools distributed with occasional swift runs. The substrate is predominantly sand, and the steep banks are well vegetated, with alders overhanging much of the stream.

Wetland Identification and Delineation

Section 3 - Wetland Identification and Delineation

3.1 General

This section presents the results of the wetlands identification and delineation efforts performed in the southern and western wetlands, and the wetlands evaluation efforts performed in the southern, western, and reference (background) wetlands.

In accordance with the FOP, the southern and western wetlands were subject to wetland boundary delineation efforts which incorporated the multi-parameter method specified in the United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (USACE, 1987). The 1987 USACE manual was used instead of the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (Federal Interagency Committee for Wetlands Delineation, 1989) specified in the FOP because this latter manual was withdrawn by the agencies. Wetland delineation methods are presented in Appendix A. No delineation was performed at the reference (background) wetland or the secondary wetlands, in accordance with the FOP.

In addition, in accordance with the RI Work Plan and the FOP, a qualitative evaluation of the resource/functional value of the reference (background), southern, and western wetlands was performed using the USACE's Wetlands Evaluation Technique (WET) (Adams, et. al., 1987).

3.2 Wetland Delineation Results

The results of the wetland delineation are presented in Figure 3, which depicts the surveyed boundary of the western and southern wetlands as determined from on-site delineation efforts. The delineated boundary of the southern and western wetlands was surveyed using field instruments and tied into a photogrammetrically-prepared site map. This survey method was used instead of the procedure identified in the FOP, which proposed identification of the wetland boundary on prints of 1992 aerial photographs of the site proper and adjacent areas, because the survey method provided a more accurate and reproducible record of the wetland boundaries. This change in survey approach was discussed with USEPA and verbally approved. Figure 3 also includes numbered wetland delineation flag locations that correspond to the data

point locations evaluated on the routine on-site determination forms (Appendix A-1). As discussed in Appendix A, the "A," "B," and "C" designations presented on the data forms represent upland, wetland, and transitional/arbitrary cut locations, respectively, along the transects that are used to identify the wetland boundary. The results of the wetland delineation efforts are presented below.

Western Wetland

Eighty-six wetland delineation flags were placed in the western wetland to mark the upland-wetland boundary. A total of 49 data point locations and 25 transects were evaluated in the western wetland. The western wetland consists of 17.2 acres of mostly wooded wet habitat. Some wet meadow area is associated with a beaver dam and the surface water channel in the western wetland. The northern edge of the western wetland borders an old field and some field habitat that meet the wetland criteria; a portion of the field is included as part of the western wetland.

Southern Wetland

Wetland delineation flags were placed in 249 locations in the southern wetland to mark the upland-wetland boundary. A total of 130 data point locations and 83 transects were evaluated in the southern wetland. The southern wetland consists of 82.4 acres, including two upland islands of 18.9 acres and 3.3 acres; these upland areas are not included in the total southern wetland acreage. A portion of the southern boundary of the southern wetland was terminated at a tributary to Lawrence Brook. While the wetland continues further south on the southern side of the tributary, delineation efforts stopped at this tributary, because the tributary would mark the southern extent of any surface water pathways from the site proper. The northwest boundary of the southern wetland was initially delineated on the east side of an area of standing water that exists behind the partially blocked stone culvert that connects the southern and western wetland. However, based on a further review of field notes and delineation criteria, the wetland boundary was relocated to the west side of this area of standing water. Due to spring high water levels, the standing water area was initially identified as a pond (i.e., not a wetland area). Further review of field observations and the topographic survey indicated that the standing water area is subject to fluctuating water levels that are characteristic of wetlands. The northwest boundary was redefined using topographic information developed

as part of the site investigations. The southern wetland features a greater diversity of vegetative community/habitat types than the western and reference wetlands; it includes wooded wet, floodplain, and emergent marsh/wet meadow areas.

Comparison with Previous Wetland Maps

The southern and western wetland boundaries, established as part of the wetland delineation program, along with the reference (background) wetland and secondary wetland areas, were compared with established wetland reference maps, including the NWI map for one Brushton, NY quadrangle, and the NYSDEC Freshwater Wetlands Map of Franklin County. Because both the NWI and NYSDEC maps were prepared based on interpretation of aerial photographs rather than field delineation, the wetland descriptions presented in this report are considered more accurate than the descriptions presented in the NWI and NYSDEC maps. There is a margin of error inherent in the use and interpretation of aerial photographs, and it is recognized that ground-truthing and historical analysis may result in revision of the wetland boundaries presented on NWI maps, established through photographic interpretation.

The wetlands defined as a result of field investigations generally conform to those depicted on the NWI map for the Brushton, N.Y. quadrangle. The NWI wetlands were identified from aerial photographs based on interpretation of vegetation, visible hydrology, and geography, in accordance with Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS - 79/31, December 1979). The aerial photographs for the Brushton, N.Y. quadrangle were taken in April 1981 and likely reflect spring/snowmelt conditions and, therefore, may represent maximum wet conditions.

The NYSDEC Freshwater Wetlands Map for Franklin County (Map 8 of 44) also addresses the OU2 study area and depicts wetland boundaries that are somewhat different from those depicted on the NWI maps. These differences are attributed to the timing and interpretation of aerial photographs. The configuration of the reference (background) wetland is slightly different on the two maps, and the southern wetland is less extensive on the NYSDEC Freshwater Wetlands Map than shown on the NWI map. Although field delineation efforts were not required for the secondary wetlands, the general configuration of these wetlands

was noted based on available references. The NYSDEC map shows northwest wetland No. 1 to be an extension of the western wetland, while northwest wetland No. 2 is similar in configuration and extent and is generally consistent on both maps. The NYSDEC code classifications for the primary and secondary wetland areas are presented in Table 2-1.

3.3 Wetland Evaluation Technique Functional Analysis

3.3.1 Methods

As specified in the FOP, the resource/functional value of the reference (background), southern, and western wetlands was evaluated using the Wetland Evaluation Technique (WET). WET is a software program designed by the USACE to assess wetland functions and values. Wetland functions consist of physical, chemical, and biological characteristics, and wetland values are those functions that are considered to be beneficial to society. Specific information and data concerning wetland characteristics are entered into the program, and WET assigns a rating of "low", "moderate", or "high", based on the 14 functions and values it evaluates. WET rates each function in terms of social significance, effectiveness, and opportunity. A Level 2 WET (Version 2.0) analysis was performed, as specified in the FOP.

The wetland functions and the associated values assigned by WET for the reference (background), western, and southern wetlands are presented in Tables 3-1 and 3-2, and the results of the Level 2 WET (Version 2.0) analysis are discussed below. For clarification purposes, the tables summarizing the WET analyses (Tables 3-1 and 3-2) contain asterisks "(*)", which denote parameters for which category-specific values were not evaluated. Those values denoted by asterisks in these tables are not typically addressed in a Level 2 WET analysis, the scope of which was defined by the FOP.

3.3.2 Results

The results of the WET functional analysis performed for the primary wetlands are presented in Tables 3-1 and 3-2. According to WET, the southern, western, and reference (background) wetlands are similar in function and value. The wetlands were assigned a low rating for social significance in

all but one of 14 functions, primarily due to the degree of isolation of these wetlands from populated areas which leads to a low potential for human/societal impacts. A rating of moderate social significance was assigned to the western and southern wetlands for sediment/toxicant retention, again due to their proximity to a presumed contaminant source (OU1). Similarly, the southern and western wetlands were assigned a high opportunity rating for sediment/toxicant retention, due to their close proximity to a potential contaminant source (OU1). These wetlands also received a high effectiveness rating for sediment/toxicant retention because their forested nature serves to limit the flux of water and sediments through the wetlands, and moderates the effects of precipitation events and high water levels. The fact that no similar potential contaminant source is known to be associated with the reference wetland accounts for the rating differences in sediment/toxicant retention ratings compared to the southern and western wetlands. In other words, the WET analysis indicated that the southern and western wetland had higher functional significance than the reference wetland due to their potential to retain sediments/toxicants from OU1. However, this result is really an artifact due to the proximity of the southern and western wetlands to the site proper, and the fact that the reference wetland is presumably not near a similar potential contaminant source.

As shown in Tables 3-1 and 3-2, the effectiveness ratings for all three wetlands are basically consistent. However, the reference (background) wetland has lower effectiveness ratings for Wildlife Diversity/Abundance (D/A), Breeding and Migration due to the lack of open water habitat for waterfowl and absence of snags for cavity-nesting birds. The reference wetland also has a low rating for Ground-Water Discharge because no defined surface water/stream channels drain this wetland, while both the southern and western wetland have an established surface water component. The reference wetland has a low rating for Sediment Stabilization for the same reason.

Analytical Data

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Section 4 - Analytical Data

Analytical data has been developed for various media as part of the site characterization of the Contamination Pathways RI. These data include physical and analytical testing of surface water, sediment, surface soil, subsurface soil, and ground water, in addition to the biomarker analysis discussed in this report. The purpose of this section is to present the characterization results of the media that relate to potential impacts on the ecological system in the area. Specifically, the Contamination Pathways RI results that will be discussed consist of the distribution and concentration of analytical parameters in surface water, sediment, and surface soils that relate to the interpretation of biomarker analytical results. As discussed in Section 6, the parameters selected for biomarker analysis consist of PCBs/pesticides, arsenic, lead and mercury. Therefore, only the results for these parameters are presented in this section as a basis for evaluating biomarker analytical results. A full discussion of all media data will be presented in the Contamination Pathways Characterization Summary Report and CPRI Report.

Relevant analytical results from previous investigations will also be presented in this section. Information that is available for review consists of sediment data from the RI/FS Report (August 1985, Erdman, Anthony, Associates) and Addendum FS Report (November 1987, Erdman, Anthony, Associates). The characterization of surface water, sediment, and surface soil, based on the current and previous investigations, will be used to evaluate and correlate potential impacts on flora and fauna in the area.

4.1 Surface Water

Two rounds of surface water sampling were performed as part of the Contamination Pathways RI. The first round was performed in April 1993, representing high flow conditions, with a second round of sampling in August 1993, representing normal flow conditions.

During the April 1993 event, surface water samples were collected at a total of 8 locations;

- Four locations within Lawrence Brook:
  - A background location upstream of OU1 (Location Y2-SW01);
  - Immediately east of the site in the adjacent aquatic site (Location Y2-SW02);
  - The Wangum Road gaging station (Location Y2-SW03); and

- The junction of the wetlands forming the terminus of the unnamed tributary that flows northwest from OU1 and Lawrence Brook (Location Y2-SW04).

- Two locations within drainages from the southern wetlands:
  - East flowing intermittent tributary at Mill Road (Location Y2-SW05); and
  - East flowing intermittent tributary at Lawrence Brook on the south side of southern wetland (Location Y2-SW06).
- Two locations within the western wetlands:
  - Within the standing water in the western wetland (Location Y2-SW07); and
  - The drainage ditch on the north side of the abandoned railroad bed that drains from OU1 (Location Y2-SW08).

The sample locations are presented on Figures 4 and 5. Surface water sampling was conducted during the period of April 13 through April 15, 1993, and represented high flow conditions intended to characterize the potential impacts associated with higher sediment transport rates and overland runoff from normally dry areas. Surface water sampling procedures are provided in Appendix B.

The second round of surface water sampling was performed on August 3, 1993, as representative of normal flow conditions. In accordance with the FOP, surface water sampling was conducted at the following four locations within Lawrence Brook:

- A reference location upstream of OU1 (Location Y2-SW01A);
- Immediately east of the site in the adjacent aquatic site (Location Y2-SW02);
- The Wangum Road gaging station (Location Y2-SW03); and
- The junction of the wetlands forming the terminus of the unnamed tributary that flows northwest from OU1 and Lawrence Brook (Location Y2-SW04).

In accordance with the FOP, surface water samples were not collected in August 1993 from the other four previously sampled locations.

The samples collected during both surface water monitoring events were submitted for analysis for the following list of parameters:

- CLP TCL PCBs/pesticides;
- CLP TCL volatile organics;
- CLP TCL semi-volatile organics;
- CLP TAL inorganics;
- Total phenols; and
- Hardness.

A full discussion of the results for all analytical parameters will be included in the Contamination Pathways Characterization Summary Report and the Contamination Pathways RI Report.

The results of the surface water sampling events that are relevant to biomarker sampling and analysis are summarized as follows:

- PCBs/Pesticides - PCBs/Pesticides were not detected in surface water samples from the April or August 1993 sampling events.
- Inorganics - Analytes detected in the April 1993 sampling event included aluminum, barium, calcium, copper, iron, lead, magnesium, manganese, potassium, sodium, and zinc. The detected analytes are summarized on Table 4-1. However, arsenic and mercury were not detected in any of the eight locations. Lead and zinc were detected at only one location (SW08), that drains into the primary western wetland from OU1 at 1.0 ug/L and 346 ug/L, respectively.

  Analytes detected in the August 1993 sampling event included barium, calcium, copper, iron, magnesium, manganese, mercury, potassium, sodium, and zinc, as shown on Table 4-1. However, arsenic and lead were not detected at any of the four locations. Mercury was detected at 0.22 J ug/L at one location (Location SW03), in Lawrence Brook at Wangum Road.

In summary, while certain analytes were detected in the drainage ditch that flows from OU1 to the western wetland, there were no significant detections of analytes in the Lawrence Brook surface water samples, with the exception of mercury at one downstream location. Mercury was not detected at the adjacent aquatic site that is closest to OU1 and, therefore, the downstream detection does not appear to be related to the site.

4.2 Sediment

Sediment analytical data has been generated as part of the Contamination Pathways RI, as well as during previous site investigations. Both sets of sediment data are discussed below.

4.2.1 Contamination Pathways RI Sediment Data

Contamination Pathways RI sediment sampling activities were conducted during the two week period of April 19 through April 30, 1993. A total of 55 sediment samples were collected from 36 locations; 27 locations in wetlands; eight locations in Lawrence Brook; and one location east of Lawrence Brook in the ditch along the railroad bed.

The sample locations were distributed based on the general location and guidance provided in the RI Work Plan prepared by Ebasco. The approximate location of the sediment samples is indicated on Figures 4 and 5. Sediment sampling procedures are presented in Appendix B.

All the samples collected during the sediment sampling activities were submitted for analysis for the following parameters:

- CLP TCL PCBs/pesticides;
- CLP TCL volatile organics;
- CLP TCL semi-volatile organics;
- CLP TAL inorganics; and
- Total Phenols.

Additional sediment sampling was performed at 16 locations between October 19 and 22, 1993, as a result of sample data being rejected during validation. Supplemental sampling information is presented in Appendix B.

A full discussion of the results for all analytical parameters will be included in the Contamination Pathways Characterization Summary Report and the Contamination Pathways RI Report.

The results of the Contamination Pathways RI sediment sampling program that are relevant to biomarker sampling and analyses are summarized as follows:

- PCBs

  Primary Areas - The highest concentration of PCBs were detected in the drainage way that drains from the fenced area of OU1 into the western wetland, as shown on Figure 6. A summary of PCB detections in sediment samples is provided on Table 4-2. The highest observed PCB concentration was within the western extension of OU1 (58,000 NJ ug/kg in the surface sample SD19). PCBs were also detected at SD10, SD11, and SD21 (11,000 NJ, 520 J, and 510 J ug/kg, respectively) below the standing water of the western wetland beaver pond. Downstream of the beaver dam, PCBs were detected at SD13 (4,200 NJ and 230 J ug/kg), SD22 (4,200 NJ ug/kg), and SD12 (3,900J mg/kg) at the northern limit of the western wetland. PCBs were not detected at any sediment sampling locations within the southern wetland, reference (background) wetland, adjacent aquatic site or reference (background) aquatic site.

  Secondary Areas

  PCBs were detected at only two locations within the secondary EI areas. PCBs were detected in northwest wetland No. 1 at SD23 (780 J ug/Kg) and SD24 (4,000 J ug/Kg), as shown on Figure 7. PCBs were not detected in any other secondary areas, including northwest wetland No. 2 and the two secondary aquatic sites on Lawrence Brook.

The data indicates that detectable PCB concentrations are limited to certain areas of the western wetland and its north-west flowing drainage, possibly downstream as far as the southern portion of northwest wetland No. 1.

- Pesticides

Primary Areas

Pesticides were not detected in any of the sediment samples from Lawrence Brook, with the exception of one detection in the reference (background) aquatic site. Several pesticides were detected at sediment locations in the western wetland, as summarized on Table 4-2. Detected pesticides include heptachlor, aldrin, endosulfan I, dieldrin, 4,4'-DDE, endrin, 4,4'-DDD, 4,4'-DDT, methoxychlor, endrin ketone, endrin aldehyde, and gamma-chlordane. The highest pesticide concentrations were detected at sample locations SD19 in the western extension of OU1 leading into the western wetland (aldrin 7400 NJ ug/kg, methoxychlor 1200 J ug/kg, endrin ketone 7100 NJ ug/kg, and gamma chlordane 4200 NJ ug/kg) and SD09, also in the OU1 western extension (aldrin 7500 NJ ug/kg). 4,4'-DDD was detected in the western wetland drainage ditch at SD08 (8.5 NJ ug/kg). 4,4'-DDT was detected in the western wetland at SD10 (280 J ug/kg). A trace level of 4,4'-DDE was detected in the southern wetland at SD07 (1.1 J ug/kg).

Secondary Areas

Very low concentrations of a few pesticides (4,4'-DDE, 4,4'-DDT, endrin ketone, and endrin aldehyde) were detected in northwest wetland No. 1. 4,4'-DDE was detected in the northwest wetland No. 1 at SD25 (3.3 NJ ug/kg). 4,4'-DDT was detected in the northwest wetland No. 1 at SD25 (3.8 NJ ug/kg). Pesticides were not detected at any of the other secondary wetland or aquatic sampling locations.

Areas of elevated pesticide concentrations are generally restricted to the ditch/drainage area of the western wetland. Pesticides were not previously identified as a constituent of concern for

OU1, suggesting other sources for the pesticides in the western wetland that may include the railroad bed, areas of active agricultural or residential use or pest control.

- Inorganics - A summary of inorganic compounds detected in sediment samples is provided in Tables 4-3 and 4-3A. Table 4-3A summarizes the sediment resampling data for zinc. Detection of arsenic, chromium, copper, lead, mercury, nickel, and zinc were common in sediment samples from both the reference (background) and other areas. The highest detection of arsenic was at SD36 (16.8 J mg/kg) at a background location along the railroad bed. Chromium was detected in background railroad samples SD36 (22.2 J mg/kg) and SD29 (17.5 J mg/kg). The highest levels of chromium detected were at SD08 (27.9 J mg/kg) in the western wetland and at SD06 (27.1 J mg/kg) in the southern wetland.

Copper was detected at it highest concentration in background location SD36 along the railroad bed at 51.6 J mg/kg (104 J mg/kg in the duplicate). Copper was detected in reference (background) wetland samples SD01 and SD02 at 35.4J, and 38.9 J mg/kg, respectively. The highest copper concentrations outside of the reference areas were in the western wetland at SD19 (28.9 J mg/kg) and at SD20 (26J mg/kg).

Lead was detected at wetland background locations SD01, SD02, and SD03 in surface samples from 22.4 J to 37.1 J mg/kg. Railroad background location SD36 had a lead concentration of 268 J mg/kg. Elevated lead concentrations were detected in the western wetland at SD09 (3580 mg/kg), SD19 (2270 J mg/kg), SD22 (2430 J mg/kg), SD21 (1800 J mg/kg), and SD10 (1340 J mg/kg).

Mercury was detected in background samples SD28 and SD29 (0.31 J and 0.25J mg/kg, respectively) in Lawrence Brook, but was undetected in all other downstream Lawrence Brook sediment samples. Slightly elevated levels of mercury, compared to background results, were detected in the western wetland at SD09, SD10, SD11, SD14, and SD15 at levels from 1.1 J mg/kg to 2.5 J mg/kg.

Southern wetland mercury concentrations ranged from 0.62 J mg/kg to 1.6 J mg/kg at sample locations SD04, SD05, and SD06.

Nickel was detected at the highest concentration in background railroad sample SD36 (24.6 J mg/kg). The highest concentration detected in the study area was only 21.2 J mg/kg at SD08 in the western wetland.

Zinc was detected at the background railroad sample location SD36 (213 J mg/kg and 393 J mg/kg). Zinc concentrations, comparable to railroad background concentrations, were detected in the primary western wetland at SD09 (211 mg/kg) and SD19 (219 J mg/kg), also, along the abandoned railroad bed.

Inorganic detections in secondary areas which are elevated above background concentrations include lead in the southern portion of northwest wetland No. 1 at SD23 (408J mg/kg). Concentrations of copper, comparable to background concentrations, were detected at SD23 (55.4J mg/kg). Zinc concentrations were detected in the northwest wetland No. 1 at SD23 (233 J mg/kg) and SD24 (211 J mg/kg), and in the northwest wetland No. 2 at SD27 (279 J mg/kg).

In general, no site-related impacts were detected in Lawrence Brook, based on inorganic sediment sample analyses. Wetland sediment sample inorganic results are generally comparable among background and downstream locations, with a few exceptions. Evaluation of arsenic, chromium, copper and nickel results indicate that no site-related impacts related to these analytes in sediment are apparent. Areas of elevated lead concentrations above background concentrations are restricted to the western wetland, and primarily in the ditch draining from OU1. Lower, yet still elevated, concentrations of lead above background are present in the southern portion of northwest wetland No. 1. Elevated mercury concentrations above background are found in the western wetland, again, in the ditch, but also in the beaver pond and in the southern wetland. Because PCBs and lead, both site-related constituents and analytes of concern, were not detected in the southern wetland, the

presence of mercury, based on its detection in the southern wetland, is not believed to be site-related. However, mercury will be evaluated in the RI as a potentially site-related constituent.

4.2.2 Historic Sediment Data

As discussed earlier, sediment samples have been obtained in the area as part of previous investigations. Sediment samples were obtained in December 1984 and April 1985, as part of the original RI, by Erdman, Anthony, Associates. Sediment samples were also obtained in May 1987 as part of the Addendum FS performed by Erdman, Anthony, Associates. Samples were analyzed for PCBs, with limited samples analyzed for select priority metals. Based upon a review of the information available, there is no reference that indicates the data was validated.

Historic sediment sample locations are shown on Figure 8 and are primarily in the drainage way in the western extension of OU1 and in the primary western wetland. Three samples were obtained in secondary ecological investigation areas at progressive distances from the western wetland in the northwest drainage way, with the farthest location near where the unnamed western tributary joins Lawrence Brook.

A summary of previous PCB data and select metals data is presented in Tables 4-4 and 4-5. The distribution of previous PCB analytical results is presented on Figure 9. The highest PCB concentration previously detected was in a surface sample from location Z2-T1-3, just west of the western extension of OU1 in the western wetland. Other elevated concentrations were detected along the drainage way within the western extension of OU1. PCBs were also detected at the northern extent of the western wetland at Z3-1 (6.4 mg/kg) near recent sample SD12 (3.9 J mg/kg).

In addition, PCBs were also reported in decreasing concentrations in the three samples located in the secondary ecological investigation areas north of North Lawrence Road in the northwestern drainage. Sample Z3-5 (0.54 mg/kg) is comparable to recent sample SD23 (0.78 J mg/kg). Sample Z3-S7 (0.37 mg/kg), approximately 7,400 feet northwest of the site near Savage Road, is at a comparable location

to recent sample SD25 (less than 0.12 mg/kg). Sample Z3-S8, located approximately 12,000 feet northwest of the site near the junction with Lawrence Brook, reported a concentration of 0.085 mg/kg. No detection of PCBs were reported in recent data from northwest wetland No. 2.

The distribution of the select metals, based on limited data, indicates elevated lead concentrations at SED5-S1 (8380 mg/kg), and SED8 (837 mg/kg) in the drainage from the site proper into the western wetland. There is no available inorganic data in the secondary area from previous investigations.

4.3 Surface Soils

Surficial soil sampling was conducted during the period of May 3 through May 5, 1993. Surface soil samples were collected at 24 locations from a 0- to 6-inch depth in four general areas: adjacent to the site proper to the east, south and west, as well as background locations. All surface soil samples were located relatively close to OU1, with approximately half the samples located within or on the edges of the primary southern or western wetlands, and half the samples located in upland areas not related to any ecological investigation activities. The approximate sample locations and identification codes are indicated on Figure 5.

Surface soil samples were submitted to be analyzed for the following list of parameters:

- CLP TCL PCBs/pesticides;
- CLP TCL volatile organics;
- CLP TCL semi-volatile organics;
- CLP TAL inorganics; and
- Total phenols.

Additional surface soil samples were collected at 11 locations for zinc analysis, as a result of sample data being rejected during validation. A summary of all surface soil sampling information is presented in Appendix B.

A full discussion of the results for all analytical parameters will be included in the Contamination Pathways Characterization Summary Report and Contamination Pathways RI report.

A summary of the analytical results for surface soils that are relevant to biota sampling and analyses is presented below.

- PCBs - PCBs were detected at one surface soil location SS-19 in the western wetland at 1,000 J ug/kg.
- Pesticides - Detected pesticides in surface soils, as summarized in Table 4-6, included alpha-BHC, delta-BHC, gamma-BHC aldrin, heptachlor epoxide, 4,4'-DDE, 4,4'-DDD endosulfan sulfate, 4,4'-DDT, methoxychlor, endrin ketone, and gamma-chlordane. The highest concentrations of any pesticide were reported for methoxychlor in samples from SS15 (290 J ug/kg) and SS12 (190 NJ ug/kg) along the abandoned railroad bed. 4,4' - DDD was detected at four locations with the highest concentration along the railroad bed south of OU1 at SS15 (25 J ug/kg; 31 J ug/kg in duplicate) and SS12 (12 NJ ug/kg; 14 NJ ug/kg in diluted sample) with other 4,4,-DDD detections near the Milk House property east of OU1 at 2.1J and 1.3J ug/kg. 4,4'- DDT was detected at SS16 (3.0 NJ ug/kg) along the railroad bed, SS14 (1.2 NJ ug/kg) just west of the OU1 fence and at SS06 (2.6 NJ ug/kg) and SS08 (1.1 NJ ug/kg) east of OU1 on the Milk House property. 4,4'-DDE was detected at three locations, two south of the railroad bed (SS11 and SS18) and one east of the site (SS08), all at less than 1 ug/kg. With the exception of the previously mentioned methoxychlor, 4,4'-DDD, and endrin ketone, all other detections are less than 10 ug/kg.

  In general, pesticide detections above background are located along the abandoned railroad bed, or east of OU1 near the Milk House property.

- Inorganics - Twenty inorganic compounds were detected at various surface soil sampling locations, as summarized on Tables 4-7 and 4-7A. Table 4-7A summarizes the surface soil resampling data for zinc. The highest arsenic concentrations were detected at SS03, SS05, SS06 and SS10 from 9.2 - 15.1 mg/kg. The highest chromium concentrations were detected at SS04, SS05, SS06, SS10, SS13

and SS23 from 12 to 19.2 mg/kg with 15.1 mg/kg present at the background location SS24. Mercury was detected at only one surface soil sample location (SD05 at 0.53J mg/kg). Copper was detected at the background railroad location SS03 at 60.5 mg/kg with the highest copper concentrations along the railroad bed at SS06 (204 mg/kg) and SS10 (100 mg/kg). Lead was detected at the background railroad location SS03 at 125 mg/kg with the highest concentration north of the site at SS13 (267 mg/kg) and along the railroad bed at SS06 (233 mg/kg), SS16 (171 mg/kg) and SS10 (170 mg/kg). Lead was also detected near the Milk House east of the site at SS05 at 200 mg/kg. Lead was undetected in background samples SS01 and SS02, in railroad bed related samples SS12, SS15, and SS20, and in samples from off the railroad bed in the southern and western wetland (SS9, SS11, SS18, SS19, SS21, and SS22).

In general, the distribution of inorganics in surface soils suggests some correlation with samples from near the railroad bed. No significant detection of arsenic, lead, or mercury were reported for surface soil samples from near the southern or western wetlands.

4.4 Media Data Summary

4.4.1 Surface Water Data Summary

Surface water samples from Lawrence Brook showed no site-related impacts relative to PCB/pesticides and inorganics. The data suggests a possible inorganic impact, primarily from lead, on water quality in the drainage ditch that drains from OU1 into the western wetland.

4.4.2 Sediment Data Summary

Contamination Pathways RI sediment data indicates elevated concentrations relative to background of PCBs, and inorganics, primarily lead, are present in the western wetland. Pesticides, which have not been identified as a site-related constituent of concern in previous investigations, are also present in the western wetland. These elevated concentrations are generally restricted to locations along the ditch, north of the abandoned railroad tracks, and the northwest flowing drainage within the western wetland. PCBs were not detected in sediments in the southern wetland; limited detections of low

concentrations of pesticides and inorganics were detected in the southern wetland. Low levels of PCBs were detected in the secondary wetland, northwest wetland No. 1, along with limited detections of low-level pesticides and inorganics; primarily lead. No other PCBs or pesticides, or elevated inorganic concentrations were detected in other secondary areas.

4.4.3 Surface Soil Data Summary

Surface soil samples were generally from areas both inside and outside of the southern and western wetlands. Only one PCB detection was reported for a sample in the western wetland. The data suggests a correlation of some pesticide detections and elevated inorganic concentrations above background for samples located along the abandoned railroad bed.

Flora/Fauna Survey

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Section 5 - Flora/Fauna Survey

5.1 General

Detailed flora and fauna surveys were conducted in all primary ecological investigation areas: the reference (background) wetland, southern and western wetland, and the reference (background) and adjacent aquatic sites. Flora and fauna survey activities were not conducted in the secondary ecological investigation areas. The need for subsequent flora and fauna surveys in the secondary wetlands and aquatic sites is discussed in the conclusions section of this report, and is based on results of the Contamination Pathways RI surface water, sediment, and surface soil sampling activities and the results of the ecological investigations conducted in the primary areas.

5.2 Flora Survey

5.2.1 Methods

The flora survey had both terrestrial and aquatic components. The terrestrial (wetland) flora survey involved more rigorous methodologies (i.e., point-centered quarter method for trees and modified Braun-Blanquet analysis for ground cover), while the aquatic flora survey relied on general visual observations at the primary aquatic sites and was conducted in association with aquatic fauna survey tasks. The flora survey efforts were performed in May 1993. A complete description of the flora survey methods is presented in Appendix C.

5.2.2 Results

This section describes characteristics of the primary wetlands based on analysis of flora survey results. Four tree species account for the most dominant and second most dominant species in the study areas: red maple, grey birch, black ash and American elm. Results of the modified Braun-Blanquet cover class analysis indicate characteristics of plant communities and habitat types, which are discussed below. Shrubs and vines less than 2.5 cm in diameter were also evaluated by cover class, in accordance with the FOP. Frequency plots of each cover class per data point for the reference, western, and southern wetlands for shrubs and herbs are presented in Appendix C, and depict vegetation trends in the various study areas. A general discussion of the results is presented below.

Reference (Background) Wetland

Of the three study areas, the reference (background) wetland supports the greatest number of trees per acre (trees/acre) followed by the western wetland, and the southern wetland which supported the fewest trees/acre. In the reference wetland, the point-centered quarter method resulted in 538 trees/acre with a basal area of 100 square feet per acre. The dominant tree species in the reference wetland was grey birch, comprising 35 percent of the forest with an estimated 189 trees/acre and associated basal area of 35.0 square feet per acre. The second most dominant tree species in the reference wetland was red maple, comprising 22 percent of the forest with an estimated 118 trees/acre and associated basal area of 21.9 square feet per acre.

In the reference (background) wetland, the most common herbaceous species was dwarf raspberry, present in 14 of 20 quadrants with an average cover class of 1, and sensitive fern, present in 13 of 20 quadrants with an average cover class of 2. Also common in the reference wetland were sedge and Virginia creeper, each in 7 of 20 quadrants, with average cover classes of 1 and 2, respectively. Because sensitive fern has a greater cover class on average than dwarf raspberry, and is only present in one less quadrant, sensitive fern is the more abundant of the two species.

In the reference wetland, the dominant shrubs were black ash and American elm, present in 6 and 5 of 20 quadrants respectively, and each having an average cover class of 1.

Western Wetland

In the western wetland, the point-centered quarter method resulted in 293 trees/acre with a basal area of 72 square feet per acre. The dominant tree species in the western wetland was black ash, comprising 42 percent of the forest with an estimated 124 trees/acre and associated basal area of 30 square feet per acre. The second most dominant tree species in the western wetland was American elm, comprising 26 percent of the forest with an estimated 76 trees/acre and associated basal area of 18.7 square feet per acre.

In the western wetland, the most common herbaceous species was trout lily, observed in 12 of 16 quadrants, with an average cover class of 2. Sedge and red raspberry, both with an average cover class of 1, were present in 8 and 6 of 16 quadrants respectively.

In the western wetland, the dominant shrub was black ash, present in 13 of 16 quadrants, with an average cover class of 1. Other dominant shrubs in the western wetland include chokecherry, wild raisin, and American elm, present in 9, 6, and 5 of 16 quadrants, respectively and all having an average cover class of 1.

Southern Wetland

The southern wetland supports an estimated 246 trees/acre with an associated basal of 48 square feet area per acre. The dominant tree species in the southern wetland was red maple, comprising 42 percent of the forest with an estimated 104 trees/acre and associated basal area of 15.5 square feet per acre. The second most dominant tree species in the southern wetland was grey birch, comprising 21 percent of the forest with an estimated 52 trees/acre and associated basal area of 7.8 square feet per acre.

Canada mayflower was the most commonly observed herbaceous species in the southern wetland, and was recorded in 16 of 20 quadrants evaluated in this study area. The average cover class for Canada mayflower was 2, representing a 6 to 25 percent ground cover. Other dominant vegetative species in the southern wetland include sensitive fern, cinnamon fern, and goldthread, each recorded as present in 8 of 20 quadrants, with an average cover class of 3 (i.e., 26 to 50 percent cover).

In the southern wetland, the most common shrub was arrowwood, present in 10 of 20 quadrants, with an average cover class of 2. The other dominant shrub in the southern wetland was black ash, present in 7 of 20 quadrants with an average cover class of 1.

Aquatic Sites

Aquatic flora survey results presented in Appendix C on Tables C-25 and C-26 indicate similar species composition and standing crop at both the reference and adjacent aquatic sites.

5.2.3 Discussion

Results of the flora survey discussed above indicate that the primary wetlands exhibit some differences in vegetative composition (i.e., dominant species, density). Such differences are likely attributable to topographic influences, proximity to surface water channels, and drainage patterns, as well as selection of data point locations. In our opinion, the primary reason for observed vegetative differences among the primary wetlands is that the southern and western wetlands contain beaver dams which affect hydrology and soil saturation conditions, whereas the reference wetland has no signs of beaver activity. The vegetative components of all the primary wetlands generally provide moderate to high quality habitat for wildlife, especially as feeding and nesting areas for songbird species. No impacts on vegetation related to the presence site-related chemicals were observed or are considered likely.

5.3 Fauna Survey

Terrestrial and aquatic fauna surveys were conducted in all primary ecological investigation areas. Methods and results of the terrestrial and aquatic surveys are presented below.

5.3.1 Wetland Fauna Survey

In accordance with the FOP, surveys of terrestrial vertebrate and soil macroinvertebrate populations were conducted to characterize species diversity and relative abundance of wetland fauna at the primary wetland areas. Comparison of population parameters and community composition between the wetland areas provides information to detect potential chemical-related effects (if any) on biological populations of the wetland areas. The wetland fauna survey was conducted following the techniques specified in Section 2.5.2 of the FOP.

5.3.1.1 Methods

As outlined in the FOP, small mammals were collected from the primary wetlands. Information was collected to evaluate species diversity and abundance for the wetland areas and for use in identifying target species for terrestrial biota sampling. Details on terrestrial vertebrate sampling procedures are presented in Appendix D.

Soil macroinvertebrates were sampled in the three wetland areas to provide additional information on community composition and population densities. As was the case with the vertebrate fauna survey, comparison of results from the southern and western wetlands with the reference wetland could reveal differences that could be attributable to chemical-related impacts. Soil macroinvertebrates sampling methods are presented in Appendix D.

5.3.2.1 Results

- **Terrestrial Vertebrates**

  During the 5-day terrestrial vertebrate fauna survey, several species of small mammals were collected, including star-nosed moles (Condylura cristata), masked shrews (Sorex cinereus), short-tail shrews (Blarina brevicauda), red-backed voles (Clethrionomys gapperi), and a meadow vole (Microtus pennsylvanicus). In addition a wood frog (Rana sylvatica) was collected at the southern wetland. Daily summaries of species collected from the reference, western, and southern wetlands during the wetland fauna survey are provided in Tables 5-1 to 5-3. A summary of the small mammals collected from all of the wetland areas during the survey is presented in Table 5-4.

  Due to precipitation constantly filling the pitfall traps with water, the captured individuals experienced a high mortality rate. Traps were checked several times each day in an effort to minimize mortality. However, due to the high mortality, it was not possible to generate quantitative population density estimates based on mark-recapture results, and thus data interpretation is primarily qualitative. In addition, the generally small numbers of individuals

collected during the fauna survey makes quantitative comparison of estimated population densities difficult. However, population densities in the three wetland areas generally appear similar.

With regard to vertebrate community composition, the results presented in Table 5-4 indicate similar relative abundance and population densities among small mammal species sampled during the wetland fauna survey. Masked shrews represent the most abundant small mammal species captured at each of the wetland areas, with relative abundance ranging from 78% of the total catch in the southern wetland to 91% in the western wetland. Species composition of the small mammal communities in each primary wetland area are generally similar as shown in Table 5-4.

As specified in the FOP, size distribution curves (by weight and total length) were constructed for the most common small mammal species (masked shrews). The individual size distribution curves for masked shrews collected from the primary wetland areas are presented in Figure 10. The weight frequency curves (with total weights rounded to the nearest gram) and length frequency curves for masked shrews indicate similar size structure in each population. Once again, the small numbers of individuals collected makes it difficult to make comparisons and draw conclusions about the size structure of the populations in the three wetlands, but the masked shrew populations appear to be similar in all three areas.

Individuals collected during the terrestrial vertebrate survey represent those species typically found in wooded wet habitat. Masked shrews are common in the northeastern United States, and appear to be one of the more abundant species in all three wetland areas. Likewise, the other species observed during the survey, including short-tail shrews, voles, and moles, are commonly found in the area, and their presence in the wetlands is expected. In general, the species composition of the wetland areas appears roughly similar. Although slight differences in species composition and population density were observed during the survey, these minor

differences are most likely due to the habitat differences among the three areas which were discussed previously.

- **Soil Macroinvertebrates**

  Soil macroinvertebrate species that were collected in soil samples from all three wetland areas during the wetland fauna survey include worms (Oligichaeta), millipedes (Spirobolidae), and fly larvae (Diptera). Other species that were observed less frequently include roundworms (Nematoda), snails (Arionidae), springtails (Colembola), and ants (Hymenoptera-Formicidae). A summary of the soil macroinvertebrate species observed in soil samples from each wetland area is presented in Table 5-5.

  The hydric soil types encountered in the primary wetland areas during the soil macroinvertebrate survey are characteristic of saturated soils under predominantly anaerobic conditions. Typically, soil macroinvertebrate communities present in these soil types have relatively low species diversity and population densities. As such, the soil samples collected from all three wetland areas similarly have low species diversity and a low abundance of soil macroinvertebrates. No discernible differences were noted in the soil macroinvertebrate communities of the three wetland areas.

5.3.2 Aquatic Fauna Survey

5.3.2.1 Methods

The aquatic fauna survey was performed to characterize the community structure of the fish and benthic macroinvertebrate populations of the primary aquatic areas in Lawrence Brook. This characterization allows for an evaluation of the potential chemical-related effects (if any) on biological populations through a comparison of ecological community structure in a potentially impacted area relative to a reference (background) area. The aquatic fauna sampling was conducted following the techniques specified in the FOP. Details of aquatic sampling methods are presented in Appendix D.

5.3.2.2 Results

Results of the fish survey are presented in Table 5-6. At the reference (background) aquatic site, 18 fish species totalling 770 individuals were collected. Common forage species included common shiners (Notropis cornutus), spottail shiners (Notropis hudsonius), finescale dace (Phoxinus neogaeus), and cutlips minnows (Exoglossum maxillingua). At the adjacent aquatic site, 21 species of fish totalling 368 individuals were collected. Common forage species included fantail darters (Etheostoma flabellare), longnose dace (Rhinichtys cataractae), and common shiners (Notropis cornutus). Of the larger predatory fish the most common species observed at the adjacent aquatic site was the small-mouth bass (Micropterus dolomieui), with one individual each of brown trout (Salmo trutta), rock bass (Ambloplites rupestris), and yellow bullhead (Ictalurus natalis).

A summary of the benthic macroinvertebrate species observed at the reference (background) and adjacent aquatic sites is presented in Table 5-7. The most common species included caddisflies (Trichoptera), mayflies (Ephemeroptera), beetles (Coleoptera), and fly larvae (Diptera). Additional species observed less frequently include stoneflies (Plecoptera), roundworms (Nematoda), leeches (Hirudinea), alderflies (Megaloptera), mussels (Pelecypoda), and water mites (Hydracarina).

The results of the fish and macroinvertebrate surveys indicate generally similar aquatic faunal communities at both the reference (background) and adjacent aquatic sites. The species composition and relative species abundances are similar at both sites, and are typical of what would be expected in streams of this type. Minor differences in community composition and population densities are likely related to habitat differences rather than any chemical-related impacts, especially because chemical concentrations at the adjacent aquatic site were generally non-detectable, or not significantly different from background.

Biota Sampling and Tissue Residue Analysis

The objective of the biota sampling and tissue residue analysis program is to determine the extent of bioaccumulation, if any, of site-related chemicals in terrestrial and aquatic organisms. The target species for the terrestrial and aquatic biota sampling efforts were selected based on their abundance as determined in the flora/fauna survey, as well as their potential ecological significance. Target analytical parameters for tissue residue analysis were determined, based on general bioaccumulation characteristics of the parameters and by comparing concentrations detected in potentially impacted areas to those detected in reference (background) soils and sediments.

Initial biota sampling activities were conducted in the primary sampling areas, i.e., the reference and adjacent aquatic sites, and the reference, southern, and western wetlands (Figure 2). The need for subsequent biota sampling in the secondary wetland and aquatic areas is addressed in this report, based on results of the surface water, sediment, and surface soil sampling that was conducted in all identified aquatic and terrestrial areas (both primary and secondary areas), and the results of the ecological investigation conducted in the primary areas.

As outlined in the FOP, three types of samples were collected for tissue residue analysis: invertebrates, terrestrial fauna, and fish. Specific protocols for collecting these samples are presented in Appendix E.

6.1 *Terrestrial Biota Sampling*

6.1.1 Target Species and Analytes

As specified in the FOP, target species for terrestrial biota sampling and tissue residue analysis were to be selected based on their ecological significance and abundance as determined by the fauna survey. Based on preliminary information available at the time, the FOP proposed small mammals and earthworms as potential target species. The terrestrial fauna survey performed during the week of June 21, 1993, indicated that the following species were likely to be present in sufficient numbers for tissue residue analysis: masked shrews, green frogs, and earthworms. In addition to their anticipated availability, these species were selected based on their representation of distinct ecological functional groups. Specifically, masked shrews represented small mammals that might be consumed by

carnivorous wildlife. Green frogs were an amphibian species which represented mid-level consumers and were, thus both consumers of smaller animals (e.g. insects) and prey of larger animals (e.g. birds). Earthworms represented soil macroinvertebrates that could be prey for birds and other wildlife. These target species were proposed to USEPA in a letter dated June 28, 1993, and subsequently approved.

In the June 28, 1993 letter, several concerns were voiced regarding potential availability of specimens for tissue residue analysis. Specifically, the small numbers of individuals collected during the fauna survey raised questions about whether sufficient amounts of tissue could be obtained to support the desired analytical protocols. The issue of which chemicals would be selected as target analytes was also raised, since this would directly determine how much tissue was needed for each individual sample. To maximize capture efficiency, the small mammal sampling method was modified to employ larger numbers of smaller drift fence/pitfall trap samplers which were placed at several different locations within each wetland area.

Target analytical parameters for the tissue residue analysis of terrestrial biota were selected as specified in the FOP, based on analytical results from surface soil and sediment sampling, and a comparison of detected concentrations between reference (background) and potentially impacted areas. Target analytes for tissue residue analysis were also selected based on the chemicals' tendency to bioaccumulate; short-lived and/or readily metabolizable compounds were not included as target analytes. Specific recommendations for target analytes were proposed to USEPA in the June 28, 1993 letter and subsequently discussed with and approved by USEPA. The resulting target analytes for tissue residue analysis and the rationale for their selection, as well as the exclusion of other potential parameters, is summarized below.

PCBs

PCBs were found at some surface soil and sediment sampling locations, as discussed in Section 4. PCBs are relatively persistent and bioaccumulative materials and, thus might be present in biota if any significantly exposure had occurred. PCBs were, therefore, selected as target analytes.

Pesticides

Some of the more common chlorinated insecticides (e.g. aldrin, chlordane) were detected at relatively low (i.e. less than 1,000 ug/kg in most cases) levels in certain surface soil and sediment samples. The highest observed pesticide concentrations were at SD-19 in the ditch, draining into the western wetland (aldrin 7,400 ug/kg, gamma-chlordane 4,200 ug/kg). Some of the chlorinated insecticides are persistent and bioaccumulative and, thus may be present in biota. Although pesticides are not considered to be site-related chemicals of interest because they have not been detected during previous investigations at the site proper, they can be analyzed using the same protocols as PCBs. Therefore, partly because pesticide inclusion did not entail a much greater level of analytical effort, they were included as target analytes.

Phenolics

Phenolics were generally present in both reference and potentially impacted surface soil and sediment sampling locations at similar concentrations. Phenolics have previously been considered as potential site-related chemicals of interest. However, phenolics, in general, are natural constituents, with several phenolic compounds naturally occurring in wetland humus. The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile on Phenol (1989) reports that phenol itself is a natural constituent of animal matter. Phenol is a normal constituent of human urine in subjects with no known exposure to phenol (ATSDR, 1989). Both the ATSDR (1989) and Howard et al. (1989) report that phenol is not expected to bioconcentrate significantly in aquatic organisms.

In mammals, absorbed phenol is rapidly metabolized and excreted as free phenol or conjugates (ATSDR, 1989). The ATSDR (1989) also noted that no good biomarkers for phenol-induced effects

were available. For these reasons, phenolics were not expected to bioconcentrate in animal tissues and, thus they were not recommended as analytical parameters for tissue residue analysis. In addition, total phenolics is a non-specific analytical parameter that applies to a complex class of compounds. Analyses of tissue samples for this parameter would provide data that could not be used in risk assessment (either human health or ecological) because no toxicity endpoints or criteria are available for total phenolics.

Semi-volatile Organics

Available information indicated that the two general classes of semi-volatile organic compounds that might be considered for tissue residue analysis were individual phenol compounds and polynuclear aromatic hydrocarbons (PAHs). Phenols were not recommended as target parameters for reasons discussed above. Similarly, PAHs are readily metabolized by most higher organisms and do not readily bioaccumulate in tissues. For these reasons, no semi-volatile organics were recommended as target analytes.

Volatile Organics

Volatile organic compounds were generally not detected in surface soil, sediment, or surface water, with the exception of acetone, 2-butanone, and toluene at a few locations. In addition, volatiles are relatively non-persistent and are generally readily metabolized and thus do not bioaccumulate in organisms. Thus, volatile organics were not included as target analytes.

Metals

Lead and mercury are two metals that are relatively bioaccumulative. Lead was detected in some instances in the drainage way from OU1 at elevated concentrations relative to background locations, while mercury was detected at slightly elevated levels relative to background locations. Lead and mercury were thus recommended to be included as target analytes for tissue residue analysis. At the request of USEPA, arsenic was also included as an inorganic target analyte.

Based on the above analytical parameters (i.e., PCBs, pesticides, lead, mercury, and arsenic), it was determined that a 30-gram tissue sample would be necessary to support all of the desired analyses and achieve appropriate detection limits. When individuals of target species weighed less than 30 grams, composite samples would be necessary to achieve the desired sample weight.

In the course of the small mammal sampling, it became apparent that masked shrews were not sufficiently abundant to provide the required three 30-gram tissue samples from each primary wetland area. Despite the use of over 100 collection buckets (pitfall traps), capture of masked shrews was only fair, and their small size (3 to 5 grams each) made it unlikely that sufficient numbers for these samples could be obtained in a reasonable time frame. However, some other small mammal species were captured in sufficient numbers for one complete sample to be obtained and suggested a possible option to meet the objectives of the tissue residue sampling program. Specifically, short-tailed shrews and red-backed voles were obtained in sufficient numbers for one sample in each of the three primary wetlands. Each of these species could be considered generally representative of small mammal wetland species, and would also represent the forage base available to potential predators. In addition, their presence at all three primary wetlands would allow for comparisons of chemical concentrations among the three areas. On this basis, BB&L recommended to USEPA that one sample each of masked shrews, short-tailed shrews, and red-backed voles be obtained from each of the primary wetlands for tissue residue analysis. This recommendation was transmitted in a letter to the USEPA dated September 17, 1993, and was subsequently approved.

Specific sample locations for terrestrial biota were placed near areas of potential chemical exposure, as determined based on wetland surface soil and sediment analytical data and/or surface drainage patterns. Sample locations were also selected so that they would be located in areas having suitable habitat for each of the target species (e.g., the presence of standing water was necessary for green frogs). The terrestrial biota sampling locations are shown on Figure 11.

6.1.2 Results and Discussion

The results of the terrestrial biota sampling and tissue residue analyses are summarized in Tables 6-1 and 6-2.

Reference (Background) Wetland

At the reference (background) wetland, PCBs were not detected in any of the biological samples. 4,4'-DDE was the only pesticide detected, at very low concentrations in the short-tailed shrew sample (5.2 ug/kg). Inorganics were also detected in biota collected from the reference wetland. Arsenic was detected in the short-tailed shrew sample (0.21 J mg/kg) and each of the earthworm samples (0.19 J to 0.43 J mg/kg). Lead was detected in the masked shrew sample (0.25 J mg/kg), the red-backed vole sample (2.2 J mg/kg), each of the earthworm samples (0.73 J to 2.3 J mg/kg), and one green frog sample (0.14 J mg/kg). Many of the lead and arsenic analytical results for all three wetlands were qualified as estimated concentrations during the data validation process, however, and thus the interpretation of these results is somewhat speculative. In addition, low levels of mercury were detected in all of the biological samples collected from the reference wetland. Mercury concentrations ranged from 0.03 mg/kg in both the red-backed voles and green frogs to 0.16 mg/kg in masked shrews.

Western Wetland

In the western wetland, low levels of PCBs were detected in the masked shrew sample (140 ug/kg) and the short-tailed shrew sample (1,000 ug/kg). PCBs were also detected at low levels in one of three earthworm samples (1,190 ug/kg), and each of the three green frog samples (39 to 228 ug/kg). Low levels of pesticides were detected in biota from the western wetland, including alpha-chlordane in the masked shrew sample (7 ug/kg), the short-tailed shrew sample (41 ug/kg), and two out of the three frog samples (both at 10 ug/kg). In addition, 4,4'-DDE was detected in the masked shrew sample (4.5 ug/kg), alpha-BHC was detected in one of the three green frog samples (2 ug/kg), and gamma BHC was detected in one green frog sample (1.7 ug/kg). Inorganics detected in biota from the western wetland included arsenic in the masked shrew sample (0.17 J mg/kg), the red-backed vole sample (0.11 J mg/kg), all three earthworm samples (0.30 J to 0.89 J mg/kg), and one green frog sample (0.12 J mg/kg). Lead was detected in each biota sample except red-backed voles. Lead concentrations ranged

from 0.3 J mg/kg in a green frog sample to 13.7 mg/kg in an earthworm sample. Additionally, low levels of mercury were detected in all of the biological samples collected from the western wetland. Mercury concentrations ranged from 0.02 J mg/kg in green frogs to 0.24 mg/kg in an earthworm sample.

Southern Wetland

In the southern wetland, the only organic compounds detected in biota were PCBs, detected in the masked shrew sample (230 ug/kg). 4,4'-DDE was detected in the short-tailed shrew sample (7.7 ug/kg), and gamma BHC was detected in the red-backed vole (2.7 ug/kg). Inorganics detected in biota collected from the southern wetland included arsenic detected in masked shrews (0.11 J mg/kg), short-tailed shrews (0.11 J mg/kg), one of the three green frog samples (0.13 J mg/kg), and each of the three earthworm samples (0.35 to 3.1 mg/kg). Low concentrations of lead were detected in all of the biological samples from the southern wetland, except for one green frog sample. Lead concentrations ranged from 0.12 J mg/kg in a green frog sample to 11.4 J mg/kg in an earthworm sample. Low levels of mercury were also detected in all of the biological samples, and ranged from 0.02 J mg/kg in red-backed voles and green frogs to 0.13 mg/kg in an earthworm sample.

These results indicate low, but detectable PCB concentrations in biota in the western wetland relative to the reference (background) wetland. This result is to be expected given the detectable PCB concentrations found in surface soil and sediments in this wetland. However, the extent of bioaccumulation does not appear to be significant. Specifically, PCBs were detected at concentrations in the 10,000 ug/kg range in some media samples from the western wetland (maximum concentrations detected in sediment samples were up to 58,000 ug/kg during the Contamination Pathways RI and up to 210,000 ug/kg during previous investigations). However, PCB concentrations in biota samples from these same areas of the western wetland were on the order of only 1,000 ug/kg or less. This information indicates that biota sampling in areas with substantially lower PCB concentrations in surface soil and sediment concentrations (i.e. southern and secondary wetlands) is unlikely to reveal detectable levels of PCBs in resident terrestrial biota. In fact, PCB concentrations in biota from the

southern wetland were all non-detectable, with the exception of a low concentration (230 ug/kg) detected in the one masked shrew sample taken a few hundred feet south of the railroad bed and, therefore, close to OU1. These results indicate that additional biota sampling and tissue residue analysis for PCBs in the secondary areas is not necessary.

With regard to other analytes, pesticide concentrations were generally non-detectable or in the low ug/kg range in biota samples from all three primary areas. These low concentrations are not considered significant in terms of potential ecological risk. Results of tissue residue analyses for samples from the southern and reference (background) wetlands corresponded with surface soil and sediment sampling data showing low to non-detectable pesticide concentrations in both these areas. Pesticides concentrations in biota samples from the western wetland were also comparable, even though some surface soil and sediment samples from the western wetland showed potentially elevated concentrations.

With regard to inorganics, analytical results for mercury show generally similar concentrations in the low ug/kg range for biota samples from all three primary wetlands (0.03 to 0.16 mg/kg in reference wetland; 0.02 to 0.24 mg/kg in western wetland; and 0.02 to 0.13 mg/kg in southern wetland). No site-related influences are apparent. Interpretation of inorganic analytical data for lead and arsenic is somewhat complicated due to the presence of data qualifiers on most results. However, it appears that one earthworm sample (BS002) from the southern wetland had arsenic and lead concentrations that were somewhat elevated relative to analogous samples from the reference wetland. Similarly, it appears that one earthworm sample (BS027) and one green frog sample (BS004) from the western wetland had lead concentrations that were somewhat elevated relative to the reference wetland. The results of the flora/fauna survey indicate that they are not causing any apparent ecological effects. In addition, these data suggest that further biota sampling and tissue residue analysis for these constituents is not warranted in the secondary wetland areas, where sediment chemical concentrations are substantially lower and/or non-detectable relative to those in the western and southern wetland areas.

6.2 Aquatic Biota Sampling

6.2.1 Target Species and Analytes

Target species selected for the aquatic biota sampling and tissue residue analysis were selected in accordance with the FOP. The criteria for selecting target species were abundance, ecological significance, and availability at all sampling locations. The FOP tentatively identified brown trout (Salmo Trutta) and Johnny darters (Etheostoma nigrum) as potential target species that would meet these criteria. The May 19 to 20, 1993, sampling at the adjacent and reference aquatic sites (summarized in Table 5-6) suggested some additional possible candidate species for aquatic biota sampling. Each of these candidate species is discussed below.

Brown trout

Edible-size brown trout were collected at both sampling locations but in small numbers (two at the reference aquatic site area and one at the adjacent aquatic site). As the only edible-size sport species collected, as well as the fact that they are a top carnivore, brown trout would be desirable to sample both for human health and ecological risk assessment purposes. However, the small number of fish apparently available was a concern.

Johnny darter

Johnny darters were relatively common at the reference aquatic site but were virtually absent from the adjacent aquatic site.

Fantail darter

Fantail darters were collected in reasonable numbers at both primary aquatic sites.

White suckers

Relatively large numbers of white suckers were collected at both locations. Some individuals could be considered of edible size, although they would not be considered a sport species or desirable by most anglers.

Minnows

Among the various minnow species collected, cutlip minnows and common shiners were relatively abundant at both sites. Other minnow species were not abundant or were not present in sufficient numbers at both primary aquatic sites.

Based on this information, BB&L recommended in the June 28, 1993 letter that brown trout and fantail darters be the two target species for aquatic biota sampling. Brown trout were recommended because of their ecological significance (as a predator at the top of the food chain) and their relevance to human health risk assessment (potential consumption by anglers). However, the aquatic survey raised concerns that brown trout might not be available in sufficient numbers. To address this concern, white suckers were recommended as a possible backup edible-size fish species should insufficient numbers of brown trout be captured. Although not a sport species or a top carnivore, white suckers of edible size were collected during the fauna survey, and they represented the most suitable alternative if insufficient numbers (i.e., three fish per location) of brown trout were unavailable. Fantail darters were recommended because of their abundance at both sites and their taxonomic and ecological similarity to johnny darters, which were originally proposed in the FOP.

During the aquatic biota sampling, no brown trout were captured at the adjacent aquatic site. Therefore, three individual white sucker fillet samples were collected as a substitute species at both the adjacent and reference aquatic sites. In addition, three whole-body composite samples of fantail darters were collected from each of the primary aquatic sites, as specified in the June 28, 1993 letter. Target analytical parameters from the aquatic biota tissue residue analyses were the same as those specified previously for terrestrial species.

Aquatic biota were collected using a backpack electrofishing unit and dip nets in a manner analogous to the aquatic fauna survey as presented in Appendix D. Sample locations were essentially the same as those that were subject to the fauna survey, which were selected based upon the results of previous

surface water and sediment sampling and the habitat requirements of the target species. Aquatic biota sampling locations are shown on Figure 11.

6.2.2 Results and Discussion

Results of the aquatic biota sampling and tissue residue analyses are presented in Tables 6-3 and 6-4.

Reference (Background) Aquatic Site

At the reference (background) aquatic site, low concentrations of PCBs were detected in each of the fantail darter samples (54 to 68 ug/kg). PCBs were not detected in any of the white sucker fillet samples. Likewise, 4,4'-DDE was detected at low concentrations in the fantail darter samples collected from the reference (background) aquatic site (4.6 to 7 ug/kg), and was not detected in any of the white suckers. Inorganics detected in the fish samples from the reference aquatic site include arsenic in one of the three white sucker samples (0.19 J mg/kg), and lead detected in one of the three fantail darter samples (0.12 J mg/kg). Mercury was detected in all three white sucker samples (0.15 to 0.19 mg/kg), and all three fantail darter samples (0.12 to 0.14 mg/kg).

Adjacent Aquatic Site

At the adjacent aquatic site, PCBs were detected at low concentrations in two of the three fantail darter samples (37 and 62 ug/kg). PCBs were not detected in any of the white sucker fillet samples. Low concentrations of 4,4'-DDE were detected in all three of the fantail darter samples, ranging from 5.6 to 6.8 ug/kg. No pesticides were detected in the white sucker samples. Inorganics detected in the aquatic biota samples from the adjacent aquatic site include arsenic in one of three white sucker fillets (0.16 J mg/kg), and one of three fantail darter samples (0.1 J mg/kg). Low concentrations of lead were detected in two of the white sucker fillets (0.12 J and 0.37 J mg/kg), but lead was not detected in any fantail darter samples. Mercury was detected in all three of the white sucker samples (0.17 to 0.29 mg/kg), and all three of the fantail darter samples (0.12 to 0.16 mg/kg).

These results indicate generally low levels of organics and inorganics in biota at both the reference and adjacent aquatic sites. PCB levels were non-detectable in all white sucker fillets from both locations. PCB levels in composite whole-body fantail darter samples were non-detectable or slightly above detection limits (i.e., less than 30 to 68 ug/kg) from both locations, and there was no difference in PCB concentrations between fish from the two locations (reference aquatic site 54 to 68 ug/kg; adjacent aquatic site less than 30 to 62 ug/kg). Analytical results for 4,4'-DDE exhibited similar trends, with non-detectable levels in white sucker fillets, and comparable low ug/kg levels in composite fantail darter samples from both locations. The fact that PCBs and 4,4'-DDE concentrations are detectable in fantail darters but not white sucker samples is not surprising considering that the darters were analyzed as whole-body samples with correspondingly higher lipid (body fat) content than the sucker fillet samples. These results reflect consistently low or non-detectable levels of PCBs and pesticides in aquatic biota at both the reference and adjacent aquatic sites. The low, but detectable concentrations appear to be indicative of a regional background condition; however, the similarity between the two aquatic sites indicates that the chemical concentrations are not related to the OU1 site.

Results of tissue residue analyses for inorganics show similar trends. Mercury was detected at low levels in all fish samples, with similar concentrations in all samples. Arsenic and lead data were qualified, but reflected low or non-detectable concentrations in both adjacent and reference aquatic sites. Once again, no site-related chemical impacts on tissue residues were apparent, and none would be expected, based on the similarly low concentrations detected in surface water and sediment samples from both the adjacent and reference aquatic sites.

Based on the absence of significant differences in tissue residue analytical results between the adjacent and reference aquatic sites, and the fact that the secondary aquatic sites have comparable or lower chemical concentrations in surface water and sediments relative to the adjacent site, additional tissue residue analysis of biota samples from the secondary aquatic areas is not deemed necessary.

Summary and Conclusions

Section 7 - Summary and Conclusions

The EI discussed in this report was designed to identify chemical-related impacts, if any, in off-site areas near the York Oil Superfund Site. In accordance with the approved FOP, the initial tasks of the EI focused on those areas nearest the OU1 site, since historical information suggested these areas were more likely to have been affected, if at all, by site-related chemicals of interest. The results of the EI in these near-site areas are compared with results from reference areas. Coupled with the results of surface soil, sediment, and surface water samples, the ecological investigation results provide a basis to determine whether any chemical-related ecological impacts could be identified. Chemical-related ecological impacts would be defined based on ecological investigation results showing significant differences (i.e., in ecological parameters or biomarker results), and environmental media (i.e., surface soil, sediment, surface water) analytical data indicating elevated concentrations of site-related constituents relative to background areas. If such impacts were detected, the need for additional ecological investigations work in more distant secondary areas would be determined based on the type of impacts observed in the primary areas and the chemical concentrations detected in environmental media in the secondary areas.

7.1 Wetland Areas

Data concerning chemical concentrations in surface soils, sediments, and surface waters were presented and discussed in Section 4 of this report. With regard to the wetland locations, low, but detectable, levels of PCBs and lead (above background) were observed in the western wetland. Samples containing elevated concentrations were primarily located along the ditch and abandoned railroad bed that forms the southern border of the western wetland, as well as along the drainage channel that flows to the northwest. In the southern wetland, PCBs and most other organics were not detected, and inorganic concentrations were not significantly elevated relative to the background locations. PCBs and organic compounds were not detected in the secondary wetland areas (northwest wetlands No. 1 and No. 2), with the exception of detectable PCB concentrations of 4,000 J and 780 J ug/kg in two sediment samples from the southern part of northwest wetland No. 1.

The results of the initial site reconnaissance and subsequent wetland flora/fauna surveys indicated general similarities among the primary wetland areas. Species composition and population densities were

comparable, and any differences in the southern and western wetland relative to the reference wetland were attributable to habitat differences (i.e. presence of beaver activity and standing water in the western and southern wetlands). Despite the presence of elevated chemical concentrations in certain areas, specifically PCB and lead in parts of the western wetland mentioned above, no ecological affects that could be attributed to those chemical concentrations were apparent.

Wetland biota sampling was performed at locations in the western and southern wetlands where elevated chemical concentrations in surface soils and sediments had been detected, or were suspected based on drainage patterns, as well as in the reference wetland. Target species of small mammals, earthworms, and green frogs were collected and analyzed for selected target analytes, including PCBs, pesticides, and arsenic, lead, and mercury. Results of this sampling indicated generally non-detectable levels of PCBs and pesticides in biota from the reference and southern wetlands. This is to be expected considering the non-detectable PCB concentrations detected in surface soils and sediments from these areas. PCB concentrations were elevated in approximately two-thirds of the biota samples from the western wetland relative to the reference wetland. However, PCB concentrations in these biota were in the 1,000 ug/kg range or less, reflecting a very limited amount of bioaccumulation in biota in the western wetland.

Taken together, the results of the surface water, sediment, surface soil sampling, the flora/fauna survey, and the biota sampling and tissue residue analysis indicate that additional ecological investigation activities are not necessary in the secondary wetland areas (northwest wetlands No. 1 and No. 2). These secondary areas have low or non-detectable concentrations of PCBs and other chemicals and concentrations in the secondary wetlands are less than those detected in the southern wetland and much less than those detected in the western wetland. Because the flora/fauna survey indicated no detectable ecological impacts in the primary areas, and because the tissue residue analysis indicated no significant bioaccumulation in these primary areas, additional flora/fauna surveys and/or biota sampling in the secondary areas are unlikely to provide useful data and are deemed unnecessary. Flora/fauna surveys would likely show no significant differences relative to the reference area, and biota surveys would likely show low or non-detectable tissue residue levels, probably similar to, if not lower than, those found in the southern and reference wetland biota.

7.2 Aquatic Areas

With regard to the aquatic sampling locations, low or non-detectable chemical concentrations were detected in surface waters and sediments in both the primary and secondary areas. As a result, no chemical-related ecological impacts or significant chemical bioaccumulation would be expected in these areas. This was verified by results of the flora/fauna survey and biota sampling and tissue residue analysis in the primary areas (i.e. the adjacent aquatic site). The flora/fauna survey revealed no significant differences in species composition or population densities between the adjacent and reference aquatic site that could be attributed to chemical impacts. The biota sampling indicated similarly low or non-detectable chemical levels in fish samples from both the reference and adjacent aquatic sites. Based on the fact that no significant ecological impacts or chemical bioaccumulation were detected in the adjacent or reference aquatic areas, and the fact that chemical concentrations in surface waters and sediments of the secondary aquatic areas were non-detectable or not above background concentrations, no additional flora/fauna surveys or biota sampling is recommended for the secondary areas.

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SECTION 8 - REFERENCES

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Tables

TABLE 2–1

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

NWI AND NYSDEC CLASSIFICATIONS/CODES
FOR PRIMARY AND SECONDARY WETLANDS

	NWI Classification[1]	NYSDEC Code[2]
Primary Wetlands		
Western	PSS1E*	BR–16
Southern	PFO1E**	BR–15
Reference	PFO1E**	BR–14
Secondary Wetlands		
Northwest Wetland No. 1	PFO1E**	BR–16
Northwest Wetland No. 2	PFO1E**	BR–20

[1] NWI, 1981
[2] NYSDEC, 1985 codes represent NYSDEC identification number within the Brushton Quadrangle.
* PSS1E palustrine broad–leaved deciduous scrub–shrub with seasonal saturation
** PFO1E palustrine broad–leaved deciduous forest with seasonal saturation

TABLE 2–2

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF VEGETATIVE SPECIES OBSERVED IN PRIMARY AND SECONDARY WETLANDS

Herbaceous Species	Common Name
Actaea rubra	Baneberry
Adiantum pedatum	Maidenhair Fern
Aralia nudicaulis	Wild Sarsaparilla
Aster spp.	Aster
Barbarea vulgaris	Common Wintercress
Caltha palustris	Marsh marigold
Carex exilis	Sedge
Carex gracillima	Sedge
Carex spp.	Sedge
Carex stricta	Tussock sedge
Clintonia borealis	Bluebead
Coptis groenlandica	Goldthread
Cornus canadensis	Bunchberry
Cypripedium acaule	Pink ladyslipper
Daucus carota	Queen Anne's Lace
Dennstaedtia punctilobula	Hayscented fern
Dentaria diphylla	Toothwort
Equisetum arvense	Field horsetail
Equisetum laevigatum	Smooth Scouring Rush
Equisetum sylvaticum	Woodland horsetail
Erythronium americanum	Trout lily
Erythronium amicanium	Trout Lily
Euthamia graminifolia	Grass leaved goldenrod
Fragaria virginiana	Strawberry
Galium palustre	Marsh Bedstraw
Gaultheria procumbens	Wintergreen
Geranium maculatum	Wild Geranium
Geranium robertianum	Herb Robert
Geum rivale	Water Avens
Hepatica americana	Hepatica
Hierochloe odorata	Holy Grass
Impatiens capensis	Jewelweed
Iris versicolor	Blue flag
Juncus effusus	Soft rush
Lycopodium annotinum	Stiff clubmoss
Lycopodium clavatum	Staghorn clubmoss
Lycopodium obscurum	Ground pine
Lycopodium tristachyum	Ground cedar
Lythrum salicaria	Purple loosestrife
Maianthemum canadense	Canada mayflower

TABLE 2–2 (Cont'd.)

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF VEGETATIVE SPECIES OBSERVED IN PRIMARY AND SECONDARY WETLANDS

Herbaceous Species	Common Name
Medeola virginiana	Indian cucumber root
Mitchella repens	Partridgeberry
Mitella diphylla	Mitrewort
Onoclea sensibilis	Sensitive fern
Osmunda cinnamomea	Cinnamon Fern
Osmunda claytoniana	Interrupted fern
Osumunda regalis	Royal fern
Parthenocissus quinquefolia	Virginia Creeper
Polystichum acrostichoides	Christmas fern
Pteridium aquilinum	Bracken
Ranunculus spp.	Buttercup
Ribes hirtellum	Smooth gooseberry
Ribes triste	Swamp current
Rubus allegheniensis	Blackberry
Rubus hispidus	Swamp dewberry
Rubus idaeus	Red Raspberry
Rubus pubescens	Dwarf Raspberry
Smilacina racemosa	False Solomans seal
Solidago gigantea	Smooth goldenrod
Solidago rugosa	Rough–leaved Goldenrod
Solidago rugosa	Rough goldenrod
Solidago spp.	Goldenrod
Taraxacum officinale	Dandelion
Thalictrum dasycarpum	Purple Meadow Rue
Thelypteris noveboracensis	New York fern
Tiarella cordifolia	Foamflower
Toxicodendron radicans	Poison ivy
Trientalis borealis	Starflower
Trillium erectum	Red trillium
Trillium grandiflorum	White trillium
Trillium undulatum	Painted trillium
Typha latifolia	Cattail
Veratrum viride	False Hellebore
Vicia spp.	Vetch
Viola conspersa	American dog violet
Viola papilionacea	Common Blue Violet

TABLE 2-2 (Cont'd)

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF VEGETATIVE SPECIES OBSERVED IN PRIMARY AND SECONDARY WETLANDS

Tree/Shrub Species	Common Name
Abies balsamifera	Balsam Fir
Acer negundo	Boxelder
Acer rubrum	Red Maple
Acer saccharinum	Silver Maple
Acer saccharum	Sugar Maple
Alnus serrulata	Speckled Alder
Amalanchier canadensis	Shadbush
Aronia melanocarpa	Black Chokeberry
Betula alleghanensis	Yellow Birch
Betula populifolia	Gray Birch
Carpinus carolina	Blue Beech
Carpinus carolina	Musclewood
Cornus alternifolia	Alternateleaved Dogwood
Cornus racemosa	Grey Dogwood
Cornus stolonifera	Red Osier Dogwood
Crataegus pedicellata	Hawthorn
Fraxinus americana	White Ash
Fraxinus nigra	Black Ash
Juglans cinerea	Butternut
Larix laricina	Tamarack
Nemopanthus mucronatus	Moutain-holly
Ostrya virginiana	Eastern Hop-hornbeam
Pinus resinosa	Red Pine
Pinus strobus	White Pine
Populus balsamifera	Balsam Poplar
Populus grandidentata	Bigtooth Aspen
Populus tremuloides	Quaking Aspen
Prunus pensylvanica	Pin Cherry
Prunus serotina	Black Cherry
Prunus virginiana	Choke Cherry
Pyrus malus	Apple
Rhamnus alnifolia	Alder-leaved Buckthorn
Salix peticlaris	Willow
Sambucus canadensis	Flat-topped Elderberry
Sorbus americana	Moutain Ash
Spiraea latifolia	Meadowsweet
Spiraea tomentosa	Steeplebush
Taxus canadensis	Yew
Thuja occidentalis	Northern White-Cedar
Tilia americana	Basswood
Tsuga canadensis	Eastern Hemlock
Ulmus americana	American Elm
Viburnum cassinoides	Wild Raisin
Viburnum dentatum	Arrowwood

Table 3-1

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

Comparative Summary of WET Analysis for Reference Wetland and Western Wetland

	Social Significance		Effectiveness		Opportunity	
	Reference Wetland	Western Wetland	Reference Wetland	Western Wetland	Reference Wetland	Western Wetland
Ground-Water Recharge	L	L	U	U	*	*
Ground-Water Discharge	L	L	L	M	*	*
Flood Flow Alteration	L	L	H	H	M	L
Sediment Stabilization	L	L	L	M	*	*
Sediment/Toxicant Retention	L	M	H	H	L	H
Nutrient Removal/Transformation	L	L	H	H	L	L
Production Export	*	*	L	M	*	*
Wildlife Diversity/Abundance	L	L	*	*	*	*
Wildlife D/A Breeding	*	*	H	H	*	*
Wildlife D/A Migration	*	*	L	H	*	*
Wildlife D/A Wintering	*	*	L	L	*	*
Aquatic Diversity/Abundance	L	L	L	M	*	*
Uniqueness/Heritage	L	L	*	*	*	*
Recreation	L	L	*	*	*	*

Notes:

H = High
M = Moderate
L = Low
U = Uncertain
* = Not evaluated

Table 3-2

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

Comparative Summary of WET Analysis for Reference Wetland and Southern Wetland

	Social Significance		Effectiveness		Opportunity	
	Reference Wetland	Southern Wetland	Reference Wetland	Southern Wetland	Reference Wetland	Southern Wetland
Ground-Water Recharge	L	L	U	U	*	*
Ground-Water Discharge	L	L	L	M	*	*
Flood Flow Alteration	L	L	H	H	M	L
Sediment Stabilization	L	L	L	M	*	*
Sediment/Toxicant Retention	L	M	H	H	L	H
Nutrient Removal/Transformation	L	L	H	L	L	L
Production Export	*	*	L	M	*	*
Wildlife Diversity/Abundance	L	L	*	*	*	*
Wildlife D/A Breeding	*	*	H	H	*	*
Wildlife D/A Migration	*	*	L	H	*	*
Wildlife D/A Wintering	*	*	L	L	*	*
Aquatic Diversity/Abundance	L	L	L	M	*	*
Uniqueness/Heritage	L	L	*	*	*	*
Recreation	L	L	*	*	*	*

Notes:

H = High
M = Moderate
L = Low
U = Uncertain
* = Not evaluated

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TABLE 4-1

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE WATER INORGANICS DATA
(ug/L)

Sampling Dates: April 13-15, 1993

Sample Number	Y2-SW01-01		Y2-SW02-01		Y2-SW03-01		Y2-SW04-01		Y2-SW05-01		Y2-SW05-01		Y2-SW06-01		Y2-SW07-01	
Form I ID	17292		17217		16903		16890		17241		17209		17250		17152	
											Field Dup.					
Aluminum																
Arsenic																
Barium	22.2	J	23.2	J	18.1	J	17.9	J	17.2	J	16.3	J	14.8	J	16.3	J
Calcium	13700		15000		11900		12000		17300		16600		9300		14700	
Copper															5.0	J
Iron	375		509		494		456		448		436		505		690	
Lead																
Magnesium	4310		4510		3690		3750		5670		5440		2940		4810	
Manganese	32.4	J	39.3	J	33.0	J	33.8	J	19.6	J	19.4	J	14.7	J	173	J
Mercury																
Potassium	1440		1510		1250		1240		707		648		816		1060	
Sodium	2910		3070		2370		2320		6900		6450		2710		27200	
Zinc																

Note: Only detected analytes or analytes of concern are shown.

301751

TABLE 4–1 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE WATER INORGANICS DATA
(ug/L)

Sampling Dates: April 13–15, 1993

Sample Number	Y2–SW08–01		Y2–SWDI–1	
Form I ID	17284		17144	
			Rinse Blank	
Aluminum			35.5	J
Arsenic				
Barium	154	J		
Calcium	111000			
Copper				
Iron	854		28.7	J
Lead	1.0	J		
Magnesium	26500			
Manganese	183	J		
Mercury				
Potassium	5720			
Sodium	973000			
Zinc	346			

Note: Only detected analytes or analytes of concern are shown.

301752

TABLE 4-1 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE WATER INORGANICS DATA
(ug/L)

Sampling Date: August 3, 1993

Sample Number	Y2-SW01-02		Y2-SW02-02		Y2-SW03-02		Y2-SW03-02 FI		Y2-SW04-02							
Form I ID	32178		32119		32208		32186		32194							
							Field Dup.									
Aluminum																
Arsenic																
Barium	25.0		35.0		33.1		35.1		31.6							
Calcium	20100		24000		25900		24900		24900							
Copper	5.1	J			3.0	J	6.7	J	2.4	J						
Iron	252		424		339	J	2450	J	428							
Lead																
Magnesium	6140		7390		7980		7660		7670							
Manganese	33.4	J	56.1	J	36.2	J	41.1	J	75.3	J						
Mercury					0.22	J										
Potassium	1090	J	1400	J	1250	J	1360	J	1400	J						
Sodium	3020		4010		4010		3980		3850							
Zinc	20.1	J	15.1		21.3	J	14.0	J	15.2							

301753

TABLE 4–2

INTERIM ECOLOGICAL REEPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT PESTICIDES/PCBs DATA
(ug/Kg except where otherwise noted)

Sampling Dates: April 20 – 22, 27, 30, and May 4, 1993

Sample Number	Y2–SD03–01		Y2–SD07–01		Y2–SD08–01		Y2–SD09–01		Y2–SD09–02		Y2–SD10–01		Y2–SD11–01		Y2–SD12–01	
Form I ID	18973		18485		18078		18086		18094		18108		18116		18582	
Dilution Factor	1		1		1		1000		500		20		1		1	
% Moisture	80		65		77		39		35		83		87		81	
Location	Ref. W.L.		S.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Heptachlor																
Aldrin					45	J	7500	NJ	1300	NJ	440	J	17	J		
Endosulfan I																
Dieldrin	3.9	NJ														
4,4'–DDE			1.1	J												
Endrin															54	J
4,4'–DDD					8.5	NJ										
4,4'–DDT											280	J				
Methoxychlor					77	J							25	NJ	120	J
Endrin ketone					61	J					440	J	24	J		
Endrin aldehyde																
gamma–Chlordane																
Aroclor–1254					1200	NJ	49000	NJ	7700	NJ	11000	NJ	520	J	3900	J
Aroclor–1260																

Note: Only detected constituents are shown.
See page 4 for location key.

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TABLE 4–2 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT PESTICIDES/PCBs DATA
(ug/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27, 30, and May 4, 1993

Sample Number	Y2–SD13–01		Y2–SD13–02		Y2–SD14–01		Y2–SD14–02		Y2–SD15–01		Y2–SD15–02		Y2–SD16–02		Y2–SD18–01	
Form I ID	18515		18523		18310		18329		18035		18043		18264		17985	
Dilution Factor	20		5		1		1		1		1		1		1	
% Moisture	67		47		79		53		84		64		67		34	
Location	W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Heptachlor							1.4	J			3.2	NJ				
Aldrin	290	NJ	18													
Endosulfan I																
Dieldrin																
4,4'–DDE																
Endrin																
4,4'–DDD																
4,4'–DDT																
Methoxychlor	120	NJ	8.6	NJ					9.0	NJ			41	J	40	J
Endrin ketone	120	J	8.6	J	2.3	NJ									32	
Endrin aldehyde																
gamma–Chlordane																
Aroclor–1254	4200	NJ	230	J											610	J
Aroclor–1260																

Note: Only detected constituents are shown.
See page 4 for location key.

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TABLE 4–2 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT PESTICIDES/PCBs DATA
(ug/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27, 30, and May 4, 1993

Sample Number	Y2–SD19–01		Y2–SD19–02		Y2–SD19–03		Y2–SD21–01		Y2–SD21–02		Y2–SD21–03		Y2–SD22–01		Y2–SD23–01	
Form I ID	17993		18051		18060		18000		18272		18280		18493		18710	
Dilution Factor	100		500		500		1		5		1		20		5	
% Moisture	72		52		16		75		56		50		59		82	
Location	W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		N.W. No. 1	
Heptachlor																
Aldrin	7400	NJ	2500	NJ	250	NJ			53	NJ	3.3	J	370	NJ		
Endosulfan I																
Dieldrin																
4,4'–DDE																
Endrin																
4,4'–DDD																
4,4'–DDT																
Methoxychlor	1200	J					15	J	13	NJ	4.3	J	120	J		
Endrin ketone	710	NJ											92	J	34	NJ
Endrin aldehyde																
gamma–Chlordane	4200	NJ	1200	NJ	220	NJ										
Aroclor–1254	58000	NJ	22000	NJ	2600	NJ	510	J	520	NJ			4200	NJ	780	J
Aroclor–1260																

Note: Only detected constituents are shown.
See page 4 for location key.

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TABLE 4–2 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT PESTICIDES/PCBs DATA
(ug/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27, 30, and May 4, 1993

Sample Number	Y2–SD23–02		Y2–SD24–01		Y2–SD25–01		Y2–SD28–01		Y2–SD36–01							
Form I ID	18728		18680		18019		18477		18540							
Dilution Factor	1		1		1		1		20							
% Moisture	81		90		72		63		63							
Location	N.W. No.1		N.W. No.1		N.W. No.1		Ref. AQ		Back. R.R.							
Heptachlor																
Aldrin																
Endosulfan I									2.5	J						
Dieldrin																
4,4'–DDE					3.3	NJ										
Endrin																
4,4'–DDD																
4,4'–DDT					3.8	NJ										
Methoxychlor							3.5	NJ								
Endrin ketone					3.7	J										
Endrin aldehyde	7.3	J														
gamma–Chlordane																
Aroclor–1254																
Aroclor–1260			4000	J												

Note: Only detected constituents are shown.

Location Key:
Ref. W.L. – Reference Wetland
S.W.L. – Southern Wetland
W.W.L. – Western Wetland
N.W. No. 1 – Northwestern Wetland No.1
Ref. AQ – Reference Aquatic Site
Back. R.R. – Background sample along railroad bed.

301757

TABLE 4–3

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Field Sample Number	Y2–SD01–1		Y2–SD01–02		Y2–SD02–01		Y2–SD03–01		Y2–SD04–01		Y2–SD04–02		Y2–SD05–01		Y2–SD05–01	
Form I ID	19015		19023		19007		18973		17969		17977		18345		18353	
% Solids	17.5		21.1		11.1		20.2		50.1		80.4		48.4		48.4	
Location	Ref. W.L.		Ref. W.L.		Ref. W.L.		Ref. W.L.		S.W.L.		S.W.L.		S.W.L.		(Field Dup.)	
Aluminum	2360	J	3310	J	6800	J	3430	J	1300		355		10400	J	12600	J
Arsenic	2.3	J							0.47	J						
Barium	228	J	211	J	272	J	83.9	J					73.2	J	81.9	J
Beryllium																
Cadmium																
Calcium	35400	J	36400	J	42900	J	2620	J	786	J	205	J	1570	J	1720	J
Chromium	6.5	J	7.1	J	9.9	J	5.9	J	1.9	J			12.9	J	15.2	J
Cobalt													3.8	J	3.1	J
Copper	16.3	J	35.4	J	38.9	J	21.0	J								
Iron	6260	J	3770	J	9240	J	1370	J	656		370		7570	J	7950	J
Lead	25.9	J	1.5	J	22.4	J	37.1	J					15.0	J	29.3	J
Magnesium	1930	J	2080	J	2450	J	225	J					1120	J	1390	J
Manganese	168	J	121	J	240	J	24.6	J					49.7	J	47.4	J
Mercury									0.62	J			0.51	J	0.32	J
Nickel			8.9	J	15.9	J	4.7	J	2.1	J	1.5	J	7.6	J	8.6	J
Potassium	105	J	87.7	J	233	J	339	J					649	J	804	J
Selenium			3.1	J												
Silver																
Sodium																
Vanadium													15.2	J	17.5	J
Zinc	R		R		R		R									

Note: Only detected analytes are shown.
See page 9 for location key.

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TABLE 4-3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20-22, 27-29, 30 and May 4, 1993

Field Sample Number	Y2-SD06-01		Y2-SD07-01		Y2-SD08-01		Y2-SD09-01		Y2-SD09-02		Y2-SD10-01		Y2-SD11-01		Y2-SD11-02	
Form I ID	18337		18485		18078		18086		18094		18108		18116		18124	
% Solids	32.3		34.8		22.7		61.4		64.9		16.7		12.8		37.8	
Location	S.W.L.		S.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Aluminum	14700	J	13400	J	11500	J	1830		5160		3910	J	4660	J	4150	J
Arsenic					3.5	J	1.7	J	2.4	J	7.4	J	5.0	J	2.0	J
Barium	168	J	197	J	222	J	1340		297		933	J	138	J	58.8	J
Beryllium																
Cadmium							1.7								1.3	J
Calcium	11100	J	4880	J	44100	J	2510	J	3550	J	16200	J	12400	J	6620	J
Chromium	27.1	J	20.0	J	27.9	J	10.0	J	13.9		9.4	J	8.6	J	10.8	J
Cobalt	5.1	J	7.7	J	9.5	J	1.2	J	3.3	J						
Copper			8.1	J												
Iron	10100	J	19100	J	25200	J	4180		9440		14200	J	4230	J	1800	J
Lead	11.4	J	25.4	J	94.0	J	3580		367		1340	J	138	J	5.8	J
Magnesium	2830	J	3020	J	24800	J	364		2850		1250	J	1270	J	805	J
Manganese	162	J	373	J	266	J	38.8		84.4		627	J	236	J	63.7	J
Mercury	1.6	J					1.4	J			1.7	J			2.5	J
Nickel	10.6	J	11.7	J	21.2	J	5.3	J	8.9		9.8	J	7.6	J	5.6	J
Potassium			729	J	1560	J			646							
Selenium																
Silver																
Sodium							1300	J	777	J	4280	J	3230	J	1190	J
Vanadium	19.7	J	27.4	J	41.8	J			14.8							
Zinc	98.5	J	87.0	J			211		36.8							

Note: Only detected analytes are shown.
See page 9 for location key.

301759

TABLE 4–3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Field Sample Number	Y2–SD12–01		Y2–SD12–02		Y2–SD12–03		Y2–SD13–01		Y2–SD13–02		Y2–SD14–01		Y2–SD14–02		Y2–SD15–01	
Form I ID	18582		18590		18604		18515		18523		18310		18329		18035	
% Solids	18.7		21.4		23.6		33.2		53.2		20.8		47.2		16.3	
Location	W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Aluminum	4390	J	6780	J	6030	J	4960	J	3400		6120	J	9790	J	2640	J
Arsenic							3.4	J	3.7	J					4.7	J
Barium	164	J	97.0	J	72.9	J	330	J	145		91.9	J	118	J	66.8	J
Beryllium													0.53	J		
Cadmium																
Calcium	8740	J	10200	J	10000	J	12300	J	8050		17100	J	11600	J	20600	J
Chromium	9.9	J	13.1	J	11.5	J	11.4	J	6.7	J	14.7	J	17.0	J		
Cobalt					3.3	J	4.3	J	2.5	J			1.9	J		
Copper	17.9	J	21.3	J	21.1	J	15.5	J	9.2				23.5	J		
Iron	5310	J	6380	J	5960	J	15200	J	4660		4000	J	3500	J	3580	J
Lead	149	J	19.3	J	10.3	J	295	J	73.8		15.2	J	6.6	J	25.8	J
Magnesium	1610	J	1930	J	1470	J	1720	J	1070		2210	J	1920	J	2140	J
Manganese	142	J	148	J	155	J	574	J	335		137	J	64.4	J	383	J
Mercury							0.39	J	0.19		1.3	J	1.1	J	1.1	J
Nickel	6.1	J	7.7	J	5.7	J	9.9	J	5.3	J	9.2	J	6.3	J		
Potassium	486	J	383	J	308	J										
Selenium					0.95	J			0.97	J	1.1	J	1.4	J		
Silver																
Sodium																
Vanadium							20.4	J	13.0		8.2	J	6.5	J		
Zinc	110	J	76.4	J	64.2	J	101	J	70.7		86.5	J				

Note: Only detected analytes are shown.
See page 9 for location key.

301760

TABLE 4–3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Field Sample Number	Y2–SD15–02		Y2–SD16–01		Y2–SD16–02		Y2–SD17–01		Y2–SD17–02		Y2–SD18–01		Y2–SD19–01		Y2–SD19–02	
Form I ID	18043		18230		18264		18299		18302		17985		17993		18051	
% Solids	36.5		26.8		32.6		43.4		50.7		66.5		28.1		48.3	
Location	W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Aluminum	2430	J	4710	J	5900	J	4210	J	4680		1450		1450	J	1630	J
Arsenic	1.8	J	4.0	J	3.4	J					0.49	J	6.3	J	2.8	J
Barium	39.2	J	76.9	J	72.6	J	68.3	J	52.4		63.1		1160	J	424	J
Beryllium																
Cadmium													1.2	J		
Calcium	9830	J	13300	J	9620	J	15100	J	9960		1350	J	5390	J	2660	J
Chromium	5.3	J	11.6	J	11.6	J	7.2	J	7.6	J	2.5	J	7.3	J	4.9	J
Cobalt							1.6	J	2.0	J						
Copper											4.8	J	28.9	J		
Iron	2540	J	7040	J	6490	J	4040	J	4020		4280		20900	J	3220	J
Lead	6.2	J	20.2	J	11.8	J	9.6	J	7.2		94.3		2270	J	387	J
Magnesium	1250	J	1780	J	1450	J	1680	J	1370		431		615	J	365	J
Manganese	207	J	384	J	314	J	282	J	101		31.9		131	J	28.0	J
Mercury	R				0.51	J	0.36	J							R	
Nickel	3.6	J	9.0	J	6.5	J	3.7	J	3.9	J	3.2	J	9.4	J	4.3	J
Potassium																
Selenium					0.91	J										
Silver																
Sodium																
Vanadium							7.0	J	8.6							
Zinc													219	J		

Note: Only detected analytes are shown.
See page 9 for location key.

301761

TABLE 4-3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20-22, 27-29, 30 and May 4, 1993

Field Sample Number	Y2-SD19-03		Y2-SD20-01		Y2-SD20-02		Y2-SD21-01		Y2-SD21-02		Y2-SD21-02		Y2-SD22-01		Y2-SD22-02	
Form I ID	18060		18930		18949		18000		18272		18272		18493		18507	
% Solids	83.8		25.2		45.9		25.5		43.6		43.6		40.9		58.8	
Location	W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.		W.W.L.	
Aluminum	1960		4750	J	6840	J	1510	J	6480	J	6480	J	3490	J	4260	
Arsenic	0.99	J	2.2	J			1.8	J	6.2	J	6.2	J			1.4	J
Barium	54.6		106	J	105	J	52.6	J	70.0	J	70.0	J	319	J	81.6	
Beryllium																
Cadmium																
Calcium	7890	J	28600	J	14200	J	5070	J	6690	J	6690	J	9800	J	11300	
Chromium	4.4	J	9.5	J	12.9	J	6.0	J	14.1	J	14.1	J	9.1	J	9.2	J
Cobalt	1.5	J			1.5	J			4.0	J	4.0	J	2.8	J	3.1	J
Copper	5	U	22.1	J	26.0	J	6.1	J					15.8	J	11.9	
Iron	4510		4650	J	3740	J	1700	J	24000	J	24000	J	6720	J	5440	
Lead	26.1		21.4	J	7.8	J	1800	J	62.4	J	62.4	J	2430	J	16.7	
Magnesium	4210		3050	J	2370	J	595	J	1260	J	1260	J	1320	J	1640	
Manganese	58.0		221	J	44.8	J	142	J	277	J	277	J	581	J	403	
Mercury							0.47	J							0.18	
Nickel	3.7	J	7.8	J	6.6	J	4.6	J	4.5	J	4.5	J	4.9	J	6.2	J
Potassium			366	J	351	J										
Selenium			1.80	J	0.93	J			0.57	J	0.57	J	0.80	J	0.47	J
Silver									1.9	J	1.9	J				
Sodium																
Vanadium									42.0	J	42.0	J	11.5	J	18.5	
Zinc			R		R								90.3	J	75.1	

Note: Only detected analytes are shown.
See page 9 for location key.

301762

TABLE 4–3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Field Sample Number	Y2–SD23–01		Y2–SD23–02		Y2–SD24–01		Y2–SD25–01		Y2–SD26–01		Y2–SD26–02		Y2–SD27–01		Y2–SD27–01	
Form I ID	18710		18728		18680		18019		18868		18876		18957		18965	
% Solids	18.0		19.3		9.7		28.4		42.8		65.1		13.2		12.2	
Location	N.W. No. 1		N.W. No. 1		N.W. No. 1		N.W. No. 1		N.W. No. 2		N.W. No. 2		N.W. No. 2		(Field Dup.)	
Aluminum	3780	J	4250	J	1950	J	2790	J	7240	J	8330		1680	J	1830	J
Arsenic							2.5	J			3.4					
Barium	325	J	234	J	449	J	59.9	J	118	J	118		103	J	123	J
Beryllium																
Cadmium																
Calcium	35000	J	48600	J	27900	J	5140	J	6760	J	6930		27900	J	34800	J
Chromium	11.3	J	10.6	J			5.7	J	11.7	J	13.2					
Cobalt	7.7	J	3.5	J	9.6	J			4.2	J	5.6					
Copper	55.4	J	48.6	J	23.9	J	4.1	J	11.3	J	12.7		21.8	J	23.9	J
Iron	11700	J	8750	J	29500	J	11300	J	10200	J	12600		7800	J	8120	J
Lead	408	J	30.1	J	142	J	19.0	J	18.7	J	15.2	J	11.5	J	15.2	J
Magnesium	4040	J	4910	J	2490	J	958	J	1920	J	2110		2820	J	3600	J
Manganese	1760	J	775	J	6950	J	574	J	643	J	493		289	J	340	J
Mercury																
Nickel	14.3	J	14.3	J			3.5	J	5.8	J	7.1		14.4	J	8.4	J
Potassium	816	J	470	J	423	J			511	J	581		201	J	153	J
Selenium	1.7	J											1.6	J	1.7	J
Silver																
Sodium	1190	J	1300	J							265					
Vanadium	21.0	J	18.7	J					15.5	J	18.0					
Zinc	233	J	139	J	211	J			83.6	J	84.1	J	R		R	

Note: Only detected analytes are shown.
See page 9 for location key.

301763

TABLE 4–3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Field Sample Number	Y2–SD28–01		Y2–SD29–01		Y2–SD30–01		Y2–SD31–01		Y2–SD32–01		Y2–SD33–01		Y2–SD34–01		Y2–SD35–01	
Form I ID	18477		18027		18736		18531		18850		18841		18744		18752	
% Solids	37.2		65.2		54.9		72.7		57.4		64.9		49.5		52.1	
Location	Ref. AQ		Ref. AQ		Adj. AQ		Adj. AQ		AQ W.B.		AQ W.B.		AQ D.R.		AQ D.R.	
Aluminum	11000	J	3130		9850		4860		6800		3050		7600	J	8090	
Arsenic			1.1	J			0.42	J								
Barium	144	J	37.4		123		64.1		76.4		37.3		91.5	J	112	
Beryllium															0.37	J
Cadmium																
Calcium	5890	J	1380	J	6850		4260		8090		5530		3530	J	5420	
Chromium	17.5	J	6.4	J	17.4		9.3	J	12.8	J	5.7	J	14.5	J	15.2	
Cobalt	7.3	J	1.8	J	7.2		4.5		4.9	J	2.7	J	5.8	J	6.5	
Copper	10.4	J	2.9	J	11.1		5.5		7.5		4.1	J	8.5	J	8.9	
Iron	17000	J	5120		14700		7630		10700		6540		12200	J	13300	
Lead	16.9	J	7.1		9.8	J	4.9		11.2	J	4.3	J	6.8	J	4.7	J
Magnesium	2900	J	836		4030		2130		5000		2930		2630	J	3520	
Manganese	810	J	170		341		197		270		207		414	J	355	
Mercury	0.31	J	0.25	J												
Nickel	11.4	J	4.4	J	12.2		6.6		8.8		4.1	J	9.5	J	9.9	
Potassium	958	J			1140		543		953		425		775	J	973	J
Selenium																
Silver													1.3	J		
Sodium																
Vanadium	21.6	J			20.7		10.7		15.7		8.2		18.5	J	18.0	
Zinc	83.7	J			74.9	J	41.1		49.3	J	54.5	J	54.5	J	69.0	J

Note: Only detected analytes are shown.
See page 9 for location key.

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TABLE 4-3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Sampling Dates: April 20-22, 27-29, 30 and May 4, 1993

Field Sample Number	Y2-SD36-01		Y2-SD36-01		Y2-SDDI-02		Y2-SDDI-03		Y2-SDDI-04		Y2-SDDI-05		Y2-SDDI-06		Y2-SDDI-07	
Form I ID	18540		18574		17942		17950		18132		18363		18612		18760	
% Solids	36.9		29.4		Rinse Blank		Rinse Blank		Rinse Blank		Rinse Blank		Rinse Blank		Rinse Blank	
Location	Back. R.R.		(Field Dup.)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	
Aluminum	6180	J	13300	J												
Arsenic	9.9	J	16.8	J												
Barium	172	J	336	J												
Beryllium																
Cadmium							2.1									
Calcium	9950	J	19600	J												
Chromium	11.1	J	22.2	J												
Cobalt	16.6	J	29.9	J												
Copper	51.6	J	104	J					22.7		5.1	J				
Iron	29100	J	51800	J	61.3		86.2		59.9		165		250		43.1	J
Lead	158	J	268	J	1.9	J	1.3	J	2.5		1.0	J				
Magnesium	1080	J	2280	J	43.3	J	44.6	J	45.2	J	57.2	J	48.0	J	44.4	J
Manganese	4450	J	7840	J	14.8		7.2		5.6		4.1	J	3.8	J	3.3	J
Mercury																
Nickel	13.4	J	24.6	J												
Potassium			1230	J			96.8	J	136	J	129	J				
Selenium	1.1	J	0.91	J					1.3	J						
Silver	2.1	J	5.1	J												
Sodium																
Vanadium	19.7	J	38.9	J												
Zinc	213	J	393	J												

Note: Only detected analytes are shown.
See page 9 for location key.

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TABLE 4–3 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS DATA
(mg/Kg except where otherwise noted)

Field Sample Number	Y2–SDDI–08		Y2–SDDI–09			
Form I ID	18884		19031			
% Solids	Rinse Blank		Rinse Blank			
Location	(ug/L)		(ug/L)			
Aluminum			14.2	J		
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium			112	J		
Chromium						
Cobalt						
Copper						
Iron	208		44.9			
Lead						
Magnesium	94.1	J				
Manganese	4.8	J	1.7	J		
Mercury						
Nickel						
Potassium	100	J				
Selenium						
Silver						
Sodium			179	J		
Vanadium						
Zinc						

Sampling Dates: April 20–22, 27–29, 30 and May 4, 1993

Location Key:

Ref. W.L. – Reference Wetland
S.W.L. – Southern Wetland
W.W.L. – Western Wetland
N.W. No. 1 – Northwest Wetland No. 1
N.W. No. 2 – Northwest Wetland No. 2
Ref. AQ – Reference Aquatic Site
Adj. AQ – Adjacent Aquatic Site
AQ W.B. – Aquatic Site at wetland boundary
AQ D.R. – Aquatic Site at junction with Deer River
Back. R.R. – Background sample along railroad bed

Note: Only detected analytes are shown.
See page 9 for location key.

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TABLE 4-3A

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SEDIMENT INORGANICS RESAMPLE DATA
(mg/Kg, except where otherwise noted)

Sampling Dates: October 21-22, 1993

Sample Number	Y2-SD01-01		Y2-SD01-02		Y2-SD02-01		Y2-SD03-01		Y2-SD27-01		Y2-SDDI-14		Y2-SDDI-15	
Form I ID	SD0101		SD0102		SD0201		SD0301		SD2701		SDDI14		SDDI15	
Lab ID	38097-013		38097-014		38097-015		38097-012		38111-005		38097-016		38111-006	
% Solids	15.5		24.1		12.6		25.1		6.6		RB: ug/L		RB: ug/L	
Zinc							30.7	J	279	J				

RB = Rinse Blank
Note: Only detected analytes are shown.
Table presents resample data for zinc at select sediment locations, due to rejection of earlier zinc data during validation.

TABLE 4–4

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF PREVIOUS PCB DATA

SAMPLE LOCATION	DEPTH (FT.)	CONCENTRATION (mg/kg) 1248	1254	1260	TOTAL
Z1–T1A	0.0	30.5	ND	4.3	34.8
Z1–T1A	1.0	5.7	ND	1.4	7.1
Z1–T1–2	0.0	5.6	ND	ND	5.6
Z1–T2–2	0.0	ND	7.7	ND	7.7
Z1–T2A	0.0	85	ND	11	96
Z1–T2A	1.0	0.2	ND	0.14	0.34
Z1–T2A	1.0	0.23	ND	0.23	0.46
Z1–T3–1	0.0	ND	ND	ND	ND
Z1–T3–1	0.0	ND	ND	ND	ND
Z1–T3–2	0.0	ND	50	ND	50
Z1–T3–3	0.0	0.062	ND	ND	0.062
Z1–T3–3	0.0	0.086	ND	ND	0.086
Z2–T1–1	0.0	ND	15.0	ND	15
Z2–T1–3	0.0	210	ND	ND	210
Z2–T1–3	1.5	21.5	ND	1.7	23.2
Z2–T2–1	0.0	ND	ND	ND	ND
Z2–T2–5	0.0	ND	5.3	ND	5.3
Z2–T3–2	0.0	ND	3.4	ND	3.4
Z2–T3–3	0.0	ND	ND	1.8	1.8
Z2–T3–3	0.0	ND	ND	2.0	2.0
Z2–T3–5	0.0	0.73	ND	0.25	0.98
Z3–1	0.0	ND	6.4	ND	6.4
Z3–5	0.0	ND	0.54	ND	0.54
Z3–7	0.0	ND	0.37	ND	0.37
Z3–8	0.0	ND	0.085	ND	0.085
Z4–1	0.0	ND	ND	ND	ND
Z4–3	0.0	0.066	ND	0.027	0.093
Z4–6	0.0	0.024	ND	ND	0.024

Notes:

DUP = Duplicate Sample.
ND = Not Detected.
Z Series samples collected December 1984 and April 1985.

Source: Erdman, Anthony, Associates; November 1987; Addendum Feasibility Study
York Oil Superfund Site

TABLE 4–4 (cont'd.)

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF PREVIOUS PCB DATA

SAMPLE LOCATION	DEPTH (FT.)	CONCENTRATION (mg/kg) 1248	1254	1260	TOTAL
SED1 S–1	0.0 to 0.5	ND	ND	--	ND
SED1 S–2	0.5 to 1.0	ND	ND	--	ND
SED1 S–2	0.5 to 1.0	ND	ND	--	ND
SED1A	0.0 to 1.0	54	28	--	82
SED2 S–1	0.0 to 1.0 Top	ND	ND	--	ND
SED2 S–1	0.0 to 1.0 Bottom	BDL	ND	--	ND
SED2 S–1	1.0 to 2.3 Bottom	0.58 J	ND	--	ND
SED2 S–2	1.0 to 2.3 Top	ND	ND	--	ND
SED2A	0.0 to 1.0	6	5	--	11
SED3 S–1	0.0 to 1.0 Top	5.0	ND	--	5
SED3 S–1	0.0 to 1.0 Bottom	ND	ND	--	ND
SED3 S–1	0.0 to 1.0 Bottom	1.6	ND	--	1.6
SED3A	0.0 to 1.0	26	17	--	43
SED3A	0.0 to 1.0	32	ND	--	32
SED4 S–1	0.0 to 1.0	ND	ND	--	ND
SED5 S–1	0.0 to 1.0 Bottom	6.9	ND	--	6.9
SED5 S–1	0.0 to 1.0 Top	36	ND	--	36
SED6 S–1	0.0 to 0.7	120	ND	--	120
SED6 S–2	0.7 to 1.7	ND	ND	--	ND
SED6 S–2	0.7 to 1.7	0.062	ND	--	0.062
SED7 S–1	0.0 to 0.7	42	ND	--	42
SED7 S–1	0.0 to 0.7	54	ND	--	54
SED7 S–2	0.7 to 1.0	9.2	ND	--	9.2
SED8 S–1	0.0 to 0.1	ND	ND	--	ND
SED8 S–2	0.8 to 1.0	5	ND	--	5
SED9 S–1	0.0 to 0.7 top	BDL	ND	--	ND
SED9 S–1	0.0 to 0.7 bottom	ND	ND	--	ND
SED9 S–2	0.7 to 1.3 top	ND	ND	--	ND
SED9 S–2	0.7 to 1.3 bottom	BDL	ND	--	ND
SED10 S–2	0.7 to 1.3	ND	ND	--	ND
SED10 S–2	0.7 to 1.3	ND	ND	--	ND

Notes:

-- = No reported results.
DUP = Duplicate Sample.
ND = Not Detected.
BDL = Possibly detected below detection limits.
J = Indicates compound found below working detection limit.
Samples SED1 through SED10 collected May 12 – 15, 1993.

Source: Erdman, Anthony, Associates; November 1987; Addendum Feasibility Study York Oil Superfund Site

TABLE 4–5

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF PREVIOUS SELECT PRIORITY METALS TEST DATA

SAMPLE NUMBER	DEPTH (FT.)	CADMIUM mg/kg	CHROMIUM mg/kg	COPPER mg/kg	LEAD mg/kg	ZINC mg/kg
SED3–S1	0.3–0.5	ND	4.3	5.7	71	19
SED8	0–1.0	ND	7.5	33	837	291
SED7	0.8–1.0	ND	6.3	8.5	20	24
SED5–S1	0–1.0	ND	11	27	8380	101
SED1	0–0.5	ND	14	19	509	64
SED6	0–0.7 Top	ND	3.7	40	68	26
SED6	0–0.7 Bottom	1.4	5.4	13	37	209
Z1–PPI	Surface	--	11	11	640	41

Notes:

DUP = Duplicate Sample.
ND = Not Detected.
Z Series samples collected December 1984 and April 1985
SED Series samples collected May 12 – 15, 1987.

Source: Erdman, Anthony, Associates; November 1987; Addendum Feasibility Study
York Oil Superfund Site

TABLE 4–6

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL PESTICIDES/PCBS DATA
(ug/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Sample Number	Y2–SS01–01		Y2–SS04–01		Y2–SS05–01		Y2–SS06–01		Y2–SS07–01		Y2–SS08–01		Y2–SS10–01		Y2–SS11–01	
Form I ID	20501		20005		19996		20021		20030		20048		19953		20595	
Dilution Factor	1		1		1		1		1		1		10		1	
% Moisture	64		20		15		34		18		28		22		38	
alpha–BHC																
delta–BHC													9.2	J		
gamma–BHC (Lindane)															0.51	J
Aldrin																
Heptachlor Epoxide																
4,4'–DDE											0.68	J			0.93	J
4,4'–DDD			1.3	J	2.1	J										
Endosulfan Sulfate																
4,4'–DDT							2.6	NJ			1.1	NJ				
Methoxychlor									2.8	J						
Endrin ketone			3.5	NJ	4.9	NJ	8.4	NJ								
gamma–Chlordane	3.4	J														
Aroclor–1260																

Note: Only detected constituent compounds are shown.

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TABLE 4–6 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL PESTICIDES/PCBS DATA
(ug/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Sample Number	Y2–SS12–01		Y2–SS12–01DL		Y2–SS13–01		Y2–SS14–01		Y2–SS15–01		Y2–SS15–01		Y2–SS16–01		Y2–SS17–01	
Form I ID	20650		20650		19661		20510		20498		20579		19945		20609	
Dilution Factor	1		10		2		1		10		10		2		1	
% Moisture	18		18		19		26		30		31		24		30	
											Field Dup.					
alpha–BHC																
delta–BHC	4.7	J											2.6	NJ		
gamma–BHC (Lindane)																
Aldrin													3.8	NJ		
Heptachlor Epoxide	4.7	J	5.5	J												
4,4'–DDE																
4,4'–DDD	12	NJ	14	NJ					25	J	31	J				
Endosulfan Sulfate																
4,4'–DDT							1.2	NJ					3.0	NJ		
Methoxychlor	170	J	190	NJ	22	NJ	10	J	290	J	290	J	84	J		
Endrin ketone													18	NJ	1.4	J
gamma–Chlordane																
Aroclor–1260																

Note: Only detected constituent compounds are shown.

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TABLE 4–6 (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL PESTICIDES/PCBS DATA
(ug/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Sample Number	Y2–SS18–01		Y2–SS19–01		Y2–SS21–01		Y2–SS23–01							
Form I ID	20617		20528		20560		20013							
Dilution Factor	1		1		1		1							
% Moisture	58		77		52		29							
alpha–BHC					0.27	J								
delta–BHC							1.0	NJ						
gamma–BHC (Lindane)														
Aldrin														
Heptachlor Epoxide					0.78	NJ								
4,4'–DDE	0.94	NJ												
4,4'–DDD														
Endosulfan Sulfate							0.55	NJ						
4,4'–DDT														
Methoxychlor														
Endrin ketone														
gamma–Chlordane														
Aroclor–1260			1000	J										

Note: Only detected constituent compounds are shown.

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TABLE 4-7

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL INORGANICS DATA
(mg/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Field Sample Number	Y2-SS01-01		Y2-SS02-01		Y2-SS03-01		Y2-SS04-01		Y2-SS05-01		Y2-SS06-01		Y2-SS07-01		Y2-SS08-01	
Form I ID	20501		20633		19988		20005		19996		20021		20030		20048	
% Solids	35.9		65.5		71.3		79.7		84.6		66.0		81.7		72.4	
Aluminum	1990	J	929	J	2630		9340		6240		4080		6050		1780	J
Antimony																
Arsenic	1.2	J			9.2		5.10		10.0		15.1		2.5		0.72	J
Barium	13.4	J	15.7	J	47.5		86.3		134		105		49.2		11.0	J
Calcium	500	J	567	J	2690	J	3530	J	7790	J	3050	J	1570	J	423	J
Chromium			2.0	J	7.6		16.6		13.0		12.7		6.8		3.1	J
Cobalt			1.2	J	4.7		7.5		6.7		5.7		3.4	J	1.3	J
Copper	3.5	J	22.5	J	60.5		29.0		57.2		204		7.6		1.8	J
Iron	3910	J	10700	J	22100		20500		26600		13800		10800		3290	J
Lead					125		58.6		200		233		40.7			
Magnesium	357	J	129	J	546		2540		4110		1020		1020		316	J
Manganese	195	J	44.9	J	183	J	439	J	387	J	188	J	236	J	168	J
Mercury									0.53	J						
Nickel					10.0		16.1		15.3		11.9		6.7			
Potassium	138	J	127	J	380		1010		673		564		374		112	J
Selenium					0.55	J	0.23	J	0.35	J	1.0	J				
Silver	1.8	J	0.93	J	2.1	J	1.5	J	1.7	J						
Sodium																
Vanadium	6.1	J	5.4	J	10.9		26.1		20.5		16.3		14.2		4.9	J
Zinc	35.4	J	16.7	J											12.2	J

Note: Only detected analytes are shown.

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TABLE 4-7 (Cont'd.)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL INORGANICS DATA
(mg/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Field Sample Number	Y2-SS09-01		Y2-SS10-01		Y2-SS11-01		Y2-SS12-01		Y2-SS13-01		Y2-SS14-01		Y2-SS15-01		Y2-SS15-01	
Form I ID	19937		19953		20595		20650		19961		20510		20498		20579	
% Solids	66.8		78.5		62.1		82.3		81.0		74.0		70.5		68.7	
															Field Dup.	
Aluminum	5270		4090		1760	J			12000.0		1390	J	7340	J	320	J
Antimony																
Arsenic	1.9	J	12.8						5.6		0.75	J				
Barium	43.6		66.8		34.7	J			152.0		8.8	J	47.5	J	6.1	J
Calcium	2990	J	2040	J	768	J			136000	J	340	J				
Chromium	8.3		16.7		5.7	J			19.2		3.4	J				
Cobalt	2.8	J	7.4		2.1	J			11.2							
Copper	3.5	J	100		62.8	J	3.2	J	44.4		1.6	J	5.8	J	5.7	J
Iron	10400		35600		16000	J	913	J	34600		2620	J	15400	J	2370	J
Lead			170						267							
Magnesium	708		775		167	J			46500.0		251	J				
Manganese	452	J	196	J	68.0	J			1270	J	133	J	1030	J	11.1	J
Mercury																
Nickel	4.2	J	17.5						20.8							
Potassium	152		447		278	J	39.1	J	1610		95	J	310	J	55.1	J
Selenium	0.43	J	0.76	J												
Silver			3.5		1.5	J			0.79	J						
Sodium									887							
Vanadium	15.6		21.2		7.5	J	0.84	J	37.5		4.0	J	21.1	J	1.6	J
Zinc					11.2	J					28.5	J				

Note: Only detected analytes are shown.

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TABLE 4-7 (Cont'd.)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL INORGANICS DATA
(mg/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Field Sample Number	Y2-SS16-01		Y2-SS17-01		Y2-SS18-01		Y2-SS19-01		Y2-SS20-01		Y2-SS20-01		Y2-SS21-01		Y2-SS22-01	
Form I ID	19945		20609		20617		20528		20552		20587		20560		20625	
% Solids	76.4		69.8		42.0		22.9		76.7		76.6		48.1		45.3	
											Field Dup.					
Aluminum	2490		523	J	1050	J	8070	J	908	J	544	J	3910	J	1700	J
Antimony																
Arsenic	7.4															
Barium	38.5		10.3	J	18.7	J	53.8	J	6.0	J	11.2	J	25.9	J	36.0	J
Calcium	1270	J	452	J	821	J	2160	J	223	J	429	J	960	J	1430	J
Chromium	5.8		4.9	J	7.7	J							7.5	J	3.5	J
Cobalt	2.9	J			1.5	J							2.6	J	3.0	J
Copper	32.3		13.7	J	22.9	J	7.9	J	1.1	J	13.4	J	4.6	J	42.0	J
Iron	12400		5720	J	12400	J	15100	J	1730	J	5390	J	7910	J	16200	J
Lead	171															
Magnesium	795		104	J	166	J	1530	J	174	J	88.4	J	715	J	252	J
Manganese	118	J	46.9	J	48.7	J			91.4	J	27.6	J	409	J	97.7	J
Mercury																
Nickel	6.8															
Potassium	251		110	J	163	J	514	J	68.2	J	106	J	201	J	308	J
Selenium	0.44	J														
Silver			0.78	J									1.2	J	1.4	J
Sodium																
Vanadium	9.4		4.0	J	5.9	J	23.0	J	2.5	J	4.0	J	11.8	J	11.8	J
Zinc			14.2	J			30.7	J							68.7	J

Note: Only detected analytes are shown.

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TABLE 4–7 (Cont'd.)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL INORGANICS DATA

(mg/Kg, except where otherwise noted)

Sampling Dates: April 30 and May 4 and 5, 1993

Field Sample Number	Y2–SS23–01		Y2–SS24–01		Y2–SSDI–10		Y2–SSDI–11									
Form I ID	20013		19970		20056		20641									
% Solids	70.9		61.9		Rinse Blank		Rinse Blank									
					ug/L		ug/L									
Aluminum	8370		8800				12.5	J								
Antimony							20.4	J								
Arsenic	2.7		5.4													
Barium	62.6		72.0													
Calcium	7920	J	3430	J	131		79.4									
Chromium	15.2		15.1													
Cobalt	8.1		5.9													
Copper	19.5		9.9													
Iron	15100		19500		119		14.6	J								
Lead	61.8		38.6													
Magnesium	4840		1390													
Manganese	533	J	1670	J	1.6	J	3.2									
Mercury																
Nickel	13.9		10.1													
Potassium	1000		436													
Selenium																
Silver	0.99	J	1.2	J												
Sodium					247		183									
Vanadium	18.1		28.6													
Zinc																

Note: Only detected analytes are shown.

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TABLE 4-7A (Cont'd)

INTERIM ECOLOGICAL REPORT
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION
YORK OIL SUPERFUND SITE

SUMMARY OF SURFACE SOIL INORGANICS RESAMPLE DATA
(mg/Kg, except where otherwise noted)

Sampling Dates: October 19-20, 1993

Sample Number	Y2-SS13-01		Y2-SS16-01		Y2-SS23-01		Y2-SS24-01		Y2-SS07-01		Y2-SD20-01		Y2-SD20-02		Y2-SSDI-12		Y2-SDDI-13	
Form I ID	SS1301		SS1601		SS2301		SS2401		MMSSD7		SD2001		SD2002		SSDI12		SDDI13	
Lab ID	38050-010		38050-006		38050-009		38050-003		38050-013		38068-013		38068-014		38050-001		38068-015	
% Solids	84.3		73.8		68.4		79.9		80.4		15.3		55.3					
									Field Dup.						RB: ug/L		RB: ug/L	
Zinc	144	J	17.2	J	136	J	30.0	J	24.9	J	58.60	J	12.60	J	20	U	20	U

RB - Rinse Blank
Note: Table presents resample data for zinc at select sediment locations due to rejection of earlier data during validation.

TABLE 5–1

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

DAILY CATCH RESULTS OF THE WETLAND VERTEBRATE SURVEY[1]
REFERENCE WETLAND

Collection Date	Species	Length (mm)	Weight (grams)	Reproductive Condition	Condition
6/21 pm	No Captures				
6/22 am	Star–nosed mole	164	43.0	F	NM (dead)
	Star–nosed mole	163	41.0	M	NM (dead)
	Masked shrew	109	10.0	M	NM (dead)
	Masked shrew	112	12.0	M	NM (dead)
	Masked shrew	94	4.9	M	NM (dead)
	Masked shrew	102	6.9	F	NM (dead)
	Masked shrew	104	6.0	F	NM (dead)
	Masked shrew	103	6.0	F	NM (dead)
	Masked shrew	79	3.1	I	NM (dead)
	Masked shrew	80	3.2	I	NM (dead)
	Red–backed vole	100	12.5	F	NM (dead)
6/22 pm	Masked shrew	81	4.7	F	NM (dead)
6/23 am	Masked shrew	88	4.4	F	NM (escapes)
	Masked shrew	–	–	F	NM (dead, partially eaten)
	Masked shrew	82	3.3	F	NM (dead)
6/23 pm	No Captures				
6/24 am	Masked shrew	79	4.0	F	NM (dead)
	Masked shrew	105	8.9	M	NM (dead)
6/24 pm	Masked shrew	92	5.0	M	NM (dead)
6/25 am	Masked shrew	–	–	–	NM (escaped)
	Masked shrew	88	3.8	F	NM (clipped left rear toe)
	Masked shrew	–	–	–	NM (dead, partially eaten)
6/25 pm	Masked shrew	88	4.0	M	NM (dead)

Notes:

1 Samples were collected with a 100' drift fence and pitfall traps.
NM No Marks
F Female
M Male
I Immature

TABLE 5–2

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

DAILY CATCH RESULTS OF THE WETLAND VERTEBRATE SURVEY[1]
WESTERN WETLAND

Collection Date	Species	Length (mm)	Weight (grams)	Reproductive Condition	Condition
6/21 pm	No Captures				
6/22 am	No Captures				
6/22 pm	Masked shrew	105	6.0	M	NM (dead)
	Masked shrew	93	6.0	M	NM (dead)
	Masked shrew	89	5.2	M	NM (dead)
	Masked shrew	91	5.2	F	NM (dead)
	Masked shrew	89	4.2	F	NM (dead)
	Masked shrew	88	3.9	F	NM (dead)
	Masked shrew	90	5.3	F	NM (dead)
	Masked shrew	85	–	F	NM (dead, partially eaten)
6/23 am	Masked shrew	80	–	M	NM (dead, partially eaten)
	Masked shrew	74	3.1	M	NM (clipped left, rear toe)
6/23 pm	No Captures				
6/24 am	No Captures				
6/24 pm	No Captures				
6/25 am	Meadow vole	125	20.0	M	NM (clipped left rear toe)
6/25 pm	No Captures				

Notes:

1 Samples were collected with a 100' drift fence and pitfall traps.
NM No Marks
F Female
M Male
I Immature

TABLE 5–3

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

DAILY CATCH RESULTS OF THE WETLAND VERTEBRATE SURVEY[1]
SOUTHERN WETLAND

Collection Date	Species	Length (mm)	Weight (grams)	Reproductive Condition	Condition
6/22 pm	No Captures				
6/22 am	Star–nosed mole	190	6.0	F	NM (dead)
	Masked shrew	85	3.0	I	NM (dead)
	Masked shrew	80	3.1	I	NM (dead)
6/22 pm	No Captures				
6/23 am	Masked shrew	–	–	–	NM (escaped)
	Masked shrew	89	4.6	F	NM (dead)
	Masked shrew	84	–	F	NM (dead, partially eaten)
6/23 pm	Red–backed vole	145	–	F	NM (escaped)
6/24 am	Masked shrew	88	3.1	F	NM (dead)
6/24 pm	No Captures				
6/25 am	Masked shrew	81	3.8	M	NM (dead)
	Wood frog	31	2.2	I	NM (dead)
6/25 pm	No Captures				

Notes:

1 Samples were collected with a 100' drift fence and pitfall traps.
NM No Marks
F Female
M Male
I Immature

TABLE 5–4

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF SMALL MAMMALS COLLECTED DURING THE WETLAND VERTEBRATE SURVEY

Species	Average Length (mm)	Average Weight (grams)	Total Number of Individuals	Percent of Total Capture
Reference Wetland				
Masked shrew	93	5.6	19	86
Star–nosed mole	164	42	2	9
Red–backed vole	100	12.5	1	5
Western Wetland				
Masked shrew	88	4.9	10	91
Meadow vole	125	20	1	9
Southern Wetland				
Masked shrew	85	3.5	7	78
Star–nosed mole	190	6.0	1	11
Red–backed vole	145	NA	1	11

Notes:

NA Not available

TABLE 5–5

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF SOIL MACROINVERTEBRATE SPECIES IDENTIFIED
DURING THE WETLAND FAUNA SURVEY

Species	Reference Wetland S–1	Reference Wetland S–2	Western Wetland S–1	Western Wetland S–2	Southern Wetland S–1	Southern Wetland S–2
Nematoda	1	4	0	0	0	0
Oligochaeta						
Enchraeidae	1	2	0	1	1	0
Lumbricidae	0	2	0	0	2	2
Diplopoda						
Spirobolidae	2	0	0	1	1	1
Gastropoda						
Haplotrematidae	1	0	0	0	0	0
Arionidae	0	0	0	1	0	0
Insecta						
Coleoptera						
Carabidae	0	0	0	1	1	1
Curculionidae	0	0	0	0	0	1
pupae, unknown	0	0	0	0	0	1
Collembola						
Onychiuridae	1	0	0	0	0	0
Diptera						
Chironomidae	0	0	4	0	1	0
Dolichopodae	2	2	4	0	0	0
Rhagionidae	1	0	0	0	0	0
Tabanidae	2	0	44	0	0	1
Tipulidae	0	0	0	0	0	0
apterous adult, unknown	0	0	0	0	0	1
pupae, unknown	0	1	0	0	0	1
Hymenoptera						
Formicidae	0	0	0	1	0	1
TOTAL	11	11	52	5	6	10

Notes:

[1] Organisms were collected from 2780 cubic centimeters of soil. Sampling was conducted from June 22 to July 8.

TABLE 5–6

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF FISH SPECIES IDENTIFIED DURING THE AQUATIC FAUNA SURVEY[1]

Species	Number of Individuals					
	Reference Aquatic Site			Adjacent Aquatic Site		
	Pass 1	Pass 2	Total	Pass 1	Pass 2	Total
Brown trout	2	0	2	1	0	1
Smallmouth bass	0	0	0	3	2	5
Rockbass	4	4	8	1	0	1
Yellow bullhead	0	0	0	1	0	1
White sucker	65	29	94	8	8	16
Northern hogsucker	0	0	0	4	0	4
Spottail shiner	60	19	79	3	0	3
Brassy minnow	17	11	28	1	0	1
Golden shiner	26	2	28	4	0	4
Cutlips minnow	37	23	60	12	3	15
Eastern blacknose dace	8	2	10	3	0	3
Longnose dace	0	0	0	35	32	67
Northern redbelly dace	24	7	31	1	0	1
Finescale dace	41	25	66	0	0	0
Greenside darter	6	1	7	1	0	1
Fantail darter	24	10	34	120	62	182
Johnny darter	14	2	16	0	1	1
Tesselated darter	3	0	3	0	0	0
Eastern mudminnow	0	0	0	13	5	18
Common shiner	175	34	209	9	12	21
Creek chub	21	20	41	1	1	2
Brook lamprey	12	30	42	7	7	14
5–Spine stickleback	6	6	12	6	1	7
TOTAL:	545	225	770	234	134	368

Notes:

[1] Fish were collected with a backpack electrofishing unit. Sampling was conducted from May 19–20, 19

TABLE 5-7

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF BENTHIC MACROINVERTEBRATE SPECIES IDENTIFIED DURING THE AQUATIC FAUNA SURVEY[1]

	Reference Aquatic Site			Adjacent Aquatic Site		
Species	R-1	R-2	R-3	P-1	P-2	P-3
Trichoptera						
Helicopsyche	4	0	22	8	0	3
Brachycentridae	42	0	0	14	7	6
Leptoceridae	27	1	1	4	0	2
Hydropsychidae	0	1	0	10	21	6
Philopotomidae	0	0	0	4	4	0
Psychomyiidae	0	0	0	2	0	0
Glossosomatidae	0	1	4	0	0	0
Pupae (unknown)	2	1	3	3	4	1
Ephemeroptera						
Caenidae	0	0	0	1	0	9
Leptophlebidae	2	1	1	6	4	0
Baetidae	11	4	10	14	53	6
Heptageniidae	1	0	0	4	5	3
Ephemerellidae	6	2	0	10	6	0
Plecoptera						
Perlidae	1	0	0	1	3	1
Megaloptera						
Sialidae	0	0	0	1	0	0
Diptera						
Tipulidae	4	0	2	11	6	1
Chironomidae	56	22	19	87	112	134
Simuliidae	2	0	5	8	2	3
Pupae (unknown)	0	3	0	0	0	0
Coleoptera						
Psephenidae	0	0	0	3	4	0
Elmidae (adult)	0	0	0	16	8	0
Elmidae (larvae)	18	11	6	27	35	4
Nemetoda	4	3	2	1	2	2
Pelecypoda	1	0	0	0	1	0
Annelida Hirudinea	1	1	0	0	0	1
Gastropoda	0	1	1	0	0	0
Ancylidae	0	0	0	1	0	0
Hydracarina	1	0	0	2	0	0
TOTAL:	183	52	76	238	277	182

Notes:

[1] Organisms were collected using a Surber sampler. Sampling was conducted from May 19-20, 1993.

TABLE 6-1

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF PCB/PESTICIDE ANALYSIS[1]
TERRESTRIAL SPECIES

Sample Description[2]		Lipids (%)	Total PCBs (ug/kg)	Alpha-Chlordane (ug/kg)	4,4'-DDE (ug/kg)	Alpha-BHC (ug/kg)	Gamma BHC (ug/kg)
Reference Wetland							
Masked shrew	Y2-BS053-MS	3.52	ND	ND	ND	ND	ND
Short-tail shrew	Y2-BS033-SS	3.56	ND	ND	5.2	ND	ND
Red-back vole	Y2-BS032-RV	3.7	ND	ND	ND	ND	ND
Earthworm	Y2-BS020-EW	1.64	ND	ND	ND	ND	ND
Earthworm	Y2-BS040-EW	1.57	ND	ND	ND	ND	ND
Earthworm	Y2-BS042-EW	1.53	ND	ND	ND	ND	ND
Green frog	Y2-BS017-GF	1.94	ND	ND	ND	ND	ND
Green frog	Y2-BS018-GF	3.48	ND	ND	ND	ND	ND
Green frog	Y2-BS019-GF	1.97	ND	ND	ND	ND	ND
Western Wetland							
Masked shrew	Y2-BS051-MS	4.4	140	7	4.5	ND	ND
Short-tail shrew	Y2-BS014-SS	3.7	1000	41	ND	ND	ND
Red-back vole	Y2-BSO52-RV	3.16	ND	ND	ND	ND	ND
Earthworm	Y2-BS027-EW	1.67	1190	ND	ND	ND	ND
Earthworm	Y2-BS047-EW	1.6	ND	ND	ND	ND	ND
Earthworm	Y2-BS048-EW	1.7	ND	ND	ND	ND	ND
Green frog	Y2-BS004-GF	1.45	228	10	ND	2	ND
Green frog	Y2-BS006-GF	1.15	39	ND	ND	ND	ND
Green frog	Y2-BS026-GF	1.76	120	10	ND	ND	1.7
Southern Wetland							
Masked shrew	Y2-BS050-MS	4.4	230	ND	ND	ND	ND
Short-tail shrew	Y2-BS025-SS	3.54	ND	ND	7.7	ND	ND
Red-back vole	Y2-BS024-RV	3.82	ND	ND	ND	ND	2.7
Earthworm	Y2-BS002-EW	1.68	ND	ND	ND	ND	ND
Earthworm	Y2-BS015-EW	1.29	ND	ND	ND	ND	ND
Earthworm	Y2-BSO16-EW	1.45	ND	ND	ND	ND	ND
Green frog	Y2-BS022-GF	1.76	ND	ND	ND	ND	ND
Green frog	Y2-BS023-GF	2.52	ND	ND	ND	ND	ND
Green frog	Y2-BS043-GF	1.86	ND	ND	ND	ND	ND

Notes:

1 Only detected chemicals are presented.
2 Samples represent whole-body composite samples.
Results reported on wet weight basis.
ND Not detected (Detection limits are 10 ug/kg to 30 ug/kg for PCB Aroclors, 3.6 ug/kg for Alpha-Chlordane, 2.6 ug/kg for 4'4-DDE, and 1.0 ug/kg for Alpha-BHC).

TABLE 6–2

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF INORGANIC ANALYSIS
TERRESTRIAL SPECIES

Sample Description[1]		Lipids (%)	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
Reference Wetland					
Masked shrew	Y2–BS053–MS	3.52	ND	0.25 J	0.16
Short–tail shrew	Y2–BS033–SS	3.56	0.21 J	ND	0.13
Red–back vole	Y2–BS032–RV	3.7	ND	2.2 J	0.03
Earthworm	Y2–BS020–EW	1.64	0.19 J	0.73 J	0.15
Earthworm	Y2–BS040–EW	1.57	0.43 J	2.3 J	0.07
Earthworm	Y2–BS042–EW	1.53	0.21 J	1.1	0.1
Green frog	Y2–BS017–GF	1.94	ND	ND	0.03
Green frog	Y2–BS018–GF	3.48	ND	ND	0.03
Green frog	Y2–BS019–GF	1.97	ND	0.14 J	0.03
Western Wetland					
Masked shrew	Y2–BS051–MS	4.4	0.17 J	0.39 J	0.15
Short–tail shrew	Y2–BS014–SS	3.7	ND	0.37 J	0.11
Red–back vole	Y2–BSO52–RV	3.16	0.11 J	ND	0.02 J
Earthworm	Y2–BS027–EW	1.67	0.3 J	13.7	0.06
Earthworm	Y2–BS047–EW	1.6	0.89 J	0.69 J	0.15
Earthworm	Y2–BS048–EW	1.7	0.39 J	1.9	0.24
Green frog	Y2–BS004–GF	1.45	ND	10.5 J	0.02 J
Green frog	Y2–BS006–GF	1.15	ND	0.3 J	0.02 J
Green frog	Y2–BS026–GF	1.76	0.12 J	0.62 J	0.04
Southern Wetland					
Masked shrew	Y2–BS050–MS	4.4	0.11 J	1.5 J	0.05
Short–tail shrew	Y2–BS025–SS	3.54	0.11 J	0.29 J	0.12
Red–back vole	Y2–BS024–RV	3.82	ND	0.27 J	0.02 J
Earthworm	Y2–BS002–EW	1.68	3.1	11.4 J	0.11
Earthworm	Y2–BS015–EW	1.29	0.35	3.3 J	0.13
Earthworm	Y2–BSO16–EW	1.45	0.41 J	2.2 J	0.09
Green frog	Y2–BS022–GF	1.76	ND	0.13 J	0.03
Green frog	Y2–BS023–GF	2.52	ND	0.12 J	0.02 J
Green frog	Y2–BS043–GF	1.86	0.13 J	ND	0.02 J

Notes:

Results reported on wet weight basis.

1 Samples represent whole–body composite samples.

ND Not detected. (Detection limits range from 0.09 mg/kg to 0.1 mg/kg).

J Estimated Value

TABLE 6–3

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF PCB/PESTICIDE ANALYSIS[1]
AQUATIC SPECIES

Sample Description[2]		Lipids (%)	Total PCBs (ug/kg)	4,4'–DDE (ug/kg)
Reference Aquatic Site				
White sucker	Y2–BS044–WS	1.3	ND	ND
White sucker	Y2–BS045–WS	1.5	ND	ND
White sucker	Y2–BS046–WS	1.0	ND	ND
Fantail darter	Y2–BS010–FD	4.1	67	7
Fantail darter	Y2–BS011–FD	4.5	68	6.6
Fantail darter	Y2–BS012–FD	5.4	54	4.6
Adjacent Aquatic Site				
White sucker	Y2–BS034–WS	1	ND	ND
White sucker	Y2–BS035–WS	0.8	ND	ND
White sucker	Y2–BS036–WS	0.8	ND	ND
Fantail darter	Y2–BS037–FD	4.3	62	6.5
Fantail darter	Y2–BS038–FD	4	ND	6.8
Fantail darter	Y2–BS039–FD	3.5	37	5.6

Notes:

1 Only detected chemicals are presented.
2 Samples represent whole–body composite samples for fantail darters, and individual skin–on fillets for white suckers.
ND Not detected (Detection limits are 10 ug/kg to 30 ug/kg for PCB Aroclors, and 2.6 ug/kg for 4'4–DDE.
Results reported on wet weight basis.

TABLE 6–4

Interim Ecological Report
Contamination Pathways Remedial Investigation
York Oil Superfund Site

SUMMARY OF INORGANIC ANALYSIS
AQUATIC SPECIES

Sample Description[1]		Lipids (%)	Arsenic (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
Reference Aquatic Site					
White sucker	Y2–BS044–WS	1.34	ND	ND	0.15
White sucker	Y2–BS045–WS	1.49	ND	ND	0.18
White sucker	Y2–BS046–WS	1.0	0.19 J	ND	0.19
Fantail darter	Y2–BS010–FD	4.11	ND	0.12 J	0.14
Fantail darter	Y2–BS011–FD	4.47	ND	ND	0.12
Fantail darter	Y2–BS012–FD	5.43	ND	ND	0.14
Adjacent Aquatic Site					
White sucker	Y2–BS034–WS	1.03	0.16 J	0.37 J	0.29
White sucker	Y2–BS035–WS	0.77	ND	0.12 J	0.26
White sucker	Y2–BS036–WS	0.78	ND	ND	0.17
Fantail darter	Y2–BS037–FD	4.26	ND	ND	0.14
Fantail darter	Y2–BS038–FD	3.97	0.1 J	ND	0.16
Fantail darter	Y2–BS039–FD	3.54	ND	ND	0.12

Notes:

1 Samples represent whole–body composite samples for fantail darters, and individual skin–on fillets for white suckers.

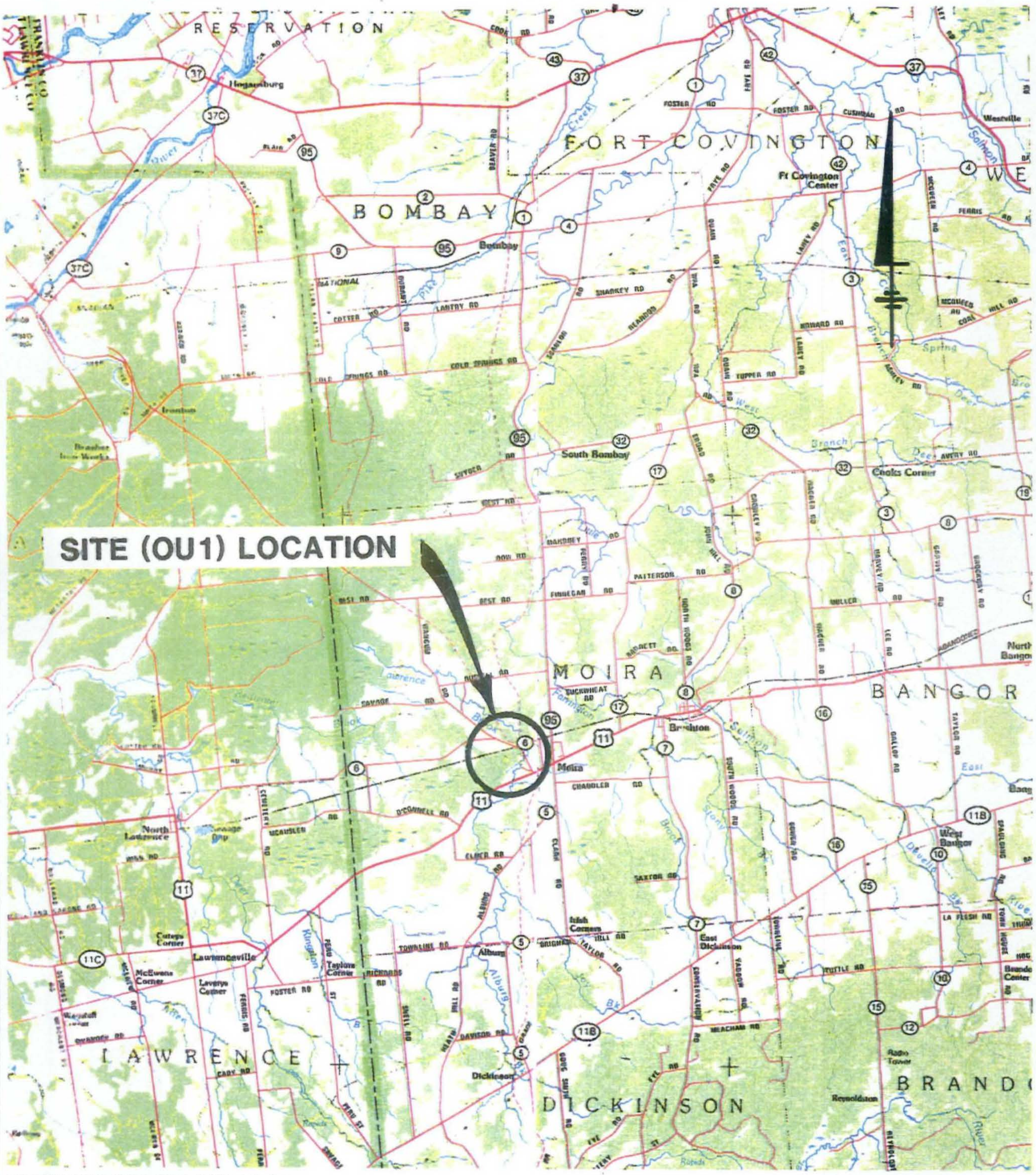
ND Not detected. (Detection limits range from 0.09 mg/kg to 0.1 mg/kg).

J Estimated Value

Results reported on wet weight basis.

Figures

FIGURE 1



REFERENCE: 1988 NEW YORK STATE ATLAS & GAZETTEER

MILES 1 0 1 2

MAP SECTION LOCATION

JULY 1992
688.02.23

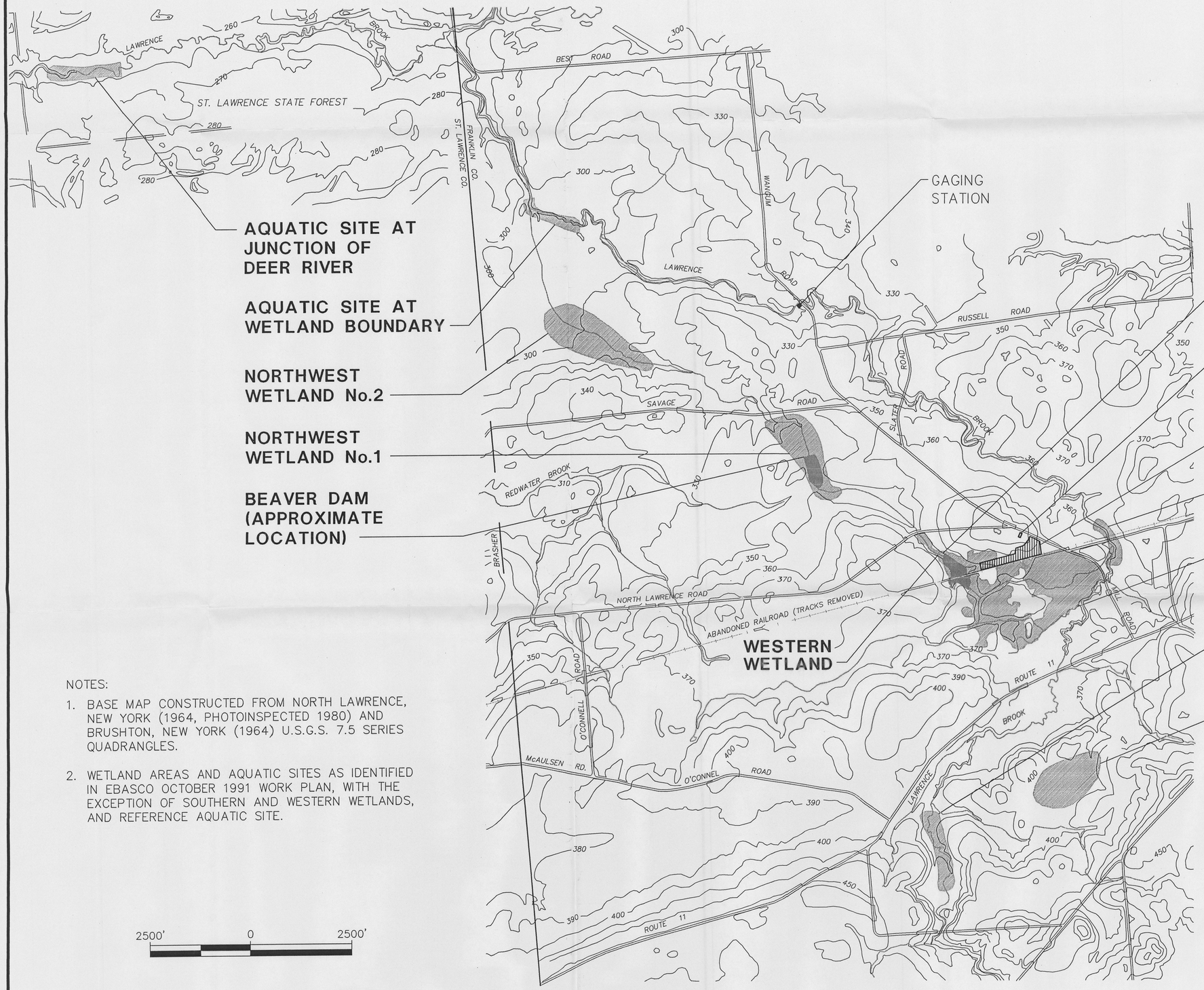
YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

CONTAMINATION PATHWAYS
REMEDIAL INVESTIGATION

SITE LOCATION

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

301791



LEGEND:

- WETLAND AREAS AND AQUATIC SITES WITHIN CONTAMINATION PATHWAYS STUDY AREA (2)
- 10' CONTOURS
- WATER
- RAILROADS
- ROADS

NOTES:

1. BASE MAP CONSTRUCTED FROM NORTH LAWRENCE, NEW YORK (1964, PHOTOINSPECTED 1980) AND BRUSHTON, NEW YORK (1964) U.S.G.S. 7.5 SERIES QUADRANGLES.
2. WETLAND AREAS AND AQUATIC SITES AS IDENTIFIED IN EBASCO OCTOBER 1991 WORK PLAN, WITH THE EXCEPTION OF SOUTHERN AND WESTERN WETLANDS, AND REFERENCE AQUATIC SITE.

2500' 0 2500'

8/94 TWD NES
68802051\68802G01.DWG

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

REGIONAL STUDY AREA MAP

FIGURE **2**

301792

YORK OIL
(OUI SITE)

WESTERN
WETLAND

SOUTHERN
WETLAND

LEGEND:

- 365.5 — ELEVATION
- 365 — CONTOURS
- WATER
- *C-66 — WETLAND DELINEATION FLAG LOCATION

NOTES:

1. WETLAND DELINEATION EFFORTS, EXECUTED IN MAY 1993 BY BLASLAND, BOUCK & LEE, INC., WERE PERFORMED IN ACCORDANCE WITH THE METHOD SPECIFIED IN THE UNITED STATES ARMY CORP OF ENGINEERS WETLAND DELINEATION MANUAL (USACE, 1987)
2. * WETLAND BOUNDARY IN THE AREA OF C-1 THROUGH C-9 WAS RELOCATED TO THE WEST, AFTER FURTHER REVIEW, AS DESCRIBED IN SECTION 3.2 OF THE INTERIM ECOLOGICAL INVESTIGATION REPORT.

250' 0 250' 500'

BLASLAND,BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

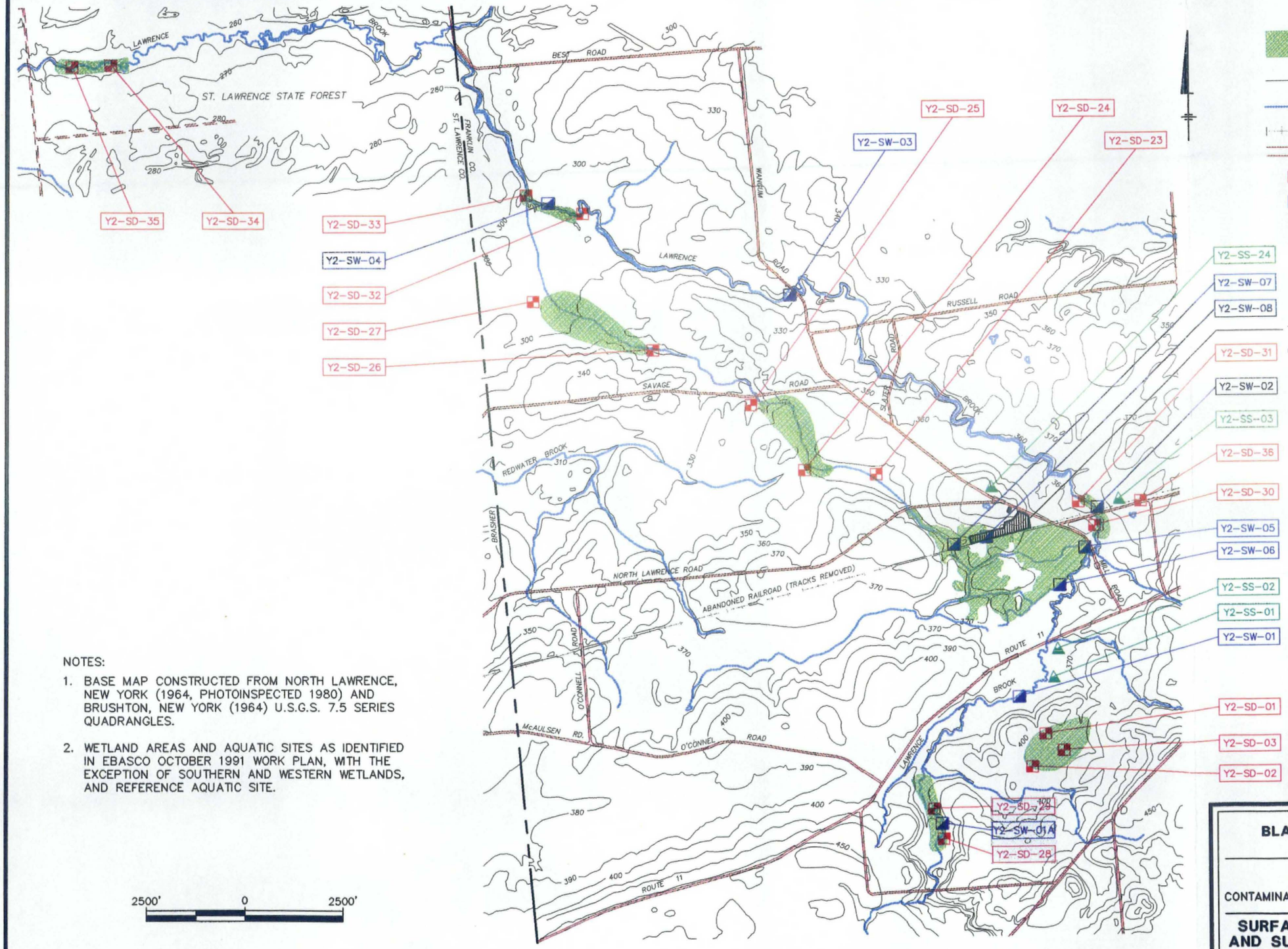
YORK OIL SUPERFUND SITE
CONTAMINATION PATHWAYS
REMEDIAL INVESTIGATION

WETLANDS DELINEATION MAP

FIGURE **3**

8/94 A4-TWO HDS
6992005/RIM03006.DWG

301793



NOTES:

1. BASE MAP CONSTRUCTED FROM NORTH LAWRENCE, NEW YORK (1964, PHOTOINSPECTED 1980) AND BRUSHTON, NEW YORK (1964) U.S.G.S. 7.5 SERIES QUADRANGLES.
2. WETLAND AREAS AND AQUATIC SITES AS IDENTIFIED IN EBASCO OCTOBER 1991 WORK PLAN, WITH THE EXCEPTION OF SOUTHERN AND WESTERN WETLANDS, AND REFERENCE AQUATIC SITE.

NOTE:

SEE LOCAL AREA SAMPLE LOCATION MAP FOR SURFACE WATER, SEDIMENT, AND SURFACE SOIL SAMPLE LOCATIONS NEAR OU1.

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

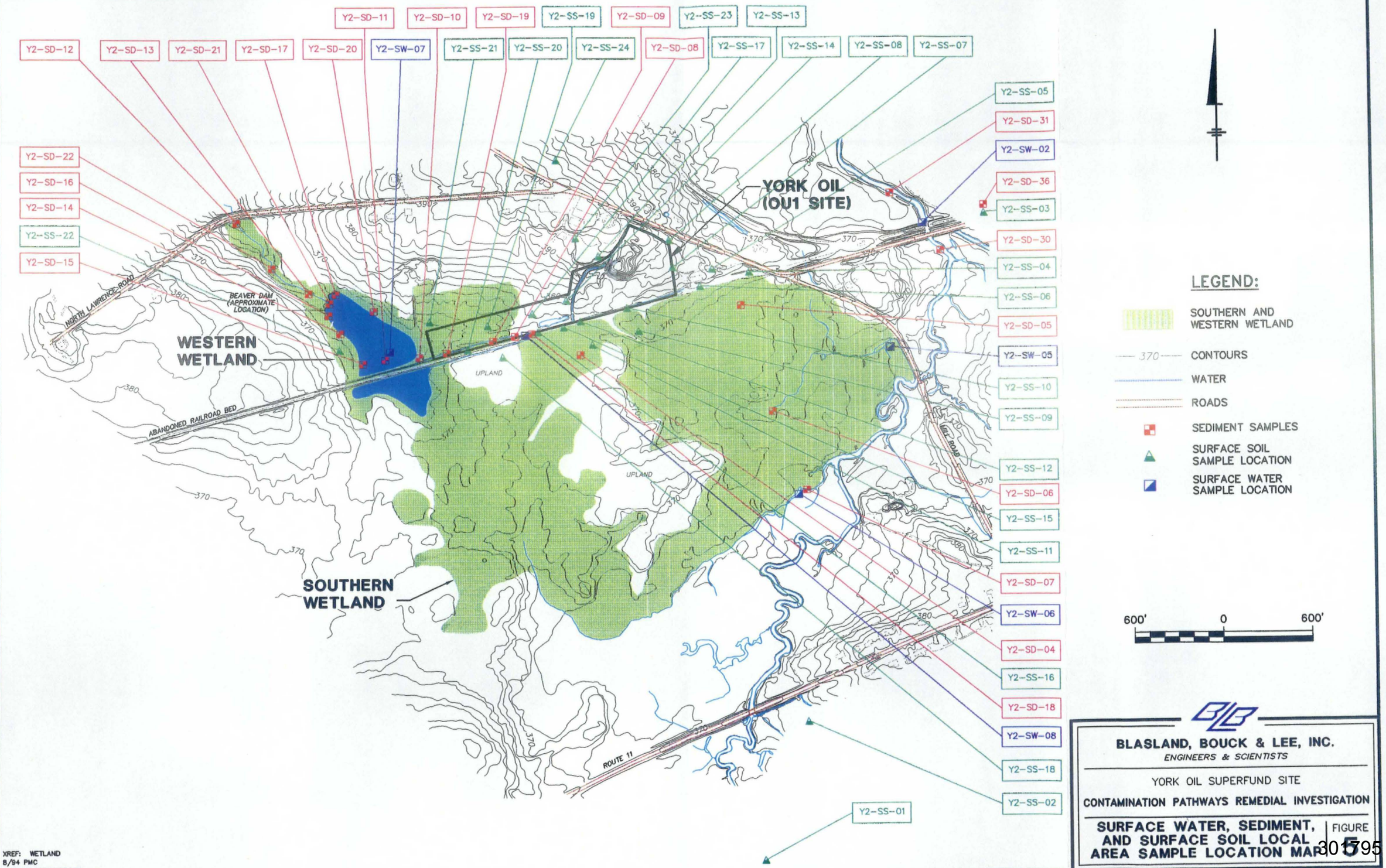
YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

SURFACE WATER, SEDIMENT AND SURFACE SOIL REGIONAL SAMPLE LOCATION MAP

FIGURE 4

8/94 PMC
6880230R\68802G02.DWG



XREF: WETLAND
8/94 PMC
6880230R/68802G07.DWG

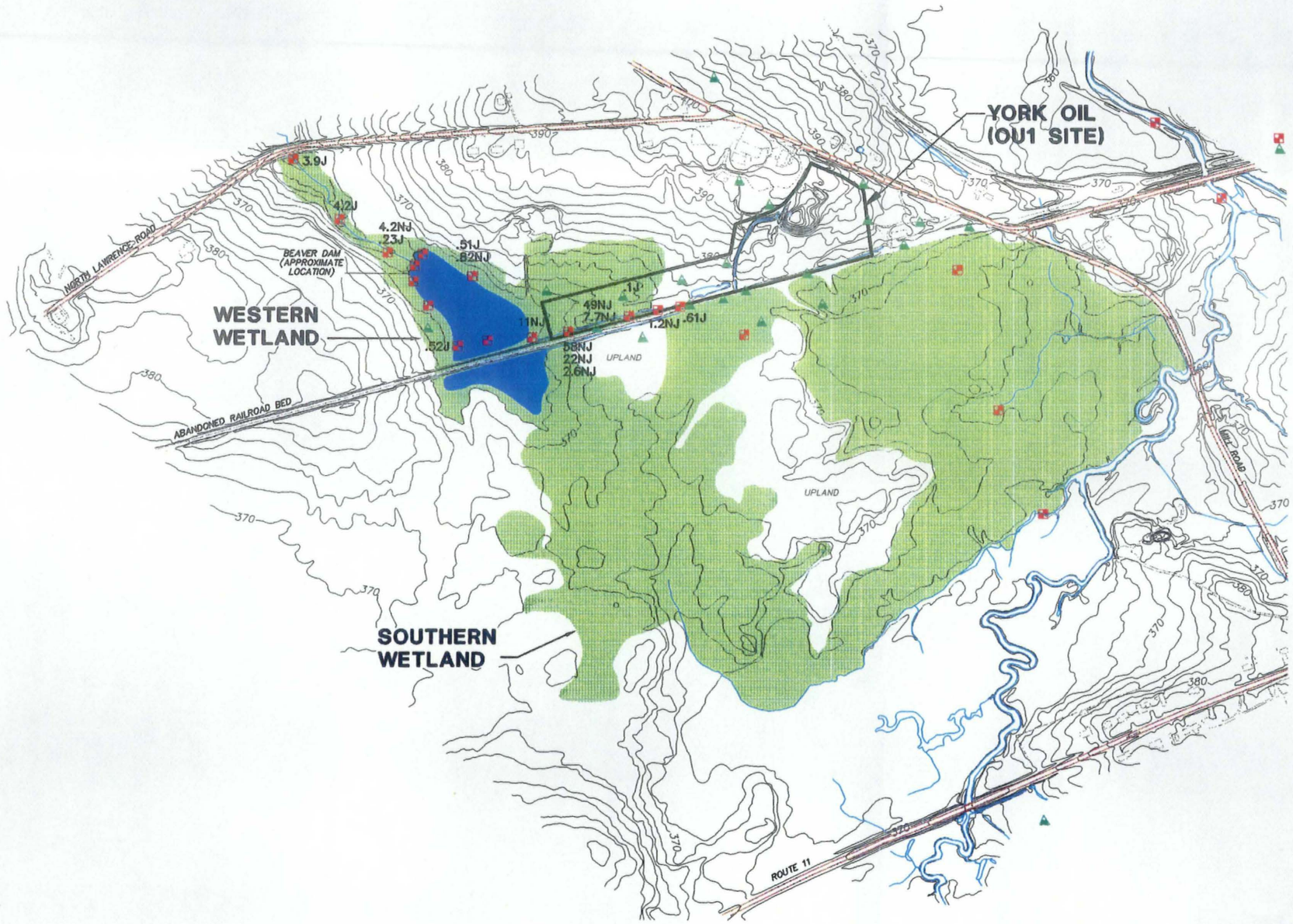
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

SURFACE WATER, SEDIMENT, AND SURFACE SOIL LOCAL AREA SAMPLE LOCATION MAP

FIGURE **5**



LEGEND:

- SOUTHERN AND WESTERN WETLAND
- 370 — CONTOURS
- WATER
- ROADS
- SEDIMENT SAMPLES
- SURFACE SOIL SAMPLE LOCATION

NOTES:

ONLY DETECTED CONTAMINANTS SHOWN.

J – ANALYTE WAS POSITIVELY IDENTIFIED; THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION.

NJ – ANALYSIS INDICATED TENTATIVELY IDENTIFIED ANALYTE; ASSOCIATED VALUE REPRESENTS APPROXIMATE CONCENTRATIONS.

600' 0 600'

XREF: ALL, WETLAND
8/94 PMC
6880230R/68802G08.DWG

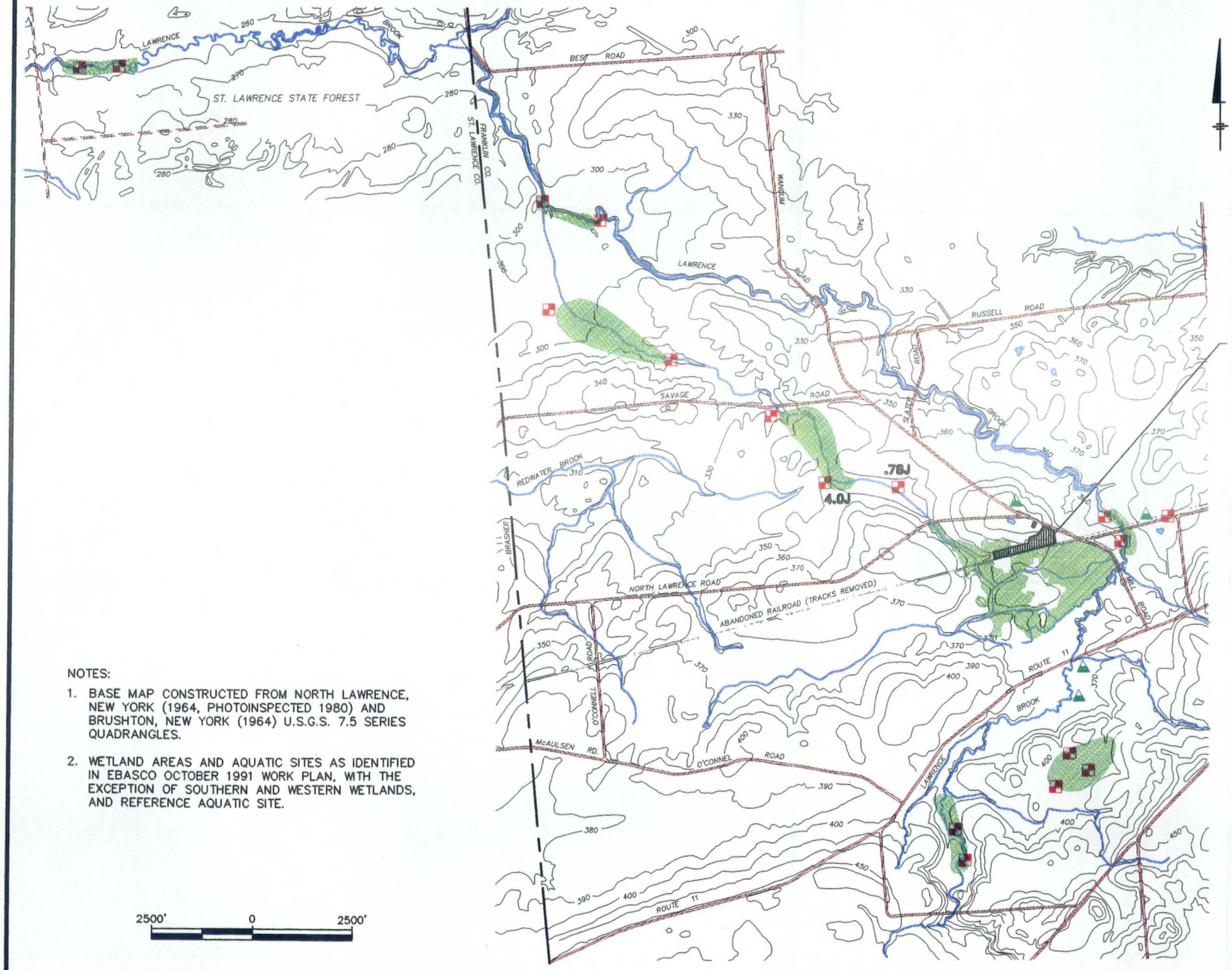
BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

SEDIMENT AND SURFACE SOIL SAMPLE PCB DATA (ppm)

FIGURE 6



NOTES:

1. BASE MAP CONSTRUCTED FROM NORTH LAWRENCE, NEW YORK (1964, PHOTOINSPECTED 1980) AND BRUSHTON, NEW YORK (1964) U.S.G.S. 7.5 SERIES QUADRANGLES.
2. WETLAND AREAS AND AQUATIC SITES AS IDENTIFIED IN EBASCO OCTOBER 1991 WORK PLAN, WITH THE EXCEPTION OF SOUTHERN AND WESTERN WETLANDS, AND REFERENCE AQUATIC SITE.

2500' 0 2500'

NOTES:

ONLY DETECTED CONTAMINANTS SHOWN.

J – ANALYTE WAS POSITIVELY IDENTIFIED; THE ASSOCIATED NUMERICAL VALUE IS THE APPROXIMATE CONCENTRATION.

NJ – ANALYSIS INDICATED TENTATIVELY IDENTIFIED ANALYTE; ASSOCIATED VALUE REPRESENTS APPROXIMATE CONCENTRATIONS.

SEE LOCAL AREA SAMPLE LOCATION MAP FOR SURFACE WATER, SEDIMENT, AND SURFACE SOIL SAMPLE LOCATIONS NEAR OU1.

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

SEDIMENT AND SURFACE SOIL SAMPLE PCB DATA (ppm)

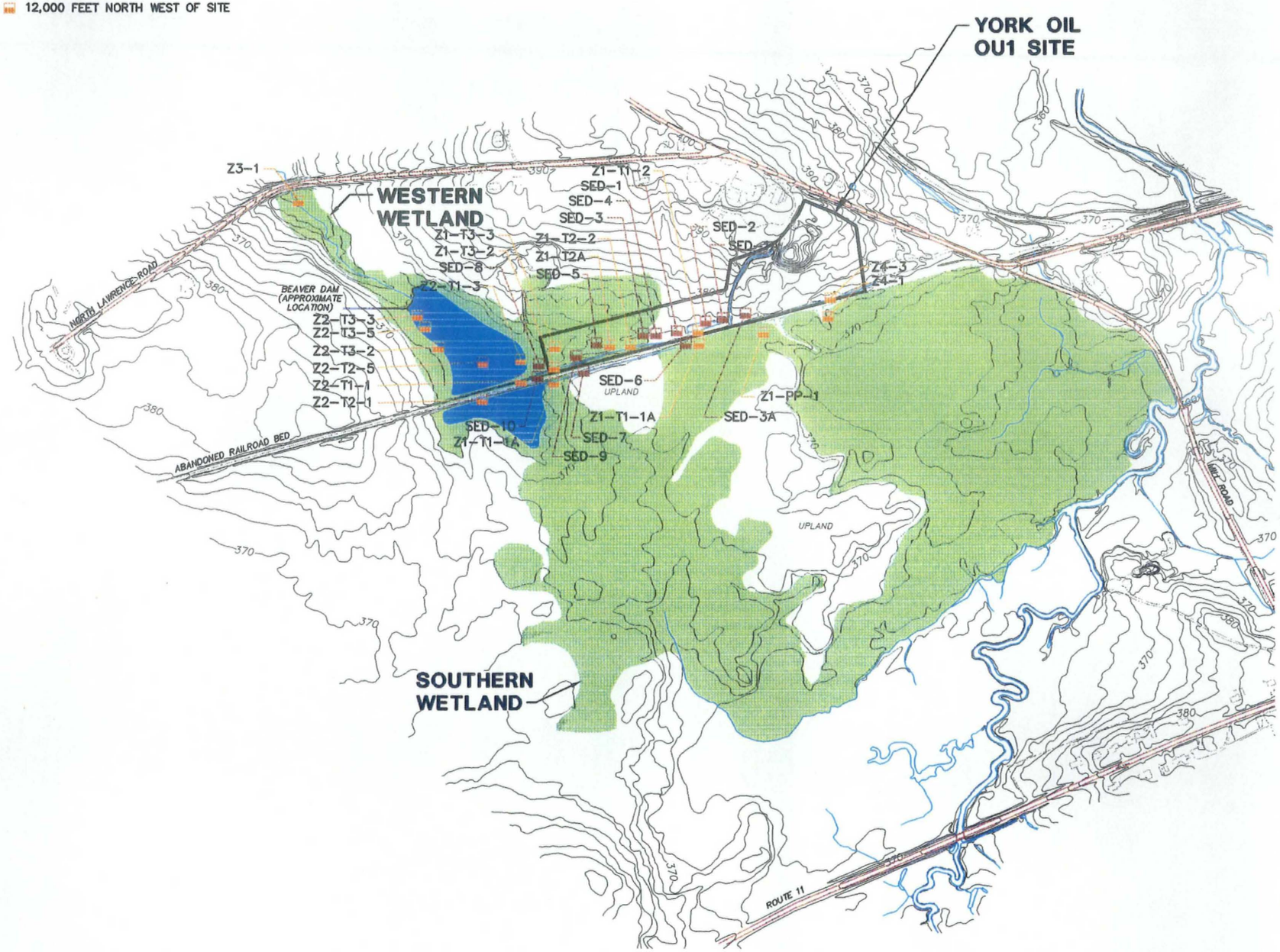
FIGURE 7

8/94 PMC
6880230R\68802G03.DWG

Z3-5

Z3-S7 7400 FEET NORTH WEST OF SITE

Z3-S8 12,000 FEET NORTH WEST OF SITE



LEGEND:

- SOUTHERN AND WESTERN WETLAND
- 370 CONTOURS
- WATER
- ROADS
- 1987 SAMPLE LOCATION
- 1984 SAMPLE LOCATION

600' 0 600'

SCALE: 1" = 600'

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

CONTAMINATION PATHWAYS
REMEDIAL INVESTIGATION

HISTORICAL SEDIMENT SAMPLE LOCATIONS

FIGURE 8

301798

X: ALL WETLAND
6/94 PMC
6880230R/68802G05.DWG

0.54

0.37 7400 FEET NORTH WEST OF SITE

0.085 12,000 FEET NORTH WEST OF SITE

YORK OIL
OU1 SITE

WESTERN
WETLAND

SOUTHERN
WETLAND

NORTH LAWRENCE ROAD

BEAVER DAM
(APPROXIMATE
LOCATION)

ABANDONED RAILROAD BED

ROUTE 11

UPLAND

UPLAND

6.4
0.062
56
5.0
210
5.0
1.6
5.6
7.7
96
0.34
6.9
36
0.58
28.0
0.093
3.8
0.98
3.4
5.3
15
120
0.062
34.8
7.1
54
9.2
43.0
32.0
0.024

370 380 390 400

LEGEND:

SOUTHERN AND WESTERN WETLAND

370 CONTOURS

WATER

ROADS

43.0 1987 SAMPLE LOCATION

0.024 1984 SAMPLE LOCATION

600' 0 600'

SCALE: 1" = 600'

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

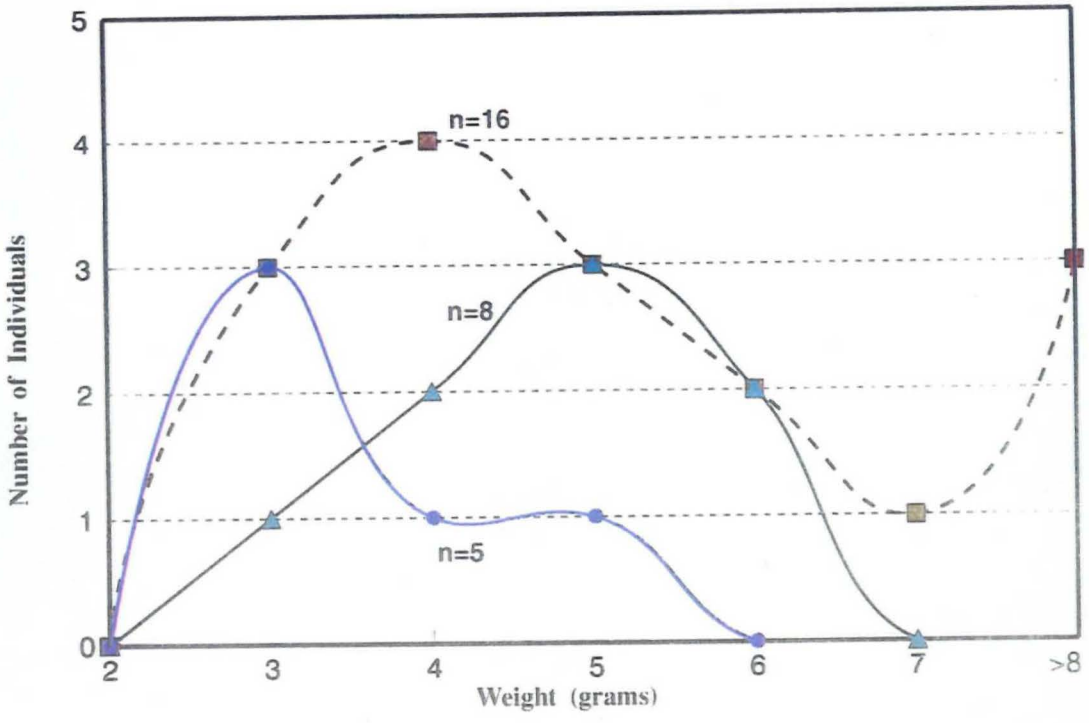
CONTAMINATION PATHWAYS
REMEDIAL INVESTIGATION

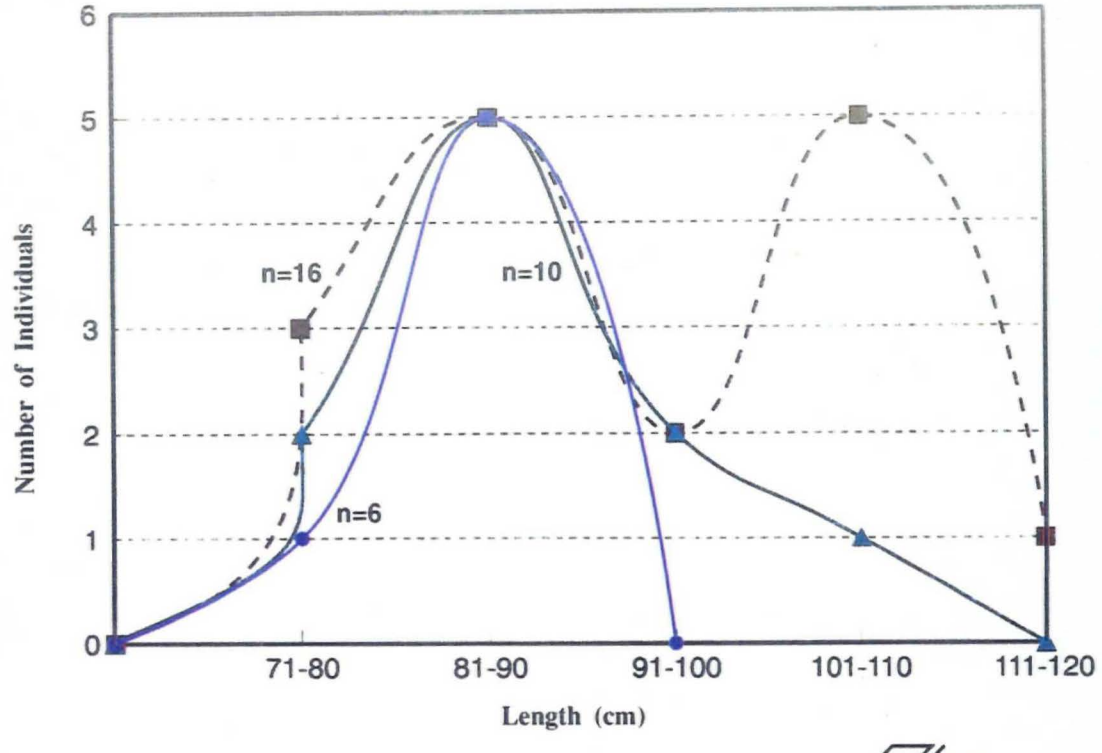
HISTORICAL SEDIMENT
TOTAL PCBs (ppm)

FIGURE
9

301799

X: ALL_WETLAND
8/94 PMC
6880230R/68802G04.DWG





Legend

- Southern Wetland
- Western Wetland
- Reference Wetland

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

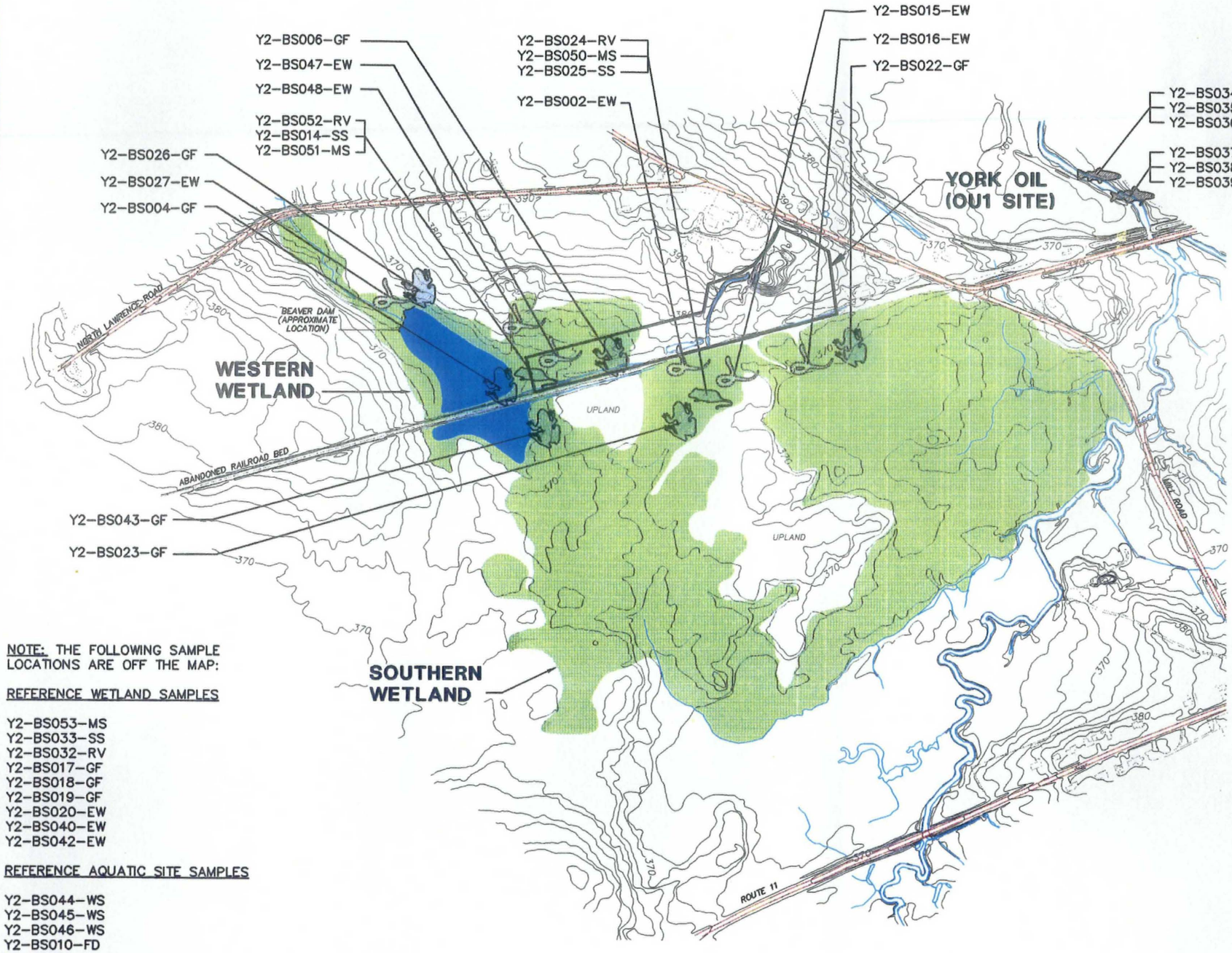
YORK OIL SUPERFUND SITE
MOIRA, NEW YORK
INDIVIDUAL FREQUENCY CURVES FOR MASKED SHREWS

GRAPHS FOR LENGTH AND WEIGHT OF INDIVIDUALS

FIGURE 10

8/94 D54-DJH
6880283R/68802N01.CDR

301800



NOTE: THE FOLLOWING SAMPLE LOCATIONS ARE OFF THE MAP:

REFERENCE WETLAND SAMPLES

Y2-BS053-MS
Y2-BS033-SS
Y2-BS032-RV
Y2-BS017-GF
Y2-BS018-GF
Y2-BS019-GF
Y2-BS020-EW
Y2-BS040-EW
Y2-BS042-EW

REFERENCE AQUATIC SITE SAMPLES

Y2-BS044-WS
Y2-BS045-WS
Y2-BS046-WS
Y2-BS010-FD
Y2-BS011-FD
Y2-BS012-FD

XREF: ALL WETLAND
8/94 PMC
6880230R/6880209.DWG

LEGEND:

- SOUTHERN AND WESTERN WETLAND
- 370 — CONTOURS
- WATER
- ROADS
- SMALL MAMMAL SAMPLE LOCATION
- FROG SAMPLE LOCATION
- EARTHWORM SAMPLE LOCATION
- WHITE SUCKER SAMPLE LOCATION
- FANTAIL DARTER SAMPLE LOCATION

ABBREVIATIONS:

MS	MASKED SHREW
RV	RED-BACKED VOLE
SS	SHORTTAILED SHREW
GF	GREEN FROG
EW	EARTHWORM
WS	WHITE SUCKER
FD	FANTAIL DARTER

600' 0 600'

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

YORK OIL SUPERFUND SITE

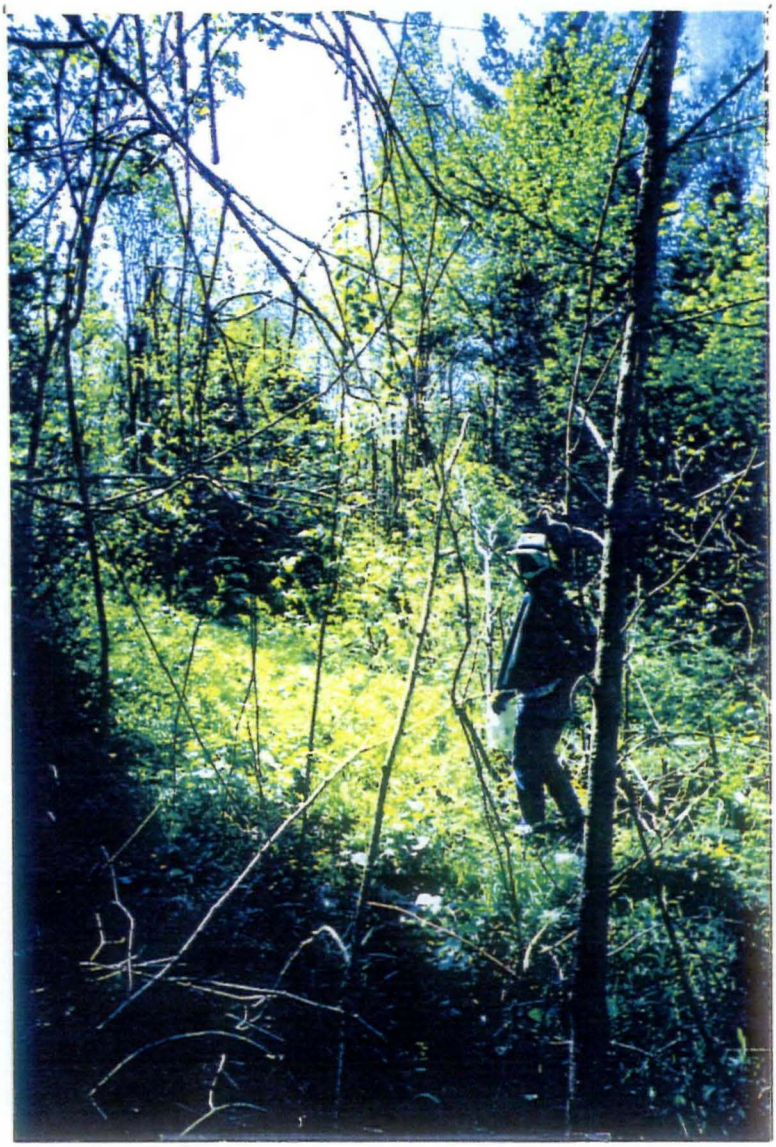
CONTAMINATION PATHWAYS REMEDIAL INVESTIGATION

BIOTA SAMPLE LOCATIONS

FIGURE **11**

301801

APPENDIX A
ATTACHMENT A-2 - PHOTO LOG



JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 1 TAKEN BY James Saxton

DESCRIPTION: Western wetland

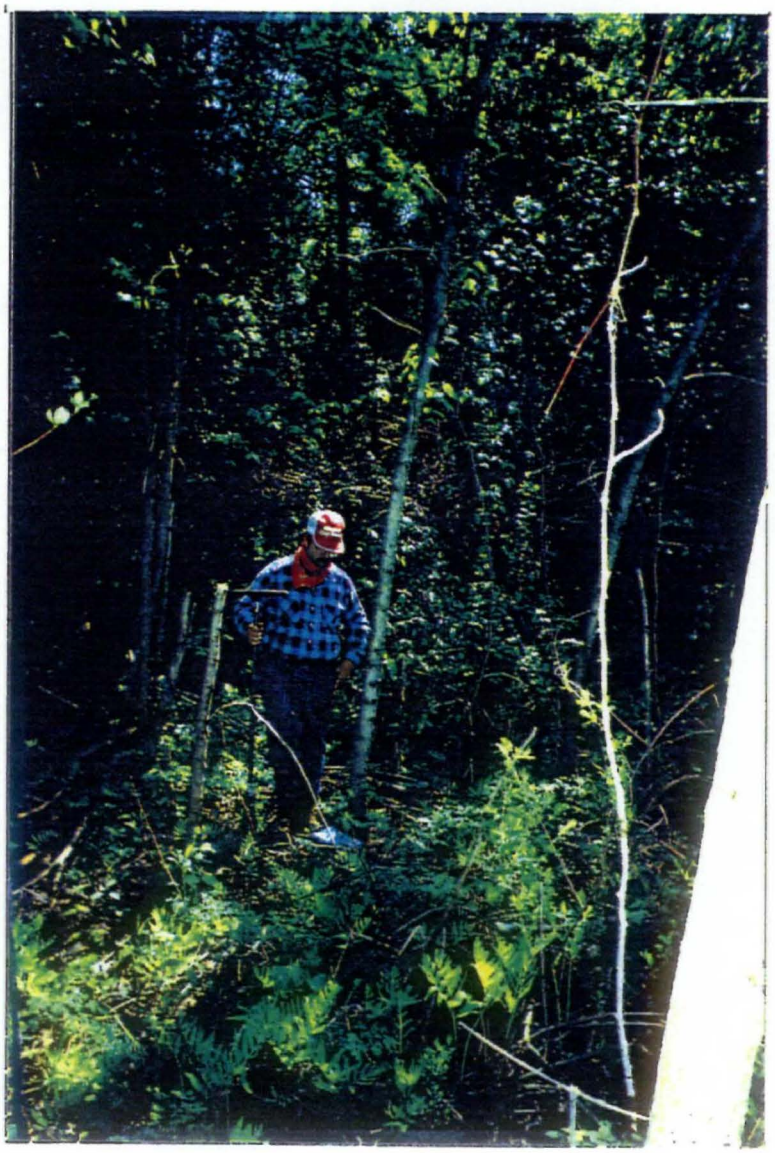
JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 2 TAKEN BY Linda Elligott

DESCRIPTION: Small channel (foreground) in eastern part of western wetland



JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 3 TAKEN BY Linda Elligott

DESCRIPTION: Western wetland at waters edge - west side of open standing water area (Beaver Dammed)

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 4 TAKEN BY Linda Elligott

DESCRIPTION: Electrofishing crew, Lawrence Brook

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 5 TAKEN BY Linda Elligott

DESCRIPTION: Eastern edge of western wetland near Larch Forest/Field Edge

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 6 TAKEN BY James Saxton

DESCRIPTION: Marsh Marigold in western wetland

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 7 TAKEN BY Linda Elligott

DESCRIPTION: Northern edge of southern wetland at turnaround for railroad bed

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 8 TAKEN BY James Saxton

DESCRIPTION: Southern wetland from Mill Road access point

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 9 TAKEN BY Linda Elligott

DESCRIPTION: Southern wetland from Mill Road

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 10 TAKEN BY Linda Elligott

DESCRIPTION: Southern wetland - view of called out upland areas

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 11 TAKEN BY Linda Elligott

DESCRIPTION: Southern wetland - near upland/wetland boundary

JOB PHOTOGRAPH

PROJECT York Oil Contamination Pathways IEIR

FILE NO. 688.04 DATE May 1993

PHOTO NO. 12 TAKEN BY James Saxton

DESCRIPTION: Southern wetland

APPENDIX F
LABORATORY PROCEDURES USED FOR PREPARATION AND ANALYSIS OF WETLAND AND AQUATIC FAUNA

Hazleton Environmental Services

OAU - DO NOT DUPLICATE

ASSAY TITLE: Mercury in Tissues by Automated Cold Vapor Atomic Absorption

AREA OF APPLICABILITY: Hazleton Environmental Services, Inc. (HES) Inorganic Chemistry

SCOPE:

This method is applicable to fish, animal and plant tissues for the determination of mercury.

PRINCIPLE:

Samples are digested with a mixture of sulfuric and nitric acids. The digested sample is pumped into the PS200 automated mercury system and is mixed with Stannous chloride ($SnCl_2$) where the divalent mercury (Hg^{++}) is reduced to form elemental mercury vapor. The mixture flows into a liquid-gas separator where argon or nitrogen is introduced to carry the mercury vapor through a drying tube for water vapor removal.

The dry mercury vapor then enters one path of a double path optical cell which has been optimized for fast response time (small diameter) and sensitivity (long length). A mercury source, powered by a constant current power supply, delivers a stable source of emission at 254 nm. Absorbance by the mercury cold vapor is measured using a solid state detector with a wide dynamic range. The resulting signal is referenced to the simultaneous absorbance of the pure carrier gas flowing through the second optical path under identical conditions. Absorbance is measured as a function of mercury concentration. The resulting data is captured and processed by the PS200 automated data system.

SENSITIVITY:

Using a 2.0 gram sample size, the detection limit of this method is 0.025 mg/Kg.

PRECISION AND ACCURACY:

The analyses of 8 replicates of RM 50 Albacore Tuna, with a certified value of 0.95 ppm, produced an average recovery of 101% (0.96 ppm) and a standard deviation of 6.3% (0.0607 ppm).

REFERENCES:

U.S. EPA, "Test Methods for Evaluation Solid Waste," EPA Publication No. SW-846, Second Edition, Methods 3030, 3040; and 7470, Washington, D.C. (Revised April 1984)

"Mercury in Fish, "AOAC Official Methods of Analysis, 15th Edition, Method 977.15 (modified), (1990)

Leeman Labs, PS200 Automated Mercury Analyzer Operating Manual, Lowell, MA (June 1991).

APPROVED BY: _____ DATE: 7/6/93
John Walton
Supervisor
Inorganic Chemistry

APPROVED BY: _____ DATE: 6-29-93
David C. Hills
V.P. Laboratory Operations

APPROVED BY: _____ DATE: 6/29/93
Amy L. Austin
Supervisor
Quality Assurance

Hazleton Environmental Services

QAU - DO NOT DUPLICATE

ANALYTE: Arsenic by Graphite Furnace

AREA OF APPLICABILITY: HES, Inc.
Atomic Absorption

SCOPE:

This method is applicable to determination of arsenic in fish, animal and plant tissues.

PRINCIPLE:

Prior to instrumental analysis, samples are ground and homogenized to a fine powder consistency, then digested using nitric acid and a CEM-MDS 81D microwave oven to solubilize the element of interest.

The amount of arsenic is determined at a wavelength of 193.7 nm by comparing the signal of the unknown sample, measured by the graphite furnace atomic absorption spectrophotometer, with the signal of the standard solutions. The method of standard additions is used where interferences are indicated. Nickel nitrate is used as a matrix modifier.

SENSITIVITY, PRECISION, AND ACCURACY:

Using a 1 gram sample size diluted to 100 mL, the detection limit of this method is 0.1 mg/Kg, with a reporting limit of 0.5 mg/Kg.

The analyses of 11 replicates on DOLT-1 (NRCC Cananda), produced a mean recovery of 103.4% (4.18 ppm) and a standard deviation of 10.5. The mean recovery of 11 replicate spikes at 1.0 ppm was 91.1%

REFERENCES:

- U.S. Environmental Protection Agency, "Methods for Chemical Analysis of Water and Wastes", Metals 1-19 and Method 206.2, Cincinnati, Ohio (1979).
- U.S. Environmental Protection Agency, "Test Methods for Evaluating Solid Waste", SW-846, Second Edition, Method 7060, Washington, DC (Revised April 1984).
- USEPA, Contract Laboratory Program (CLP), Statement of Work ILM02.0, 1990.
- "Techniques in Graphite Furnace Atomic Absorption Spectrophotometry", Perkin Elmer Corp, Norwalk, Conneticut, (April 1985).

APPROVED BY: John C Walton DATE: 7-14-93
John C. Walton
Supervisor
Inorganic Chemistry

APPROVED BY: David C. Hills DATE: 7-14-93
David C. Hills
V.P. Laboratory Operations

REVIEWED BY: Amy L. Austin DATE: 7/14/93
Amy L. Austin
Supervisor
Quality Assurance

Hazleton Environmental Services

OAU - DO NOT DUPLICATE

ANALYTE: Lead by Graphite Furnace

AREA OF APPLICABILITY: HES, Inc.
Atomic Absorption

SCOPE:

This method is applicable to determination of Lead in fish, animal and plant tissues.

PRINCIPLE:

Prior to instrumental analysis, samples are ground and homogenized to a fine powder consistency, then digested using nitric acid and a CEM-MTS 81D microwave oven to solubilize the element of interest.

The amount of lead is determined at a wavelength of 283.3 nm by comparing the signal of the unknown sample, measured by the graphite furnace atomic absorption spectrophotometer, with the signal of the standard solutions. The method of standard additions is used where interferences are indicated. Diabasic ammonium phosphate is used as a matrix modifier.

SENSITIVITY, PRECISION, AND ACCURACY:

Using a 1 gram sample size diluted to 100 mL, the detection limit of this method is 0.1 mg/Kg, with a reporting limit of 0.5 mg/Kg.

The analyses of 10 replicates of DOLT-1 (NRCC Canada), produced a mean recovery of 88.1% (1.36 ppm) and a standard deviation of 13.4.

The mean recovery of 9 replicate spikes (2.0 mg/Kg) produced an average recovery of 99.4%.

REFERENCES:

- U.S. Environmental Protection Agency, "Methods for Chemical Analysis of Water and Wastes", Metals 1-19 and Method 239.2, Cincinnati, Ohio (1979).
- U.S. Environmental Protection Agency, "Test Methods for Evaluating Solid Waste", SW-846, Second Edition, Method 7421, Washington, DC (Revised April 1984).
- USEPA, Contract Laboratory Program (CLP), Statement of Work ILM02.0, 1990.
- "Techniques in Graphite Furnace Atomic Absorption Spectromphotometry", Perkin-Elmer Corp, Norwalk, Connecticut (April 1985).

APPROVED BY: John C Walton DATE: 7-14-93
John C. Walton
Supervisor
Inorganic Chemistry

APPROVED BY: David C. Hills DATE: 7-14-93
David C. Hills
V.P. Laboratory Operations

REVIEWED BY: Amy L. Austin DATE: 7/14/93
Amy L. Austin
Supervisor
Quality Assurance

Hazleton Environmental Services

OAU - DO NOT DUPLICATE

ASSAY TITLE: Determination of Organochlorine Pesticides and Polychlorinated Biphenyls (PCBs) in Biological Matrices

AREA OF APPLICABILITY: HES, Inc.
Pesticide Residue

SCOPE:

This method covers the determination of the following organochlorine pesticides and PCBs in biological tissues using gas chromatography with electron capture detection (GC-EC). The following compounds are calibrated and analyzed for under this method, others may be included if validated for under this method:

Aldrin	4,4'-DDT	Endrin ketone	Toxaphene
alpha-BHC	O,P'-DDE	Heptachlor	Transnonachlor
beta-BHC	O,P'-DDD	Heptachlor epoxide	PCB-1016
delta-BHC	O,P'-DDT	Hexachlorobenzene	PCB-1221
gamma-BHC	Dieldrin	Methoxychlor	PCB-1232
alpha-Chlordane	Endosulfan I	Mirex	PCB-1242
gamma-Chlordane	Endosulfan II	Oxychlordane	PCB-1248
Cis-nonachlor	Endrin	Pentachloroanisole	PCB-1254
4,4'-DDE	Endosulfan sulfate		PCB-1260
4,4'-DDD	Endrin aldehyde		

PRINCIPLE:

Biological matrices are dried using anhydrous sodium sulfate and extracted for 16 hours with methylene chloride in soxhlet extractors. The sample extracts are then concentrated and injected onto a GPC to remove lipids. This method also provides a silica gel cleanup procedure to separate PCBs from the organochlorine pesticides and an elemental sulfur removal procedure to aid in the elimination of interferences caused by that element. The extract is separated by gas chromatography, and the analytes of interest are measured with an electron capture detector.

SENSITIVITY, PRECISION, AND ACCURACY:

The method detection limits (Attachment 1) represent the target detection limits that can be achieved in biological tissues using this method if no interferences exist.

The precision, accuracy, and control limits for pesticides and PCBs in biological samples are presented in Attachment 2.

REFERENCES:

Environmental Protection Agency (EPA). "Test Methods for Evaluating Solid Waste". SW-846. Methods 3540, 3630, and 8080. (September 1986)

Environmental Protection Agency (EPA) Contract Laboratory Program. Statement of work for Organic Analysis Multi-Media Multi-Concentration. Exhibits B, D, and E. (October 1986; January 1987, February 1987, July 1987, August 1987, and 1990 OLM1.8).

APPROVED BY: Tod Noltemeyer DATE: 7/22/93
Tod Noltemeyer
Supervisor
Pesticide Residue

APPROVED BY: David C. Hills DATE: 7-16-93
David C. Hills
Vice President, Lab Operations

REVIEWED BY: Amy Austin DATE: 7/15/93
Amy Austin
Supervisor
Quality Assurance Unit

Table 1

Compound	Method Detection Limit (µg/kg)[a]
alpha-BHC	1.6
beta-BHC	3.1
delta-BHC	3.1
gamma-BHC (Lindane)	1.1
Heptachlor	3.1
Aldrin	3.2
Heptachlor epoxide	1.5
Endosulfan I	2.6
Dieldrin	11
4,4'-DDE	2.6
Endrin	6.7
Endosulfan II	2.8
4,4'-DDD	4.0
Endosulfan sulfate	12
4,4'-DDT	2.3
Methoxychlor	3.8
Endrin Ketone	2.1
alpha-Chlordane	3.6
gamma-Chlordane	5.9
Aroclor-1016	16
Aroclor-1221	NA
Aroclor-1232	NA
Aroclor-1242	12
Aroclor-1248	27
Aroclor-1254	30
Aroclor-1260	10
Hexachlorobenzene	8.9
O,P'-DDE	7.2
O,P'-DDD	5.2
O,P'-DDT	6.2
Pentachloroanisole	NA
Oxychlordane	1.6
Trans-nonachlor	2.8
Cis-nonachlor	3.8
Endrin aldehyde	5.0
Mirex	3.9
Toxaphene	10

NA Not available at this time.
[a] Wet weight basis.

APPENDIX G
VALIDATED LABORATORY DATA SUMMARY FORMS FOR FAUNA ANALYSES

TRILLIUM INC.

DATA VALIDATION

FOR

YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

ORGANIC ANALYSIS DATA
Pesticides/PCBs in Biological Tissues

Laboratory Project No. 688.02
SDG #1

Chemical Analysis Performed by:

Hazleton Environmental Services, Inc.
Madison, Wisconsin

FOR

Blasland & Bouck Engineers, P.C.

BY

Trillium, Inc.
7A Grace's Drive
Coatesville, Pennsylvania 19320
(215) 383-7233

November 16, 1993

92212/CAE

TRILLIUM INC.

EXECUTIVE SUMMARY

Validation of the GC organics analysis data (pesticides/PCBs) prepared by Hazleton Environmental Services for 20 biota samples from the York Oil Superfund site in Moira, New York has been completed. The EPA Region II Standard Operating Procedure (SOP) HW-6 (Rev 8), "Evaluation of Organics Data for the CLP," (1/92) was used as the basis for the validation; evaluations were modified as necessary to incorporate the specifications of the referenced laboratory SOP used for analysis. The data were reported by the laboratory under Project No. 688.02 (sample delivery group [SDG] #1), which includes the following samples:

Y2-BS050-MS*	Y2-BS051-MS*	Y2-BS002-EW
Y2-BS004-GF	Y2-BS006-GF	Y2-BS010-FD
Y2-BS011-FD	Y2-BS012-FD	Y2-BS014-SS
Y2-BS015-EW	Y2-BS016-EW	Y2-BS017-GF
Y2-BS018-GF	Y2-BS019-GF	Y2-BS020-EW
Y2-BS022-GF	Y2-BS023-GF	Y2-BS024-RV
Y2-BS025-SS	Y2-BS026-GF	

* these are composites of individual samples received with different ID numbers

The "Y2" portion of the sample identifications (IDs) was left off the Data Summary Form entries (Attachment A) due to space limitations and throughout this report for the sake of brevity.

Based on the validation effort, the sample results were determined to be valid as reported.

This validation report should be considered part of the data package for all future distributions of the pesticide/PCB data.

INTRODUCTION

Analyses were performed according to Hazleton Environmental Services SOP MP-HZBP-MA (7/23/93), which references both the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01.8 and EPA SW-846 (9/86) Methods 3540, 3630, and 8080. Results of sample analyses are reported by the laboratory without qualifications.

The data validation process is intended to evaluate the data on a technical basis rather than a contract compliance basis for chemical analyses conducted under the CLP. An initial assumption is that the data package is presented in accordance with CLP (or, in this case, "CLP-like") requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation.

During the validation process, laboratory-reported data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added by the data validator. Final validated results are, therefore, either qualified or unqualified. Unqualified results mean that the reported values may be used without reservation. Validator-qualified results are annotated with the following codes in accordance with the National Functional Guidelines:

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

These codes are recorded on the Data Summary Forms contained in Attachment A and the Organic Analysis Data Sheets (Form I) in Attachment B of this validation report to indicate qualifications placed on the data as a result of the review.

Details of the validation findings and conclusions for the pesticide/PCB data are provided in the following sections of this report:

I. Holding Times

II. Calibration and Instrument Performance

- A. Linearity Check
- B. Retention Time (RT) Windows
- C. Initial and Continuing Calibration Standards
- D. DDT and Endrin Breakdown
- E. Analytical Sequence

III. Blanks

IV. Surrogate Recovery

V. Laboratory Control Sample

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

VII. Field Duplicate

VIII. Compound Identification

IX. Compound Quantitation and Reported Detection Limits

X. System Performance

XI. Documentation

XII. Overall Assessment

I. Holding Times

The samples were collected between September 8 and 17, 1993. Extractions were performed on October 8, 1993 and all extracts were analyzed between October 18 and 22, 1993. Chain of custody (COC) records indicate that the samples were shipped to the laboratory on ice; the data package narrative and internal COC records document that the samples were frozen prior to preparation for analysis.

No holding time has been established for analysis of pesticides/PCBs in biological tissues, however the samples were carefully handled and well-documented from collection through preparation. There is, therefore, no reason for concern with respect to data quality on this basis. Appropriate storage of the sample extracts is not as well-documented; for the purposes of the validation it was assumed that the extracts were held in refrigerated storage prior to all analyses.

II. Calibration and Instrument Performance

Primary (quantitation) analyses were conducted in two series beginning on 10/18/93 and 10/22/93. Confirmation analyses were also performed in two series beginning on 10/18/93 and 10/22/93. The samples were analyzed on a GC system identified as "HP009A" using column DB-5 for quantitation and on a system identified as "HP009B" using column DB-608 for confirmation.

Documentation of all applicable calibration and performance standards was provided in the data package.

A. Linearity Check

Linearity checks were performed at the beginning of each series using three concentration levels of an Evaluation Mixture (EVAL A, B, C) containing aldrin, endrin, and 4,4'-DDT in addition to the two surrogate compounds. Percent relative standard deviations (%RSDs) were less than the QC criterion of 15% specified by the SOP for all analytes in all four series.

B. Retention Time (RT) Windows

RT windows were established as the RT of each analyte in the initial runs of Individual A (IND A) and Individual B (IND B) standards in each series ± an absolute time. The absolute times varied from 0.07 - 0.21 minutes for the various analytes on the quantitation column and from 0.07-0.22 minutes for the analytes on the confirmation column, but were consistent for a given analyte between the two sets of series. No documentation was provided to

support the use of these analyte-specific values to generate the RT windows; for the purposes of the validation it was assumed that the laboratory maintains the source data for this procedure on file. The absolute values used to generate the windows in these series are similar to, but not the same as, those specified by CLP.

All analytes were inside the RT windows in all standards run throughout each of the series **except** for the series-ending IND B run on 10/22 at 07:45 (HP009A-quantitation) and the series-ending IND A run on 10/22 at 07:45 (HP009B-confirmation). Since no sample analyses took place after the affected standards, no reinjections were required per the laboratory SOP. Since both affected series-ending standards were run approximately 24 hours after injection of the last sample from this SDG, no sample results were determined to be affected. It would be preferable for series-ending standards to be run closer to the last sample analysis, or for documentation of additional standards run in the interim to be provided in the data package for review.

C. Initial and Continuing Calibration Standards

Initial calibration standards containing all of the relevant target analytes (IND A/B) were run at a single concentration immediately following the linearity check in each series. Continuing ("ongoing") standards were run at regular intervals throughout each series.

Calculation of percent difference (%D) values between the analyte calibration factors (CFs) in the initial IND A/B standards and the ongoing IND A/B standards in each series was correctly performed and accurate values were reported on the summary forms. All %D values were below the maximum QC requirement of 20% in all four series.

Resolution between adjacent peaks was acceptable (< 25%, calculated as the height of the valley divided by the lower of the two adjacent peak heights) in all standards run in each analytical series.

D. DDT and Endrin Breakdown

Individual DDT and endrin breakdowns were acceptable (<20%) in all EVAL B standards run in each of the four series.

E. Analytical Sequence

The correct analytical sequence appears to have been followed for all standards and samples in this data set. Results for no more than five samples analyzed between ongoing standard injections

(EVAL B, IND A, or IND B) in any series were reported. However, in the absence of an analysis log showing all injections made, it is impossible to confirm whether or not more injections were made (but not reported here) between standards in cases where more than one hour is found between injections. For example, in the series beginning 10/18/93 on HP009A, the last sample was injected 10/21 at 10:29, but the next standard reported (the series-ending IND B) was not injected until 10/22 at 07:45 (almost 21 hours later). It would significantly improve the data package to include an analysis log that lists all injections on each instrument during the relevant series; those injections not pertaining to this SDG may be "x'd" out for confidentiality reasons, if needed.

III. Blanks

One method blank (sodium sulfate matrix) was extracted with this set of tissue samples. No target analytes were detected in the method blank.

IV. Surrogate Recovery

Advisory QC limits of 40-130% were applied to both surrogates (tetrachloro-m-xylene [TMX] and decachlorobiphenyl [DCB]) used for these analyses. Percent recoveries (%Rs) were reported on a CLP-like Form II in the data package; for validation purposes (and because it was not specified in the data package or the SOP) it was assumed that the CFs from the EVAL B run at the start of each series were used for calculation of the surrogate concentrations.

The recoveries found on Form II could not be reproduced exactly in all cases, but the differences were small enough to be accounted for by rounding variations. All %Rs were acceptable; where slight differences were found both the reported and validator-calculated recoveries were acceptable, so there was no adverse effect on the data.

Both surrogates are found in the aroclor portion of each sample extract after silica gel fractionation. This leaves the pesticide fractions without a RT reference peak and without a direct measure of recovery from that run. Since the ongoing standards run throughout each series showed only minor variations in RTs for the surrogates and since recoveries of individual pesticides in both the control sample and the MS/MSD pair were acceptable, it was determined that this had no adverse effect on the quality of the reported data.

V. Laboratory Control Sample

A "control spike" was extracted with this set of samples, using "analyte-free" tuna fish as the matrix. Analyte recoveries were correctly calculated and accurately reported, however there is no documentation of the "analyte-free" nature of the starting matrix, therefore the results cannot be fully confirmed as reported. For the purposes of the validation, it was assumed that the control spike matrix was analyte-free, as indicated in the narrative. All recoveries were acceptable, though slightly high in some cases, ranging from 100-132%.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Sample BS026-GF was run as an MS/MSD pair. Recoveries and relative percent differences (RPDs) between paired recoveries were correctly calculated and accurately reported. Analyte-specific recovery limits are specified in the laboratory SOP (Table 2) for all spiked analytes **except** alpha-chlordane and gamma-chlordane; recoveries for approximately half of the spiked analytes in both the MS and the MSD were slightly high with respect to the specified limits. No action was taken on this basis; the QC limits are advisory only, and the overall results were very good.

Recoveries for all 19 spiked compounds ranged from 71 to 136% in the MS and MSD; RPDs showed good precision, ranging from 0.0% to 14.4%.

Aroclor 1260 was identified in the original, MS, and MSD analyses of BS026-GF and showed excellent reproducibility with reported concentrations of 120, 107, and 102 µg/Kg, respectively.

VII. Field Duplicate

No field duplicate pair was identified in the data package.

VIII. Target Compound List (TCL) Compound Identification

Reported single-response target compounds were correctly identified based on their detection within the established RT windows on both the DB-5 and DB-608 columns.

Aroclor 1254 and/or Aroclor 1260 were reported in several samples; these are multi-response analytes and are identified by their peak patterns rather than by individual RTs. Identifications as reported are reasonable, and no qualifiers were applied.

However, the user should be aware that the pattern matches are far from exact in these samples: in most cases, one or more of the larger peaks visible in the standard are completely missing from the sample, and the relative heights of peaks that are present in the sample are often inconsistent with the standard. This is not surprising, given the biological matrix being analyzed; the variations can probably be attributed to selective metabolism of the individual PCBs by the different species. In some cases, the low concentrations observed also contribute to the less-than-perfect pattern matches.

It is probably a safe conclusion that several PCBs are present in each of the samples in which an Aroclor was reported; the identity of the specific Aroclor(s) reported might be misleading, however, due to pattern distortions. GC/MS confirmation would be useful for confirming the presence of chlorinated components (i.e., the individual PCBs) where concentrations are sufficiently high for detection by this method.

IX. Compound Quantitation and Reported Detection Limits

Target compound quantitations and method detection limits (MDLs) were correctly calculated and accurately reported for all samples in this data package. Concentrations calculated from the confirmation column by the validator were very consistent with those obtained from the quantitation column for the reported single-response analytes; this lends further support to the validity of both the analyte identifications and the reported concentrations.

For each of five samples (BS015-EW, BS016-EW, BS017-GF, BS020-EW, and BS023-GF) less than 20 grams of sample was extracted for analysis, resulting in effective dilution factors (DFs) of 1.05-1.33. These DFs are recorded on the Data Summary Forms (DSFs) in Attachment A and were appropriately accounted for by the laboratory in the reported sample results.

Low concentrations of one or two single-response analytes were confirmed present in several of the samples, however, the values were below the MDLs in each case. Since the laboratory SOP makes no provision for reporting values below the MDLs, these results were not added to the reporting forms by the validator.

The DSFs in Attachment A list individual sample analytes affected by the applied qualifications. All positive results are listed on these forms, whether or not the value or the qualifier was changed as a result of the validation. Where no result is listed, the compound was not detected and the MDL was not

qualified. Sample-specific detection limits may be found on the laboratory-generated Form I for each sample (Attachment B), or may be calculated from the information on the Data Summary Forms as follows: unadjusted MDL (far left column) multiplied by the dilution factor.

X. System Performance

The analytical systems appear to have been working well at the time of these analyses, based on the evaluation of the available raw data.

XI. Documentation

Chain-of-custody (COC) records were present and accurately completed for all samples reported in this data package except that cooler temperature on laboratory receipt was not recorded; it is noted on each COC that the samples were packed in ice. No preservation criteria have been established for biological samples, and no qualifiers were applied on this basis; however, documentation of the cooler temperature on receipt would be useful for future reference.

Internal laboratory COC records were provided for each sample, documenting the retrieval of each "whole sample" from storage for preparation and return of the samples to storage, generally on the same day. No similar documentation is provided, however, for the extracts, and it is not clear how the extracts were stored prior to analysis.

Pattern matching for the aroclor identifications was difficult for some of the samples with the chromatograms provided. Since most of the aroclor concentrations detected were relatively low and since both surrogates are found in this fraction of the extract, the chromatograms are normalized to the much larger surrogate peaks, making aroclor peak patterns very hard to discern. While there are other means for evaluating them, it would be helpful to have chromatograms that allow closer comparisons to the reference standards.

Copies of extraction logs and analysis run logs were not included in the data package, as required by the project-specific Quality Assurance Project Plan (QAPP), page 29.

Documentation of percent lipids determinations were not included in the data package. Since these values were used only to facilitate the GPC clean-ups (i.e., to avoid overloading the

columns with lipids), there is no direct effect on the reported sample results and confirmation of these values is not essential.

XII. Overall Assessment

Sample results for the pesticide/PCB compounds were determined to be valid as reported based on the validation effort.

This validation report should be considered part of the data package for all future distributions of the pesticide/PCB data.

TRILLIUM INC.

ATTACHMENT A

DATA SUMMARY FORMS
Laboratory Project No. 688.02 (SDG #1)
Pesticides/ PCBs

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 1

Trillium Project No.: 92212

MDL	Sample Number	BS050–MS	BS051–MS	BS002–EW	BS004–GF	BS006–GF	BS010–FD	BS011–FD	BS012–FD
	Lab ID	31000328	31000329	31000330	31000331	31000332	31000333	31000334	31000335
	Dilution Factor	1	1	1	1	1	1	1	1
1.6	alpha–BHC				2.0				
3.1	beta–BHC								
3.1	delta–BHC								
1.1	gamma–BHC (Lindane)								
3.1	Heptachlor								
3.2	Aldrin								
1.5	Heptachlor Epoxide								
2.6	Endosulfan I								
11	Dieldrin								
2.6	4,4'–DDE		4.5				7.0	6.6	4.6
6.7	Endrin								
2.8	Endosulfan II								
4.0	4,4'–DDD								
12	Endosulfan Sulfate								
2.3	4,4'–DDT								
3.8	Methoxychlor								
2.1	Endrin ketone								
3.6	alpha–Chlordane		7.0		10				
5.9	gamma–Chlordane								
10	Toxaphene								
16	Aroclor–1016								
20	Aroclor–1221								
20	Aroclor–1232								
12	Aroclor–1242								
27	Aroclor–1248								
30	Aroclor–1254				140		67	68	54
10	Aroclor–1260	230	140		88	39			

301838

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 1

Trillium Project No.: 92212

	Sample Number	BS014–SS		BS015–EW		BS016–EW		BS017–GF		BS018–GF		BS019–GF		BS020–EW		BS022–GF	
	Lab ID	31000336		31000337		31000338		31000339		31000340		31000341		31000342		31000343	
	Dilution Factor	1		1.33		1.25		1.05		1		1		1.33		1	
MDL																	
1.6	alpha–BHC																
3.1	beta–BHC																
3.1	delta–BHC																
1.1	gamma–BHC (Lindane)																
3.1	Heptachlor																
3.2	Aldrin																
1.5	Heptachlor Epoxide																
2.6	Endosulfan I																
11	Dieldrin																
2.6	4,4'–DDE																
6.7	Endrin																
2.8	Endosulfan II																
4.0	4,4'–DDD																
12	Endosulfan Sulfate																
2.3	4,4'–DDT																
3.8	Methoxychlor																
2.1	Endrin ketone																
3.6	alpha–Chlordane	41															
5.9	gamma–Chlordane																
10	Toxaphene																
16	Aroclor–1016																
20	Aroclor–1221																
20	Aroclor–1232																
12	Aroclor–1242																
27	Aroclor–1248																
30	Aroclor–1254																
10	Aroclor–1260	1000															

301839

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 1

Trillium Project No.: 92212

MDL	Sample Number	BS023–GF	BS024–RV	BS025–SS	BS026–GF			
	Lab ID	31000344	31000345	31000346	31000347			
	Dilution Factor	1.33	1	1	1			
1.6	alpha–BHC							
3.1	beta–BHC							
3.1	delta–BHC							
1.1	gamma–BHC (Lindane)		2.7		1.7			
3.1	Heptachlor							
3.2	Aldrin							
1.5	Heptachlor Epoxide							
2.6	Endosulfan I							
11	Dieldrin							
2.6	4,4'–DDE			7.7				
6.7	Endrin							
2.8	Endosulfan II							
4.0	4,4'–DDD							
12	Endosulfan Sulfate							
2.3	4,4'–DDT							
3.8	Methoxychlor							
2.1	Endrin ketone							
3.6	alpha–Chlordane				10			
5.9	gamma–Chlordane							
10	Toxaphene							
16	Aroclor–1016							
20	Aroclor–1221							
20	Aroclor–1232							
12	Aroclor–1242							
27	Aroclor–1248							
30	Aroclor–1254							
10	Aroclor–1260				120			

301840

TRILLIUM INC.

ATTACHMENT B

ORGANIC ANALYSIS DATA SHEETS (Form I)
Laboratory Project No. 688.02 (SDG #1)
Pesticides/PCBs

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000328	Y2-BS050-MS

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 4.40 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		230 ug/kg
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000329	Y2-BS051-MS

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 4.40 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	7.0 ug/kg
72-55-9	4,4'-DDE		2.6 u	4.5 ug/kg
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			140 ug/kg
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000330	Y2-BS002-EW

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.68 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000331	Y2-BS004-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.45 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		2.0 ug/kg	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	10 ug/kg
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			140 ug/kg
N.A.	Aroclor 1260			88 ug/kg
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000332	Y2-BS006-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.15 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		39 ug/kg
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301846

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000333	Y2-BS010-FD

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 4.11 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	7.0 ug/kg
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			67 ug/kg
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000334	Y2-BS011-FD

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 4.47 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	6.6 ug/kg
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		68 ug/kg
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000335	Y2-BS012-FD

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 5.43 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	4.6 ug/kg
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			54 ug/kg
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000336	Y2-BS014-SS

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.70 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	41 ug/kg
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		1000 ug/kg
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000337	Y2-BS015-EW

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.29 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.5 u	
76-44-8	Heptachlor			4.1 u
309-00-2	Aldrin			4.3 u
1024-57-3	Heptachlor Epoxide		2.0 u	
959-98-8	Endosulfan I		3.5 u	
60-57-1	Dieldrin		15 u	
33213-65-9	Endosulfan II		3.7 u	
7421-93-4	Endrin Aldehyde		6.7 u	
50-29-3	4,4'-DDT		3.1 u	3.1 u
72-43-5	Methoxychlor		5.1 u	
319-84-6	Alpha-BHC		2.1 u	
319-85-7	Beta-BHC		4.1 u	
319-86-8	Delta-BHC		4.1 u	
5103-74-2	Gamma-Chlordane		7.9 u	7.9 u
5103-71-9	Alpha-Chlordane		4.8 u	4.8 u
72-55-9	4,4'-DDE		3.5 u	3.5 u
72-20-8	Endrin		8.9 u	
72-54-8	4,4'-DDD		5.3 u	
1031-07-8	Endosulfan Sulfate		16 u	
53494-70-5	Endrin Ketone		2.8 u	
N.A.	Aroclor 1016			21 u
N.A.	Aroclor 1221			27 u
N.A.	Aroclor 1232			27 u
N.A.	Aroclor 1242			16 u
N.A.	Aroclor 1248			36 u
N.A.	Aroclor 1254			40 u
N.A.	Aroclor 1260			13 u
8001-35-2	Toxaphene		13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:15.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000338	Y2-BS016-EW

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.45 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.4 u	
76-44-8	Heptachlor			3.9 u
309-00-2	Aldrin			4.0 u
1024-57-3	Heptachlor Epoxide		1.9 u	
959-98-8	Endosulfan I		3.3 u	
60-57-1	Dieldrin		14 u	
33213-65-9	Endosulfan II		3.5 u	
7421-93-4	Endrin Aldehyde		6.3 u	
50-29-3	4,4'-DDT		2.9 u	2.9 u
72-43-5	Methoxychlor		4.8 u	
319-84-6	Alpha-BHC		2.0 u	
319-85-7	Beta-BHC		3.9 u	
319-86-8	Delta-BHC		3.9 u	
5103-74-2	Gamma-Chlordane		7.4 u	7.4 u
5103-71-9	Alpha-Chlordane		4.5 u	4.5 u
72-55-9	4,4'-DDE		3.3 u	3.3 u
72-20-8	Endrin		8.4 u	
72-54-8	4,4'-DDD		5.0 u	
1031-07-8	Endosulfan Sulfate		15 u	
53494-70-5	Endrin Ketone		2.6 u	
N.A.	Aroclor 1016			20 u
N.A.	Aroclor 1221			25 u
N.A.	Aroclor 1232			25 u
N.A.	Aroclor 1242			15 u
N.A.	Aroclor 1248			34 u
N.A.	Aroclor 1254			38 u
N.A.	Aroclor 1260			13 u
8001-35-2	Toxaphene		13 u	

N.A. = Not Available

W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:16.02 g Vm: 2ul T: 10.0 ml

FORM I

301852

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000339	Y2-BS017-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.94 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.2 u	
76-44-8	Heptachlor		3.3 u
309-00-2	Aldrin		3.4 u
1024-57-3	Heptachlor Epoxide	1.6 u	
959-98-8	Endosulfan I	2.7 u	
60-57-1	Dieldrin	12 u	
33213-65-9	Endosulfan II	2.9 u	
7421-93-4	Endrin Aldehyde	5.3 u	
50-29-3	4,4'-DDT	2.4 u	2.4 u
72-43-5	Methoxychlor	4.0 u	
319-84-6	Alpha-BHC	1.7 u	
319-85-7	Beta-BHC	3.3 u	
319-86-8	Delta-BHC	3.3 u	
5103-74-2	Gamma-Chlordane	6.2 u	6.2 u
5103-71-9	Alpha-Chlordane	3.8 u	3.8 u
72-55-9	4,4'-DDE	2.7 u	2.7 u
72-20-8	Endrin	7.0 u	
72-54-8	4,4'-DDD	4.2 u	
1031-07-8	Endosulfan Sulfate	13 u	
53494-70-5	Endrin Ketone	2.2 u	
N.A.	Aroclor 1016		17 u
N.A.	Aroclor 1221		21 u
N.A.	Aroclor 1232		21 u
N.A.	Aroclor 1242		13 u
N.A.	Aroclor 1248		28 u
N.A.	Aroclor 1254		32 u
N.A.	Aroclor 1260		11 u
8001-35-2	Toxaphene	11 u	

N.A. = Not Available

W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:19.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000340	Y2-BS018-GF

11/16/93

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.48 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available

W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000341	Y2-BS019-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.97 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000342	Y2-BS020-EW

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.64 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.5 u	
76-44-8	Heptachlor			4.1 u
309-00-2	Aldrin			4.3 u
1024-57-3	Heptachlor Epoxide		2.0 u	
959-98-8	Endosulfan I		3.5 u	
60-57-1	Dieldrin		15 u	
33213-65-9	Endosulfan II		3.7 u	
7421-93-4	Endrin Aldehyde		6.7 u	
50-29-3	4,4'-DDT		3.1 u	3.1 u
72-43-5	Methoxychlor		5.1 u	
319-84-6	Alpha-BHC		2.1 u	
319-85-7	Beta-BHC		4.1 u	
319-86-8	Delta-BHC		4.1 u	
5103-74-2	Gamma-Chlordane		7.9 u	7.9 u
5103-71-9	Alpha-Chlordane		4.8 u	4.8 u
72-55-9	4,4'-DDE		3.5 u	3.5 u
72-20-8	Endrin		8.9 u	
72-54-8	4,4'-DDD		5.3 u	
1031-07-8	Endosulfan Sulfate		16 u	
53494-70-5	Endrin Ketone		2.8 u	
N.A.	Aroclor 1016			21 u
N.A.	Aroclor 1221			27 u
N.A.	Aroclor 1232			27 u
N.A.	Aroclor 1242			16 u
N.A.	Aroclor 1248			36 u
N.A.	Aroclor 1254			40 u
N.A.	Aroclor 1260			13 u
8001-35-2	Toxaphene		13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:15.00 g Vm: 2ul T: 10.0 ml

FORM I

301856

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000343	Y2-BS022-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.76 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available

W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.01 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000344	Y2-BS023-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 2.52 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.5 u	
76-44-8	Heptachlor		4.1 u
309-00-2	Aldrin		4.3 u
1024-57-3	Heptachlor Epoxide	2.0 u	
959-98-8	Endosulfan I	3.5 u	
60-57-1	Dieldrin	15 u	
33213-65-9	Endosulfan II	3.7 u	
7421-93-4	Endrin Aldehyde	6.7 u	
50-29-3	4,4'-DDT	3.1 u	3.1 u
72-43-5	Methoxychlor	5.1 u	
319-84-6	Alpha-BHC	2.1 u	
319-85-7	Beta-BHC	4.1 u	
319-86-8	Delta-BHC	4.1 u	
5103-74-2	Gamma-Chlordane	7.9 u	7.9 u
5103-71-9	Alpha-Chlordane	4.8 u	4.8 u
72-55-9	4,4'-DDE	3.5 u	3.5 u
72-20-8	Endrin	8.9 u	
72-54-8	4,4'-DDD	5.3 u	
1031-07-8	Endosulfan Sulfate	16 u	
53494-70-5	Endrin Ketone	2.8 u	
N.A.	Aroclor 1016		21 u
N.A.	Aroclor 1221		27 u
N.A.	Aroclor 1232		27 u
N.A.	Aroclor 1242		16 u
N.A.	Aroclor 1248		36 u
N.A.	Aroclor 1254		40 u
N.A.	Aroclor 1260		13 u
8001-35-2	Toxaphene	13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:15.02 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000345	Y2-BS024-RV

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.82 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	2.7 ug/kg	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.01 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000346	Y2-BS025-SS

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.54 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	7.7 ug/kg
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000347	Y2-BS026-GF

Date Extracted/Prepared: 10/8/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.76 %

CAS Number	Compound	Dil. 1.0 Pesticide Analys Results ug/kg	Dil. 1.0 PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.7 ug/kg	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	10 ug/kg
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		120 ug/kg
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

TRILLIUM INC.

DATA VALIDATION

FOR

YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

ORGANIC ANALYSIS DATA
Pesticides/PCBs in Biological Tissues

Laboratory Project No. 688.02
SDG #2

Chemical Analysis Performed by:

Hazleton Environmental Services, Inc.
Madison, Wisconsin

FOR

Blasland & Bouck Engineers, P.C.

BY

Trillium, Inc.
7A Grace's Drive
Coatesville, Pennsylvania 19320
(215) 383-7233

November 17, 1993

92212/CAE

TRILLIUM INC.

EXECUTIVE SUMMARY

Validation of the GC organics analysis data (pesticides/PCBs) prepared by Hazleton Environmental Services for 19 biota samples from the York Oil Superfund site in Moira, New York, has been completed. The EPA Region II Standard Operating Procedure (SOP) HW-6 (Rev 8), "Evaluation of Organics Data for the CLP," (1/92) was used as the basis for the validation; evaluations were modified as necessary to incorporate the specifications of the referenced laboratory SOP used for analysis. The data were reported by the laboratory under Project No. 688.02 (sample delivery group [SDG] #2), which includes the following samples:

Y2-BS052-RW*	Y2-BS053-MS*	Y2-BS027-EW
Y2-BS048-EW	Y2-BS032-RV	Y2-BS033-SS
Y2-BS034-WS	Y2-BS035-WS	Y2-BS036-WS
Y2-BS037-FD	Y2-BS038-FD	Y2-BS039-FD
Y2-BS040-EW	Y2-BS042-EW	Y2-BS043-GF
Y2-BS044-WS	Y2-BS045-WS	Y2-BS046-WS
Y2-BS047-EW		

* these are composites of individual samples received with different ID numbers

The "Y2" portion of the sample identifications (IDs) was left off the Data Summary Form entries (Attachment A) due to space limitations and throughout this report for the sake of brevity.

Based on the validation effort, the sample results were determined to be valid as reported.

This validation report should be considered part of the data package for all future distributions of the pesticide/PCB data.

INTRODUCTION

Analyses were performed according to Hazleton Environmental Services SOP MP-HZBP-MA (7/23/93), which references both the USEPA Contract Laboratory Program (CLP) Statement of Work OLM01.8 and EPA SW-846 (9/86) Methods 3540, 3630, and 8080. Results of sample analyses are reported by the laboratory without qualifications.

The data validation process is intended to evaluate the data on a technical basis rather than a contract compliance basis for chemical analyses conducted under the CLP. An initial assumption is that the data package is presented in accordance with CLP (or, in this case, "CLP-like") requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate and sufficient quality review prior to submission for validation.

During the validation process, laboratory-reported data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added by the data validator. Final validated results are, therefore, either qualified or unqualified. Unqualified results mean that the reported values may be used without reservation. Validator-qualified results are annotated with the following codes in accordance with the National Functional Guidelines:

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

N - The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

These codes are recorded on the Data Summary Forms contained in Attachment A and the Organic Analysis Data Sheets (Form I) in Attachment B of this validation report to indicate qualifications placed on the data as a result of the review.

Details of the validation findings and conclusions for the pesticide/PCB data are provided in the following sections of this report:

I. Holding Times

II. Calibration and Instrument Performance

- A. Linearity Check
- B. Retention Time Windows
- C. Initial and Continuing Calibration Standards
- D. DDT and Endrin Breakdown
- E. Analytical Sequence

III. Blanks

IV. Surrogate Recovery

V. Laboratory Control Sample

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

VII. Field Duplicate

VIII. Compound Identification

IX. Compound Quantitation and Reported Detection Limits

X. System Performance

XI. Documentation

XII. Overall Assessment

I. Holding Times

The samples were collected between September 8 and 17, 1993. Extractions were performed on October 11, 1993 and all extracts were analyzed between October 25 and 28, 1993. Chain of custody (COC) records indicate that the samples were shipped to the laboratory on ice; the data package narrative and internal COC records document that the samples were frozen prior to preparation for analysis.

No holding time has been established for analysis of pesticides/PCBs in biological tissues, however the samples were carefully handled and well-documented from collection through preparation. There is, therefore, no reason for concern with respect to data quality on this basis. Appropriate storage of the sample extracts is not as well-documented; for the purposes of the validation it was assumed that the extracts were held in refrigerated storage prior to all analyses.

II. Calibration and Instrument Performance

Primary (quantitation) analyses were conducted in a single series beginning on 10/25/93; confirmation analyses were also performed in a single series beginning on 10/25/93. The samples were analyzed on a GC system identified as "HP009A" using column DB-5 for quantitation and on a system identified as "HP009B" using column DB-608 for confirmation.

Documentation of all applicable calibration and performance standards was provided in the data package.

A. Linearity Check

Linearity checks were performed at the beginning of each series using three concentration levels of an Evaluation Mixture (EVAL A, B, C) containing aldrin, endrin, and 4,4'-DDT in addition to the two surrogate compounds. Percent relative standard deviations (%RSDs) were less than the maximum acceptable limit of 15% specified by the SOP for all analytes in both series.

B. Retention Time (RT) Windows

RT windows were established as the RT of each analyte in the initial runs of Individual A (IND A) and Individual B (IND B) standards in each series ± an absolute time. The absolute times varied from 0.07 - 0.21 minutes for the various analytes on the quantitation column and from 0.07-0.23 minutes for the various analytes on the confirmation column. No documentation was provided

to support the use of these analyte-specific values to generate the RT windows; for the purposes of the validation it was assumed that the laboratory maintains the source data for this procedure on file. The absolute values used to generate the windows in these series are similar to, but not the same as, those specified by CLP.

All standard analytes were inside the RT windows in all standards run throughout the two reported series.

C. Initial and Continuing Calibration Standards

Initial calibration standards containing all of the relevant target analytes (IND A/B) were run at a single concentration immediately following the linearity check in each series. Continuing ("ongoing") standards were run at regular intervals throughout each series.

Calculation of percent difference (%D) values between the analyte calibration factors (CFs) in the initial IND A/B standards and the ongoing IND A/B standards in each series was correctly performed and accurate values were reported on the summary forms. All %D values were below the maximum QC criterion of 20% in the quantitation series. In the confirmation series, %D values for delta-BHC (20.0%) and endrin ketone (20.2%) were just at the QC limit and most of the %Ds measured were between 15 and 20% (generally higher than usual) in the IND B standard on 10/28 at 05:27. No sample results were qualified on this basis, since quantitative results were not reported from this analysis series.

Resolution between adjacent peaks was acceptable (< 25%, calculated as the height of the valley divided by the lower of the two adjacent peak heights) in all standards run in each analytical series.

D. DDT and Endrin Breakdown

Individual DDT and endrin breakdowns were acceptable (<20%) in all EVAL B standards run in both series.

E. Analytical Sequence

The correct analytical sequence was followed for all standards and samples in this data set. Results for no more than five samples analyzed between ongoing standard injections (EVAL B, IND A, or IND B) in either series were reported, and no significant time lags were observed between injections. However, inclusion of an analysis log showing all injections made would be an improvement to the data package.

III. Blanks

One method blank (sodium sulfate matrix) was extracted with this set of tissue samples. No target analytes were detected in the method blank.

IV. Surrogate Recovery

Advisory QC limits of 40-130% were applied to both surrogates (tetrachloro-m-xylene [TMX] and decachlorobiphenyl [DCB]) used for these analyses. Percent recoveries (%Rs) were reported on a CLP-like Form II in the data package. An analyst notation on Form II indicated that CFs from EVAL B were used for calculation of the surrogate concentrations; it was assumed that this reference was to the **first** EVAL B standard run in each series (i.e., as part of the linearity check).

The recoveries found on Form II could not be reproduced exactly in all cases, but the differences were small enough to be accounted for by rounding variations. All %Rs were acceptable; where slight differences were found both the reported and validator-calculated recoveries were acceptable, so there was no adverse effect on the data.

Both surrogates are found in the aroclor portion of each sample extract after silica gel fractionation. This leaves the pesticide fraction without a RT reference peak and without a direct measure of recovery from that run. Since the ongoing standards run throughout each series showed very consistent RTs for both surrogates, and recoveries of individual pesticides in both the control sample and the MS/MSD pair were acceptable, it was determined that this had no adverse effect on the quality of the reported data.

V. Laboratory Control Sample

A "control spike" was extracted with this set of samples, using "analyte-free" tuna fish as the matrix. Analyte recoveries were correctly calculated and accurately reported, however there is no documentation of the "analyte-free" nature of the starting matrix, therefore the results cannot be fully confirmed as reported. For the purposes of the validation, it was assumed that the control spike matrix was analyte-free, as indicated in the narrative. All recoveries were acceptable, ranging from 92-124%.

VI. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Sample BS034-WS was run as an MS/MSD pair. Recoveries and relative percent differences (RPDs) between paired recoveries were correctly calculated and accurately reported. Analyte-specific QC limits are specified in the laboratory SOP (Table 2) for all spiked analytes **except** alpha-chlordane and gamma-chlordane; recoveries for several analytes in the MSD and for dieldrin in the MSD were slightly high with respect to the specified limits. No action was taken on this basis; the QC limits are advisory only, and the overall results were very good.

Recoveries for all 19 spiked compounds ranged from 64 to 124% in the MS and MSD; RPDs showed acceptable precision, ranging from 8.3% to 18.2%.

No non-spiked analytes were detected in the original or the spiked sample analyses.

VII. Field Duplicate

No field duplicate pair was identified in the data package.

VIII. Target Compound List (TCL) Compound Identification

Reported single-response target compounds were correctly identified based on their detection within the established RT windows on both the DB-5 and DB-608 columns.

Aroclor 1254 and/or Aroclor 1260 were reported in three samples; these are multi-response analytes and are identified by their peak patterns rather than individual RTs. Identifications as reported are reasonable, and no qualifiers were applied. In fact, the responses in BS027-EW gave a near-perfect match for Aroclor 1254 and a good match (some relative ratios were inconsistent with the standard) for Aroclor 1260. However, the user should be aware that the pattern matches are not so obvious in BS037-FD and BS039-FD. In both cases, very low concentrations of Aroclor 1254 were reported and the patterns obtained are <u>not</u> exact matches. The biological matrix of the samples being analyzed (selective metabolism of the individual PCBs by the different species may have occurred) and the low concentrations detected probably both contribute to the pattern variations.

IX. Compound Quantitation and Reported Detection Limits

Target compound quantitations and method detection limits (MDLs) were correctly calculated and accurately reported for all samples in this data package. Concentrations calculated from the confirmation column by the validator were reasonably consistent with those obtained from the quantitation column for the reported single-response analytes; this lends further support to the validity of both the analyte identifications and the reported concentrations.

For each of eight samples (BS027-EW, BS048-EW, BS037-FD, BS038-FD, BS039-FD, BS040-EW, BS042-EW and BS047-EW) less than 20 grams of sample was extracted for analysis, resulting in effective dilution factors (DFs) of 1.05-1.33. These DFs are recorded on the Data Summary Forms (DSFs) in Attachment A and were appropriately accounted for by the laboratory in the reported sample results.

A confirmed response for 4,4'-DDE (DDE) was found in the pesticide fraction of BS053-MS, but only a small response (below the MDL) was obtained for this analyte in the aroclor fraction. Since most of the DDE should be found in the aroclor fraction, the laboratory concluded that there was no DDE in the sample, and that the response in the pesticide fraction was, in fact, an interference. The DL reported for DDE in this sample was elevated to the concentration calculated assuming it was DDE (3.1 µg/Kg); this value is recorded on the DSF in Attachment A, although it does not represent a qualification of the data by the validator.

Low concentrations of one or two single-response analytes were confirmed present in several of the samples, however, the values were below the MDLs in each case. Since the laboratory SOP makes no provision for reporting values below the MDLs, these results were not added to the reporting forms by the validator.

The DSFs in Attachment A list individual sample analytes affected by the applied qualifications. All positive results are listed on these forms, whether or not the value or the qualifier was changed as a result of the validation. Where no result is listed, the compound was not detected and the MDL was not qualified. Sample-specific detection limits may be found on the laboratory-generated Form I for each sample (Attachment B), or may be calculated from the information on the Data Summary Forms as follows: unadjusted MDL (far left column) multiplied by the dilution factor.

X. System Performance

The analytical systems appear to have been working well at the time of these analyses, based on the evaluation of the available raw data.

XI. Documentation

COC records were present and accurately completed for all samples reported in this data package except that cooler temperature on laboratory receipt was not recorded; it is noted that the samples were packed in ice. No preservation criteria have been established for biological samples, and no qualifiers were applied on this basis; however, documentation of the cooler temperature on receipt would be useful for future reference.

Pattern matching for aroclor identifications was difficult with the chromatograms provided. Since the aroclor concentrations detected in two samples were very low and since both surrogates are found in this fraction of the extract, the chromatograms are normalized to the much larger surrogate peaks, making aroclor peak patterns very hard to discern. While there are other means for evaluating them, it would be helpful to have chromatograms that allow better visual comparisons to the reference standards.

Internal laboratory COC records were provided for each sample, documenting the retrieval of each "whole sample" from storage for preparation and return of the samples to storage, generally on the same day. No similar documentation is provided, however, for the extracts, and it is not clear how the extracts were stored prior to analysis.

Copies of extraction logs and analysis run logs were not included in the data package, as required by the project-specific Quality Assurance Project Plan (QAPP), page 29.

Documentation of percent lipids determinations was not included in the data package. Since these values were used only to facilitate the GPC clean-ups (i.e., to avoid overloading the columns with lipids), there is no direct effect on the reported sample results and confirmation of these values is not essential.

XII. Overall Assessment

Sample results for the pesticide/PCB compounds were determined to be valid as reported based on the validation effort.

This validation report should be considered <u>part of the data package</u> for all future distributions of the pesticide/PCB data.

TRILLIUM INC.

ATTACHMENT A

DATA SUMMARY FORMS
Laboratory Project No. 688.02 (SDG #2)
Pesticides/ PCBs

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 2

Trillium Project No.: 92212

MDL	Sample Number	BS052–RW		BS053–MS		BS027–EW		BS048–EW		BS032–RV		BS033–SS		BS034–WS		BS035–WS	
	Lab ID	31000351		31000352		31000353		31000354		31000355		31000356		31000357		31000361	
	Dilution Factor	1		1		1.18		1.18		1		1		1		1	
1.6	alpha–BHC																
3.1	beta–BHC																
3.1	delta–BHC																
1.1	gamma–BHC (Lindane)																
3.1	Heptachlor																
3.2	Aldrin																
1.5	Heptachlor Epoxide																
2.6	Endosulfan I																
11	Dieldrin																
2.6	4,4'–DDE			3.1	U							5.2					
6.7	Endrin																
2.8	Endosulfan II																
4.0	4,4'–DDD																
12	Endosulfan Sulfate																
2.3	4,4'–DDT																
3.8	Methoxychlor																
2.1	Endrin ketone																
3.6	alpha–Chlordane																
5.9	gamma–Chlordane																
10	Toxaphene																
16	Aroclor–1016																
20	Aroclor–1221																
20	Aroclor–1232																
12	Aroclor–1242																
27	Aroclor–1248																
30	Aroclor–1254					850											
10	Aroclor–1260					340											

301873

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 2

Trillium Project No.: 92212

MDL	Sample Number	BS036–WS	BS037–FD	BS038–FD	BS039–FD	BS040–EW	BS042–EW	BS043–GF	BS044–WS
	Lab ID	31000362	31000363	31000364	31000365	31000366	31000367	31000368	31000369
	Dilution Factor	1	1.11	1.33	1.11	1.25	1.33	1	1
1.6	alpha–BHC								
3.1	beta–BHC								
3.1	delta–BHC								
1.1	gamma–BHC (Lindane)								
3.1	Heptachlor								
3.2	Aldrin								
1.5	Heptachlor Epoxide								
2.6	Endosulfan I								
11	Dieldrin								
2.6	4,4'–DDE		6.5	6.8	5.6				
6.7	Endrin								
2.8	Endosulfan II								
4.0	4,4'–DDD								
12	Endosulfan Sulfate								
2.3	4,4'–DDT								
3.8	Methoxychlor								
2.1	Endrin ketone								
3.6	alpha–Chlordane								
5.9	gamma–Chlordane								
10	Toxaphene								
16	Aroclor–1016								
20	Aroclor–1221								
20	Aroclor–1232								
12	Aroclor–1242								
27	Aroclor–1248								
30	Aroclor–1254		62		37				
10	Aroclor–1260								

301874

DATA SUMMARY FORM: PESTICIDES AND PCBS
BIOTA SAMPLES
(ug/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8--17, 1993

SDG #: 2

Trillium Project No.: 92212

MDL	Sample Number	BS045-WS	BS046-WS	BS047-EW					
	Lab ID	31000370	31000371	31000372					
	Dilution Factor	1	1	1.05					
1.6	alpha-BHC								
3.1	beta-BHC								
3.1	delta-BHC								
1.1	gamma-BHC (Lindane)								
3.1	Heptachlor								
3.2	Aldrin								
1.5	Heptachlor Epoxide								
2.6	Endosulfan I								
11	Dieldrin								
2.6	4,4'-DDE								
6.7	Endrin								
2.8	Endosulfan II								
4.0	4,4'-DDD								
12	Endosulfan Sulfate								
2.3	4,4'-DDT								
3.8	Methoxychlor								
2.1	Endrin ketone								
3.6	alpha-Chlordane								
5.9	gamma-Chlordane								
10	Toxaphene								
16	Aroclor-1016								
20	Aroclor-1221								
20	Aroclor-1232								
12	Aroclor-1242								
27	Aroclor-1248								
30	Aroclor-1254								
10	Aroclor-1260								

301875

TRILLIUM INC.

ATTACHMENT B

ORGANIC ANALYSIS DATA SHEETS (Form I)
Laboratory Project No. 688.02 (SDG #2)
Pesticides/PCBs

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000351	Y2-BS052-RW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.16 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301877

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000352	Y2-BS053-MS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.52 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		3.1 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301878

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000353	Y2-BS027-EW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.67 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.3 u	
76-44-8	Heptachlor			3.6 u
309-00-2	Aldrin			3.8 u
1024-57-3	Heptachlor Epoxide		1.8 u	
959-98-8	Endosulfan I		3.1 u	
60-57-1	Dieldrin		13 u	
33213-65-9	Endosulfan II		3.3 u	
7421-93-4	Endrin Aldehyde		5.9 u	
50-29-3	4,4'-DDT		2.7 u	2.7 u
72-43-5	Methoxychlor		4.5 u	
319-84-6	Alpha-BHC		1.9 u	
319-85-7	Beta-BHC		3.6 u	
319-86-8	Delta-BHC		3.6 u	
5103-74-2	Gamma-Chlordane		6.9 u	6.9 u
5103-71-9	Alpha-Chlordane		4.2 u	4.2 u
72-55-9	4,4'-DDE		3.1 u	3.1 u
72-20-8	Endrin		7.9 u	
72-54-8	4,4'-DDD		4.7 u	
1031-07-8	Endosulfan Sulfate		14 u	
53494-70-5	Endrin Ketone		2.5 u	
N.A.	Aroclor 1016			19 u
N.A.	Aroclor 1221			24 u
N.A.	Aroclor 1232			24 u
N.A.	Aroclor 1242			14 u
N.A.	Aroclor 1248			32 u
N.A.	Aroclor 1254			850 ug/kg
N.A.	Aroclor 1260			340 ug/kg
8001-35-2	Toxaphene		12 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:17.00 g Vm: 2ul T: 10.0 ml

FORM I

301879

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000354	Y2-BS048-EW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.70 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.3 u	
76-44-8	Heptachlor			3.6 u
309-00-2	Aldrin			3.8 u
1024-57-3	Heptachlor Epoxide		1.8 u	
959-98-8	Endosulfan I		3.1 u	
60-57-1	Dieldrin		13 u	
33213-65-9	Endosulfan II		3.3 u	
7421-93-4	Endrin Aldehyde		5.9 u	
50-29-3	4,4'-DDT		2.7 u	2.7 u
72-43-5	Methoxychlor		4.5 u	
319-84-6	Alpha-BHC		1.9 u	
319-85-7	Beta-BHC		3.6 u	
319-86-8	Delta-BHC		3.6 u	
5103-74-2	Gamma-Chlordane		6.9 u	6.9 u
5103-71-9	Alpha-Chlordane		4.2 u	4.2 u
72-55-9	4,4'-DDE		3.1 u	3.1 u
72-20-8	Endrin		7.9 u	
72-54-8	4,4'-DDD		4.7 u	
1031-07-8	Endosulfan Sulfate		14 u	
53494-70-5	Endrin Ketone		2.5 u	
N.A.	Aroclor 1016			19 u
N.A.	Aroclor 1221			24 u
N.A.	Aroclor 1232			24 u
N.A.	Aroclor 1242			14 u
N.A.	Aroclor 1248			32 u
N.A.	Aroclor 1254			35 u
N.A.	Aroclor 1260			12 u
8001-35-2	Toxaphene		12 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:17.00 g Vm: 2ul T: 10.0 ml

FORM I

301880

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000355	Y2-BS032-RV

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.70 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301881

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000356	Y2-BS033-SS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.56 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	5.2 ug/kg
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301882

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000357	Y2-BS034-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.03 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301883

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000361	Y2-BS035-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 0.77 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301884

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000362	Y2-BS036-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 0.78 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301885

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000363	Y2-BS037-FD

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 4.26 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.2 u	
76-44-8	Heptachlor			3.4 u
309-00-2	Aldrin			3.6 u
1024-57-3	Heptachlor Epoxide		1.7 u	
959-98-8	Endosulfan I		2.9 u	
60-57-1	Dieldrin		12 u	
33213-65-9	Endosulfan II		3.1 u	
7421-93-4	Endrin Aldehyde		5.6 u	
50-29-3	4,4'-DDT		2.6 u	2.6 u
72-43-5	Methoxychlor		4.2 u	
319-84-6	Alpha-BHC		1.8 u	
319-85-7	Beta-BHC		3.4 u	
319-86-8	Delta-BHC		3.4 u	
5103-74-2	Gamma-Chlordane		6.6 u	6.6 u
5103-71-9	Alpha-Chlordane		4.0 u	4.0 u
72-55-9	4,4'-DDE		2.9 u	6.5 ug/kg
72-20-8	Endrin		7.4 u	
72-54-8	4,4'-DDD		4.4 u	
1031-07-8	Endosulfan Sulfate		13 u	
53494-70-5	Endrin Ketone		2.3 u	
N.A.	Aroclor 1016			18 u
N.A.	Aroclor 1221			22 u
N.A.	Aroclor 1232			22 u
N.A.	Aroclor 1242			13 u
N.A.	Aroclor 1248			30 u
N.A.	Aroclor 1254			62 ug/kg
N.A.	Aroclor 1260			11 u
8001-35-2	Toxaphene		11 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:18.00 g Vm: 2ul T: 10.0 ml

FORM I

301886

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000364	Y2-BS038-FD

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.97 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.5 u	
76-44-8	Heptachlor		4.1 u
309-00-2	Aldrin		4.3 u
1024-57-3	Heptachlor Epoxide	2.0 u	
959-98-8	Endosulfan I	3.5 u	
60-57-1	Dieldrin	15 u	
33213-65-9	Endosulfan II	3.7 u	
7421-93-4	Endrin Aldehyde	6.7 u	
50-29-3	4,4'-DDT	3.1 u	3.1 u
72-43-5	Methoxychlor	5.1 u	
319-84-6	Alpha-BHC	2.1 u	
319-85-7	Beta-BHC	4.1 u	
319-86-8	Delta-BHC	4.1 u	
5103-74-2	Gamma-Chlordane	7.9 u	7.9 u
5103-71-9	Alpha-Chlordane	4.8 u	4.8 u
72-55-9	4,4'-DDE	3.5 u	6.8 ug/kg
72-20-8	Endrin	8.9 u	
72-54-8	4,4'-DDD	5.3 u	
1031-07-8	Endosulfan Sulfate	16 u	
53494-70-5	Endrin Ketone	2.8 u	
N.A.	Aroclor 1016		21 u
N.A.	Aroclor 1221		27 u
N.A.	Aroclor 1232		27 u
N.A.	Aroclor 1242		16 u
N.A.	Aroclor 1248		36 u
N.A.	Aroclor 1254		40 u
N.A.	Aroclor 1260		13 u
8001-35-2	Toxaphene	13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:15.00 g Vm: 2ul T: 10.0 ml

FORM I

301887

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000365	Y2-BS039-FD

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 3.54 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.2 u	
76-44-8	Heptachlor			3.4 u
309-00-2	Aldrin			3.6 u
1024-57-3	Heptachlor Epoxide		1.7 u	
959-98-8	Endosulfan I		2.9 u	
60-57-1	Dieldrin		12 u	
33213-65-9	Endosulfan II		3.1 u	
7421-93-4	Endrin Aldehyde		5.6 u	
50-29-3	4,4'-DDT		2.6 u	2.6 u
72-43-5	Methoxychlor		4.2 u	
319-84-6	Alpha-BHC		1.8 u	
319-85-7	Beta-BHC		3.4 u	
319-86-8	Delta-BHC		3.4 u	
5103-74-2	Gamma-Chlordane		6.6 u	6.6 u
5103-71-9	Alpha-Chlordane		4.0 u	4.0 u
72-55-9	4,4'-DDE		2.9 u	5.6 ug/kg
72-20-8	Endrin		7.4 u	
72-54-8	4,4'-DDD		4.4 u	
1031-07-8	Endosulfan Sulfate		13 u	
53494-70-5	Endrin Ketone		2.3 u	
N.A.	Aroclor 1016			18 u
N.A.	Aroclor 1221			22 u
N.A.	Aroclor 1232			22 u
N.A.	Aroclor 1242			13 u
N.A.	Aroclor 1248			30 u
N.A.	Aroclor 1254			37 ug/kg
N.A.	Aroclor 1260			11 u
8001-35-2	Toxaphene		11 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:18.00 g Vm: 2ul T: 10.0 ml

FORM I

301888

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000366	Y2-BS040-EW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.57 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.4 u	
76-44-8	Heptachlor			3.9 u
309-00-2	Aldrin			4.0 u
1024-57-3	Heptachlor Epoxide		1.9 u	
959-98-8	Endosulfan I		3.3 u	
60-57-1	Dieldrin		14 u	
33213-65-9	Endosulfan II		3.5 u	
7421-93-4	Endrin Aldehyde		6.3 u	
50-29-3	4,4'-DDT		2.9 u	2.9 u
72-43-5	Methoxychlor		4.8 u	
319-84-6	Alpha-BHC		2.0 u	
319-85-7	Beta-BHC		3.9 u	
319-86-8	Delta-BHC		3.9 u	
5103-74-2	Gamma-Chlordane		7.4 u	7.4 u
5103-71-9	Alpha-Chlordane		4.5 u	4.5 u
72-55-9	4,4'-DDE		3.3 u	3.3 u
72-20-8	Endrin		8.4 u	
72-54-8	4,4'-DDD		5.0 u	
1031-07-8	Endosulfan Sulfate		15 u	
53494-70-5	Endrin Ketone		2.6 u	
N.A.	Aroclor 1016			20 u
N.A.	Aroclor 1221			25 u
N.A.	Aroclor 1232			25 u
N.A.	Aroclor 1242			15 u
N.A.	Aroclor 1248			34 u
N.A.	Aroclor 1254			38 u
N.A.	Aroclor 1260			13 u
8001-35-2	Toxaphene		13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:16.01 g Vm: 2ul T: 10.0 ml

FORM I

301889

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000367	Y2-BS042-EW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.53 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.5 u	
76-44-8	Heptachlor			4.1 u
309-00-2	Aldrin			4.3 u
1024-57-3	Heptachlor Epoxide		2.0 u	
959-98-8	Endosulfan I		3.5 u	
60-57-1	Dieldrin		15 u	
33213-65-9	Endosulfan II		3.7 u	
7421-93-4	Endrin Aldehyde		6.7 u	
50-29-3	4,4'-DDT		3.1 u	3.1 u
72-43-5	Methoxychlor		5.1 u	
319-84-6	Alpha-BHC		2.1 u	
319-85-7	Beta-BHC		4.1 u	
319-86-8	Delta-BHC		4.1 u	
5103-74-2	Gamma-Chlordane		7.9 u	7.9 u
5103-71-9	Alpha-Chlordane		4.8 u	4.8 u
72-55-9	4,4'-DDE		3.5 u	3.5 u
72-20-8	Endrin		8.9 u	
72-54-8	4,4'-DDD		5.3 u	
1031-07-8	Endosulfan Sulfate		16 u	
53494-70-5	Endrin Ketone		2.8 u	
N.A.	Aroclor 1016			21 u
N.A.	Aroclor 1221			27 u
N.A.	Aroclor 1232			27 u
N.A.	Aroclor 1242			16 u
N.A.	Aroclor 1248			36 u
N.A.	Aroclor 1254			40 u
N.A.	Aroclor 1260			13 u
8001-35-2	Toxaphene		13 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:15.00 g Vm: 2ul T: 10.0 ml

FORM I

301890

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000368	Y2-BS034-GF

#3 CAE 11/8/93

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.86 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.01 g Vm: 2ul T: 10.0 ml

FORM I

301891

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000369	Y2-BS044-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.34 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301892

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000370	Y2-BS045-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.49 %

		Dil. 1.0	1.0
CAS Number	Compound	Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)	1.1 u	
76-44-8	Heptachlor		3.1 u
309-00-2	Aldrin		3.2 u
1024-57-3	Heptachlor Epoxide	1.5 u	
959-98-8	Endosulfan I	2.6 u	
60-57-1	Dieldrin	11 u	
33213-65-9	Endosulfan II	2.8 u	
7421-93-4	Endrin Aldehyde	5.0 u	
50-29-3	4,4'-DDT	2.3 u	2.3 u
72-43-5	Methoxychlor	3.8 u	
319-84-6	Alpha-BHC	1.6 u	
319-85-7	Beta-BHC	3.1 u	
319-86-8	Delta-BHC	3.1 u	
5103-74-2	Gamma-Chlordane	5.9 u	5.9 u
5103-71-9	Alpha-Chlordane	3.6 u	3.6 u
72-55-9	4,4'-DDE	2.6 u	2.6 u
72-20-8	Endrin	6.7 u	
72-54-8	4,4'-DDD	4.0 u	
1031-07-8	Endosulfan Sulfate	12 u	
53494-70-5	Endrin Ketone	2.1 u	
N.A.	Aroclor 1016		16 u
N.A.	Aroclor 1221		20 u
N.A.	Aroclor 1232		20 u
N.A.	Aroclor 1242		12 u
N.A.	Aroclor 1248		27 u
N.A.	Aroclor 1254		30 u
N.A.	Aroclor 1260		10 u
8001-35-2	Toxaphene	10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301893

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000371	Y2-BS046-WS

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.00 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.1 u	
76-44-8	Heptachlor			3.1 u
309-00-2	Aldrin			3.2 u
1024-57-3	Heptachlor Epoxide		1.5 u	
959-98-8	Endosulfan I		2.6 u	
60-57-1	Dieldrin		11 u	
33213-65-9	Endosulfan II		2.8 u	
7421-93-4	Endrin Aldehyde		5.0 u	
50-29-3	4,4'-DDT		2.3 u	2.3 u
72-43-5	Methoxychlor		3.8 u	
319-84-6	Alpha-BHC		1.6 u	
319-85-7	Beta-BHC		3.1 u	
319-86-8	Delta-BHC		3.1 u	
5103-74-2	Gamma-Chlordane		5.9 u	5.9 u
5103-71-9	Alpha-Chlordane		3.6 u	3.6 u
72-55-9	4,4'-DDE		2.6 u	2.6 u
72-20-8	Endrin		6.7 u	
72-54-8	4,4'-DDD		4.0 u	
1031-07-8	Endosulfan Sulfate		12 u	
53494-70-5	Endrin Ketone		2.1 u	
N.A.	Aroclor 1016			16 u
N.A.	Aroclor 1221			20 u
N.A.	Aroclor 1232			20 u
N.A.	Aroclor 1242			12 u
N.A.	Aroclor 1248			27 u
N.A.	Aroclor 1254			30 u
N.A.	Aroclor 1260			10 u
8001-35-2	Toxaphene		10 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:20.00 g Vm: 2ul T: 10.0 ml

FORM I

301894

ORGANIC ANALYSIS DATA SHEET PESTICIDE / PCB'S

Laboratory Name: HES, Inc.
Client: Blasland & Bouck
York Oil
Matrix: Biological Tissue

Laboratory Sample Number	Client Sample Number
31000372	Y2-BS047-EW

Date Extracted/Prepared: 10/11/93

GPC Cleanup: YES
Concentration: LOW
Lipids: 1.60 %

		Dil.	1.0	1.0
CAS Number	Compound		Pesticide Analys Results ug/kg	PCB Analysis Results ug/kg
58-89-9	Gamma-BHC (Lindane)		1.2 u	
76-44-8	Heptachlor			3.3 u
309-00-2	Aldrin			3.4 u
1024-57-3	Heptachlor Epoxide		1.6 u	
959-98-8	Endosulfan I		2.7 u	
60-57-1	Dieldrin		12 u	
33213-65-9	Endosulfan II		2.9 u	
7421-93-4	Endrin Aldehyde		5.3 u	
50-29-3	4,4'-DDT		2.4 u	2.4 u
72-43-5	Methoxychlor		4.0 u	
319-84-6	Alpha-BHC		1.7 u	
319-85-7	Beta-BHC		3.3 u	
319-86-8	Delta-BHC		3.3 u	
5103-74-2	Gamma-Chlordane		6.2 u	6.2 u
5103-71-9	Alpha-Chlordane		3.8 u	3.8 u
72-55-9	4,4'-DDE		2.7 u	2.7 u
72-20-8	Endrin		7.0 u	
72-54-8	4,4'-DDD		4.2 u	
1031-07-8	Endosulfan Sulfate		13 u	
53494-70-5	Endrin Ketone		2.2 u	
N.A.	Aroclor 1016			17 u
N.A.	Aroclor 1221			21 u
N.A.	Aroclor 1232			21 u
N.A.	Aroclor 1242			13 u
N.A.	Aroclor 1248			28 u
N.A.	Aroclor 1254			32 u
N.A.	Aroclor 1260			11 u
8001-35-2	Toxaphene		11 u	

N.A. = Not Available W = Weight of sample extracted (g)
Vm = Volume of extract injected on megabore (ul)
T = Volume of total extract (ml)

W:19.00 g Vm: 2ul T: 10.0 ml

FORM I

301895

TRILLIUM INC.

DATA VALIDATION

FOR

YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

INORGANIC DATA:
Arsenic, Lead and Mercury in Biological Tissues

Laboratory Project No. 688.02
SDG No. 050-MS

Chemical Analyses Performed by
Hazleton Environmental Services
Madison, Wisconsin

FOR:

Blasland & Bouck Engineers, P.C.

BY:

Trillium, Inc.
7A Grace's Drive
Coatesville, PA 19320
(215) 383-7233

November 18, 1993

92212/CAE

TRILLIUM INC.

EXECUTIVE SUMMARY

Validation of the inorganics data (arsenic, lead and mercury) prepared by Hazleton Environmental Services for 20 biological tissue samples from the York Oil Superfund site in Moira, New York, has been completed. The EPA Region II Standard Operating Procedure (SOP) No. HW-2, Revision #XI (1/92) was used as the basis for the validation; evaluations were modified as necessary to incorporate the specifications of the referenced laboratory SOPs used for analysis. These data were reported by the laboratory under Project No. 688.02, SDG No. 050-MS, which includes the following field samples:

Y2-BS002-FW	Y2-BS004-GF	Y2-BS006-GF
Y2-BS010-FD	Y2-BS011-FD	Y2-BS012-FD
Y2-BS014-SS	Y2-BS015-EW	Y2-BS016-EW
Y2-BS017-GF	Y2-BS018-GF	Y2-BS019-GF
Y2-BS020-EW	Y2-BS022-GF	Y2-BS023-GF
Y2-BS024-RV	Y2-BS025-SS	Y2-BS026-GF
Y2-BS050-MS*	Y2-BS051-MS*	

* these are composites of individual samples received with different ID numbers

The "Y2-" portion of the sample identifications (IDs) was left off the Data Summary Form entries due to space limitations and throughout this report for the sake of brevity.

Key findings of the validation effort resulted in the following qualifications of sample results:

- Results for lead in all samples were qualified as estimated (J, UJ).
- Results for mercury in BS004-GF, BS006-GF, BS023-GF and BS024-RV were qualified as estimated (J).
- Results for arsenic in BS050-MS, BS051-MS, BS004-GF, BS006-GF, BS010-FD, BS011-FD, BS012-FD, BS014-SS, BS016-EW, BS017-GF, BS018-GF, BS019-GF, BS020-EW, BS022-GF, BS023-GF, BS024-RV, BS025-SS and BS026-GF were qualified as estimated (J, UJ).

The laboratory should be requested to provide clarifications of reported QC information as described in Sections II and VII.

This report should be considered <u>part of the data package</u> for all future distributions of the inorganics data.

INTRODUCTION

Analyses were performed according to the following Hazleton Environmental Services SOPs:

Arsenic: MP-AST-MA (7/14/93)
Lead: MP-PBT-MA (7/14/93)
Mercury: MP-HGTA-MA (7/1/93)

Each SOP references the applicable methods from SW-846 (Second Edition, 4/84); the SOPs for arsenic and lead also reference the Contract Laboratory Program (CLP) Statement of Work for inorganics analysis, ILM02.0 (1990). A method detection limit (MDL) of 0.1 mg/Kg is specified for arsenic and for lead; the MDL specified for mercury is 0.025 mg/Kg. A reporting limit (RL) of 0.5 mg/Kg is further specified for arsenic and lead; no separate RL is specified for mercury.

Results of sample analyses are reported by the laboratory as either qualified or unqualified. Unqualified results mean that the reported values may be used without reservation. Various qualifier codes are used by the laboratory to denote specific information regarding the laboratory results.

The data validation process is intended to evaluate data on a technical basis rather than a contract compliance basis for chemical analyses conducted under the CLP. An initial assumption is that the data package is presented in accordance with the CLP (or, "CLP-like") requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate quality review prior to submission for validation.

During the validation process, laboratory-qualified and unqualified data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data validator. Final validated results are, therefore, either qualified or unqualified. Unqualified results still mean that the reported values may be used without reservation. Validator-qualified results are annotated with the following codes:

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable (Note: Analyte may or may not be present).

UJ - The material was analyzed for, but was not detected. The associated value, which is either the sample quantitation limit or the sample detection limit, is an estimate and may be inaccurate or imprecise.

These codes are recorded on the Data Summary Forms contained in Attachment A and the Inorganic Analysis Data Sheets (Form I) in Attachment B to qualify the results as appropriate according to the review of the data package.

Details of the validation findings and conclusions for the inorganics data are provided in the following sections of this report:

I. Holding Times

II. Calibration

III. Blanks

IV. ICP Interference Check Sample

V. Matrix Spike Sample Analysis

VI. Duplicate Sample Analysis

VII. Laboratory Control Sample Analysis

VIII. Furnace Atomic Absorption QC

IX. ICP Serial Dilution Analysis

X. Detection Limits

XI. Sample Result Verification

XII. Documentation

XIII. Overall Assessment

I. Holding Times

The samples were collected September 8-17, 1993, and prepared for analysis on October 20 and October 26, 1993. Analyses were completed on or before October 26, 1993.

No holding time requirements have been established for metals analysis in biological tissue samples; however the samples were carefully handled and well-documented from collection through preparation. There is, therefore, no reason for concern with respect to data quality on this basis. Appropriate storage of the sample digestates is not as well-documented; for the purposes of the validation it was assumed that the digestates were held in refrigerated storage prior to all analyses.

II. Calibration

Initial and continuing calibrations were satisfactory for all target elements.

Contract required detection limit (CRDL) standards were run in each analysis series for all three analytes. Concentrations were equal to the CRDLs specified by the CLP (10 µg/L, 3 µg/L, and 0.2 µg/L, for arsenic, lead and mercury, respectively, equivalent to 1 mg/Kg, 0.3 mg/Kg, and 0.01 mg/Kg, respectively), rather than the RLs or MDLs specific to these analyses. Percent recoveries were outside the acceptance limits of 80 to 120% for lead (74.7%) and mercury (125%).

The low recovery for lead suggests that sample results near the measured concentration may be biased low; therefore, sample results less than 0.6 mg/Kg (2xCRDL) warranted qualification as estimated (J, UJ). Results for lead in BS006-GF, BS010-FD, BS011-FD, BS012-FD, BS014-SS, BS017-GF, BS018-GF, BS019-GF, BS022-GF, BS023-GF, BS024-RV, BS025-SS, and BS051-MS were qualified on this basis.

The CRDL standard concentration for mercury (0.2 µg/L) is equivalent to 0.01 mg/Kg in a sample prepared according to the Hazleton SOP. This concentration is lower than the MDL specified by Hazleton for this method (0.025 mg/Kg). However, the specified MDL is actually five times the MDL calculated based on the instrument detection limit (IDL) for mercury reported on Form X (0.1 µg/L, or 0.005 mg/Kg). This inconsistency should be clarified by the laboratory.

Positive results were reported for mercury in all of the samples; those results reported at 0.02 mg/Kg (2xCRDL, as run)

warranted qualification based on the high recovery. Results for mercury in BS004-GF, BS006-GF, BS023-GF and BS024-RV were qualified on this basis.

III. Blanks

Preparation and calibration blanks were prepared and analyzed at the proper frequencies for all analytes.

No analytes were detected in any of the reported blanks at concentrations in excess of the specified RLs, however, low levels of arsenic and lead above the MDLs (≤0.12 mg/Kg in all cases) were reported in one or more calibration blanks. No sample results were adversely affected by these slightly contaminated blanks.

No responses less than the negative RLs or MDLs were detected in any of the blanks associated with this SDG.

IV. ICP Interference Check Sample

No samples in the SDG were analyzed by ICP.

V. Matrix Spike Sample Analysis

Sample BS026-GF was used for the matrix spike analysis. Acceptable recoveries were obtained for arsenic and mercury, but the recovery for lead was unacceptably high (156.9%). On this basis, all positive results reported for lead in the samples in this SDG were qualified as estimated (J).

VI. Duplicate Sample Analysis

Sample BS026-GF was used for the laboratory duplicate analysis. All paired results were less than five times the RLs for the target analytes; relative percent differences (RPDs) showed acceptable reproducibility (≤28.5%) for the low concentrations measured.

VII. Laboratory Control Sample Analyses

All %Rs for the laboratory control sample (LCS) run in each analysis series were correctly calculated and accurately reported. All %Rs were within the control limits established by EPA.

The LCS for arsenic was run twice and the LCS for lead was run three times before the responses that were reported on Form VII were obtained. It is not considered an acceptable practice to perform multiple analyses and select the "best" one for reporting. If there were specific reasons for the re-analyses (e.g., a bad injection), they should be documented in the raw data by the analyst and, ideally, in the narrative prior to issue of the data package. No qualifiers were applied on this basis; most of the sample results for arsenic and lead were otherwise qualified as estimated anyway. Recoveries obtained in the initial LCS runs for both analytes were too low; the laboratory should be requested to clarify how the reported results were obtained.

VIII. Furnace Atomic Absorption QC

Post-digestion spike recoveries were outside the acceptable range (85-115%) for arsenic in all samples **except** BS015-EW; in each case, the recovery was less than 85% but greater than 40%. The following actions were taken:

- Sample BS002-FW was rerun by the method of standard additions (MSA). An acceptable correlation coefficient was achieved on the third MSA attempt; this result was correctly calculated and accurately reported. Therefore, the "S" qualifier appropriately applied by the laboratory to this lead result was removed by the validator and no additional qualifiers were required.

- Sample BS020-EW was rerun by the method of standard additions (MSA). The correlation coefficient was unacceptable (<0.995) in all three MSA attempts; the result calculated from the MSA with the highest correlation (0.9768) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation; it is also below the specified RL for this analyte. The "+" qualifier was removed by the validator.

- For all other samples affected by low recoveries, sample absorbance was less than 50% of the spike absorbance; therefore, no reruns were required and the results were appropriately flagged with a "W" by the laboratory. All sample results so reported for arsenic were qualified as estimated (J, UJ) based on the low recoveries; the "W" qualifiers were removed by the validator.

Post-digestion spike recoveries for lead in several samples were below 85% but greater than 40%. The following actions were taken:

- Samples BS002-FW and BS004-GF were rerun at dilutions and acceptable recoveries were obtained; the dilution results were accurately reported and no further qualifications were warranted on this basis.

- Sample absorbance in BS006-GF, BS010-FD, BS011-FD, BS020-EW, and BS023-GF was less than 50% of the spike absorbance; therefore, no reruns were required and the results were appropriately flagged with a "W" by the laboratory. These results warranted qualification as estimated (J, UJ) on this basis, but since all were previously qualified due to the high matrix spike recovery, no further action was required.

- Sample BS026-GF and its spike and duplicate were rerun by MSA. Acceptable correlations were obtained for the unspiked sample and duplicate; the "S" qualifier applied to the sample result was therefore removed and no further action was required. The correlation for the spiked sample was unacceptable in each of two MSA runs performed; the result from the run with the higher correlation (0.9804) was correctly reported on Form V, and must be considered an estimated value. This may be a contributing factor to the high matrix spike recovery obtained for this sample. No changes to the previously-assigned qualifiers were warranted.

Duplicate injection precision met the 20% relative standard deviation (RSD) criterion for all elements in all sample analyses where positive results were reported **except** for lead in BS002-FW (26.7%). This result was previously qualified as estimated, and no further action was warranted on this basis. A second result for lead (BS006-GF) was similarly flagged by the laboratory, but in this case the response was below the RL and a slightly high %RSD is not unexpected. The "M" qualifier was removed and no further action was taken.

IX. ICP Serial Dilution Analysis

No analyses were performed by ICP on samples in this SDG.

X. Detection Limits

MDLs were correctly calculated and accurately reported. **Note that the reported MDLs are not corrected for percent solids.**

XI. Sample Result Verification

Sample results were correctly calculated and accurately reported. Appropriate dilutions were made as required for quantitation of target analytes. **Note that the reported results are not adjusted for the percent solids in each sample.**

Positive sample results for arsenic and lead greater than the applicable MDLs but below the RLs were correctly reported by the laboratory with "B" qualifiers. As concentrations approach the MDL the accuracy of the measurement decreases; values closer to the RL, however, are generally more accurate. A guideline of 2xMDL was used to determine whether the reported results warranted qualification: specifically, sample results below the respective RL and not otherwise qualified warrant qualification as estimated (J) if they are also less than 2xMDL. No sample results in this SDG were qualified as estimated (J) on this basis alone. All "B" qualifiers applied by the laboratory were removed by the validator.

Documentation of percent solids calculations was provided in the data package, and calculations were correctly performed. Note that the percent solids in each of the tissue samples was very low (≤29.8%); since the reported results are not adjusted to account for the moisture content of each sample, no qualifiers were applied on this basis.

XII. Documentation

Chain-of-custody (COC) records were present and accurately completed for all samples reported in this data package except that cooler temperature on laboratory receipt was not recorded; it is noted on each COC that the samples were packed in ice. No preservation criteria have been established for biological samples, and no qualifiers were applied on this basis; however, documentation of the cooler temperature on receipt would be useful for future reference.

Internal laboratory COC records were provided for each sample, documenting the retrieval of each "whole sample" from storage for preparation and return of the samples to storage, generally on the same day. No similar documentation is provided, however, for the

digestates, and it is not clear how they were stored prior to analysis.

XIII. Overall Assessment

Sample results for inorganic analytes were determined to be valid as reported, with the following exceptions:

- Results for lead in BS006-GF, BS010-FD, BS011-FD, BS012-FD, BS014-SS, BS017-GF, BS018-GF, BS019-GF, BS022-GF, BS023-GF, BS024-RV, BS025-SS, and BS051-MS were qualified as estimated (J, UJ) due to a low recovery in the associated CRDL standard. Results for lead in BS006-GF, BS010-FD, and BS023-GF warranted similar qualification based on low post-digest spike recoveries and the high recovery in the matrix spike analysis. The result for lead in BS011-FD warranted similar qualification due to a low post-digest recovery; results for lead in BS014-SS, BS022-GF, BS024-RV, BS025-SS and BS051-MS warranted similar qualification due to the high matrix spike recovery.

- Results for mercury in BS004-GF, BS006-GF, BS023-GF and BS024-RV were qualified as estimated (J) due to a high CRDL standard recovery.

- Results for lead in BS002-FW, BS004-GF, BS015-EW, BS016-EW, BS020-EW, BS026-GF and BS050-MS were qualified as estimated (J) based on an unacceptably high recovery in the matrix spike analysis. The result for lead in BS020-EW warranted similar qualification due to a low post-digest spike recovery, and the result for lead in BS002-FW warranted similar qualification due to a high %RSD between the duplicate injections.

- The result for arsenic in BS020-EW was qualified as estimated (J) due to poor correlation in the MSA analysis.

- Results for arsenic in BS050-MS, BS051-MS, BS004-GF, BS006-GF, BS010-FD, BS011-FD, BS012-FD, BS014-SS, BS016-EW, BS017-GF, BS018-GF, BS019-GF, BS022-GF, BS023-GF, BS024-RV, BS025-SS and BS026-GF were qualified as estimated (J, UJ) due low post-digest spike recoveries.

The laboratory should be requested to provide clarifications of reported QC information as described in Sections II and VII to

ensure that accurate documentation is available for future reference.

This report should be considered part of the data package for all future distributions of the inorganics data.

TRILLIUM INC.

ATTACHMENT A

Data Summary Forms
Laboratory Project No. 688.02
SDG 050-MS
Arsenic, Lead and Mercury in Biological Tissues

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 050–MS

Trillium Project No.: 92212

	Sample Number	BS002–FW		BS004–GF		BS006–GF		BS010–FD		BS011–FD		BS012–FD		BS014–SS		BS015–EW		BS016–EW	
	Lab ID	31000330		31000331		31000332		31000333		31000334		31000335		31000336		31000337		31000338	
	% Solids	21.2		15.2		14.8		24.8		24.4		25.8		27.6		22.2		24.2	
RL																			
0.5	Arsenic	3.1		0.09	UJ	0.10	UJ	0.09	UJ	0.10	UJ	0.09	UJ	0.09	UJ	0.35		0.41	J
0.5	Lead	11.4	J	10.5	J	0.30	J	0.12	J	0.10	UJ	0.09	UJ	0.37	J	3.3	J	2.2	J
0.025	Mercury	0.11		0.02	J	0.02	J	0.14		0.12		0.14		0.11		0.13		0.09	

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 050–MS

Trillium Project No.: 92212

	Sample Number	BS017–GF		BS018–GF		BS019–GF		BS020–EW		BS022–GF		BS023–GF		BS024–RV		BS025–SS		BS026–GF	
	Lab ID	31000339		31000340		31000341		31000342		31000343		31000344		31000345		31000346		31000347	
	% Solids	19.9		23.0		18.8		16.4		22.0		18.3		24.9		29.2		18.0	
RL																			
0.5	Arsenic	0.09	UJ	0.10	UJ	0.09	UJ	0.19	J	0.10	UJ	0.10	UJ	0.09	UJ	0.11	J	0.12	J
0.5	Lead	0.09	UJ	0.10	UJ	0.14	J	0.73	J	0.13	J	0.12	J	0.27	J	0.29	J	0.62	J
0.025	Mercury	0.03		0.03		0.03		0.15		0.03		0.02	J	0.02	J	0.12		0.04	

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 050–MS

Trillium Project No.: 92212

RL	Sample Number	BS050–MS		BS051–MS															
	Lab ID	31000328		31000329															
	% Solids	29.8		28.9															
0.5	Arsenic	0.11	J	0.17	J														
0.5	Lead	1.5	J	0.39	J														
0.025	Mercury	0.05		0.15															

TRILLIUM INC.

ATTACHMENT B

Inorganic Analysis Data Sheets (Form I)
Laboratory Project No. 688.02
SDG 050-MS
Arsenic, Lead and Mercury in Biological Tissues

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS002-FW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 3100032O

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 21.2 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG CAE 11/18/93

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	3.1		S	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	11.4		~~M~~ J	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.11			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS004-GF

Name: HES_INC._____ Contract: BBES_____

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000331

Level (low/med): LOW__ Date Received: 10/04/93

% Solids: ~~100.0~~ 15.2 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	JW	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	10.5		JW	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/18/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

_____

_____

_____

_____

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS004-GF

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000331

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 15.2 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	JW	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	10.5		JW	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/18/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B5006-GF

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000332

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 14.8 CAE 11/8/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	J W	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.30		J W PM	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/18/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B5010-FD

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000333

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 24.8 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.09	U	J W	F CAE 11/18/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.12	B	J W	F CAE 11/18/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.14			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS011-FD

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: ____ SAS No.: ____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000334

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 24.4 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.10	U	J W	F CAE 11/18/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.10	U	J W	F CAE 11/18/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.12			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: ____ Clarity Before: ____ Texture: ____

Color After: ____ Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85012-FD

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: ____ SAS No.: ____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000335

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 25.8 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	IN	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.09	U	IN	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.14			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: ____ Clarity Before: ____ Texture: ____

Color After: ____ Clarity After: ____ Artifacts: ____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 014-SS

Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000336

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 27.6 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	J/N	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.37		J/N	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.11			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

~~BS~~ 015-EW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000337

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 22.2 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony			CAE	NR
7440-38-2	Arsenic	0.35	B	11/18/93	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	3.3		N	F CAE 11/18/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.13			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 016-EW

Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000338

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 24.2 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.41	B	N J	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	2.2		N J	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.09			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS017-GF

Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000339

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 19.9 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	IN	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.09	U	IN	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.03			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS018-GF

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000340

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 23.0 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.10	U	~~SW~~	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.10	U	~~SW~~	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.03			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/18/93

CAE 11/18/93

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS019-GF

Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000341

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 18.8 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	J ~~N~~	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.14	~~B~~	J ~~N~~	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.03			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS020-EW

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000342

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 16.4 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.19	B	J+	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.73		J W	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.15			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/18/93

CAE 11/18/93

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 022-GF

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000343

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 22.0 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	J W	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.13	~~B~~	J N	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.03			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 023-GF

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000344

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 18.3 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	J W	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.12	~~B~~	J W	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/18/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 024-RV

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000345

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 24.9 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	~~J~~ W	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.27	~~B~~	~~J~~ W	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		~~J~~	AV	CAE 11/18/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN ILM03.0

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

~~35~~ 025-SS

Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000346

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 29.2 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.11	B	~~IN~~	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.29	B	~~IN~~	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.12			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/18/93

CAE 11/18/93

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN ILM03.0

301929

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 026-GF

b Name: HES_INC. Contract: BBES

b Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

atrix (soil/water): BIOTA Lab Sample ID: 31000347

vel (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 18.0 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.12	B	W J	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.62		J SN	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.04			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/18/93

CAE 11/18/93

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

304930

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS050-MS

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000328

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 29.8 CAE 11/18/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.11	B	J W	F	CAE 11/18/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	1.5		J N	F	CAE 11/18/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.05			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN ILM03.0

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS051-MS

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 050-MS

Matrix (soil/water): BIOTA Lab Sample ID: 31000329

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 28.9 CAE 11/18/93 wet

Concentration Units (ug/L or mg/kg ~~dry~~ weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.17	B	W	F CAE 11/18/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.39		N	F CAE 11/18/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.15			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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TRILLIUM INC.

DATA VALIDATION

FOR

YORK OIL SUPERFUND SITE
MOIRA, NEW YORK

INORGANIC DATA:
Arsenic, Lead and Mercury in Biological Tissues

Laboratory Project No. 688.02
SDG No. 027-EW

Chemical Analyses Performed by
Hazleton Environmental Services
Madison, Wisconsin

FOR:

Blasland & Bouck Engineers, P.C.

BY:

Trillium, Inc.
7A Grace's Drive
Coatesville, PA 19320
(215) 383-7233

November 19, 1993

92212/CAE

TRILLIUM INC.

EXECUTIVE SUMMARY

Validation of the inorganics data (arsenic, lead and mercury) prepared by Hazleton Environmental Services for 19 biological tissue samples from the York Oil Superfund site in Moira, New York, has been completed. The EPA Region II Standard Operating Procedure (SOP) No. HW-2, Revision #XI (1/92) was used as the basis for the validation; evaluations were modified as necessary to incorporate the specifications of the referenced laboratory SOPs used for analysis. These data were reported by the laboratory under Project No. 688.02, SDG No. 027-EW, which includes the following field samples:

Y2-BS027-EW	Y2-BS032-RV	Y2-BS033-SS
Y2-BS034-WS	Y2-BS035-WS	Y2-BS036-WS
Y2-BS037-FD	Y2-BS038-FD	Y2-BS039-FD
Y2-BS040-EW	Y2-BS042-EW	Y2-BS043-GF
Y2-BS044-WS	Y2-BS045-WS	Y2-BS046-WS
Y2-BS047-EW	Y2-BS048-EW	Y2-BS052-RW*
Y2-BS053-MS*		

* these are composites of individual samples received with different ID numbers

The "Y2-" portion of the sample identifications (IDs) was left off the Data Summary Form entries due to space limitations and throughout this report for the sake of brevity.

Key findings of the validation effort resulted in the following qualifications of sample results:

- Results for lead in all samples **except** BS027-EW, BS042-EW and BS048-EW were qualified as estimated (J, UJ).
- Results for mercury in BS043-GF and BS052-RW were qualified as estimated (J
- Results for arsenic in all samples were qualified as estimated (J, UJ).

The laboratory should be requested to provide clarifications of reported QC information as described in Sections II and VII to ensure that accurate documentation is available for future reference.

This report should be considered part of the data package for all future distributions of the inorganics data.

INTRODUCTION

Analyses were performed according to the following Hazleton Environmental Services SOPs:

Arsenic: MP-AST-MA (7/14/93)
Lead: MP-PBT-MA (7/14/93)
Mercury: MP-HGTA-MA (7/1/93)

Each SOP references the applicable methods from SW-846 (Second Edition, 4/84); the SOPs for arsenic and lead also reference the Contract Laboratory Program (CLP) Statement of Work for inorganics analysis, ILM02.0 (1990). A method detection limit (MDL) of 0.1 mg/Kg is specified for arsenic and for lead; the MDL specified for mercury is 0.025 mg/Kg. A reporting limit (RL) of 0.5 mg/Kg is further specified for arsenic and lead; no separate RL is specified for mercury.

Results of sample analyses are reported by the laboratory as either qualified or unqualified. Unqualified results mean that the reported values may be used without reservation. Various qualifier codes are used by the laboratory to denote specific information regarding the laboratory results.

The data validation process is intended to evaluate data on a technical basis rather than a contract compliance basis for chemical analyses conducted under the CLP. An initial assumption is that the data package is presented in accordance with the CLP (or, "CLP-like") requirements. It is also assumed that the data package represents the best efforts of the laboratory and has already been subjected to adequate quality review prior to submission for validation.

During the validation process, laboratory-qualified and unqualified data are verified against all available supporting documentation. Based on this evaluation, qualifier codes may be added, deleted, or modified by the data validator. Final validated results are, therefore, either qualified or unqualified. Unqualified results still mean that the reported values may be used without reservation. Validator-qualified results are annotated with the following codes:

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable (Note: Analyte may or may not be present).

UJ - The material was analyzed for, but was not detected. The associated value, which is either the sample quantitation limit or the sample detection limit, is an estimate and may be inaccurate or imprecise.

These codes are recorded on the Data Summary Forms contained in Attachment A and the Inorganic Analysis Data Sheets (Form I) in Attachment B to qualify the results as appropriate according to the review of the data package.

Details of the validation findings and conclusions for the inorganics data are provided in the following sections of this report:

I. Holding Times

II. Calibration

III. Blanks

IV. ICP Interference Check Sample

V. Matrix Spike Sample Analysis

VI. Duplicate Sample Analysis

VII. Laboratory Control Sample Analysis

VIII. Furnace Atomic Absorption QC

IX. ICP Serial Dilution Analysis

X. Detection Limits

XI. Sample Result Verification

XII. Documentation

XIII. Overall Assessment

I. Holding Times

The samples were collected September 8-17, 1993, and prepared for analysis on October 20 and October 26, 1993. Analyses were completed on or before October 27, 1993.

No holding time requirements have been established for metals analysis in biological tissue samples; however the samples were carefully handled and well-documented from collection through preparation. There is, therefore, no reason for concern with respect to data quality on this basis. Appropriate storage of the sample digestates is not as well-documented; for the purposes of the validation it was assumed that the digestates were held in refrigerated storage prior to all analyses.

II. Calibration

Initial and continuing calibrations were satisfactory for all target elements.

Contract required detection limit (CRDL) standards were run in each analysis series for all three analytes. Concentrations were equal to the CRDLs specified by the CLP (10 µg/L, 3 µg/L, and 0.2 µg/L, for arsenic, lead and mercury, respectively, equivalent to 1 mg/Kg, 0.3 mg/Kg, and 0.01 mg/Kg, respectively), rather than the RLs or MDLs specific to these analyses. Percent recoveries were outside the acceptance limits of 80 to 120% for lead (74.7%) in the first analysis series and for mercury (125%).

The low recovery for lead suggests that associated sample results near the measured concentration may be biased low; therefore, sample results less than 0.6 mg/Kg (2xCRDL) warranted qualification as estimated (J, UJ). Results for lead in BS052-RW and BS053-MS were qualified on this basis; results for the other two samples run in the affected series were higher than 0.6 mg/Kg.

The CRDL standard concentration for mercury (0.2 µg/L) is equivalent to 0.01 mg/Kg in a sample prepared according to the Hazleton SOP. This concentration is lower than the MDL specified by Hazleton for this method (0.025 mg/Kg). However, the specified MDL is actually five times the MDL calculated based on the instrument detection limit (IDL) for mercury reported on Form X (0.1 µg/L, or 0.005 mg/Kg). This inconsistency should be clarified by the laboratory.

Positive results were reported for mercury in all of the samples; those results reported at 0.02 mg/Kg (2xCRDL, as run)

warranted qualification based on the high recovery. Results for mercury in BS043-GF and BS052-RW were qualified on this basis.

III. Blanks

Preparation and calibration blanks were prepared and analyzed at the proper frequencies for all analytes.

No analytes were detected in any of the reported blanks at concentrations in excess of the specified RLs, however, low levels of arsenic and lead above the MDLs (≤0.12 mg/Kg in all cases) were reported in one or more calibration blanks. No sample results were adversely affected by these slightly contaminated blanks.

No responses less than the negative RLs or MDLs were detected in any of the blanks associated with this SDG.

IV. ICP Interference Check Sample

No samples in the SDG were analyzed by ICP.

V. Matrix Spike Sample Analysis

Sample BS034-WS was used for the matrix spike analysis. Acceptable recoveries (75-125%) were obtained for arsenic and lead. The recovery for mercury was slightly low (70.2%), but the unspiked sample concentration was more than four times the spike amount added; therefore, accurate recovery is not expected and no qualifiers were applied on this basis.

VI. Duplicate Sample Analysis

Sample BS034-WS was used for the laboratory duplicate analysis. Paired results for arsenic and lead were less than five times the RLs for the target analytes; relative percent differences (RPDs) showed relatively poor reproducibility (65.6% and 87.2%, respectively), but both sets of results agreed within 2xRL. Therefore, no qualifiers were warranted on this basis.

The paired results for mercury were well above the MDL and showed excellent reproducibility with an RPD of 5.3%; no qualifiers were warranted on this basis.

VII. Laboratory Control Sample Analyses

Reported recoveries for the laboratory control sample (LCS) run for each element were correctly calculated and accurately reported. All %Rs were within the control limits established by EPA.

Seven runs labelled "LCST" were found in the raw data for arsenic; the value reported on Form X came from the last run found. The LCST for lead was apparently run three times before the response that were reported on Form VII was obtained. It is not considered an acceptable practice to perform multiple analyses and select the "best" one for reporting. If there were specific reasons for re-analysis (e.g., a bad injection), they should be documented in the raw data by the analyst and, ideally, in the narrative prior to issue of the data package. If some of the LCST injections are not applicable to this SDG, the raw data should be so noted ("z'd" out entries on Form XIV are not sufficient). Unique ID numbers should be assigned to each LCST to avoid this problem and clarify the association between the raw data and the reported values.

No qualifiers were applied on this basis; most of the sample results for arsenic and lead were otherwise qualified as estimated anyway. Recoveries obtained in most of the unreported LCS runs for both analytes were too low; the laboratory should be requested to clarify how the reported results were obtained.

VIII. Furnace Atomic Absorption QC

Post-digestion spike recoveries were outside the acceptable range (85-115%) for arsenic in all samples. In all but four cases, the recovery was less than 85% but greater than 40%; recoveries were less than 40% for BS038-FD, BS040-EW, BS046-WS and BS047-EW. The following actions were taken:

- Sample BS033-SS was rerun by the method of standard additions (MSA). An acceptable correlation coefficient was not achieved on either MSA attempt; the result (2.2 µg/L, or 0.21 mg/Kg) from the MSA with the best correlation (0.9942) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation.

- Sample BS034-WS and its spike and duplicate were rerun by MSA. The correlation coefficient was acceptable in the only run performed on the unspiked sample and in the second MSA run of the spike; low correlations were

obtained in both runs of the duplicate. The reported results were correctly calculated and accurately reported from the run with the highest correlation in each case (1.6 µg/L, or 0.16 mg/Kg for the unspiked sample). Therefore, the "S" qualifier appropriately applied by the laboratory to the lead result for the unspiked sample was removed by the validator and no additional qualifiers were required on this basis.

- Sample BS038-FD was rerun by MSA. An acceptable correlation coefficient was not achieved in any of the three MSA attempts; the result (1.1 µg/L, or 0.10 mg/Kg) from the MSA with the best correlation (0.9917) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation.

- Sample BS040-FD was rerun by MSA. An acceptable correlation coefficient was not achieved in either MSA attempt; the result (4.6 µg/L, or 0.43 mg/Kg) from the MSA with the best correlation (0.9730) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation.

- Sample BS046-WS was rerun by MSA. The correlation coefficient was acceptable (0.9976) in the second run performed; this result was correctly calculated and accurately reported (1.9 µg/L, or 0.19 mg/Kg). Therefore, the "S" qualifier appropriately applied by the laboratory to this lead result was removed by the validator and no additional qualifiers were required on this basis.

- Sample BS047-EW was rerun by MSA. The correlation coefficient was acceptable (0.9955) in the second run performed; this result was correctly calculated and accurately reported (9.2 µg/L, or 0.89 mg/Kg). Therefore, the "S" qualifier appropriately applied by the laboratory to this lead result was removed by the validator and no additional qualifiers were required on this basis.

- For all other samples, sample absorbance was less than 50% of the spike absorbance; therefore, no reruns were required and the results were appropriately flagged with a "+" by the laboratory. All remaining sample results for lead were qualified as estimated (J, UJ) based on

the low recoveries; the "W" qualifiers were removed by the validator.

Some of the MSA analyses were not specifically required by the CLP protocols; i.e., the sample absorbances were less than 50% of the spike absorbances and diluted reruns could have been attempted. Since MSA is actually a better analytical technique, the fact that it was used more than necessary is not, by itself, a problem. However, the spiking levels used were the same in all cases: 10, 20, and 30 µg/L. These concentrations are considerably higher than most of the measured sample concentrations (1.1 - 9.2 µg/L). Spiking levels for MSA are generally targeted to be approximately 50, 100, and 150% of the expected sample concentration (based on the original run). When they are so much higher than the sample concentrations, the reported results are obtained by extrapolating beyond the established "calibration curve," and are therefore not quantitatively reliable. Since all of the results for arsenic measured by MSA in the samples listed above were less than the lowest spiking concentration, all six results warranted qualification as estimated (J) on this basis.

Post-digestion spike recoveries for lead in all samples except BS052-RW were below 85%; recovery of lead in BS047-EW was below 40%. In addition, no recovery could be measured in the initial run of BS027-EW due to detection of lead above the calibration range. The following actions were taken:

- Sample BS027-EW was rerun at a 1:10 dilution with acceptable post-digest recovery (88.6%). The result from the diluted analysis was appropriately reported and no qualifiers were warranted.

- Sample BS032-RV was rerun by MSA. An acceptable correlation coefficient was not achieved in either MSA attempt; the result (22.2 µg/L, or 2.2 mg/Kg) from the MSA with the best correlation (0.9920) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation.

- Sample BS034-WS and its spike and duplicate were rerun by MSA. Acceptable correlations were obtained for all three samples; the "S" qualifier applied to the sample result (3.9 µg/L, or 0.37 mg/Kg) was therefore removed and no further action was required.

- Sample BS035-WS was rerun by MSA. The correlation coefficient was acceptable (0.9959) in the only run performed; this result was correctly calculated and

accurately reported (1.2 µg/L, or 0.12 mg/Kg). Therefore, the "S" qualifier appropriately applied by the laboratory was removed by the validator and no additional qualifiers were required on this basis.

- Sample BS040-EW was rerun by MSA. An acceptable correlation coefficient was not achieved in either MSA attempt; the result (24.4 µg/L, or 2.3 mg/Kg) from the MSA with the best correlation (0.9874) was appropriately reported and flagged "+" by the laboratory. This result was qualified as estimated (J) based on the poor MSA correlation.

- Sample BS042-EW was rerun by MSA. The correlation coefficient was acceptable (0.9957) in the only run performed; this result was correctly calculated and accurately reported (12.3 µg/L, or 1.10 mg/Kg). Therefore, the "S" qualifier appropriately applied by the laboratory to this lead result was removed by the validator and no additional qualifiers were required on this basis.

- Sample BS047-EW was rerun by MSA. The correlation coefficient was acceptable (0.9964) in the only run performed; this result was correctly calculated and accurately reported (7.1 µg/L, or 0.69 mg/Kg). Therefore, the "S" qualifier appropriately applied by the laboratory to this lead result was removed by the validator and no additional qualifiers were required on this basis.

- Sample absorbance in the remaining samples affected by low post-digest spike recoveries for lead was less than 50% of the spike absorbance; therefore, no reruns were required and the results were appropriately flagged with a "W" by the laboratory. These results were qualified as estimated (J, UJ) on this basis.

As described above for arsenic, some of the MSA analyses performed for lead would not have been required under the CLP protocols and the spiking concentrations consistently used were not universally appropriate. Results for lead were within the 10-30 µg/L spiking range for three of the samples run by MSA; these results were therefore not adversely affected by the spiking levels used. Results for lead in BS034-WS, BS035-WS and BS047-EW were all less than the lowest spike concentration used, and were qualified as estimated (J) on this basis.

Duplicate injection precision exceeded the 20% relative standard deviation (RSD) criterion in several cases where positive results were detected (including some spiked runs). Since all of the affected results were otherwise qualified as estimated, no additional action was required on this basis.

IX. ICP Serial Dilution Analysis

No analyses were performed by ICP on samples in this SDG.

X. Detection Limits

MDLs were correctly calculated and accurately reported. **Note that the reported MDLs are not corrected for percent solids.**

XI. Sample Result Verification

Sample results were correctly calculated and accurately reported. Appropriate dilutions were made as required for quantitation of target analytes. **Note that the reported results are not adjusted for the percent solids in each sample.**

Positive sample results for arsenic and lead greater than the applicable MDLs but below the RLs were correctly reported by the laboratory with "B" qualifiers. As concentrations approach the MDL the accuracy of the measurement decreases; values closer to the RL, however, are generally more accurate. A guideline of 2xMDL was used to determine whether the reported results warranted qualification: specifically, sample results below the respective RL and not otherwise qualified warrant qualification as estimated (J) if they are also less than 2xMDL. No sample results in this SDG were qualified as estimated (J) on this basis alone. All "B" qualifiers applied by the laboratory were removed by the validator.

Documentation of percent solids calculations was provided in the data package, and calculations were correctly performed. Note that the percent solids in each of the tissue samples was very low (≤28.0%); since the reported results are not adjusted to account for the moisture content of each sample, no qualifiers were applied on this basis.

XII. Documentation

Chain-of-custody (COC) records were present and accurately completed for all samples reported in this data package except that

cooler temperature on laboratory receipt was not recorded; it is noted on each COC that the samples were packed in ice. No preservation criteria have been established for biological samples, and no qualifiers were applied on this basis; however, documentation of the cooler temperature on receipt would be useful for future reference.

Internal laboratory COC records were provided for each sample, documenting the retrieval of each "whole sample" from storage for preparation and return of the samples to storage, generally on the same day. No similar documentation is provided, however, for the digestates, and it is not clear how they were stored prior to analysis.

XIII. Overall Assessment

Sample results for inorganic analytes were determined to be valid as reported, with the following exceptions:

- Results for lead in BS052-RW and BS053-MS were qualified as estimated (J, UJ) due to low recovery of the CRDL standard. The lead result in BS053-MS warranted similar qualification due to a low post-digest spike recovery.
- Results for mercury in BS043-GF and BS052-RW were qualified as estimated (J) due to a high CRDL standard recovery.
- Results for arsenic in BS033-SS, BS034-WS, BS038-FD, BS040-EW, BS046-WS and BS047-EW were qualified as estimated (J) due to the high spiking levels used in the MSA analyses relative to the sample concentrations. Arsenic results in BS033-SS, BS038-FD, BS040-FD warranted similar qualification due to poor correlations in the MSA analyses.
- Results for arsenic in BS052-RW, BS053-MS, BS027-EW, BS048-EW, BS032-RV, BS035-WS, BS036-WS, BS037-FD, BS039-FD, BS042-EW, BS043-GF, BS044-WS and BS045-WS were qualified as estimated due to low post-digest spike recoveries.
- Results for lead in BS032-RV and BS040-EW were qualified as estimated (J) based on poor correlations in the MSA analyses.
- Results for lead in BS034-WS, BS035-WS and BS047-EW were qualified as estimated (J) due to the high spiking levels

used in the MSA analyses relative to the sample concentrations.

- Results for lead in BS033-SS, BS036-WS, BS037-FD, BS038-FD, BS039-FD, BS043-GF, BS044-WS, BS045-WS and BS046-WS were qualified as estimated due to low post-digest spike recoveries.

The laboratory should be requested to provide clarifications of reported QC information as described in Sections II and VII to ensure that accurate documentation is available for future reference.

This report should be considered part of the data package for all future distributions of the inorganics data.

TRILLIUM INC.

ATTACHMENT A

Data Summary Forms
Laboratory Project No. 688.02
SDG 027-EW
Arsenic, Lead and Mercury in Biological Tissues

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 027–EW

Trillium Project No.: 92212

	Sample Number	BS027–EW		BS032–RV		BS033–SS		BS034–WS		BS035–WS		BS036–WS		BS037–FD		BS0038–FD		BS039–FD	
	Lab ID	31000353		31000355		31000356		31000357		31000361		31000362		31000363		31000364		31000365	
	% Solids	14.8		26.7		27.7		22.5		22.6		19.4		23.8		23.8		22.1	
RL																			
0.5	Arsenic	0.30	J	0.10	UJ	0.21	J	0.16	J	0.09	UJ	0.09	UJ	0.10	UJ	0.10	J	0.09	UJ
0.5	Lead	13.7		2.2	J	0.10	UJ	0.37	J	0.12	J	0.09	UJ	0.10	UJ	0.09	UJ	0.09	UJ
0.025	Mercury	0.06		0.03		0.13		0.29		0.26		0.17		0.14		0.16		0.12	

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 027–EW

Trillium Project No.: 92212

	Sample Number	BS040–EW		BS042–EW		BS043–GF		BS044–WS		BS045–WS		BS046–WS		BS047–EW		BS048–EW		BS052–RW	
	Lab ID	31000366		31000367		31000368		31000369		31000370		31000371		31000372		31000354		31000351	
	% Solids	17.8		17.7		19.1		21.1		22.0		19.4		18.4		20.7		25.8	
RL																			
0.5	Arsenic	0.43	J	0.21	J	0.13	J	0.09	UJ	0.10	UJ	0.19	J	0.89	J	0.39	J	0.11	J
0.5	Lead	2.3	J	1.10		0.10	UJ	0.09	UJ	0.10	UJ	0.10	UJ	0.69	J	1.9		0.09	UJ
0.025	Mercury	0.07		0.10		0.02	J	0.15		0.18		0.19		0.15		0.24		0.02	J

DATA SUMMARY FORM: INORGANICS
BIOTA SAMPLES
(mg/Kg)

Site Name: York Oil Superfund Site

Sampling Dates: Sept 8–17, 1993

SDG #: 027–EW

Trillium Project No.: 92212

	Sample Number	BS053–MS	
	Lab ID	31000352	
	% Solids	28.0	
RL			
0.5	Arsenic	0.09	UJ
0.5	Lead	0.25	J
0.025	Mercury	0.16	

TRILLIUM INC.

ATTACHMENT B

Inorganic Analysis Data Sheets (Form I)
Laboratory Project No. 688.02
SDG 027-EW
Arsenic, Lead and Mercury in Biological Tissues

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85027-EW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: Sas No.: SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000353

Level (low/med): LOW Date Received: 10/04/93

% lids: ~~100.0~~ 14.8 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.30	B	W J	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	13.7			F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.06			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/19/93

Color Before: Clarity Before: Texture:

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Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS032-RV

ame: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

x (soil/water): BIOTA Lab Sample ID: 31000355

(low/med): LOW Date Received: 10/04/93

olids: ~~100.0~~ 26.7 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	2.2		W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.03			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS033-SS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000356

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 27.7 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.21	B	+ J	F CAE 11/19/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.10	U	W J	F CAE 11/19/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.13			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85034-WS

Name: HES_INC._____ Contract: BBES_____

b Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

ix (soil/water): BIOTA Lab Sample ID: 31000357

vel (low/med): LOW__ Date Received: 10/04/93

lids: ~~100.0~~ 22.5 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.16	B	S J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.37		S J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.29			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS035-WS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: Sas No.: SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000361

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 22.6 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.12	B	B J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.26			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BB036-WS

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: ____ SAS No.: ____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000362

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 19.4 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.09	U	W I	F CAE 11/19/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.09	U	W I	F CAE 11/19/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.17			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: ____ Clarity Before: ____ Texture: ____

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Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS037-FD

ame: HES_INC. Contract: BBES

Code: HAZLET Case No.: Sas No.: SDG No.: 027-EW

x (soil/water): BIOTA Lab Sample ID: 31000363

(low/med): LOW Date Received: 10/04/93

olids: ~~100.0~~ 23.8 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.10	U	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.14			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

B5038-FD

Lab Name: HES_INC. Contract: BBES

Lab Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000364

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 23.8 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	B	+ J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.09	U	+ J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.16			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85039-FD

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000365

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 22.1 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.09	U	W J	F CAE 11/19/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.09	U	W J	F CAE 11/19/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.12			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

39 040-EW

ame: HES_INC. Contract: BBES

Code: HAZLET Case No.: Sas No.: SDG No.: 027-EW

x (soil/water): BIOTA Lab Sample ID: 31000366

el (low/med): LOW Date Received: 10/04/93

ids: ~~100.0~~ 17.8 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.43	~~B~~	+ J	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	2.3		+ J	F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.07			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/19/93

CAE 11/19/93

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lor After: Clarity After: Artifacts:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85042-EW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: Sas No.: SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000367

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 17.7 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.21	B	W J	F CAE 11/19/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	1.1		S	F CAE 11/19/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.10			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

89043-GF

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000368

Level (low/med): LOW Date Received: 10/04/93

% Solids: ~~100.0~~ 19.1 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.13	B	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.10	U	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/19/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS044-WS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000369

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 21.1 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.09	U	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.15			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85045-WS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000370

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 22.0 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.10	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.10	U	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.18			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS046-WS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000371

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 19.4 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.19	B	S J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.10	U	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.19			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS047-EW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000372

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 18.4 CAE 11/14/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.89	B	S I	F CAE 11/14/93
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	0.69		S I	F CAE 11/14/93
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.15			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS 048-EW

[redacted] Name: HES_INC. Contract: BBES

[redacted] Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

[redacted]ix (soil/water): BIOTA Lab Sample ID: 31000354

[redacted]vel (low/med): LOW Date Received: 10/04/93

[redacted]lids: ~~100.0~~ 20.7 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic	0.39	B	W	F
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead	1.9			F
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.24			AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

CAE 11/19/93

[redacted]l Before: _____ Clarity Before: _____ Texture: _____

[redacted]lor After: _____ Clarity After: _____ Artifacts: _____

[redacted]nts:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

85052-RW

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000351

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 25.8 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.11	B	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.09	U	J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.02		J	AV	CAE 11/19/93
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

BS053-MS

Name: HES_INC. Contract: BBES

Code: HAZLET Case No.: _____ SAS No.: _____ SDG No.: 027-EW

Matrix (soil/water): BIOTA Lab Sample ID: 31000352

Level (low/med): LOW Date Received: 10/04/93

Solids: ~~100.0~~ 28.0 CAE 11/19/93

Concentration Units (ug/L or mg/kg ~~dry~~ wet weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum				NR	
7440-36-0	Antimony				NR	
7440-38-2	Arsenic	0.09	U	W J	F	CAE 11/19/93
7440-39-3	Barium				NR	
7440-41-7	Beryllium				NR	
7440-43-9	Cadmium				NR	
7440-70-2	Calcium				NR	
7440-47-3	Chromium				NR	
7440-48-4	Cobalt				NR	
7440-50-8	Copper				NR	
7439-89-6	Iron				NR	
7439-92-1	Lead	0.25	B	W J	F	CAE 11/19/93
7439-95-4	Magnesium				NR	
7439-96-5	Manganese				NR	
7439-97-6	Mercury	0.16			AV	
7440-02-0	Nickel				NR	
7440-09-7	Potassium				NR	
7782-49-2	Selenium				NR	
7440-22-4	Silver				NR	
7440-23-5	Sodium				NR	
7440-28-0	Thallium				NR	
7440-62-2	Vanadium				NR	
7440-66-6	Zinc				NR	
5955-70-0	Cyanide				NR	

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: